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- Other areas of air and space transportation research, policy, theory, case study, practice, and issues

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In Search of Membership Satisfaction: The University Aviation Association (UAA) Survey

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ABSTRACT

The beliefs, attitudes, and values of the over 550 members of the University Aviation Association (UAA) were the subject of a satisfaction survey sent to all members. Members were asked a variety of questions about their opinions concerning specific association functions, communication methods, meetings, general organizational operations, as well as questions about internal and external relations. Additionally, a section was provided for respondents to make anecdotal comments. Over 40 percent of the members responded to the initial mailing of the survey.

INTRODUCTION

The University Aviation Association was founded almost fifty years ago and is an organization of over 550 members. Most members are either college and university aviation educators, aviation industry professionals interested in collegiate aviation programs, or individuals from the government and aviation association sector.

Among the objectives of UAA, as stated in the Bylaw (UAA, 1995), are the following:

1. To encourage and support the attainment of the highest standards in aviation education at the college level,

2. To provide a means of developing a cadre of aviation experts,

3. To furnish a national vehicle for research and the exchange of information, and

4. To actively support aviation--oriented teacher education.

UAA addresses these objectives by conducting its business at several annual meetings, by maintaining a central office, and by providing numerous vehicles for association communication dissemination and member interaction. A Board

of Trustees determines UAA policy and an executive director administers the day--to--day central office functions.

BACKGROUND

Prior to the 1980s, UAA was largely an organization that just met several times a year; while there was always activity during the year, the association tended to maintain a somewhat low profile. However, in 1984 with the implementation of the Federal Aviation Administration's (FAA) Airway Science (AWS) program, UAA suddenly became the primary contact between the FAA and the collegiate aviation community. This contact has had a significant impact on the entire fabric of UAA. Specifically, through the financial impact of the AWS grant program on both member institutions, as well as on UAA itself, the size, scope, and the general thrust and focus of UAA changed and in many ways broadened. Additionally, although there was never any direct financial support of UAA membership services as a result of AWS, there was central office enhancement which added value to members indirectly.

Recently though, funding for the AWS program has come under scrutiny. This is a result of extensive federal budget modifications, as well as a result of the FAA's desire to play a less active role in AWS. Thus, certain contracted UAA programs, previously supported by federal sources, may be reduced or even eliminated. Consequently, the UAA membership, finance, and strategic planning committees deemed it critical to examine the current state of the association and attempt to determine the need to modify the future goals of the organization. Additionally, as the possibility of more burden being placed on the membership in the form of increased reliance on dues as a primary revenue stream for UAA, the health of the organization, as well as the attitudes and beliefs of the membership needed to be determined. Also, consideration needed to be given to the analysis of both the ``corporate culture'' and the possible need to ``re-- engineer'' the organization.

POSSIBLE ORGANIZATIONAL CHANGE

The corporate culture, or in this specific instance the organizational culture ``can be defined as the set of values, beliefs, understandings, and norms shared by members of an organization'' (Daft, 1994, p. 124). These values, although they can not be observed directly, manifest themselves in the way that members interact with each other. Such behavior can have a positive, as well as a negative affect on any organization. Within most organizations, the existence and influence of the informal group within the formal organizational structure is clearly documented in the literature. As cited in Daft, Chester Barnard first identified the existence of the informal organization and found that ``informal relationships are powerful forces that can help the organization if managed properly''

(Daft, 1994, p. 50). In the case of UAA, data needed to be gathered about such value laden ideas as the following.

1. Do members share equally in the work of the organization?

2. Do all member institutions (2 year schools and 4 year schools) benefit equally from association membership?

3. What is the state of organization?

4. Does UAA wish to change:

   a. the way the association does business both internally and externally,
   b. the organization's goals, objectives, and mission,
   c. any procedure, process, or plan?

5. What is the perception of the members as to the state and direction of the association?

A current strategy for organization analysis and change is the process of organizational ``re--engineering.'' Re--engineering is an investigative evaluation of all facets of the organization, its mission and goals, its processes and procedures, its marketing and service focus, and its people and their purposes. Re--engineering involves a bottom--up, systems analysis approach that strives to answer the questions, ``how and why do we do what we do'' and ``is this or another way best.'' There is employee/member ownership and active participation in all phases of the process.

Thus, with the fiscal portion of the AWS program changing and the need to consider re--engineering UAA apparent, a more detailed determination of the state of the organization was imperative. With this in mind, the association's executive committee and heads of several committees met and began the first step in the process, i.e. asking the members what they thought. Such a methodology is consistent with that suggested by Gable who stated ``the only way to understand what a member expects from the organization is to ask'' (1994, p. 421).

It was determined that an abbreviated SWOT (strengths, weaknesses, opportunities, and threats) survey would be the initial data gathering effort. This survey was sent to a stratified sample of members. The results of this survey was then the basis of a more extensive survey that was distributed to all members.

SURVEY METHODOLOGY

A questionnaire was selected as the full survey instrument. This method of data collection was chosen since such an approach makes ``it possible to measure what a person knows (knowledge or information), what a person likes and dislikes (values and preferences), and what a person thinks (attitudes and beliefs)'' (Tuckman, 1988, p. 213). Of these areas of focus, the last two seemed to be most important to UAA.

Sample Selection

The entire membership of UAA (n = 577) was selected to receive the survey. Such a strategy eliminated any selection bias and allowed generalization of the results to the entire organization. Of the 577 members, 411 are classified as Individual which are either Professional (educators) or Associate (aviation professional), 54 are Corporate, 100 are Institutional (a college or university), and 12 are Affiliate (students).

Survey Question Development

The development of the survey questions was the result of SWOT data and analysis of satisfaction survey literature. The SWOT results indicated that the strengths, weakness, opportunities, and threats to UAA included concerns about communication, the relationship between industry and UAA, revenue sources and funding issues, equality of institution participation, and internal association relations.

It appears that the SWOT observations above are consistent with those found in other association peer self--evaluation. Coughlan states ``that the complex and vibrant nature of associations makes it imperative that they undergo continual and critical evaluation to ensure that they are providing value to members. In many association peer review evaluations,…five categories have merited review:

1. Mission, purpose, and goals,

2. Governance,

3. Finance,

4. Membership recruitment and retention,

5. Communication'' (1994, p. 75--76).

Consequently, using the data above and selected literature, the final survey included eleven demographic questions, forty--six scale questions, and a place for the respondent to offer anecdotal comments. The demographic questions focused on the respondent's category of membership, length and vitality of membership, degrees earned, the highest institutional degrees granted (if a faculty member), past meeting attendance, aviation background and interests, and access to electronic mail and facsimile transmission.

The Likert questions used the scale 1 – Strongly Disagree, 2 – Disagree, 3 – Neutral, 4 – Agree, 5 – Strongly Agree, and 6 – Do Not Know. Questions in this section focused on the respondent's feelings and attitudes about internal and external association relationships, organizational leadership, fiscal and communications issues, membership services, and meeting planning.

Survey Distribution

A survey packet was sent to all members. The packet consisted of a cover letter explaining the need for the survey, the survey itself, and a self-addressed, stamped return envelope. All respondents were assured that their responses would be confidential. There was no plan for the sending reminders to non- respondents, as the time frame from when the survey was mailed to when initial data was needed was just five weeks.

DATA ANALYSIS

The analysis of the returned survey data was accomplished using *Minitab for Windows Statistical Software Adapted for Education* (Minitab, Inc., 1995). The statistical computations consisted of both descriptive and inferential statistics. Specifically, frequency distributions for all questions were tallied and several chi-square cross-tabulations were performed.

Although there were forty-six Likert scale questions, the following section will highlight only extremely noteworthy areas of concern. These areas centered on the organizational culture, fiscal matters, external relations, communications, and college and university relations. Discussion in these areas will include both tabular data, as well as anecdotal comments relative to the specific area subject. In the following section, the text of survey questions will appear in quotation marks.

A total of 235 surveys were returned of the 577 sent for a return rate of 40.7 percent. By category of membership, Individual respondents totaled 163, or 39.6 percent, Corporate respondents totaled 17, or 31.4 percent, Institutional respondents totaled 45, or 45.0 percent, and Affiliate respondents totaled 7, or 58.3 percent; three respondents did not indicate a category.

Demographics

The typical respondent had been a UAA member for more than five years (55.0 percent), held at least a Master's Degree (55.0 percent), considered themselves not a very active member (45.0 percent) and if an educator, were associated with an institution that offered a four-year degree (40.0 percent) or a graduate degree (38.0 percent); only 22.0 percent of the educator respondents taught at a school that offered a two-year degree.

Concerning meeting attendance, the respondents indicated that they attended more UAA fall meetings (36.0 percent) than spring meetings (23.0 percent), or had never attended a fall meeting (30.0 percent) or spring meeting (44.0 percent). The respondents' aviation background was primarily military (35.0 percent) or general aviation (45.0 percent), as compared to their current interest/focus of air carrier (13 percent) and general avia-

tion (56 percent). With respect to communication channels that were available to them, 177 or 76.0 percent of the respondents indicated that they had access to electronic mail and 221 or 95.0 percent could receive a fax.

Survey Questions

Organizational Culture: Numerous survey respondents indicated that an informal network within UAA exists. One individual stated ``UAA is a `good ol' boy' association. If you are in the `in group' it is a fine organization and if you are not, it's not.''

To attempt to determine the ``equality'' and ``friendliness'' within UAA, several survey questions focused on the organizational culture. A cross-tabulation compared how long an individual had been a member (less than three years, three – five years, and more than five years) with the survey question, ``the association represents all members fairly.'' The relationship was found insignificant [$X2$ (10, N = 168) = 9.087. P.05]. Data for all respondents is included in Table 1.

The actual definition of `fairly' may be somewhat subjective. Eighty-

TABLE 1
Level of Agreement By UAA Members to the Statement,
``The association represents all members fairly''

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Don't Know
21 (9%)	38 (16%)	49 (21%)	76 (33%)	11 (5%)	35 (15%)

seven, or 38.0 percent, of the respondents agreed or strongly agreed that the association represented members fairly, 59, or 25.0 percent, disagreed or strongly disagreed.

When asked if UAA ``is a friendly organization,'' 138 respondents, or 59.0 percent, agreed or strongly agreed. A cross tabulation between length of membership and this survey question found no significant relationship. However, when a cross-tabulation was performed comparing how long someone had been a member and whether ``new members to UAA are made to feel welcome,'' there was a significantly different response. Specifically, $X2$ (10, N = 230) =23.38,1 P <.05. Data for that computation is contained in Table 3.

When considering the number of respondents that indicated that they did not know about `feeling welcome,' 26, or 45.0 percent, had been members less than three years as compared to 23, or 18.0 percent, who had been members more than five years.

2 (1%)	7 (3%)	9 (4%)	87 (38%)	98 (42%)	1 (.5%)

TABLE 6
Level of Agreement By UAA Members to the Statement,
``The use of E-mail for association, as well as for member to member communication
should have a high priority''

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Don't Know
7 (3%)	19 (8%)	50 (22%)	87 (38%)	57 (25%)	10 (4%)

Of those that had an opinion concerning the `sense of welcome,' 52, or 41.0 percent, of those that had been members for over five years agreed or strongly agreed. It appears that newer members are less certain about the hospitality of UAA.

Fiscal Matters: Forty--nine percent of the respondents indicated that ``the health and vitality of UAA was better than when they joined.'' However, when asked about alternate financial sources, 41.0 percent of the respondents did not know if UAA ``was overly dependent on a few benefactors'' and 38.0 percent did not know if UAA ``was overly dependent on federal contracts.''

While 113, or 49.0 percent, of those responding agreed or strongly agreed that the ``health and vitality of UAA is better than when they joined,'' only 22, or 9.5 percent, indicated that they agreed or strongly agreed that ``the financial health of UAA is good.'' The respondents indicated that they were also not in general agreement concerning the financial health of the association as shown in Table 3. One hundred--eight, or 47.0 percent, of the respondents did not know about the financial health of the organization. It appears there is no agreement about the state or the definition of health and vitality of the organization, as well as, a lack of knowledge concerning alternate revenue streams other than dues.

TABLE 2
Cross-Tabulation of the Length of Membership and Sense of Welcome

Years	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Don't Know
Less than 3	1 (2%)	5 (9%)	8 (14%)	10 (17%)	8 (14%)	26 (45%)
3-5	2 (4%)	10 (22%)	7 (16%)	10 (22%)	4 (9%)	12 (27%)
More than 5	7 (6%)	14 (11%)	31 (24 %)	40 (32%)	12 (9%)	23 (18%)

Note: All percentages are by row and may not add up to 100 percent due to rounding.

TABLE 5
Level of Agreement By UAA Members to the Statement,
``The UAA Newsletter is an important means of association communication''

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Don't Know

External Relations: There was little agreement concerning the manner in which the respondents perceived the identity of UAA within the aviation community. As shown in Table 4, 36.0 percent of the respondents disagreed or strongly disagreed that ``UAA is well known within the aviation industry'' while 33.0 percent agreed or strongly agreed; 30.0 percent either were neutral or did not know. One respondent stated ``the benefits of UAA membership seems to be unknown to many of the corporate members. I feel the services provided to the institutions are adequate, but have a hard time finding the connection between the corporate and academia. Should there be a session (at meetings) on possible partnerships? More internships, etc.?'' Another respondent's comment identified another concern in that, ``UAA should try to obtain more contributions from the industry. Although it is an university association, the aviation industry benefits greatly from it.''

However, the exact interface between UAA and industry needs may be unclear. One individual stated that, ``the focus of the UAA is aviation flight training. The industry also demands a well educated manager. More support and

Degree	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Don't Know
2-year	3 (8%)	9 (26%)	10 (27%)	5 (13%)	2 (5%)	9 (24%)
4-year	6 (9%)	14 (29%)	19 (29%)	7 (11%)	1 (9%)	19 (29%)
Graduate	9 (14%)	20 (17%)	11 (17%)	8 (13%)	3 (9%)	13 (20%)
Total	18 (11%)	43 (26%)	40 (24%)	20 (12%)	6 (4%)	41 (24%)

Note: All percentages are by row and may not add up to 100% due to rounding.

acceptance needs to be given to those institutions working in the management/transportation sector.''

Communications: Two facets of communications seemed to solicit strong opinions from the respondents. Those areas were the importance of the UAA Newsletter and the need for more electronic communications. A total of 80.0 percent of the respondents (Table 5) agreed or strongly agreed that ``the UAA Newsletter is an important means of association communication.'' Only 4.0 percent of the respondents disagreed or strongly disagreed. In another survey question, 87.0 percent of the respondents agreed or strongly agreed that they ``read the Newsletter as soon as they receive it.''

Concerning electronic communication, the respondents indicated that such a medium is important. In Table 6, 144 or 63.0 percent of the participants in the survey indicated that ``the use of e--mail for association, as well as, for member to member communication should have a high priority.'' Additionally, several comments by respondents echoed the consensus of the survey. One said, ``UAA needs to build a strong and visionary infrastructure that includes information services (WWW) . . . . [and] address educational issues from a global perspec-

tive" Another said ``UAA needs to get on the Internet, use e--mail, and have a World Wide Web page."

College and University Relations: The respondents make a high number of anecdotal comments concerning the manner in which UAA addresses the needs of member institutions, particularly with respect to two--year and four--year schools. In most cases, the perceptions of those commenting indicated that a great deal of work needs to be done to foster a better climate. Perhaps the essence of the problem was captured by one individual who stated, ``there are well over 100 two--year colleges with excellent aviation programs that feel like second class citizens or orphans because we are not a university. You can revitalize and infuse new blood into the organization if UAA really made it a point to encour-

age two--year colleges to be active in membership. We are not treated as equals and made to feel welcome."

To test the significance of whether there is equal participation in association duties with respect to the highest degree granted by an institution, a cross tabulation was computed. The resulting value, X2 (10, N = 168) =6.868,1 P <.05, was not significant. However, as shown in Table 7, 61, or 37.0 percent, of the respondents indicated that they disagreed or strongly disagreed concerning fair and equitable participation in association duties among the membership.

One individual may have expressed the prevailing sentiment on this issue. ``Upon joining UAA twelve years ago I was told that it is an organization for three or four institutions; I have see nothing to change that view. One need not read the names of persons going to Washington to testify, to serve on special

committees, or to meet with industry as it is clear what institutions they will be from. That doesn't take away from the UAA fall meetings and such things as newsletter, journal, paper presentations, etc. But it is awfully boring!!''

ADDITIONAL SURVEY RESULTS

- Almost three--fourths of the respondents (162, 71.0 percent) agreed or strongly agreed that ``committees provide a valuable service to UAA, its members, and the organization.''

- Over two--thirds of the respondents (153, 67.0 percent) agreed or strongly agreed that they ``value the experiences they have had as a UAA member.''

- Over half of the respondents (135, 56.0 percent) agreed or strongly agreed that they ``get a fair return on their dues.''

- Over 60.0 percent of the respondents indicated that both the president and the executive director provide adequate leadership and the central office staff was responsive to members requests.

CONCLUSIONS AND RECOMMENDATIONS

The purpose of the membership satisfaction survey was to answer the following questions: (a) do all members share equally in the work of the organization, (b) do all member institutions benefit equally from association membership, (c) what is the state of organization, (d) are changes needed internally and externally, (e) what is the direction of the association. Although a 40.0 percent return rate does not indicate the attitudes and beliefs of the entire membership, the opinions by the respondents nonetheless indicate that certain trends have developed and tentative conclusions may be drawn. These conclusions will be in three areas which mirror the questions above. The three areas are as follows:

1. Equity and Institutional Focus

2. Organizational Culture

3. Fiscal Health, Communication, and Association Visibility

Conclusions

Equity and Institutional Focus: Although many anecdotal comments by the respondents seemed to indicate that there exists an informal organization within UAA, whether this influences association fairness and equity was not clearly defined. Thirty--eight percent of the respondents (Table 1) indicted that the association ``treats represents all members fairly.'' Conversely, 37.0 percent of the respondents answered either neutrally or that they did not know. However, with respect to the issue of whether ``There is equal participation in association duties,'' 37.0 percent of the respondents (Table 7) indicated that they disagreed

or strongly disagreed. It would appear that there is some ambivalence concerning these issues.

Whether there is truly a bias within UAA concerning the degree granted by the school and whether there is equality in association participation was not determined by this survey with any great degree of certainty. There were many anecdotal comments by respondents indicating there is a great deal of concern among the members about whether certain institutions are favored over others and whether schools granting two--years degrees were treated fairly by other members. However, no survey data supported this contention.

Organizational Culture: Although a majority (67.0 percent) of the respondents valued the experiences they have had as UAA members and 56.0 percent of the respondents felt they got a fair return on their dues, there is not a uniform sense of welcome felt by the respondents (Table 2). Numerous (45.0 percent) members of less than three years did not know about the sense of welcome within UAA, while 41.0 percent of the respondents that had been members over 5 years were more certain about a positive UAA hospitality.

Fiscal Health, Communication, and Association Visibility: Whether the state of UAA financial matters was well known to the respondents was not evident; 47.0 percent did not know about the financial health of the association. However, 49.0 percent stated that the health and vitality are better than when they joined. There was no clear indication from the respondents that UAA is overly reliant on certain benefactors or on federal contracts.

The value placed on the *UAA Newsletter* as an important means of association communication was high (Table 5); 80.0 percent of the respondents agreed or strongly agreed to the worth of the publication for that purpose. The use of e--mail for association and member--to--member communication (Table 6) appeared to have a high priority among the respondents; 63.0 percent agreed or strongly agreed to the association's increased use of this communication medium.

Concerning the visibility of UAA within the aviation community, responses of survey participants were mixed. While 33.0 percent of the respondents agreed or strongly agreed that UAA is well known within the aviation community (Table 4), 36.0 percent disagreed or strongly disagreed. It appears that there is a polarized perspective on this question.

Recommendations

The process and steps taken for UAA membership satisfaction survey have provided mixed results in many areas. The fact that there was not a more complete return rate, which could possibly have been enhanced with a second questionnaire mailing or by the use of a reminder mailing, was disappointing. Nonetheless, there are several recommendations that are apparent from the data.

1.

The satisfaction survey should be repeated at a later date and a reminder letter sent to all nonrespondents. This strategy may enhance the return rate. However, the data, although somewhat incomplete, does indicate that there are concerns among the members concerning many value laden issues. Additional data about these issues could assist the Board of Trustees in developing a clearer focus so as to begin to honestly examine association values, beliefs, and purposes and to then consider whether to begin a change process.

2. Member opinions, both from survey data and comments, indicate that there is not a clear sense of hospitality or member and institutional equity within UAA. All members of the association, from all types of institutions, should be made to feel welcome at all association activities. Additionally, the corporate culture should be constantly reviewed so that each member places high value on organization membership and association duties.

3. The need for a total re--engineering effort of UAA is not readily apparent from the data. The respondents were generally satisfied with the leadership of the organization and administration of the central office. The association is not currently in any grave state but the uncertainty of AWS funding could cause a possible change in this status. A suggested strategy would be to periodically review the state of the organization with a focus on always maintaining a strong, vital association.

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How to Use Case Analysis as an Entire Semester Course in Aviation

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ABSTRACT

The purpose of this paper is to discuss the use of the case analysis method as an entire semester course in aviation. The author taught a sixteen week course entitled Case Analysis in Aviation at the University of Nebraska at Omaha (UNO). This paper will provide a summary of that experience and will include a description of the course, the pros and cons to conducting such a class, and a review of how the students evaluated the course. The author hopes to justify using case analysis as the primary methodology for an aviation course and provide guidance on how to develop such a course for other faculty members who may be interested in using this method.

INTRODUCTION

The case method of teaching has been widely accepted in many disciplines as an excellent supplement to a traditional teaching style such as lectures. But, what about using case analysis not as a supplement for a lecture course but as the primary methodology for an entire course? The question is, how does one go about developing a course in case analysis and what kind of experiences should be anticipated? To answer this question, results of teaching a course in which analyzing previously written cases was the primary teaching format are discussed.

DEFINING THE CASE METHOD

There are many definitions of a case. Taylor (1991) defines a case as ``a description of an organization or organizational situation'' (p. 58). According to Sperle (1933) a case is a description of a decision or decisions involved in a real--life situation. A case is also defined as a report used to provide the opportunity to generate new knowledge (Jain, Gooch, & Grantham, 1975). Whether a case relates to an issue of the past or present, or whether it provides an in--depth look at an organization, a case is a written report about a real--world situation that a student can analyze through application of previously learned skills.

Advantages of the case analysis method are numerous. This method allows the student to put what has been learned into action (Ross & Headley, 1983). The ability to apply previously learned skills to a real--world situation is invaluable. The student will see ``the relationship between what he or she has studied and how he or she can apply the knowledge beyond college -- for example in the workplace -- so that instead of being controlled by the environment and by a job, he or she can master it'' (Gordon, 1976, p. 110). In addition to applying lessons from the past, students can develop new skills using the case method. ``The case method encourages creative thinking and open--minded discussion'' (Mallenby, 1983, p. 18) and is ``designed to assist in the development of a mind which has superior ability to transfer its powers from familiar types of problems to new ones'' (Hunt, 1951, p. 177).

There are many sources for locating cases. Some texts have a supplemental casebook such as ``A Casebook for Air Transportation'' by Alexander Wells (1990). Aviation cases can also be located in case books from other disciplines such as ``Case Studies in Finance'' by Bruner (1990). An additional source for a large variety of cases is the Harvard School of Business. Close to fifty different aviation cases can be ordered from Harvard. Professors are encouraged to con-tact case organizations such as the Midwest Society for Case Research. Of course, instructors and students can also write their own cases for use in the classroom.

The case methodology has traditionally been used as an additional teaching tool in lecture based courses. Implementing case analysis in this manner has been well received. According to Taylor (1991), case research methodology has been successfully demonstrated to have significant impacts on the teaching and learning process. In addition, research conducted at Wichita State University (WSU) suggests using cases in addition to the traditional lecture class provides students with the potential for enhanced learning (Ross, Headley, E., Headley, D., 1988). These studies all involved various amounts of case analysis used in conjunction with a traditional lecture course. According to the literature, there does not appear to be any such studies using case analysis as the primary teach-ing method for an entire course. So the question remains, can the case analysis method be implemented successfully as an entire semester course?

CASE ANALYSIS AS AN ENTIRE SEMESTER COURSE

Course Description

Since students who use case analysis need a strong foundation in their field of study (Ross & Headley, 1983), the case analysis course was a senior level class with prerequisites. Students had to complete the introductory aviation course and be a declared aviation major. The teaching objectives for a case analysis class were identified with the assistance of both internal and external peer re-view. The objectives for students are as follows:

1. develop critical thinking skills;

2. study past and present issues in aviation;

3. be able to communicate opinions and support them with documented information;

4. develop an ability to listen to other's opinions and keep an open mind in a discussion or debate;

5. writing clear and concise analysis based on case materials; and

6. develop team building skills;

The course was developed as a typical sixteen week model. The first two weeks were devoted to introducing the students to the case method. Since some students had no experience with this method, the components of a case as described in a case writing monograph (Bowen, 1994) were discussed in week one. A case from that monograph was introduced as an example in the second week. Using this example case, students were eased into case study by assigning simple worksheets that focused on only one section of the case at a time. These worksheets (see Appendix A) were discussed and reviewed in class until the students had good working knowledge of traditional case design. This was determined by successful completion of the worksheets.

In the weeks following, the class studied approximately one case a week. Students were expected to have read the cases prior to the start of each new week. Two or three students were assigned as researchers for the weekly case. As researchers, they were required to obtain and share with the class any recent developments related to the case topic. Therefore, a good case that may be out--of--date can still be utilized effectively. This method also allows for current events discussion and provides the opportunity for student research and presentations.

Each student was required to prepare a one--page abstract of each weekly assigned case. The major assignment was an in--depth written case analysis. For this final project, students selected a case (it could be assigned or the student could locate the case), wrote a seven page analysis, and presented it to the class. Guidelines for this assignment can be seen in Appendix B.

As mentioned, there are numerous sources for cases. A course can be tailored to a specific area based on the selection of cases for the class. For example, all cases for a course could focus on airline management, airport management, flight training, etc. Case subjects that were used in this class included ATC Privatization, Denver International Airport, Mesa/Air Midwest Buy Out, Deregulation of the Airline Industry, and Product Liability. These particular cases were selected in order to maintain a broad based topic approach and to allow for the discussion of several aviation issues. Since the course could easily be directed to either a particular discipline or can take a general approach, a case analysis class

may be designed for use as an effective capstone course for a variety of aviation programs.

Teaching Methodology

Using the case method allows the opportunity to incorporate a variety of teaching methods. For the first weeks when introducing the case method, lecture was the primary teaching style used. In addition, some discussions, both as a class and in a small group setting, were conducted to review the first case provided and ensure that all students had an understanding of the components of a case.

For analyzing the weekly cases, instructor--guided discussion was often used. Students could discuss in either a large group setting or in several small groups with reports back to the class as a whole. Discussion questions provided by the instructor included the following:

- What is the primary issue of the case?

- What are the advantages and disadvantages to the alternative solutions the author provided?

- Do you agree with the author's recommendation? Why or why not?

- What would you do in this situation?

- What recent events have taken place that affect this topic or issue?

- Did the author fulfill his or her case objectives (if provided)?

The students were asked to respond to these questions using the information provided in the case, their written one--page analysis, and previous knowledge gained from other courses.

To add some variety (and fun) students also participated in role playing. A continued memorandum (see Appendix C) was provided to the students to set up the scenario. The role play was based on a case that addressed a possible merger between two airlines. Students were assigned management positions from various departments at one of the two organizations. A board meeting was conducted and the managers from both airlines discussed a buy out versus a merger. Students were expected to be familiar with issues affecting their particular operational area and participate in the discussions accordingly. Once a decision was made as to the course of action, negotiations over the terms of the agreement were conducted. With the uniqueness and flexibility of the case method, many innovative teaching methods can be used.

There were a few problems that developed during the course. One was time. The course was taught as a three day a week, 50 minute class. This was just enough time to get really engrossed in a discussion about a case only to have to stop because the class session was over. Often we had to break some excellent

discussion in the interest of time and it is not always easy to simply pick up where the discussion. It is recommended that the course be taught as a three--hour evening course, if possible. Another problem will arise if students do not have the appropriate experience with the topic area. Students must have the background information on a given subject area, such as airline management, in order to fully participate in the case analysis process. The faculty should pay close attention to the prerequisite courses established for a case analysis class in order to address this issue.

FEEDBACK FROM THE STUDENTS

``Instructional effectiveness in higher education can be measured in two ways: the first being an evaluation of the instructor and the second being the evaluation of the students in the subject matter'' (Harford & Meadows, 1991, p. 41). To provide some feedback from the students and some insight to the effectiveness of the course, results from three surveys will be used. Two different teacher evaluations were completed by case analysis students. The first evaluation tool was the UNO Student Perception of Teacher Performance. For additional comparison, the WSU Student Perception of Teacher Performance questionnaire was also provided. To identify the student's perception of this method as an entire semester course, one additional survey, the Case Analysis Survey was developed particularly for this course and asks for student reaction to the case method.

Of the twenty--one enrolled in the course, fifteen students completed all three surveys in class, without the instructor present. Of the fifteen students, thirteen were upperclassmen (Juniors or Seniors). Given the small sample size, the results are provided to simply develop a sense of how these students reacted to the course. The majority of the students (13) were aviation majors. The remaining students had varied majors but were allowed in the class because they were aviation minors and/or had completed several aviation courses prior to enrolling in the case analysis course.

ANALYSIS OF RESULTS

Using the first survey from UNO, students consistently gave high marks throughout the evaluation. All students (100 percent) agreed or strongly agreed that the instructor stimulated thinking. Even though some students had no previous experience with the case method, 100 percent agreed or strongly agreed that the instructor was able to explain and clarify subject material. This was probably due in part to the fact that 100 percent of the students agreed or strongly agreed that the materials assigned were effective. Students were also satisfied with the grading process. 80 percent strongly agreed that grading was fair. The most substantial finding in the WSU survey is that 87 percent of students sur-

veyed responded with the highest available mark (``very much so'') to the worthwhile nature of the course.

The Case Analysis Survey provides information indicating the student's perception of the case analysis method and how it compares to other learning techniques. It should be noted that this survey only indicates the student's opinion of information learned. Another study would be required to examine the quantity and quality of subject matter students obtain using case analysis versus a more traditional teaching approach. The results of the Case Analysis Survey revealed that students thought the course was worthwhile and 93 percent would recommend it to other students. All respondents (100 percent) strongly agreed or agreed that they learned more using case analysis than they learn by reading a textbook. Since most students (thirteen out of fifteen surveyed) were Juniors or Seniors, it is not surprising that 73 percent strongly agreed or agreed that the course should remain an upper level course. Although few (13 percent) identified case analysis as their favorite learning technique, not one student indicated a dislike for this method. The majority of students strongly agreed or agreed that case analysis helps them to understand complicated subjects (86 percent) and helps them remember concepts (87 percent). All students also indicated that they have more interaction with the instructor and 80 percent of students strongly agreed or agreed that the activities in class improved their speaking skills. In addition to the data obtained from the Case Analysis Survey, a few student comments were made. One student stated that the course ``gives students the opportunity to express individual opinions, comments, and arguments on all aspects of aviation.'' In regards to workload, a student wrote, ``I know a lot of students would say otherwise, but I feel one case a week would not be too hard although it was a lot more fun fighting it out in class than writing [the case analysis].'' Several students commented that it was a fun class. There were no negative comments.

CONCLUSIONS

The surveys reveal that students accepted and enjoyed the case analysis course. Survey results show that they believed the course was worthwhile and would recommend it to others. Students indicated they improved in areas such as communication and comprehension and retention of complicated concepts. The assignments and in--class activities were also acceptable to students as indicated by the positive response to the class policies, procedures, and grading. Based on the results of the surveys and experiences of the instructor throughout the development and implementation of the course, the case analysis method can provide the opportunity to create a full semester course that offers a unique and enjoyable alternative for students and faculty.

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APPENDIX A
CASE ANALYSIS WORKSHEET

NAME:_____

After reading the entire case, answer the following questions:

1. What are the critical factors (the most important facts) of the case?

2. What is the single, main strategic issue or problem? (Be specific)

3. Do you agree with the authors solution? Why?

4. Did the author fulfill the teaching objectives? Why or why not?

APPENDIX B
GUIDELINES FOR WRITING CASE ANALYSIS

I. Summary

The summary should be concise and briefly recap the case. The primary purpose of the summary is to refresh the reader's memory of the case. Keep this section no more than one page in length.

II. Problem

Begin this section with a clear statement of the problem. Elaborate on what caused the problem if need be. The problem should be specific and action oriented. The problem or issue statement reflects a situation that must be addressed. However, do not confuse SYMPTOMS of the problem with the problem itself. This entire section should be no longer than one page.

III. Critical Factors

Identify the most relevant FACTS you considered when thinking through the problem, possible alternatives, and outcomes. Critical factors are such things as industry decline, weak financial position, etc. Briefly state critical factors pertaining to your case and tell why you believe these to be critical. This section should be no more than one page in length.

IV. Development of Alternative Actions

Each alternative should provide a feasible, realistic way to solve the problem. Describe each alternative in two or three sentences. Then briefly list the primary advantages and disadvantages for each alternative. Be consistent with critical factors. Some cases may have only two or three alternatives while others may have several. This section should be no more than two pages in length.

V. Recommendations

Select ONE alternative and elaborate on it. Explain why the alternative you selected is superior to the other alternatives and why its advantages outweigh its disadvantages. How might disadvantages be overcome or minimized? What is involved in implementing this alternative? (How long will it take? How much will it cost? etc.) What results do you anticipate? Make sure your recommendations are appropriate and actionable in relation to the situation. BE SPECIFIC!

You may have to make assumptions in formulating your recommendations. Assumptions are acceptable to the extent that they are reasonable and clearly articulated. Use the information you have and work with it. Rarely do decision makers have all the information they would like to have. This section should be no more than two pages.

APPENDIX C

TO: Air Midwest & Mesa Board Members

From: Negotiations Consultant

Date: March 1, 1994

RE: Buy out Talks

All interested parties are invited to attend the next round of negotiations regarding the proposed Mesa/Air Midwest buy out. As a reminder, in our last meeting the following issues were addressed:

- Air Midwest President and VP to gain a seat on the Mesa board.
- All other employees to remain in current positions.
- Air Midwest to become a wholly owned subsidiary
- Air Midwest will not receive more than 49% voting share
- Air Midwest and Mesa will keep separate and distinct route structures

The current offer from the Mesa board to Air Midwest is as follows:

- purchase value $30 million
- $1 cash per share of stock
- golden parachute for each Air Midwest board member, value -- $1 million, 3 year clause
- 15 percent of Air Midwest annual revenue to Mesa

Our next meeting is scheduled for 12:30 p.m., Wednesday, March 2. I request that the following people be present:

> President and V. President Maintenance Rep.
> Pilot Rep.
> Ground Crew rep.
> and any other employees representatives that you feel should attend (i.e., marketing/advertising, ticket sales, etc.)

A Survey of Environmental Issues in the Civilian Aviation Industry

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ABSTRACT

The civilian aviation industry is increasingly being required to comply with the myriad environmental laws currently in force. To gain a better understanding of the types of environmental issues that are being dealt with in the industry, a survey of consulting firms specializing in environmental work at airports was undertaken. The consulting firms were contacted by telephone and asked to answer a specific set of qualitative and quantitative questions from a survey questionnaire. The results of the survey indicated that the majority of the environmental work at civilian aviation facilities is conducted under the National Environmental Policy Act (NEPA) in the form of Environmental Impact Statements (EISs) and environmental audits. Work conducted under the Clean Water Act (CWA) was found to be the second--most important type of work according to the survey participants. Third-- and fourth--most important environmental work indicated was work under the Clean Air Act (CAA) and the Emergency Planning and Community Right--to--Know Act (EPCRA). Other environmental issues were indicated as significant by less than 10 percent of the respondents.

INTRODUCTION

Since the beginning of the industrial era, around the turn of the century, and until just after the middle of this century, industrial activities were carried out by various private and government entities with little concern for the impact that these operations had on the environment. Priorities were different during this time period and industry was mainly concerned with making a profit or providing for the national defense. Contributing to this seeming lack of concern for the environment was a general lack of understanding of the negative impacts from industry and limited knowledge of natural systems. Due to a handful of high profile sites with serious soil and groundwater contamination problems that came to light in the 1960s and 1970s, Love Canal and Times Beach to name the most infamous, increasing public awareness has been directed at the various environmental issues facing modern society. The most sweeping result of this increased awareness has been the passage of a large body of legislation which has created an entire industry of its own. This legislation, beginning in the 1960s and continuing through the 1970s and 1980s, has brought environmental issues to the forefront of national and global consciousness.

One industry that has received somewhat less attention concerning environmental issues until recently is the aviation industry. The reason for this is partly because of the higher priority of other sectors of industry, namely some defense related activities and other sites that pose an imminent threat to human health or the environment, and partly because of aviation's key role in the infrastructure of modern society and a resulting reluctance to cripple the industry with expensive and time consuming environmental programs. Until fairly recently the main environmental issues facing the aviation industry have been the problems of air and noise pollution at major air terminals. However, the industry is now being drawn into the environmental issue mainstream and is faced with complying with a host of existing, and possibly proposed environmental laws.

In order to gain insight into the types of issues that are requiring the most attention within the civilian aviation industry, a limited telephone survey was undertaken. Consulting firms specializing in environmental work within the civilian aviation industry were selected as the survey group. A more detailed description of the survey group is provided in a subsequent section of this paper.

BACKGROUND OF APPLICABLE ENVIRONMENTAL LAWS

As mentioned in the introduction section, the aviation industry is being steadily drawn into environmental issues because of the enactment of the many environmental laws, regulations, and statutes (all hereafter referred to as laws). The system of environmental laws is very diverse and complex. Compliance with these laws can be a great challenge to anyone who is legally bound to follow them. In short, the environmental law system is best defined as an organized way of using all of the laws in our legal system to minimize, prevent, punish or remedy the consequences of actions which damage or threaten the environment or public health and safety (Sullivan 1995). Following is a brief summary of the process by which these laws are created.

The primary legislative body behind most of the environmental laws is the federal government. Environmental laws begin by the introduction of a bill into either the U.S. House of Representatives or U.S. Senate. The bill is then referred to a committee for study and investigation where it is either recommended for passage or killed. When out of committee, the bill is debated in the respective house and if passed then becomes an act. In the environmental field, the House and Senate generally pass different bills, and a conference of House and Senate representatives is needed to resolve the differences. After passage in both houses the act is sent to the office of the president for signing or veto. After an act is signed into law the agency charged with administration of these laws is the U. S. Environmental Protection Agency (USEPA or EPA). The EPA has the ultimate authority for development and promulgation of regulations under the various laws. Regulations may also be promulgated by an executive agency through an executive order issued by the President.

In recent years the EPA has begun to delegate authority for enforcement of the respective environmental laws to the individual state environmental agencies. States may also promulgate their own laws as long as they are at least as stringent as those of the EPA. In many cases these state--specific laws are actually more stringent than those of the EPA.

Numerous environmental laws directly apply, or potentially apply, to operations within the civilian aviation industry. A brief discussion of these laws is appropriate so that the reader has a familiarity with them. Following is a list of the primary environmental laws with a subsequent brief description taken from Sullivan (1995), and Watson and Burnett (1993) of each.

National Environmental Policy Act (NEPA) of 1969, Public Law 91--190. The National Environmental Policy Act of 1969 is a classic document for establishing policies and national goals for the protection of the environment at large. This document represents the first stand on the part of the United States to protect the environment. Its primary impact stems from its goal of requiring industry to consider, for the first time, the impact that the activities had on the environment. This was primarily accomplished through a licensing that also required Environmental Impact Statements (EISs) to be prepared for major projects.

Theses EISs must address such basic issues as the environmental cost versus benefit of proposed projects, the ideal siting of proposed facilities in an attempt to minimize adverse impacts to the environment, and the proposed use of best available technology to minimize the risk of accidents and adverse impacts associated with routine operation of facilities.

Federal Water Pollution Control Act of 1972, and Clean Water Act Amendments of 1977, Public Laws 92--500 and 95--217, respectively. The objective of this Act and its amendments relate mainly to the cleanup and preservation of surface water quality. The primary goals of this Act were:

1. To restore the nation's rivers and lakes to a sufficiently safe quality for swimming and other recreational uses and for the protection of fish and wildlife; and

2. To eliminate discharge of pollutants into the nation's navigable waters.

An important part of the Act (Section 208) relates to waste management, especially with regard to the liquid--component waste discharges from urban--industrial areas and includes treating and disposing of all residential and industrial waste.

Safe Drinking Water Act (SDWA) of 1974, and 1986 Amendments, Public Law 93--523. The main objective of this Act is to ensure that pub-

lic drinking water supply systems meet minimum national standards for the protection of public health using cost as a consideration. This law specifically addresses groundwater and highlights three main areas:

1. Compliance with water quality standards;

2. Regulation of Underground Injection (Deep--Well Injection); and

3. Designation and Protection of Sole--Source Aquifers. Besides state statutes and/or county ordinances designed to provide increasing protection with time to public supply wellfields, negative incentives also exist in the form of provisions for withholding federal--assistance funding from projects sited within designated well--protection zones.

Resource Conservation and Recovery Act (RCRA) of 1976, and the Hazardous and Solid Waste Amendments (HSWA) of 1984, Public Laws 94--580 and 98--616, respectively. These laws are very complex and far--reaching. Their primary goal is the protection of the environment from accidental or unregulated discharges, spills, releases, and/or seepage infiltration from:

1. Hazardous substances and/or wastes, particularly at treatment, storage and disposal (TSD) facilities (RCRA Subtitle C);

2. Nonhazardous wastes (other solid waste) where emphasis is on upgrading municipal waste disposal facilities (RCRA Subtitle D); and

3. Leaking underground storage tanks (LUST) (HSWA Subtitle I).

The provisions applying to LUST (40 CFR 280) provide market for much of the consulting work currently in progress. Furthermore, various subparts of the law are concerned with different aspects of the LUST issue.

RCRA's primary objective is to regulate the use, handling and disposal of hazardous substances and, in turn, to prevent the contamination of groundwater. Considering this objective, RCRA requires a rigorous tracking and manifesting procedure of hazardous waste to prevent the mysterious disappearance of wastes as has happened in the past.

In addition, the Act introduces strict new requirements of the users of hazardous substances (generators of hazardous wastes), and the disposers of hazardous wastes.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund) of 1980, Public Law 96--510, and Superfund Amendments and Reauthorization Act (SARA) of 1986. The main objective of CERCLA and SARA is the remediation of

sites where contamination has already occurred at some time in the past. The main emphasis is placed on contaminated earth materials and groundwater. However, the powers of the Act also extend to the prevention of hazardous releases to air and surface water.

Under this Act the EPA was required to establish what is known as the National Priorities List (NPL) of existing sites that would be cleaned up first. The NPL has been completed and sites are removed and added to the list regularly.

Although the primary function of CERCLA is to address sites with existing problems, prevention of new incidents of contamination is achieved largely by provisions under the Act.

1. The obligation of both private industry and government organizations to report spills and leaks of hazardous substances to the EPA or the Coast Guard;

2. The obligation of water--supply facilities to do routine water--quality testing and report the presence of specified contaminants;

3. The liability written into the Act whereby the buyer of a property or, in the case of foreclosure, a lending facility such as a bank, may be responsible for the cleanup of the site; and

4. The deterrent posed to industry by way of the prohibitive costs associated with potential cleanup actions.

The Superfund Amendments to CERCLA (SARA) in 1986 retained the original emphasis under CERCLA, but provided additional funding and direction for attaining these objectives.

Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), Public Law 92--516, and Amendments, and Toxic Substances Control Act (TSCA) of 1976 and Amendments, Public Law 97--129. The primary objectives of these acts are to regulate the production and use of a variety of chemicals that may contaminate groundwater either through:

1. Normal use in the case of pesticides and fungicides; or

2. Accidental leaks, spills, misuse of, and/or disposal in the case of other toxic substances.

Clean Air Act (CAA) 1967 with amendments in 1970, 1977, and 1990. Over the past two decades, the Clean Air Act (CAA) has evolved from a set of principles designed to generally guide states in controlling sources of air pollution (the 1967 Air Quality Act), to a series of detailed control requirements (the 1970, 1977, and 1990 Amendments to the Act) that the federal government implements and the states administer. The CAA regulatory programs have traditionally fallen into three categories,

with a fourth category added by a 1990 Congressional amendment. The categories are:

1. Air Quality Regulation

2. New Source Programs

3. Specific Pollution Problems

4. The Operating Permit Program

Emergency Planning and Community Right--to--Know Act (Title III of SARA, 1986). On October 17, 1986, the Superfund Amendments and Reauthorization Act of 1986 (SARA) was signed into law. One part of the SARA legislation is Title III, otherwise known as the Emergency Planning and Community Right--To--Know Act of 1986 (EPCRA). EPCRA requires states to establish a process for developing local chemical emergency preparedness programs and to receive and disseminate information on hazardous chemicals present at facilities within local communities.

EPCRA has four major components:

1. emergency planning (Sections 301--303);

2. emergency release notification (Section 304);

3. community right--to--know reporting (Sections 311--312); and

4. toxic chemical release inventory reporting (Section 313).

Federal Facility Compliance Act (1992 Amendment to RCRA, 1986). The Federal Facility Compliance Act (FFCA) of 1992 amended the Resource Conservation and Recovery Act (RCRA), the law governing the handling, transport, treatment, storage and disposal of solid and hazardous waste. Passed by Congress and signed by President Bush on October 6, 1992, the primary purpose of the amendment was to ensure that there was a complete and unambiguous waiver of sovereign immunity with regard to the imposition of administrative and civil fines and penalties against federal facilities. This allowed the state environmental agencies and the EPA to impose civil penalties and administrative fines on federal facilities under RCRA section 6001 for violations of federal, state and local solid and hazardous waste laws.

Pollution Prevention Act of 1990. The Federal Pollution Prevention Act (PPA) of 1990 establishes pollution prevention as a national objective. The PPA required the EPA to develop and implement a strategy to promote source reduction. In the Act, Congress declared that pollution prevention is the highest tier in a hierarchy of acceptable practices. The pollution that cannot be prevented should be recycled. If it is not feasible

to prevent or recycle, pollution should be treated and disposal or other release into the environment should be used as a last resort. The PPA defined pollution prevention to mean source reduction and other practices that reduce or eliminate the creation of pollutants through increased efficiency in the use of raw materials, energy, water or other resources or protection of natural resources by conservation.

Occupational Safety and Health Act (OSHA) of 1970. OSHA was enacted in December 1970. The administrative vehicle of this Act, also called OSHA (Occupational Safety and Health Administration) officially began operation in April 1971. When compared with other environmental acts, the OSHA is very simple and well drafted.

In short, the three main goals of OSHA are (1) setting of safety and health standards, (2) their enforcement through federal and state inspectors, and (3) public education and consultation.

Other laws are also likely to impact operations within the aviation industry. Laws such as those dealing with Native American issues and endangered species are likely to be considered during siting of new airports or expansion activities of existing airports. However, for the sake of brevity and to keep the survey manageable, the scope of this survey will be limited only to those operations that could potentially release hazardous waste to the air, soil, surface water, or groundwater.

REVIEW OF LITERATURE

Before commencement of this survey project a study of several information sources was completed to determine whether similar projects had already been undertaken. Information studied included periodical literature, general references, dissertation abstracts and government literature. These sources were examined mainly through computerized databases using either the Internet or CD--ROM methods. No similar studies were located in any of the literature searched. Specific sources included:

- Dissertation Abstracts International on CD--ROM
- ABI/Inform (Abstracted Business Information)
- ERIC (Education Resources Information Center, US Department of Education)
- GPO on Silver Platter (Government Printing Office)
- Periodical Abstracts on CD--ROM (UMI)
- GENISYS (On--line Public Access Catalog)
- LEXIS/NEXIS
- Air and Space Catalog: the Complete Sourcebook to Everything in the Universe (Random House)
- Guide to Federal Aviation Administration Publications (FAA)

- NASA Scientific and Technical Publications: A Catalog of Special Publications, Reference Publications, Conference Publications, and Technical Papers (NASA)
- Applied Science and Technology Index (H.W. Wilson Co.)
- Engineering Index (Engineering Information, Inc.)
- NASA Scientific and Technical Aerospace Reports (NASA Star)
- Business Periodicals Index (HW Wilson)

World--Wide Web (WWW) Resources:

- Environmental Protection Agency (http://www.epa.gov)
- Fed World Environmental Home Page (http://www.fedworld.gov/envir.html)
- Envirolink (gopher://envirolink.org/1/.Environetworks)
- Environment and Nature (http://akebouo.stanford,edulychoo/Environment_and_Nature/)
- The World--Wide Web Virtual Library: Environment Ecogopher (http://ecosys.drdr.virginia.edu/Environment.html)
- Environment Information Services on the Internet (http://www.foe.co.uk/pubsinfo/infosyst/other_services.html)

RESEARCH METHOD

The primary research method used for this study was a telephone survey. A telephone survey was chosen for several reasons. The first reason is the high response rate compared to mail surveys where they can range from as little as 2 percent to as high as 30 percent (Erdos, 1970). The second, and far most important advantage to using telephone surveys, is that it allows the surveyor to have maximum quality control over the data collection process (Lavrakas, 1993). A third major advantage to using telephone surveys is the cost efficiency of the method. Mail surveys can cost less upfront than telephone surveys, but the quality of data collected will usually far outweigh the cost benefit (Lavrakas, 1993). A fourth major advantage of telephone surveys is the speed with which data can be gathered.

The survey instrument itself (See Appendix A) was designed to allow the collection of a distinct set of data pertaining to the environmental issues discussed in the introduction. As will be discussed in the following section, many other environmental issues could have been included in this survey study. However, an attempt to include all environmental issues in this study would result in an extremely lengthy and unwieldy document, one that would be far beyond the scope of a study such as this one.

Primary emphasis was placed on determining whether individual interviewees have conducted work within each of these laws. If an interviewee indicated

an affirmative answer, an attempt was made to obtain a brief description of the work done under a particular law. This was followed by an estimate of the percentage of work that is conducted within each of the mentioned laws as compared to the entire realm of environmental work performed by the interviewee within the civilian aviation industry. The percentage data were not requested to obtain definitive quantitative data for statistical or other analysis, but rather to gather general data in order to get a general understanding for the prominent environmental issues within the civil aviation industry. One of the final questions (question Number 12) was designed to elicit information on other environmental issues that had not been specifically mentioned in the survey. Finally, the interviewees were requested to offer a prediction of which environmental issues would become less prominent and which would become more prominent in the future.

These data were again collected in order to gain some general insight into the dynamics involved between the aviation industry and environmental issues.

SURVEY GROUP

The telephone survey was conducted only on firms listed in the 1995 Airport Consultants Council (ACC) membership directory. This was done in order to keep the scope of the survey to a manageable size and to gather information from a representative group of firms that deal mainly in the aviation industry. Many other firms could have been contacted such as manufacturing firms, government agencies, and the Department of Defense. However, nearly all work concerning environmental engineering, or any other environmental issues, is usually contracted out to various consulting firms even though environmental management staff are sometimes employed by the respective clients. The main reason for this is that it is simply too expensive and time consuming to employ a large staff of personnel that is sufficiently knowledgeable in all of the pertinent environmental issues, and that has the training and equipment to carry out environmental programs. Finally, firms were selected based on whether they were heavily or solely committed to aviation type business and whether they had obvious environmental expertise as discussed in the firm descriptions in the ACC directory. A total of 35 firms were selected based on the above criteria. Out of these 35 firms, 20 participated in the interview which was conducted during the week of July 10, 1995.

RESULTS

A total of 35 firms were selected from the ACC directory. Of these 35 firms, six could not be reached, two indicated that they were not in the business, and seven indicated that they could not or would not participate in the interview for one reason or another. The remaining 20 firms participated in the survey giving a response rate of approximately 57 percent.

The statistical information from the survey questionnaires has been summarized and is shown as table 1. Table 1 shows the number of affirmative and negative responses for each law about which the interviewee was queried. Table 1 also shows the average value of the answers for the question '...what is your estimate of the percentage of the total environmental work that you do that is done under this law?' The range of these answers is also provided on table 1.

Four interviewees indicated additional issues (question 12). Two of the respondents mentioned noise abatement, one respondent mentioned wetlands studies, and one respondent mentioned underground storage work under the state--specific environmental program.

The results of question 13 are summarized on table 2; however, not all 20 participants gave responses to this question. Nine issues were identified by the interviewees as issues that they expect to gain in importance in the future. Only two issues were indicated as becoming less important.

MAJOR FINDINGS/CONCLUSIONS

As shown on table 1, the most significant environmental work within the civil aviation industry, according to the survey, appears to be conducted under NEPA. Fully 90 percent of the interviewees indicated that they do work under this law. Furthermore, this work comprises nearly three--fourths (73.8 percent) of the environmental work these firms do for the civil aviation market. The vast majority of the work done under NEPA consists of environmental audits, environmental assessments, and environmental impact statements for construction of new facilities or expansion of existing facilities. These environmental assessments are required by law anytime government funding is utilized for a project (as most of the airport projects are assisted by the Federal Airport Improvement Program [AIP]). This work under NEPA is guided by the Federal Aviation Administration (FAA) publication 50--50.4A (FAA, 1985) which is meant to emulate NEPA guidance for the aviation industry.

The NEPA work may also include aspects of the other laws used in the survey, but the environmental assessment process remains the key focus. In fact, 25.0 percent of the interviewees indicated that this type of work comprises 100 percent of their environmental work in civil aviation.

The second most significant environmental issue based on the interviews (table 1) is work conducted under the Clean Water Act (CWA). Sixty--five percent of the interviewees indicated that they do work under this law. The average percentage of environmental work conducted under this law was 16.7 percent. The majority of work under this law consists of the creation of Storm Water Pollution Prevention Plans (SWPPPs) and writing of storm water discharge permits under the National Pollutant Discharge Elimination System (NPDES). Many airports are faced with a situation where their old permits are expiring and compliance with more stringent water quality regulations is imminent. General storm water discharge is the overall concern with deicing fluid and aircraft washing opera-

tion runoff being of particular concern. Wetlands issues are also a concern under this law. This issue is especially significant where expansion of a facility or construction of a new facility is planned.

The third most significant issue from table 1 is work under the Clean Air Act (CAA) with 50.0 percent of the respondents indicating affirmative answers. The average percentage of environmental work conducted under the law was 9.4 percent. Work under this law consists of permitting of facilities for air emissions

OSHA	0	20	0	NA	NA

* One respondent did not give an estimate of percentage.

Sampling pool (n) = 20.

NA = Not Applicable

NEPA = National Environmental Policy Act

FWPCA/CWA = Federal Pollution Control Act/Clean Water Act

SDWA = Safe Drinking Water Act

RCRA = Resources Conservation and Recovery Act

CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act (``Superfund'')

FIFRA/TSCA = Federal Insecticide, Fungicide and Rodenticide Act/Toxic Substances Control Act

CAA = Clean Air Act

EPCRA = Emergency Planning and Community Right-to-Know Act

FFCA = Federal Facilities Compliance Act

PPA = Pollution Prevention Act

OSHA = Occupational Safety and Health Act

TABLE 2
Predictions of Change in Importance of Environmental Issues to the
Civil Aviation Industry, 1995

	No. of Responses	
Environmental Issue	*More Important*	*Less Important*
Wetlands	7 (8)*	1
Air Quality and Permitting	6 (6)	0
Noise	4 (4)	0
SWPPP [1]	4 (4)	0
NPDES [2]	4 (4)	0
Water Quality	4 (4)	0
Endangered Species	2 (2)	0
Hazmat [3]	1 (1)	0
Overall Regulatory Environment	0 (2)	2

from exhaust and also from bulk fuel storage facilities.

The fourth most significant issue from table 1 is work under the Emergency Planning and Community Right--to--Know Act (EPCRA). Thirty percent of the respondents indicated that they do this type of work. This work comprises about 6.0 percent on average of their aviation environmental work. Work under this

law consists almost entirely of writing of emergency response plans for airport facilities in case of hazardous waste or fuel spills.

Ranked fifth on table 1 is work under RCRA with 10.0 percent of the respondents indicating work under this law. The average and range of the percentage of work done under this law were both 5 percent. However, only one respondent offered an estimate for this percentage. Work at civil airports under this program

appears to be limited to hazardous waste management, permitting and manifesting, and also some work under the Leaking Underground Storage Tank (LUST) portion of the RCRA code. Usually, RCRA would not be an issue at civilian airports unless the facility is listed as a RCRA permitted site. This could be common in the instance where a military facility has been converted to a civilian one.

Three of the laws listed on table 1 were indicated as worked under by 5.0 percent of the respondents. These three laws are CERCLA, FIFRA/TSCA and PPA. The respondent, who indicated work under CERCLA, did not offer an estimate of percentage work under this law. For FIFRA/TSCA and PPA, the respondent indicated a percentage of 5.0 percent and 25.0 percent, respectively. The work pertaining to CERCLA was indicated as consisting of soil and groundwater remediation activities at an airport facility. As with RCRA, this law would not usually be significant unless the site is listed on the National Priority List (NPL) under CERCLA. This is usually the case at inoperative facilities with past hazardous waste activities. The work under FIFRA/TSCA and PPA was indicated as consisting of hazardous waste management and pollution prevention plans for airport facilities.

Lastly, no work was indicated as being done under the Safe Drinking Water Act (SDWA), the Federal Facilities Compliance Act (FFCA) or the Occupational Safety and Health Act (OSHA). The reason for this is probably because these acts deal with very specific issues that usually do not impact civilian airport operations directly. The SDWA applies mainly to municipal water supplies, a concern more likely for the municipality serving the airport. The FFCA would not be an issue unless an airport were a federal facility. Work under OSHA is concerned mainly with worker health and safety by preventing exposure to chemical and physical hazards. Virtually all of the interviewees contacted indicated that the liability issue prevented them from entering this market.

Other issues that were indicated in question 12 were noise issues (two respondents), additional wetlands issues (one respondent), and Underground Storage Tank (UST) and Above Ground Storage Tank (AST) work under the state--specific environmental programs (one respondent).

Table 2 summarizes the results of question 13. Since all 20 survey participants did not respond to this question, the number of participants that did respond is included in the table. Of all the issues mentioned, the issue of wetlands had the highest response rate for gaining in importance (7 out of 8 responses). This is partly due to an expected tightening of wetlands policy by the EPA. The issue with the next highest indication of gaining importance is air quality regulations and air permitting (6 out of 6 responses). This issue will be especially important in areas like southern California where strict air quality guidelines exist. The issues of noise, storm water pollution prevention plans and storm water discharge permits were all indicated as becoming more important by 4 out of 4 respondents. Noise, while not a hazardous waste issue, is expected to gain importance as urban areas encroach on airports. Storm water issues will also gain importance as water quality regulations are tightened. Water quality regulations were, in fact, indicated by two respondents as gaining significance.

Finally, endangered species issues (2 respondents) and hazardous materials handling issues (1 respondent) were indicated as issues gaining in importance. Endangered species issues, while not directly hazardous waste issues, will become important mostly because of the wetlands issues discussed earlier. Hazardous waste handling becomes an important issue when considering storm water pollution prevention plans and emergency response plans.

An overall softening of the regulatory environment was indicated by 2 respondents as becoming a less important issue. This sentiment is probably a result of the EPA Common Sense Initiative (CSI) instituted under the current administration to soften the negative impacts of environmental regulation.

SUMMARY

In summary, 35 interviewees were selected from the ACC directory based on their apparent environmental experience in the civil aviation industry. Of the 35 selections, 20 resulted in successful interviews. The interview was designed to

gather general information on the most typical environmental issues likely to be important in the civil aviation industry.

The results of the survey indicated that the most prevalent type of environmental work being done by these firms is environmental audits, assessments, and impact statements for expansion and construction projects under the provisions of the Federal NEPA program. The next most important issues are wetlands studies and storm water discharge permitting and pollution prevention plans under the CWS; air permitting under the CAA; emergency response plans under the CERCLA, RCRA, FIFRA/TSCA, and PPA. Virtually no work was indicated as being done under SDWA, FFCA, or OSHA.

The primary issues expected to gain importance are wetlands issues, air quality issues, storm water issues, and noise.

Bias was likely introduced to the sampling results for a variety of reasons. Some of the reasons are likely to include the limited sampling pool size, variations in interviewee background and responses, and the different areas of practice exhibited by the various firms contacted. However, an attempt was made to select interviewees who appeared to be focused exclusively on the civilian aviation industry and who had environmental expertise. Although this survey could not possibly cover all of the environmental issues being considered in civil aviation today, it probably represents a close approximation of the key issues.

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APPENDIX A
SURVEY QUESTIONNAIRE—ENVIRONMENTAL ISSUES IN THE CIVILIAN AVIATION INDUSTRY

Opening statement: Hello, my name is Steve Morrissette. I'm a graduate student in the Aviation Institute at the University of Nebraska at Omaha. I'm conducting research for a class project on environmental issues in the aviation industry and I would appreciate just a few minutes of your time. My project is a

survey study of the primary environmental issues facing the civilian aviation industry and I obtained your company name from the 1995 Airport Consultants Council (ACC) directory as a firm that does environmental consulting to the aviation industry. I have a list of about 10 or 15 questions I'd like to ask you in order to gather some general information for my study. I can maintain your anonymity if you wish and can also provide you a copy of the study if you wish. Would you care to participate in my survey?

1. Do you do any work pertaining to the National Environmental Policy Act (NEPA)?

   YES
   NO

   If yes, please offer a brief description of the work that you do under this law:

   If yes, what is your estimate of the percentage of the total environmental work that you do that is done under NEPA?

2. Do you do any work pertaining to the Federal Water Pollution Control Act and Clean Water Act Amendments?

   YES
   NO

   If yes, please offer a brief description of the work that you do under this law:

   If yes, what is your estimate of the percentage of the total environmental work that you do that is done under these Act?

3. Do you do any work pertaining to the Safe Drinking Water Act (SDWA)?

   YES
   NO

   If yes, please offer a brief description of the work that you do under this law:

   If yes, what is your estimate of the percentage of the total environmental work that you do that is done under the SDWA?

4. Do you do any work pertaining to the Resource Conservation and Recovery Act (RCRA) and the Hazardous and Solid Waste Amendments (HSWA)?

   YES
   NO

   If yes, please offer a brief description of the work that you do under this law:

   If yes, what is your estimate of the percentage of the total environmental work that you do that is done under RCRA and HSWA?

5.

Do you do any work pertaining to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or ``Superfund'') and the Superfund Amendments and Reauthorization Act (SARA)?

YES
NO

If yes, please offer a brief description of the work that you do under this law:

If yes, what is your estimate of the percentage of the total environmental work that you do that is done under CERCLA and SARA?

6. Do you do any work pertaining to the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), and Toxic Substances Control Act (TSCA)?

YES
NO

If yes, please offer a brief description of the work that you do under this law:

If yes, what is your estimate of the percentage of the total environmental work that you do that is done under FIFRA and TSCA?

7. Do you do any work pertaining to the Clean Air Act (CAA)?

YES
NO

If yes, please offer a brief description of the work that you do under this law:

If yes, what is your estimate of the percentage of the total environmental work that you do that is done under the CAA?

8. Do you do any work pertaining to the Emergency Planning and Community Right--to--Know Act?

YES
NO

If yes, please offer a brief description of the work that you do under this law:

If yes, what is your estimate of the percentage of the total environmental work that you do that is done under this Act?

9. Do you do any work pertaining to the Federal Facility Compliance Act?

YES
NO

If yes, please offer a brief description of the work that you do under this law:

If yes, what is your estimate of the percentage of the total environmental work that you do that is done under this Act?

10. Do you do any work pertaining to the Pollution Prevention Act (PPA)?

YES
NO

If yes, please offer a brief description of the work that you do under this law:

If yes, what is your estimate of the percentage of the total environmental work that you do that is done under this Act?

11. Do you do any work pertaining to the Occupational Safety and Health Act (OSHA)?

YES
NO

If yes, please offer a brief description of the work that you do under this law:

If yes, what is your estimate of the percentage of the total environmental work that you do that is done under this Act?

12. Are there any other environmental issues or laws that you deal with within the aviation industry that have not been mentioned in this survey?

YES
NO

If yes, would you please provide a brief description of these environmental laws or issues:

13. In your estimation, and in general terms, which environmental laws and issues do you see as becoming less important and which do you see as becoming more important in relation to the aviation industry in the future?

Retention in Collegiate Aviation

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ABSTRACT

Retention issues are important to people in all aspects of business and academia. The relationship of how many people start a project and how many actually complete it is an important one, regardless whether the project is an academic degree or a business venture. Aviation, partially due to the cost associated with training, has unique retention problems. The Aviation Institute at the University of Nebraska at Omaha (UNOAI) undertook a research project to study retention issues as they relate to the Institute's academic program and the field of aviation in general. The survey and results should prove useful for other aviation programs in the United States as well as for international aviation programs.

INTRODUCTION

Retention, for the purpose of this research project, is defined as the percent of individuals that remain in a specific program until its completion (Ewell, 1984). From an organizational point of view, retention is a critical property. Businesses, universities, churches—all organizations—are interested in retaining individuals to their specific program. While identifying why individuals choose to cease their affiliation with an organization is interesting by itself, it is more interesting when paired with retention issues. Identifying why individuals choose to leave an organization aids in implementing plans to prevent similar circumstances from causing others to also leave the organization (Ewell, 1984).

Aviation presents an even more challenging environment than other fields where retention might be a significant issue. While it is true that aviation lures individuals with the ``mystery'' and ``excitement'' it offers, it also presents individuals with a challenging and complex environment that might be more difficult to cope with than realized. Additionally, if flying is the intended career path for the aviation enthusiast, the cost might be more prohibitive than initially thought. Many other issues come into play when one looks at aviation as a career.

An increasing number of employers today, including major airlines, require applicants to have university degrees. The Aviation Institute is a fairly new department at the university, offering a variety of options to prospective students. Flying and non--flying career paths are offered and, beyond baccalaureate level

degrees, options for Masters and Doctoral programs make the Institute a very attractive choice for students interested in aviation. In addition to academic and flying opportunities, the Aviation Institute offers internships, scholarships and fellowships and has an active chapter of Alpha Eta Rho, the international aviation fraternity. The Institute's flight team offers additional educational activities and incentives to students.

PURPOSE

In its short history, the Institute has been very successful; however, retention issues do exist. Of interest to the researchers was the retention of aviation students in general and the retention of students at the Aviation Institute (AI) at the University of Nebraska at Omaha (UNO) specifically. Specific retention issues at the Institute were examined and placed in a national perspective as they relate to similar issues at other aviation or general education colleges and universities.

The research project on retention at the Aviation Institute had several distinct phases. Each phase, while it might seem independent of the others, was interconnected with the basic issue: why some students who start an academic program at UNO and choose aviation as an option for their studies fail to complete the program. In some cases, the answer is simple and does not differ for the Institute or any other academic program----the quality of work performed by the student is below standards and graduation is not possible. There is always a percentage of people who, regardless of the course of study, fail to complete it (Ogletree, 1992). These individuals, while interesting, were excluded from detailed analysis for the purposes of this research project.

Of greater interest are those who do not complete the program even though their academic performance is within the standards for graduation. Issues such as finances, medical reasons that might exclude them from a flying track, disapproval of the program or the staff, lack of understanding of the possible career paths available, and other reasons are of the greatest interest to the Aviation Institute.

This project had two primary goals. First, to identify the percentage of people who start but do not complete the program. Second, to identify the cause for their failure to complete the program. The first goal is a long--term one and will be addressed in a future paper. The second goal is primarily a satisfaction analysis and was the focus of this research project. It has been suggested that satisfaction is directly related to retention (Earwood 1989). The correlation between the two will be addressed in a future paper.

RESEARCH METHODOLOGY

The sole source of data for the retention project was the Aviation Institute's students. Three subgroups of students were identified: current students (those that were enrolled in the program while the project was conducted), former stu-

dents (those that have taken some classes from the Institute in the past but were not currently enrolled in aviation classes), and alumni (those that have graduated from the program).

Questionnaires were administered in class for current students and mailed to former students and alumni. The questionnaires were anonymous; however, a demographic section allowed a respondent to provide information about sex, race, age, etc. The in--class experimenter bias administration was controlled via a script that was read to all participants. Care was taken that an individual did not complete the questionnaire more than once. A series of questions were asked and the answers marked on a form utilizing a Likert scale ranging from one (very poor) to seven (excellent) The Questionnaire that was administered can be found in Appendix A.

A simple QuatroPro(R) spreadsheet was created that allowed fast and easy entry of the data sample. A brief one--page instruction sheet that explained how the entry of information should be completed was created and given to the individual that performed the data entry. Care was taken during input, but if a problem was found, a second entry provided the correct data set to be used in the final compilation of results. Simple statistics were performed ``live'' by the spreadsheet during data entry so that general trends were immediately identified. When all data were input, a more in--depth statistical analysis was performed utilizing the Statistical Package for the Social Sciences (SPSS).

An outline of the research process follows.

- During phase one of the project, the questionnaire was created and the overall design of the project established. A pilot study was conducted during this phase to identify possible problems with the analysis and execution of the project.

- During phase two the pilot program was examined and problems identified and corrected. Changes were made as needed to both the design of the project and the forms used in the project.

- Stage three was the data collection phase. Questionnaires were administered to all three groups. The questionnaires were identified for the semester during which they were administered. This paper includes data from the summer 1995 semester but data collection will be ongoing.

- The next phase was the data analysis. Data analysis was twofold: while entering the data in the spreadsheet, some immediate results were obtained. Additionally, advanced statistical analysis was performed using SPSS. This phase could be repeated several times as the project progresses if additional data is collected and analysis needed.

- The final stage was the composition of this paper reporting both the research process and the overall findings. The paper includes all data avail-

able to date of its publication. Some problems were encountered during this stage. A planned Internet survey of aviation colleges and universities where retention issues could be discussed in an open forum had disappointing results partially due to a failure of the communications software and partially due to the fact that many instructors were unavailable during the summer. While that survey is planned to be included in the future, it is not a part of this report since it did not offer a significant contribution to the issues studied.

The sample size of this research project (n = 102) was small, dealing with only one institution. Basically, this was a preliminary study to develop the most useful and efficient methodology of surveying the attitudes and satisfaction of the students of the Aviation Institute. However, one hundred percent of the aviation students taking classes during the summer 1995 were surveyed. This methodology lends itself to multi--university application.

STATISTICAL ANALYSIS

Due to the nature of the survey, a direct interpretation of retention was not possible. Instead, a retention percentage could be calculated through the records of the Aviation Institute and a correlation between the satisfaction scales and the retention data would provide the desired answer. To date, official data is not available, but strong evidence supports this conclusion. Even though the correlation might be significant, this study represents an indirect measure of satisfaction as it relates to retention and is not a bonafide ``proof'' of the concepts presented.

The most important analysis performed was the statistical evaluation of the data. A commercially available program, SPSS(R), was used to perform all statistical analysis of multi variant nature. The main interest in the analysis was the trends identified through the data. The primary relationships that were measured were satisfaction with various aspects of the program and correlation between a student's GPA and his or her expressed satisfaction with the program. The assumption was that high satisfaction with the program would correlate highly with completion of the program.

STATISTICAL FINDINGS

The Aviation Institute's student population increased during the first four years of operation. The high correlation of retention/satisfaction supports and, in fact, can be used to explain this increased enrollment. A steady increase in the number of students is noted for the first three years of the AI's existence (see Graph 1). For 1995, a strong enrollment was evident but no substantial growth was expected. Satisfaction with the Institute as indicated by the satisfaction survey and the individual course grade reports is highly correlated with retention as predicted.

GPA:	No. of Students
3.0 – 4.0	56
2.0 – 3.0	45
Below 2.0	1

TABLE 3
Pass/Fail Rates for Summer 1995 Retention/Satisfaction Survey

Simple statistical analysis was performed as the data were entered in the customized spreadsheet. During that initial analysis, it was calculated that the majority of the students were pleased with the UNOAI's current structure and performance. More than eighty percent of all respondents awarded a total rating of five or better (good to excellent). Some categories received lower ratings; however, overall the consensus was that the UNOAI is doing a very good job at its academic/training function.

Supplementary data relating to academic performance are reported in Table 2. An interesting correlation that was not calculated is retention as it relates to academic performance. Such a calculation, even though interesting, is not possible under the current design of the project. However, a separate statistic—satisfaction with the program as it correlates to GPA—was calculated. A high correlation was identified for that measure. The demographic data provided an indicator of the academic success of the program and also pointed out some retention issues, i.e. high GPA equals high satisfaction rate which correlates with retention (Earwood, 1989).

A correlation of 0.92 was found when GPA was compared with stated satisfaction with the Institute. A correlation of 0.80 or better is expected to be found between the satisfaction scale of the questionnaire and the overall retention records of UNOAI when records are received from UNO's Registrars Office.

Greater than ninety percent of the students that took an aviation class during summer 1995 passed the course (see Table 3). More than seventy percent of the students who passed an aviation course made a B or above in the class. When compared to Table 2 and the satisfaction data, a high retention--to--correlation ratio can be observed.

1000	10	0
1000/2	11	0
1030	0	0
1040	15	2
2900	3	0
3060	29	1
3400	0	1
4000	3	0

Because recruiting and retaining women and minorities is such a critical issue today in business as well as in academe (Luedtke, 1993), the researchers conducted demographic analysis which is shown in Table 4. The simple demographic analysis reveals very few minorities enroll in aviation courses at the university (9.09 percent). This trend was not compared with the national average, but it was not very surprising since minorities tend to be underrepresented in universities in general. The ratio of male to female was favorable to males. This is another expected finding since aviation has historically been a male--dominated field. The university is actively promoting the enrollment of minorities and women.

DISCUSSION REGARDING FINDINGS

No significant correlations were found among the questionnaire categories. The correlation between categories is not a meaningful statistic of what was be-

85	12	80	2	6
87.63%	12.37%	90.91%	2.27%	6.82%

ing measured but was calculated in order to refine the questionnaire. If two (or more) categories tended to covary, changes in the questionnaire in future administrations would be warranted. The current results suggest that no such change is needed. As expected, there was a high correlation between stated satisfaction with the program and GPA. It is not surprising that people who do well tend to award praise to their academic program. It was surmised that a high correlation between satisfaction and retention in the program would be found. The anticipated high correlation, which suggested satisfaction with various aspects of the program, is an important predictor of retention in the program.

CONCLUSIONS AND RECOMMENDATIONS

In today's competitive market, especially with the decline in collegiate student population in recent years, retention is a major concern to all departments, colleges, and universities. As is taught in marketing classes, it is less expensive to retain a customer than to acquire a new one (Tinto et al, 1994). Because there are only so many college--age students (even with the returning adult student), all universities must address this issue.

Some key components of other departments or universities regarding their retention efforts include: (1) community outreach involving activities that link the community and the university together; (2) individualized academic advising; (3) incorporate a Peer Leader program whereby a freshman is regularly contacted by an upperclassman with common interests to help guide him or her; (4) ensure as much financial assistance where possible via scholarships, internships, cooperative education, etc. (Patti et al, 1993).

Many colleges and universities are establishing a separate office to deal exclusively with the retention issue. This is an important step; however, every department, every faculty member, every staff member must also be involved with the process in order for a retention program to be effective. This is even more imperative for flight programs at universities and colleges since more variables come into play (Kluepfel, 1994).

The faculty at the Aviation Institute provide one--on--one advising to the students; however, the faculty are evaluating their procedures and will incorporate a class--by--class outline to assist students further with their scheduling of classes. The Aviation Institute does have a program of ``Student Ambassadors'' that assist with public relations functions within the community; these ambassadors could likewise be utilized in a ``Peer Leader'' program described above.

Like aviation programs at other universities and colleges, the Aviation Institute must continuously establish and oversee as many internships as possible with organizations within the industry for its students. These provide students with real--life experiences and some financial.

Student knowledge of the financial assistance available is especially vital to flight students. These students must be made aware of the financial considerations that are required to obtain pilot licenses and ratings.

Along with the faculty, the vendor that provides the flight training must be involved in the retention process to assist the student to the successful completion of his or her training. Likewise, while encouraging student participation in activities (more difficult but even more important on a commuter campus) and assisting with financial aid opportunities, the faculty must be actively involved with student advising and activities. The faculty must be mentors, advisors, role models, and friends (Kluepfel, 1994). The number one attribute of 944 respondents to a survey of students' satisfaction and needs was a caring attitude of faculty and staff (Noel, 1986). Students want to be involved in a program where the faculty and staff care what happens to them, how well they do, and that they succeed in their program.

Just as in a business, if customers do not receive the help and attention needed they will take their business elsewhere. Some businesses are left wondering what happened; they never realize why they are losing business. Although some colleges and universities still believe they can just open their doors and students will come, this is likewise a false scenario. Today, colleges and universities must operate like a business if they wish to stay in business (Lenning, 1980). They must constantly assess how well they are serving the student. One way of accomplishing this is to survey the students' satisfaction; this is one important area of retention.

While satisfaction is not a direct measure of retention, it has been demonstrated in the past that there is a high correlation between retention and satisfaction. More than 90 percent of the participants rated the Aviation Institute very good to excellent. This finding is very significant. While a high correlation is likely to exist, when the data from the Registrar's office is compiled, perfect correlation is not expected because issues such as flight costs may influence the overall relationship. Individuals in the flight track of the program are approximately 10 percent of the total questionnaire database. In the future, a tool that measures why some individuals in a flight track do not complete the program will be utilized. Care will be taken so that academic reasons (failing grades) will not be used but only financial considerations and performance skills and issues will be measured.

The essence of this research project is that retention is a complex issue in most environments; this is even more so when flight considerations are taken into account. It has been demonstrated that the UNOAI retention rate is similar

to that of other institutions of higher learning that provide flight training; however, it is imperative to routinely address the satisfaction and retention issues.

The student surveys utilized in this research provide a starting point for the faculty at UNOAI to address satisfaction and retention issues of its student body. By addressing these issues and continually updating and administering the survey each year to students, the Aviation Institute should be able to ascertain the satisfaction of its students regarding its programs. This survey could easily be adapted for other aviation programs. As stated previously, satisfaction and retention are critical issues for educators in today's competitive market and must be continuously addressed.

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APPENDIX A
CURRENT STUDENT SURVEY

Thank you for participating in our survey. Your participation is strictly voluntary and your assistance greatly appreciated. Your comments will assist the Aviation Institute in making the program better for you, our students.

NOTE: We appreciate your willingness to help us. If you have completed this survey in the past (another class/previous semester) please indicate so by marking here: _____

1. Please indicate below the reason(s) you are enrolled in this course. It is because:
   ___ I am an Aviation minor.
   ___ I am an Aviation major.
   ___ Other. Please be specific:

2. Were the aviation classes in which you were last enrolled satisfactory?
   ___ yes ___ no

   I. If yes, please list the best features of those classes:

   II. If no, please indicate which class and what was the reason(s) for your dissatisfaction:

3. What other classes are you considering taking at the Aviation Institute?

4. Would you be interested in participating in other aviation--related activities?
   __yes ___no

   List some of the activities you might be interested in:

5. Your suggestions concerning the Aviation Institute are greatly appreciated and will be used to make improvements in our curriculum and services.

   Please indicate any suggestions that you might have:

6. For demographic purposes we request that you provide the following information:
   Current Semester: _____ Flying Student? _____
   Sex: ___ Male ___ Female
   Ethnic Group: ___ Black ___ White ___ Other
   Overall GPA: ___ 3.0 – 4.0 ___ 2.0 – 3.0 ___ Below 2.0

Your name is NOT required. However, if you wish to provide it, please do so below. We assure you that you name will be kept confidential and will have no effect in your standing in this class or the Aviation Institute. If you do provide us with your name, could we communicate with you if we have any questions?
   ___ Yes ___ No.

Name:_____
Phone Number: (____)_____--____
Address:_____

City:_____ State: _____ Zip: _____

Please rate the following categories using a scale from 1 (very poor) to 7 (excellent). Simply circle the best answer.

Overall
   Course Content:
   Aviation Institute–Advising:
   College of Continuing Studies Advising:
   Aviation Institute Overall:
   Faculty/Staff:
   Aviation Institute Individual Faculty/Staff:
   Availability of Scholarships and Internships:
   Bulletin Board Messages:
   Aviation Institute Newsletter:
   Aviation Institute Office Staff:

Course Materials
   Books, handouts, etc.:
   Aviation Institute Field Trips:
   Aviation Institute Exams, Homework, etc.:
   Aviation Institute Instructor policies, grades, etc.:

Student Organizations
   Alpha Eta Rho:
   Flying Mavericks:
   Student Facilities:

Flight Program
   (For flying students, or those that plan to enroll in flying classes and have visited Sky Harbor)

   Flight Operations Facility:
   Flight Equipment, planes, simulator, etc.:
   Flight Operations Personnel:
   Other:_____

APPENDIX B
INSTRUCTIONS FOR THE ADMINISTRATION OF
THE CURRENT STUDENT SURVEY AS PART OF
RETENTION RESEARCH

Thank you for participating in our research. The administration of our survey is rather simple. Read the following paragraphs to your class verbatim. It is important that there is no deviation from the text:

In just a few moments I will be passing around a short survey. Please take a few minutes to complete it. Your participation is strictly on a volunteer basis. If you choose not to participate, your grades in this or any other class or your standing at the Aviation Institute will not be affected.

There are no correct answers to the questions. This is an opinion survey; simply give us your honest opinion.

During the administration of the questionnaire, I will be outside the room; please place the questionnaires in the provided envelope, the student volunteer will seal the envelope and return it to room 422. The results of the survey will not be available to me until the term is over and the grades have been turned in to the registrars' office.

Once you have completed the survey please return to your seat, and continue to remain silent so that others may complete the survey as well. Thank you for your participation.

We anticipate that the average student will complete the survey in about 5 minutes. At the most, 10 minutes would be ample time to complete the survey. Feel free to contact either Dr. Luedtke or Mr. Papazafiropoulos if you have any questions concerning this project.

NOTE: Please indicate the number of students present in your classroom:

Thank you for your cooperation.

Cognitive Learning Bias of College Students in an Aviation Program

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ABSTRACT

Students are attracted to university aviation programs for a number of reasons. How well they learn from instruction in a classroom, an airplane, a simulator or in other environments is impacted by their ability to react to stimuli and to process different types of information. Research into cognitive learning style and preferences addresses the processing of information. This paper presents data on a study designed to assess aviation students' cognitive processing bias (the preference for learning and organizing information using one side of the brain or the other, or both sides) at a four year university aviation program. It further investigates whether patterns or correlations exist between the biases and factors such as class standing, age, gender and aviation program choices. Results of the study provide a basis for further research and study into cognitive processing capabilities and the factors that influence student development, such as instructional techniques and instructor methodologies.

INTRODUCTION

All students enrolling in a university aviation curriculum bring with them a wide variety of skills and capabilities. The education process is intended to help develop and refine those skills and capabilities in both the behavioral and cognitive domains. A review of students' interests and backgrounds at Bowling Green State University in Ohio showed new freshman and transfer students from within the university often had an artistic or music background. Such a background has been associated with right brain hemisphere processing capabilities. Somewhat interestingly, it appeared many of those students tended to struggle academically in classroom courses or very structured courses such as math and physics. Yet, they performed well in the hands--on experiential part of the curriculum, such as flying, maintenance, or laboratory.

This observation raised questions as to why students would have difficulty mastering various classroom courses yet do well when involved in the hands--on and experienced--based type of instruction which necessitated understanding of the classroom material. Were the students their own worst enemies by not applying themselves? Could the method of instruction used in the program impair their performance? Is there a different pattern of cognitive processing in those

individuals who are attracted to the aviation program or career field versus those who continue to do well in the program or who actually succeed in the field? What is the cognitive processing capabilities of successful individuals? How might instructional practices influence or affect the students' success rate?

The questions raised led to an investigation into learning style and its application to aviation curriculums. An extensive amount of information and research exists related to various learning styles (Grady, 1984; Dunn, Beaudry and Klavas, 1988). The literature suggests that faculty should modify their teaching methods to better address the learning styles of students (Kolb, 1985; McCarthy, 1987). Previous studies have been conducted to correlate the so called ``hemispheric bias theory'' with occupational choice (Bakan, 1969; Dabbs, 1980; Kolb, 1985; Veehof, 1992; Wenham and Alie, 1992), but none address the integrated functions of cognitive hemisphere processing. Also, aviation students have not generally been the focus of these studies. Galotti (1992) did study air traffic control candidates and found reason to suggest further study into learning styles as a criteria for candidate selection.

The investigation into learning style did not satisfy the author's curiosity about how the information was being processed. The instruments used to determine learning style tended to be lengthy or difficult to administer. Also, learning style research generally addresses the separate nature of each hemisphere. Crane (1992), however, has focused on studying the bilateral individual, or how the two brain hemispheres work together. Crane's approach differs from learning style research in that he attempts to identify the degree to which the relational and sequential hemispheric cognitive functions integrate and process information.

The hemispheric bias theory is associated with how cognitive processing occurs in the brain and how each hemisphere of the brain performs different cognitive activities. The left side primarily processes information using a logical sequence while the right side primarily uses relational patterns. Crane contends that the same information is processed differently in both hemispheres with the majority of individuals responding to situations by integrating the hemisphere processes depending upon the situation.

The current study attempts to delineate the cognitive (a.k.a., hemisphere) processing bias of aviation students at different age, grade and experience levels. The premise for conducting the study was that students entering the aviation program had a bias for more relational cognitive processing than sequential processing, while students in the upper grade levels or who had recently graduated had more sequential or combined relational/sequential cognitive processing capability. It is also hypothesized that as students progress through an aviation program, a natural process occurs in which those students with strong tendencies will eventually leave or transfer from the aviation program. In addition to assessing the students' yearly transition, data were collected to assess whether differences existed in factors such as age, gender, or aviation program

Strong Sequencing (SS)	Moderate Sequencing (MS)	Specialized-Alternating-Combination-(SB-AB-CB)	Moderate Relating (MR)	Strong Relating (SR)
		Figure 1. Continuum of Cognitive Preference (Crane)		

Class rank	n	%	Age	n	%

choices. This collection of data would serve as a basis for further study and analysis.

BACKGROUND

The questionnaire used in the study allows for the grouping of responses into three general categories of cognitive preference: sequential, bilateral and relating. The three groups are further delineated along a continuum into strong sequencing (SS), moderate sequencing (MS), specialized bilateral (SB), alternating bilateral (AB), combination bilateral (CB), moderate relating (MR), and strong relating (SR) (see Figure 1). The differences among the cognitive modes is determined by the way information is processed or handled.

The sequencing preference is associated with the left hemisphere of the brain and relates to those cognitive processes and organization of thought that have an external focus relative to the individual. Individuals favoring this cognitive bias often tend toward analytical and reasoning processes and use objective criteria. They learn through a process of gaining knowledge, which leads to understanding, which in turn leads to action based on the knowledge and understanding. Functioning in the sequential mode results in abstract concepts being formed but it requires very specific or objective detail as a basis for forming the concepts.

The relating preferences are associated with the right hemisphere of the brain where the cognitive focus and organization of thought tends to be more internal to the individual. Individuals favoring this cognitive bias tend to be intuitive, have greater emotional awareness and response to subjective feelings. They learn through a process of acting, which leads to understanding, which in turn leads to knowing. Functioning in the relating mode results in more generalized ``big picture'' concepts being formed. However, concrete thought or activity is required as the basis for developing and relating the concepts.

The bilateral cognitive process involves preferences that are: specialized (i.e., about half the time information is organized or a particular task is performed in only one mode, while the other half of the time information is organized or a particular task is performed in the other mode); alternating (i.e.,

information is organized or a particular task is performed in either mode); or combination (i.e., both modes are used at the same time).

As an illustration of the concept of this study, the availability of statistically significant information is best processed by an individual having a sequential or left hemispheric bias. A graphic representation of the data, however, is best processed by an individual who has a relational or right hemispheric bias. The ability to process the data in either presentational mode is illustrative of a bilateral individual.

METHODOLOGY

All students and flight instructors involved in the aviation program at Bowling Green State University were asked to complete a 20 question instrument developed by Crane (1992). The instrument is designed to identify the cognitive hemispheric processing preference of respondents. Validation and reliability of the instrument is addressed by Crane (1992) in his studies and include correlational studies to EEG measures of students. Further validation is being accomplished through correlational studies using the Myers--Briggs instrument for psychological types. This study provides a basis from which further reliability testing can be conducted.

Of the 107 eligible undergraduate students, graduate students and flight instructors involved in the aviation program, 96 chose to participate. Of the 96 responses, 87 were considered valid for the study in that all 20 questions on the instrument were answered. Table 1 provides data on the demographics of the participants. Mean score responses were rounded off to two decimal places and percentages were rounded off to one decimal place. The differences in the demographic totals are due to missing data for that particular variable. The percentages shown have as a bast the number of valid responses for each demographic variable.

The voluntary self--report instrument took approximately 15 minutes to complete and involved anonymous and confidential responses from the students. There were no special conditions or procedures required of the students and there were no abnormal risks associated with participation. Students and instructors were requested to volunteer at a general student meeting and during classes in the fall of 1993. Study participants were required to either be enrolled or actively involved in the aviation program at the university.

Statistical analysis of the responses comprised a series of t--tests and chi--square analyses and was performed by the statistical processing center at Bowling Green State University.

RESULTS

Study results classify the student population into the following biases: 20 students (23.0 percent) have a sequencing bias (SS and MS), 15 students (17.2 per-

Pilot	76	(87.4)	Female	19	(21.8)
Management	7	(8.0)	Male	68	(78.2)
Maintenance	4	(4.6)			

Note: 87 responses are valid for class rank, curriculum, and gender while 79 responses are valid for age. Percentage totals may not equal 100 due to rounding.

TABLE 2
Cognitive Bias Continuum Results of Aviation Students' Class Standing

Class	n	M	SD
Freshman	13	4.23	2.13
Sophomore	15	4.40	1.92
Junior	23	3.52	1.65
Senior	29	3.76	1.79
Graduate	7	3.85	1.46
	% Sequencing	*% Bilateral*	*% Relating*

cent) have a relating bias (SR and MR), and 52 students (59.8 percent) have a bilateral bias. A breakdown of the 52 students having bilateral bias identifies 34 as having a specialized bilateral bias (SB), 15 as having an alternating bilateral bias (AB), and 3 as having a combination bias (CB). Data compiled previously by Crane on college students in a general education course and analyzed by this researcher indicates distribution will tend toward a normal curve for a general student population when specialized bilateral is combined with alternating combination bilateral.

The mean and standard deviation were calculated for the different variables. Comparison is to be made to a normal distribution curve. A chi--square analysis revealed that there were no statistical differences among the correlations due primarily to insufficient population numbers in the groups. Though considered a limitation to this study, the data are still useful for serving as a basis for further study. The student results which identify the cognitive learning biases for the different variables are shown in Tables 2 through 5.

For class standing (Table 2), it is noted that no freshmen indicated a SS preference while no junior or senior indicated a SR preference. Graduate student flight instructors, who might be considered to be successful because of their advanced position, demonstrated no SS or SR preferences (Note: for this study the term successful denotes the ability to have progressed through a four year degree program and having acquired the necessary cognitive and behavioral skills, knowledge, and attitudes to have obtained aviation employment through a screening process).

The mean for freshmen and graduates progress from 4.23 to 3.85 and in the direction of sequential processing. While this is the expected result, statistically it is not significant in this sample. The standard deviation progresses from 2.13 to 1.46 from freshman to graduate. These data, though not significant in this

Freshman	0.0	23.1	46.2	0.0	30.8	0.0
Sophomore	6.7	6.7	40.0	26.7	13.3	6.7
Junior	13.0	8.7	43.5	30.4	4.3	0.0
Senior	3.4	27.6	34.5	13.8	20.7	0.0
Graduate	0.0	14.3	28.6	42.9	14.3	0.0

Note: SS = strong sequencing; MS = moderate sequencing; SB = specialized bilateral; AB-CB = alternating-combination bilateral; MR = moderate relating; SR = strong relating. Percentage totals may not equal 100 due to rounding.

TABLE 3
Cognitive Bias Continuum Results of Aviation Students' Age

Age	n	M	SD
<18	12	3.75	1.76
19-20	27	4.14	1.87
21-22	20	3.80	1.73
23	20	3.65	1.72

	% Sequencing		*% Bilateral*		*% Relating*	
Age	*SS*	*MS*	*SB*	*AB-CB*	*MR*	*SR*

small sample, provide a basis from which further study and comparison can be made to better determine if statistical significance will occur with a large number of students.

The age continuum (Table 3) shows similar results to the class continuum. No SR exists for age 21 and older while no SS for age 18 and younger exists. It is noted that no older students (23 and older) were identified as SS or SR. The means show a slight progression from 3.75 to 3.65 for the overall results, but it is more dramatic from ages 19--20 to ages 23 and older (4.14 to 3.65).

Crane's research data have generally shown that cognitive bias is not affected by gender, though females do tend to use lateralization to a larger degree than males (Crane, 1992). Lateralization is the organizing and processing of information in both brain hemispheres. In the gender analysis (Table 4), it is inconclusive as to whether the gender graph would support the basic hypotheses or not because no SS exists and the sample size is too small to give any indication.

The program option choice for the students is identified in Table 5. It was surmised (but not substantiated) that due to the different nature and tasks of flying, management and maintenance, the distribution of the cognitive biases of students in each curriculum option would vary. The number of students indicating their program choice as ``pilots'' differs from official academic records. The difference is attributed to many students viewing themselves as primarily pilots and thus marking that particular program choice on the questionnaire. However, of those students clearly identified as management or maintenance, none had SS or SR tendencies.

Note: SS = strong sequencing; MS = moderate sequencing; SB = specialized bilateral; AB-CB = alternating-combination bilateral; MR = moderate relating; SR = strong relating. Percentage totals may not equal 100 due to rounding.

TABLE 4
Cognitive Bias Continuum Results of Aviation Students' Gender

Sex	*n*	*M*	*SD*
Female	19	4.21	1.62
Male	68	3.79	1.84

	% Sequencing		*% Bilateral*		*% Relating*	
Sex	*SS*	*MS*	*SB*	*AB-CB*	*MR*	*SR*
Female	0.0	5.3	52.6	21.1	15.8	5.3
Male	7.4	20.6	35.3	20.3	16.2	0.0

Table 6 summarizes the results from chi--square analyses to determine if the demographic variables are related to a normal distribution of cognitive bias. The p--values show that the demographic variables and the cognitive bias are independent of each other. It should be noted that for each variable test, anywhere from 42 percent to 80 percent of cells had expected counts less than 5, which was the necessary number required to make the tests completely valid. Those cells having fewer than 5 counts for each of the variables were generally in the categories of strong sequencing, moderate relating, and strong relating.

Note: SS = strong sequencing; MS = moderate sequencing; SB = specialized bilateral; AB-CB = alternating-combination bilateral; MR = moderate relating; SR = strong relating. Percentage totals may not equal 100 due to rounding.

TABLE 5
Cognitive Bias Continuum Results of Aviation Students' Program Standing

Program	*n*	*M*	*SD*
Pilot	76	3.99	1.79
Management	7	3.14	1.68
Maintenance	4	3.25	1.89

	% Sequencing		*% Bilateral*		*% Relating*	
Program	*SS*	*MS*	*SB*	*AB-CB*	*MR*	*SR*
Pilot	6.6	15.8	38.2	22.4	15.8	1.3
Management	0.0	28.6	42.9	14.3	14.3	0.0

TABLE 6
Chi-square Analyses of Cognitive Bias to Demographic Variables

	N	df	Computed x2	p
Gender	87	5	6.63	0.25
Class	87	20	9.62	0.98
Age	79	15	17.26	0.30
Curriculum	87	10	11.03	0.36

Note: Test variables had from 42 percent to 80 percent of cells with expected counts less than 5. Chi-square may not be a valid test. p = .05.

DISCUSSION

This study attempts to determine if there is a predominant preference of cognitive processing bias among aviation students. Although the sample size is too small to determine statistical significance of the results, the information is still valuable to aviation educators as a basis for further study, investigation and debate.

The data suggest that graduates of aviation programs have a higher percentage of bilateral capabilities than those first entering the undergraduate program. This is evidenced by a progression in the means from relational toward bilateral and the smaller standard deviations from freshmen to graduate students. Fewer students at the senior or graduate level have a bias for strong sequencing or strong relational cognitive processing than at the freshman level.

That most classroom aviation instruction tends to be sequentially biased needs to be affirmed. However, the argument for the notion that a shift occurs in the cognitive bias processing capabilities is rooted in how aviation classroom instruction occurs. Learning about checklists, flight theory, aircraft systems and

federal regulations generally involve using logical or sequential thought processes.

Students who have a relational preference will find it difficult or frustrating to comprehend or learn the instructions or tasks taught in a logical or sequential process. Subsequently, those students encountering academic difficulty are likely to transfer or drop from the aviation program. At the higher grade levels, then, students strongly favoring a relational processing bias will not be in evidence. It is recognized that many factors exist that can influence a student in transferring or changing from an aviation program. Such factors can be lack of funding, personal problems, or change of interests. However, the primary assertion being made by this author is that instructional techniques and an instructor's own cognitive bias are two factors that will have a major effect on the academic progress of aviation students. This author believes the predominance of bilateral and sequential processors in the upper levels occurs as a result of classroom instruction favoring the sequencer and those students who can adapt to sequencing techniques.

The reason for this belief is that if problem--solving or task assignment is presented in only one mode of instruction, approximately half of the students may have difficulty completing the assignment or task. If students have difficulty completing the assignment or task, then academic performance will generally receive a negative evaluation. Aviation classroom instruction tends to favor the sequential process, as exhibited by standardized FAA guidelines for flight courses. If aviation educators' instructional techniques effectively reach only half the students, then educators are abrogating their responsibility to their students, their university, and to their profession.

It is further contended that aviation tends to attract a large number of relaters who tend to learn best through action and discovery techniques. Exposure to the sequential mode of course delivery proves to be frustrating for them. If a student has limited ability for processing information in that mode, they will become frustrated and either transfer or drop out of the program. As more and more rule memorization and similar sequential instruction is encountered and rewarded, those not able to adapt or otherwise compensate intellectually will invariably find it more difficult to remain and do well in the program.

This suggests that two reasons exists for the fewer relational mode students in the upper levels shown in Table 1. Students either learn to become better at lateralization and move away from solely relying on relational processes, or they leave the program to pursue other career choices. The reasons for the latter stem from the frustration of trying to learn from primarily sequential instructional techniques, or an instructor's biases do not reward students' relational strategies. For the former, further study into cognitive processing can help to assess whether lateralization occurs and whether it might be a predictor of success.

This raises the question of how flexible should aviation instructors be in their instructional techniques and methodologies. This author suggests that an in-

structor should be versed in a variety of teaching skills and be able to use various instructional methods that will address and nurture the different cognitive biases and learning styles of the students. This suggestion is confined to only the secondary schools and university setting were the goal of education is to develop individuals capable of functioning in various career fields. At the more specialized corporate or airline pilot level, it may be beneficial to have a higher percentage of individuals with a particular cognitive capability and instructional delivery should address those capabilities.

STUDY LIMITATIONS

Cognitive bias is the preference for processing information using sequential versus relational patterns. It is theorized that students desiring to be successful in an aviation program need to use cognitive hemisphere lateralization (i.e., integrate information from both hemispheres together) and incorporate several cognitive processing modes. A comparison of means shows a progression toward lateralization from entry level students to graduate students. A comparison of standard deviations shows a narrowing of the distributions from entry level students to graduate students. However, the shifts did not carry significance due in part to the small sample size. That is one limitation to the study.

Analyses were also made to see if the bias preferences could be correlated with such factors as class standing, age, gender and aviation program choices. The results indicated that no correlations exist, again, primarily due to the small sample size. This study assessed the cognitive hemispheric preferences of students in a 4--year aviation program. It was undertaken primarily to see if there existed support for a hypothesis of cognitive preferences in aviation students. It was intended to lay the basis for future hypotheses and investigation into the cognitive capabilities of aviation students and into learning and instructional styles. For that reason the study was designed as a snapshot of students in an aviation program. Not having a corresponding control group to make direct comparison of the results is a second limitation of the study. Control group generalizations are made to Crane's studies of college students. Based on those generalizations, the results are interpreted as encouraging continued research. Further comparison of aviation students to students in other specialized curriculums and to the general student population will enhance the results of both this study and Crane's.

Finally, though Crane's work has a solid basis in psychological research, his instruments are not widely known or utilized. Questions about validity and reliability can b e answered from more thorough correlational studies. Such studies are being undertaken.

RECOMMENDATIONS

Additional evidence to demonstrate that aviation educators may need to modify or improve their teaching skills and teaching effectiveness can be gathered by further study. Investigation into the cognitive capabilities of aviation students at other universities will add to the reliability of the data. Conducting a study using more varied control groups will further substantiate the findings. A multi--year longitudinal study is also recommended to help clarify and better assess the factors affecting the changes seen in the cognitive progression of aviation students. That kind of a study would help to address the issue of whether students change or remain the same in their cognitive capabilities over four years, or identify whether a correlation exists between the biases and those who remain in the program and those who do not.

A study of successful aviation individuals is suggested as being an important body of knowledge from which to draw substantive conclusions. Such a study has been completed on corporate pilots (Quilty, 1995) and the findings support a higher degree of sequential processing and bilateral capabilities in pilots.

Further study to identify instructional methods that provide examples of how aviation education and training can become more effective is also of importance. Of course, if the intent of any program is to produce a particular type of cognitive processing student, then focusing on one instructional technique will more than likely result in that end.

There may also be implications from the additional studies for the currently popular concept of crew or cockpit resource management (CRM) and ab initio training. Since one emphasis of CRM is to understand how different ways of communicating data are perceived, interpreted or processed by individuals, it is suggested that communication, coordination and task completion can be optimized if cognitive preferences or biases are understood and appropriately considered in teaching CRM concepts.

The concept of ab initio training centers on the use of the relational mode of processing where a student is immediately introduced to flying (action), and from the flying, understanding and knowledge result. This is a departure from the standard sequential methodology of instruction where knowledge is introduced first in the classroom and from which understanding then occurs and the student flight activity and actions follow. Correlation studies between successful ab initio trainees and cognitive processing bias would be of value and interest to educators in the aviation field.

McCarthy (1987) developed a system incorporating hemispheric research and learning style research to enhance teaching abilities. Research into actual delivery of different teaching and training methodologies and/or techniques that address the varied cognitive processing biases of students would be of further interest for many aviation educators.

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An Analysis of Student Programmatic Delays in Postsecondary Flight Training Programs: A National Study

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ABSTRACT

The purpose of this study was to determine the number of University Aviation Association (UAA) member postsecondary institutions that were experiencing student delays in flight certification. Such delays can lead to increased costs for the student, the failure to complete the intended academic program, and an interruption in career progression. The study also sought to determine: if the delays were increasing or decreasing; if there was a difference between less--than--four--year and four--year postsecondary flight training institutions; and whether flight simulation, student monitoring, weather, geographic location, instructor availability, instructor turnover, aircraft availability, and institutional financial and grading policies were related to flight student training progression.

The study revealed that approximately 88 percent of the respondents noted that they were experiencing a problem with flight student progress delays at their institution. The research indicated that institutional financial policies and the use of ground--based training devices were associated with a reduction in flight training progress delays.

INTRODUCTION

Since the passage of the Airline Deregulation Act (ADA) in 1978, the need for professionally--trained air carrier pilots in the United States has expanded substantially. For example, the number of hours flown by scheduled U.S. air carriers has risen from 6,697,770 in 1982 to 11,866,213 in 1992, an increase of more than 77 percent (National Transportation Safety Board, 1994).

Postsecondary academic institutions have replaced the military as a major source of cockpit staff. While the colleges and universities offering postsecondary flight training programs do not have the aviation resources of the U.S. Air Force or Navy, the airlines have found that postsecondary institutions produce high--quality, professional aviators. Further, most postsecondary programs require that the pilots learn critical thinking skills through a substantial component of general education and cognate courses (Federal Aviation Administration, 1993).

BACKGROUND

As early as 1976, the UAA's standards recognized the detrimental effects of a student's flight course progress lagging behind the related ground course in a given semester. The UAA suggested that ``concurrent enrollment in flight lecture courses and associated flight lab courses or another suitable system of flight lecture/lab course integration will facilitate maximum learning'' (Kiteley, 1976, p. 17).

Students who fail to complete the flight courses in a timely manner lose the potential for maximum learning achieved in concurrent lab/lecture courses. the UAA (Kiteley, 1976, p. 17). Further, they often fail to meet the prerequisites of the upcoming courses in their curriculum. As a result of this failure to meet the prerequisites, many change their major or drop out of the program altogether. With the growing importance of postsecondary flight providers as a source of air carrier pilots, this problem could negatively impact the future availability of professional flight crews.

In a report prepared for the Federal Aviation Administration in 1973, Hollister, LaPointe, Oman, and Tole conducted a study that measured ``skill degradation of non--instrument rated, single--engine, FAA certificated private and commercial pilots'' (1973, p. 1). The results of the study identified that the most important factor in determining the variations in pilot skill of the sampled group was recency--of--flight experience. According to the study, recency--of--flight experience:

> Accounted for the largest percentage of the variance (40% of the contribution of all experience factors combined). [Yet] it is the experience factor which can be varied most easily…Recency will decay exponentially to zero with a time constant of four weeks with no flying…These results are valuable for helping pilots to appreciate the importance of total time and recent experience. (Hollister et al, 1973, pp. ix--x)

The research by Hollister et al serves to highlight the importance of recency--of--experience, especially for low--time pilots such as those in postsecondary flight programs. A lack of flying for a period of several weeks for a flight student can lead to a vicious cycle: a lack of flying (due to a lack of money, bad weather, or other factors) develops the need for even more flying and the expenditure of more money. The end result could be an incomplete grade and programmatic delay for the student.

SURVEY METHODOLOGY

Description of the Population

A survey questionnaire was sent to flight program administrators at all University Aviation Association (UAA) member postsecondary institutions. The UAA was founded in 1950, and is ``composed largely of persons either representing or working with institutions of higher education which have aviation

programs" (Kiteley, 1976, p. iv). According to the UAA, there currently are 109 member institutions—two are located outside the United States. The survey questionnaire methodology was used because of its versatility in exploring a wide range of phenomena.

Development of the Research Instrument

The research instrument was developed in response to problems of postsecondary programmatic delays experienced by flight students at the researcher's institution, and understood to exist at other UAA member institutions. Additional questions were developed as the result of closed-- and opened--ended questionnaires completed by students at the researcher's institution (Bryan, 1995). Additional resources utilized in the development of the research instrument were curricular data developed by the UAA (Kiteley, 1976). The questionnaire is included as Appendix A. Responses to each of the items on the questionnaire are included in tables 4.1 through 4.20 in Appendix B.

Research Questions

The study began with six basic research questions from which the questionnaire was developed, as follows:

1. How many UAA institutions nationwide are currently experiencing problems with flight student programmatic delays, whereby students fail to complete their flight courses in the semester prescribed by the curriculum?

2. Is the problem of flight student programmatic delays increasing or decreasing?

3. Is there a difference between less--than--four--year and four--year postsecondary flight training institutions in the area of flight student training progression?

4. Is the use of flight simulation related to postsecondary flight student training progression?

5. Is institutional monitoring of student flight progress during the semester related to flight student training progression?

6. Are weather, geographic location, instructor availability, instructor turnover, aircraft availability, and institutional financial and grading policies related to flight student training progression?

Analysis of Findings

Of the 106 flight program administrators at UAA institutions included in the survey, 80, or approximately 75 percent, responded prior to the November 3,

1995, cutoff date. The response rate in was in the mid--range of the researcher's expectations.

Research Question 1 pertained to the number of University Aviation Association (UAA) institutions nationwide that were currently experiencing problems with flight student programmatic delays. Responses to this question were garnered from Item 6 from the questionnaire. The responses to Item 6 reported whether the institution was experiencing no problem, a minor problem, or a major problem. (The determination of whether a whether a problem was major or minor was left to the respondent.)

The data revealed that nearly 88 percent of the postsecondary institutions were experiencing a problem with the failure of flight students to complete their flight courses in the semester prescribed by the curriculum (see table 4.6). Responses to Item 6 from the questionnaire reported that 37 institutions, or 58 percent of the respondents, were experiencing minor delays, and 19 institutions, or nearly 30 percent, were experiencing major delays. Only 7 institutions, or 11 percent, reported that they were not experiencing a problem with flight student programmatic delays.

In addition to the direct response from the participants to Research Question 1 in Item 6 of the questionnaire, further data were gathered in Item 11 of the questionnaire. In that question, participants were asked ``How many of your flight students fail to complete their flight course in the semester predicated by the syllabus?''

Of the respondents, over 20 percent noted that 1--10 percent of their students failed to complete their flight course in the prescribed semester; over 34 percent reported 11--25 percent; nearly 22 percent noted 26--50 percent, and nearly 19 percent responded that more than 50 percent of their students failed to complete their flight courses on time. One respondent reported that all of their institution's students completed their flight courses in the semester predicated by the syllabus (see table 4.11).

Research Question 2 pertained to whether the problem of flight student programmatic delays was increasing or decreasing at institutions where the respondents reported that a problem existed. The data revealed that 42 respondents (nearly 66 percent) reported no trend (see table 4.7). Ten respondents (nearly 16 percent) reported that the problem of flight student programmatic delays was decreasing, while 7 (nearly 11 percent) reported the problem was increasing.

Research Question 3 sought to identify whether there was a difference between less--than--four--year and four--year postsecondary flight training institutions in the area of flight student training progression. Forty, or over 62 percent of the reporting postsecondary institutions were four--year schools, and twenty--one, or approximately 33 percent were two--year schools (see table 4.5). Three respondents, or approximately 5 percent, noted Other (two granting a master's degree and the other no degree).

While both the two--year and four--year institutions reported combined minor and major problems with flight student progression of approximately 88 percent, the two--year institutions had a greater rate of reported major problems. Two--year schools reported major problems in 38 percent of the responses, while four--year schools reported major problems in approximately 28 percent of the responses.

Research Question 4 sought information on whether the use of flight simulation was related to postsecondary flight student training progression. Items 14 and 15 from the questionnaire were used to elicit information on this subject. The data indicated that over 78 percent of the institutions require the use of simulators or pilot ground training devices as a part of their private or commercial pilot flight courses (see table 4.14). While approximately 22 percent reported no such requirement for their flight students, those schools produced nearly half of the major problem responses in Item 6 of the questionnaire.

The responses to Item 15 indicated that approximately 81 percent of the schools did not require the use of simulators for students with extended non--flying periods (see table 4.15). However, the schools that did require the use of simulators for students who did not fly for three or more weeks reported a lower rate of major problems with student progress. Ten respondents reported that they required the use of ground trainers during such non--flying periods, with only one reporting major progress problems. Fifty--two reported they did not use such devices, and reported 18 major progress problems.

The data indicated a relationship between the incidence of major flight student progress delays at postsecondary institutions and the use of ground training devices. While the use of ground trainers does not appear to lessen the incidence of minor problems, it appears to be related to a reduction in the rate of major progress delays.

Research Question 5 asked whether the monitoring of student flight progress during the semester was related to flight student training progression. The responses to this question were garnered from Item 20 of the questionnaire. The responses indicated that approximately 90 percent of the institutions monitored the progress of their flight students during the semester (see table 4.20). By reviewing the data, no clear relationship can be drawn between institutional monitoring of flight student progress during the semester and flight student delays.

Research Question 6 asked if weather, geographic location, instructor availability, instructor turnover, aircraft availability, and institutional financial and grading policies were related to flight student training progression.

Item 12 from the questionnaire elicited responses regarding weather, instructor availability, and aircraft availability as factors in flight training delays (see table 4.12). Twenty--one of the 64 institutions, or approximately 33 percent, reported that weather was the major factor in flight training delays. Twenty--eight institutions, or nearly 44 percent, noted that student finances were the most important causal factor for flight training delays. Item 12 also asked the respon-

dents to rank instructor and aircraft availability as causal factors in flight student progress delays. None of the respondents reported these two areas as primary causal factors.

A crosstabulation of institutional geographic location in Item 3 of the questionnaire and Item 6, indicating problems with flight student progress delays, was developed. The data indicated no clear relationship between geographic location of the school and flight student progress delays. A larger percentage of the institutions in the north central United States (20%) reported no problems with flight student progress delays than those located in the southeastern United States (approximately 15 percent).

Item 17 from the questionnaire asked whether flight instructor turnover was a factor in flight student progress delays. The results indicated that flight instructor turnover was not a major problem at most institutions. Forty--five, or approximately 70 percent, reported no problems in that area (see table 4.17).

Items 9 and 10 of the questionnaire were related to institutional financial policies and their impact of flight student progress delays. The responses from Items 9 and 10 were crosstabulated with the responses from Item 6 of the questionnaire, which asked whether the institution was experiencing a problem with flight student progress delays. The data in the crosstabulations revealed a relationship between institutional financial policies and the number of major progress delays.

The data indicated major flight student delays at 14 of the 29 institutions that did not have a formal process for determining student financial fitness. Only one of nine that did determine student financial fitness reported experiencing major progress delays.

Item 19 from the questionnaire asked whether the respondent's institution used the same policy regarding flight course incomplete grades as in other academic courses. Approximately 48 percent of the respondents reported a more flexible policy rendered toward flight students, while nearly 52 percent reported using the same policy as in other academic courses. None of the respondents reported that a less flexible policy was used for flight students.

A crosstabulation was developed using Item 19 and Item 6, the level of reported flight student progress delays. There was little difference between the institutions with the same policy as in other academic courses and those with a more flexible grading policy.

Of the 33 institutions reporting the same policy toward incomplete flight grades, 20 reported minor problems and 9 reported major problems. Of the 30 institutions reporting a more flexible policy, 17 indicated minor problems and 10 reported major problems.

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

The purpose of this study was to determine the number of UAA member postsecondary institutions that were experiencing student delays in flight certification. Such delays can lead to increased costs for the student, the failure to complete the intended academic program, and an interruption in career progression.

This study queried the aviation program administrators of UAA member flight institutions to determine the extent of the problem. Through a questionnaire, the researcher determined whether a relationship existed between student flight curriculum progress and certain identified factors at those institutions.

A descriptive research methodology was utilized to obtain and report the data for this study. A survey questionnaire was sent to all members of the University Aviation Association (UAA) who were located in the United States, with the exception of the researcher's home institution. The University Aviation Association was founded in 1950 and is a national organization representing the interests of institutions with postsecondary aviation programs.

The results of the study were based upon the data collected from the questionnaires completed by the respondents. The study provided useful information about the propensity for flight student programmatic delays at the institutions, and respondent perceptions of the chief causal factors for such delays. Data on institutional policies and how they relate to flight student delays were also gathered.

With the growing importance of postsecondary institutions in the training of commercial pilots, it is important that the body of research in this area of education be expanded. No prior studies have been conducted in the area of postsecondary flight student progress delays. This study was conducted in an effort to identify the causal factors in such delays, so as to provide a basis for remedial methodologies.

Conclusions

As a result of the data obtained by this study, the following conclusions and interpretations were drawn:

1. Approximately 88 percent of UAA postsecondary institutions that offer flight programs indicated that they were experiencing major or minor problems with flight student progress delays.

2. No trend was reported in the rate of flight student progress delays.

3. No relationship was noted between the incidence of flight student progress delays and the level of degree offered at the postsecondary institu-

tions. A larger percentage of the flight student progress delays were classified as major at the two--year institutions.

4. The use of simulators or ground training devices was related to a reduction in major flight student progress delays.

5. No clear relationship could be established between institutional monitoring of flight student progress during the semester and a reduction in flight student progress delays.

6. No relationship was established between weather or geographic location as a causal factor. Instructor turnover, instructor availability, and aircraft availability also were not factors in flight student progress delays. Institutional financial policies were related to student delays. No relationship was found between grading policies and student delays.

The results of this study showed that flight student progress delays (29.7 percent major and 57.8 percent minor) were a problem at approximately 88 percent of UAA institutions. The majority of the respondents indicated that there was no trend in the level of flight student delays.

Prior to this study, the researcher anticipated that two--year postsecondary institutions, with fewer cognate and general education course demands upon their flight students than four--year schools, would experience a lower incidence of flight progress delays. There was little reported difference between the two--year and four--year institutions and the combined incidence of major and minor flight student progress delays. The percentage of major flight student progress delays was greater at the two--year postsecondary institutions.

The relationship between geographic location and the role of weather was a lesser causal factor than anticipated by the researcher. Little difference in the total responses to major and minor delays were reported by schools in weather--impacted areas and typically fair weather regions.

Prior to this study, the researcher anticipated that flight instructor turnover could be a factor in flight student progress delays. This concept was garnered from a study at the researcher's home institution (Bryan, 1995), where students reported turnover as a problem. However, the respondents from the national survey did not corroborate the researcher's earlier finding.

The financial policies of the institutions are factors in flight student progress. Institutions that either required prepayment from their flight students or engaged in a formal financial determination prior to each semester, had fewer major flight progress problems than the other institutions.

Simulators or ground training devices are important tools in reducing flight student progress delays. The institutions that used these devices experienced a lower rate of major delays and reported the only incidence of no delays.

The relatively small number of institutions that required the use of ground training devices during periods of student non--flying experienced fewer problems with major flight progress delays. The 10 institutions that required the use

of simulators reported only one major delay, for a major delay rate of 10 percent. The other 51 institutions experienced 18 major flight student progress delays, for a major delay rate of approximately 35 percent.

An unanticipated result of this study was the large number of respondents indicating that student motivational factors were a problem. In response to Item 12 from the questionnaire, more than one--fourth of the respondents indicated that either student motivation or related issues (reliability, self--discipline, workload prioritization, scheduling, and the like) were important issues in training delays.

One institution indicated that it addressed the issue of student motivation by conducting institutional flight scheduling (in other words, flights were not scheduled by the student). Further, if students failed to meet a scheduled flight period on more than three occasions, the student was dropped from the program. The respondent noted that such policies were appropriate in preparing professionals for an industry with rigorous demands.

Recommendations

Indications are that postsecondary flight training institutions will continue to play an increasingly important role in the training of professional cockpit crew-members. With the high cost of the flight component of that training, it is important that postsecondary administrators and educators understand the underlying factors in flight student progress delays.

Prior to this study, no information was available about the incidence of flight student delays at postsecondary institutions. With the results of the study indicating that nearly 88 percent of the institutions were experiencing such delays, policies should be implemented to ameliorate the problem.

The study indicated that institutions that do not require prepayment of flight fees or engage in a formal determination of flight student finances prior to the start of a semester experience a higher percentage of major delays. It is recommended that institutions engage in a formal determination of student financial fitness or prepayment in an effort to reduce major flight progress delays.

The use of ground--based flight training devices was found to be associated with a reduction in flight student progress delays. With the increasing sophistication and modest cost of such devices, it is recommended that institutions incorporate the use of ground--based trainers in their flight courses.

Further, the research indicated that institutions requiring the use of ground--based training devices for students who did not fly for three or more weeks experienced a lesser rate of major flight progress delays.

This conclusion is supported by the earlier research of Hollister et al (1973) that noted flight skills for low--time pilots ``will decay exponentially to zero with a time constant of four weeks of no flying'' (p. x). Therefore, it is recommended that institutions incorporate policies that require the use of ground--based trainers for students subjected to non--flying periods of three or more weeks.

Further research is recommended in the areas of institutional financial policies toward postsecondary flight students, as well as flight student motivational attitudes, and their effect on progress delays. The use of qualitative techniques such as in--depth interviewing would likely yield greater understanding in these areas.

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APPENDIX A
POSTSECONDARY PILOT TRAINING QUESTIONNAIRE

Please respond in the spaces provided. Thank you for your participation!

1. Does your institution presently offer flight training courses for credit, either through its own or contract flight facilities?

   ___Yes ___No

   (If the answer to this question is no, please stop here and return the questionnaire in the envelope provided.)

2. How many students are enrolled in aviation programs at your institution?

   ___Less than 50 ___50--199 ___200--500 ___501--1000
   ___More than 1,000

3. Which of the following best describes the geographic location of your institution in the United States?

   ___Southwest ___Southeast ___N. Central ___S. Central
   ___Northwest ___Northeast

4.

Does your institution operate its own fleet of training aircraft, or does it utilize the services of contract flight schools?

___Uses own fleet   ___Uses contract flight schools

5. What is the highest degree offered in your school's flight program?

___Associate   ___Baccalaureate

___Other (Please indicate:_____)

6. Does a problem exist at your institution with the failure of aviation students to complete their flight courses in the prescribed semester?

___No   ___Yes, minor problem   ___Yes, major problem

7. Referring to Question 6, is the problem increasing or decreasing?

___Increasing   ___Decreasing   ___No Trend   ___N/A

8. Referring to Question 6, is the problem greater for students with jobs?

___No   ___Yes, somewhat greater   ___Yes, much greater   ___N/A

9. Does your institution require flight students to pre--pay anticipated aircraft rental costs at or before the beginning of each semester?

___Yes   ___No, prepayment not required

10. If the answer to Question 9 is ``No,'' does your institution require any formal determination that the student has sufficient funds at his/her disposal to complete the upcoming semester's flight training?

___Yes   ___No   ___N/A

11. How many of your flight students fail to complete their flight course in the semester predicated by the syllabus?

___None ___1--10% ___11--25% ___26--50% ___More than 50%

12. If the answer to Question 11 is other than ``None,'' please rank the following as causal factors in flight training delays (Place the number 1 through 5 next to the item in the order of its importance; ``1'' being the item most responsible for the flight training delays).

___Weather   ___Finances   ___Aircraft Availability

___Instructor Availability

___Other (Please describe:_____)

13. How many of your flight students fail to fly for three or more weeks during a semester in which they are enrolled in a flight course?

   ___None ___1--10% ___11--25% ___26--50% ___More than 50%

14. Does your institution utilize simulators or pilot ground trainers as a required part of your private pilot and commercial pilot flight courses?

   ___Yes ___No

15. Does your institution require the use of simulator or pilot ground trainers for flight students who do not fly for extended periods of time?

   ___Yes ___No

16. On average, how many instructors does a typical student have during private pilot flight training?

   ___One ___Two ___Three ___Four

   ___Other (Please indicate:_____)

17. Do you feel that flight instructor turnover is a factor in impeding student progress in your flight program?

   ___Yes, minor factor ___Yes, major factor ___No

18. Are ``incomplete'' grades more common for in--flight courses than for other courses at your institution?

   ___No, less common ___Yes, more common ___No difference

19. Does your institution use the same policy regarding flight course ``incomplete'' grades as in other academic courses?

   ___Same ___Less flexible ___More flexible

20. Does your institution monitor student flight time during each semester?

   ___No ___Yes, weekly ___Yes, biweekly ___Yes, monthly ___Other

APPENDIX B

TABLE 4.1
Institutions Providing Flight Training Credit

Training Credit Provided	Number	Percent
Yes	64	80.00
No	16	20.00
Total	80	100.00

TABLE 4.2
Number of Students Enrolled in Aviation Programs

Enrollment	Number	Percent
Less than 50	12	18.75
50--199	33	51.56
200--500	13	20.31
501--1000	4	6.25
More than 1,000	2	3.13
Total	64	100.00

TABLE 4.3.
Geographic Location of Postsecondary Flight Institutions

Location	Number	Percent
Southwest	4	6.25
Southeast	13	20.31
North Central	21	32.81
South Central	11	17.19
Northwest	4	6.25
Northeast	11	17.19
Total	64	100.00

TABLE 4.4
Institutions with In--House and Contract Flight Facilities

Flight Provider	Number	Percent
In--house	33	51.56
Contract facilities	31	48.44
Total	64	100.00

TABLE 4.5
Highest Degree Offered by Institution's Flight Program

Degree	Number	Percent
Associate	21	32.81
Baccalaureate	40	62.50
Other	3	4.69
Total	64	100.00

Note. Respondents were given an opportunity to indicate the type of degree in their ``Other'' response. Two reported that the institution granted a master's degree. Another reported that the institution granted no degree in the flight program.

TABLE 4.6
Level of Flight Student Progress Delay Problems by Institution

Delay Problem at Institution	Number	Percent
None	7	10.94
Minor	37	57.81
Major	19	29.69
Non--response	1	1.56
Total	64	100.00

TABLE 4.7
Institutional Trends in Flight Student Progress Delays

Trend	Number	Percent
Increasing	7	10.94
Decreasing	10	15.63
No trend	42	65.63
Not applicable	5	7.81
Total	64	100.00

TABLE 4.8
Number of Flight Student Progress Delays for
Students with Jobs

Difference	Number	Percent
No	21	32.81
Yes, somewhat greater	27	42.19
Yes, much greater	5	7.81
Not applicable	10	15.63
Non--response	1	1.56
Total	64	100.00

TABLE 4.9
Institutional Policy Toward Prepayment of Student Flight Costs

Policy	Number	Percent
Prepayment required	27	42.19
Prepayment not required	37	57.81
Total	64	100.00

TABLE 4.10
Institutions Requiring a Formal Determination of Flight Student Financial Ability

Requirement	Number	Percent
Yes	9	14.06
No	30	46.88
Not applicable	10	15.63
Non--response	15	23.43
Total	64	100.00

TABLE 4.11
Number of Students Failing to Complete Flight Training in the Predicated Semester

Non--Completion	Number	Percent
None	1	1.56
1--10%	13	20.30
11--25%	22	34.38
26--50%	14	21.88
More than 50%	12	18.75
Non--response	2	3.13
Total	64	100.00

TABLE 4.12
Causal Factors in Flight Training Delays

Rank: Weather	Number	Percent
Weather:		
1	21	32.81
2	19	29.69
3	9	14.06
4	0	0
5	2	3.13
Non--response	13	20.31
Total	64	100.00
Finances:		
1	28	43.75
2	14	21.88
3	5	7.81
4	3	4.68
5	2	3.13
Non--response	12	18.75
Total	64	100.00
Aircraft Availability:		
1	0	0
2	3	4.68
3	19	29.69
4	11	17.19
5	4	6.25
Non--response	27	42.19
Total	64	100.00
Instructor Availability:		
1	0	0
2	1	1.56
3	6	9.38
4	21	32.81
5	8	12.50
Non--response	28	43.75
Total	64	100.00
Other:		
1	12	18.75
2	15	23.44
3	1	1.56
4	0	0
5	4	6.25
Non--response	32	50.00
Total	64	100.00

TABLE 4.13
Students Failing to Fly for Three or More Weeks During a Semester

Students	Number	Percent
None	8	12.50
1--10%	25	39.06
11--25%	20	31.25
26--50%	7	10.94
More than 50%	1	1.56
Non--response	3	4.69
Total	64	100.00

TABLE 4.14
Institutions Requiring the Use of Simulators or Ground Trainers in Private Pilot or Commercial Pilot Flight Courses

Require Trainers	Number	Percent
Yes	50	78.13
No	14	21.88
Total	64	100.00

TABLE 4.15
Institutions Requiring Simulator or Ground Trainers for Students Who Do Not Fly for Extended Periods

Require Trainers	Number	Percent
Yes	10	15.62
No	52	81.25
Non--response	2	3.13
Total	64	100.00

TABLE 4.16
Average Number of Flight Instructors During Private Pilot Flight Training

Flight Instructors	Number	Percent
One	37	57.82
Two	20	31.25
Three	4	6.25
Four	1	1.56
Other	1	1.56
Non--response	1	1.56
Total	64	100.00

Note. One respondent to Question 16 listed ``Other'' as the choice. The respondent noted that the student had one instructor for ground training, one for simulation, one for stage checks, and one for flight training.

TABLE 4.17
Impact of Flight Instructor Turnover

Factor	Number	Percent
Yes, minor factor	14	21.88
Yes, major factor	5	7.81
No	45	70.31
Total	64	100.00

TABLE 4.18
Relative Frequency of Incomplete Grades in Flight

	Courses	
Frequency	Number	Percent
No, less common	4	6.25
Yes, more common	49	76.56
No difference	10	15.63
Non--response	1	1.56
Total	64	100.00

TABLE 4.19
Institutional Policy Toward Incomplete Grades for
Flight Courses

Institutional Policy	Number	Percent
Same	33	51.56
Less flexible	0	0
More flexible	31	48.44
Total	64	100.00

TABLE 4.20
Institutional Monitoring for Flight Student Progress

Monitor Progress	Number	Percent
No	7	10.94
Yes, weekly	26	40.63
Yes, biweekly	9	14.06
Yes, monthly	15	23.44
Other	7	10.94
Total	64	100.00

Note. Although the questionnaire did not provide an opportunity to indicate what was meant by an ``Other'' response to Question 20, three respondents provided elaboration. Two reported that student flight progress was monitored daily, and the other that progress was monitored on a semester basis.

Hubs versus Hub--Nots: A Comparison of Various U.S. Airports

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ABSTRACT

The purpose of this paper is to examine possible differences between hub and non--hub airports. The authors gathered both primary and secondary data on the 100 busiest U.S. airports. This study uses passenger levels, current capacity, and other variables to analyze possible differences based on airport type. The authors hope to stimulate discussion by government officials, airport authorities, and academics concerning airport policy decisions.

INTRODUCTION

Deregulation of the airline industry has changed the way companies do business. Many of the benefits are positive, for instance lower fares and more choices (Smith, 1995). Deregulation has also contributed to the dramatic increase in the number of passengers throughout the system. Many airports have struggled to handle these additional 300 million passengers a year (Lack, 1988).

Another of the major impacts of deregulation is the creation of major airport hubs. Alfred Kahn, an expert on deregulation, stated that the hub--and--spoke system is a direct economic result of reduced government control (Kahn, 1990). Deregulation helped to create an environment where major airlines benefit by using the hub system (Fawcett and Fawcett, 1988).

However, there are possible negative side--effects to shifting to a hub--and--spoke system. The hub airports experience tremendous growth in operations. This may cause various problems such as increased delays, additional noise, and dissatisfied customers. Important questions are how various airports are addressing the problems of delays, funding, Federal Government regulation, and lack of capacity, among other issues needed to be addressed.

Based on the hub--and--spoke concept, the authors defined a ``hub'' airport as an airport that acts as a hub for a class 1 carrier such as Delta at Atlanta Hartsfield or American at Dallas--Ft. Worth. Given the increased numbers and importance of hub airports, there are many questions that need to be addressed. This article

examines some of the differences and similarities between various airports. After a brief examination of the relevant literature, the research questions are presented. The results section highlights the findings of an airport survey. Finally, conclusions and possible research opportunities are presented.

OVERVIEW OF THE LITERATURE

A striking point concerning the literature is a lack of articles dealing specifically with hub type airports. The most relevant articles appear in practitioner journals such as Aviation Week & Space Technology (O'Lone, 1989; Phillips, 1994), Air Transport World (Reingold, 1995), and Airliners: The World's Airline Magazine (US Air's, 1994). Many of these articles do not deal with ``hub'' type specific issues, but rather use hub airports as examples of current operational procedures or problems.

An alternative to ``hub'' specific articles lies in the related airport literature. Most of these articles deal with critical issues that affect the large, hub--type airports. These articles have two common themes: capacity and expansion.

The hub airports are faced with ever increasing numbers of passengers and aircraft operations. As noted in the introduction, there has been a huge growth in passenger traffic since deregulation. Based on Federal Aviation Administration (FAA) growth predictions of 3.5 percent, the total number of annual enplanements will be over 640 million by the year 2005 (U.S. Department of Transportation, 1994). This is a 263 percent passenger growth in the thirty--five years following deregulation.

Much of this expansion is concentrated in the major hub airports. It is not surprising that the four busiest airports in the U.S. are all major hubs: Chicago, O'Hare; Los Angeles; Atlanta, Hartsfield; and Dallas--Ft. Worth. These four airports are predicted to have 152,213,000 enplanements in the year 2005 (U.S. Department of Transportation, 1994) and will account for approximately one--quarter of all passenger enplanements in just a few years. Considering the increasing number of people moving through these and other hubs, the busiest airports are attempting to identify methods to respond to the escalating number of passengers and flights.

While practitioner publications discuss some hub issues, academic journals present a number of relevant articles about capacity and expansion issues. Fawcett and Fawcett (1988) discuss airport expansion and present possible alternatives. They suggest the best alternative in the short--term is to restrict access by raising landing fees. Also, they imply that a long--term solution would be to add capacity if possible (U.S. Department of Transportation, 1994).

Another related study was conducted by Bishop and Thompson (1992). They examined the relationship between peak--load pricing and airline scheduling. Their findings provided empirical support for Fawcett and Fawcett's study. Bishop and Thompson found that raising landing fees did alter the flight opera-

tions of smaller, charter--type carriers (1992). They recommended peak--load pricing as an effective method to handle the increased demands on airports.

A third study combined academia, practitioners, and government employees. The National Research Council of the Transportation Research Board presented a special report discussing all of the options available to prepare airports for the projected increases in passengers (1990). Unfortunately, this work merely presented a laundry list of possible options. It did not present a clear recommendation to prepare for the increased numbers of riders. It did, however, provide weak support for expansion.

Finally, detailed examination of this issue was conducted by the FAA. Much like the previous work, they examined all the possible alternatives. They, too, did not make any recommendations, but rather presented the benefits and costs of numerous alternatives. This study provides a very descriptive analysis of the current situation (U.S. Department of Transportation, 1994).

While these studies do not directly address the hub--and--spoke system, they examine an issue which is critical to the major hubs. They provide background to compare whether and, if so, what differences occur between hub and non--hub airports. Numerous variables, such as number of delays, capacity expansion, numbers of passengers, provide excellent opportunities to perform comparisons.

RESEARCH QUESTIONS AND METHODOLOGY

A number of research questions were designed to examine not only the possible differences between hub and non--hub airports, but also the current techniques in use to reduce delays. However, the primary focus of this article remains the examination of the hub airports.

Two distinctive types of data were collected for analysis. First, secondary data was gathered from government sources on all major airports in the U.S. This included most of the basic demographic information normally collected in a survey.

Primary data was also collected using a two--page questionnaire. The survey was mailed to the airport or operations manager at the 100 busiest airports in the U.S. based on 1992 enplanements. With one exception, the format followed the traditional Dillman survey approach of a cover letter with a survey and return envelope (1978). This was followed with a reminder card the next week. Finally, a follow--up letter with survey and envelope was sent the third week. The exception was that the survey itself was not in the normal small booklet format. The goal was to increase the response rate by providing a survey that could be easily faxed back. The survey was printed on two pages on white paper and included a prepared fax cover sheet which included the return address of each respondent.

Using this research plan, 100 surveys were sent to the 100 busiest U.S. airports. Seventy--four airports returned the questionnaire (74 percent). Also, by surveying the population of the 100 busiest airports, any possible selection bias

was eliminated. However, it was necessary to test for respondent bias. Since secondary data for all 100 airports was available, it was used to compare the 74 respondents to the 26 non--respondents to test for bias.

Using Pearson's chi--square test for goodness of fit, the airports were compared using number of enplanements and number of delays. There was not a significant difference between the two groups (Enplanements P=.8397; Delays P=.2223). Therefore, it is reasonable to conclude that the respondents are representative of the population.

The data were collected to answer five research questions. The first question lays the foundation for the research. It also provides an excellent opportunity to examine the demographics of the respondents.

H1: There are demographic differences between hub and non--hub airports.

At first this appears to be obvious. The common perception is that hub airports are the large, busy airports like O'Hare. However, it is important to validate what appears to be common sense. Also, the other demographic variables include locations, delays and number of airport types. Table 1 provides summary data of the demographic findings where there are significance difference between hub and non--hubs. Appendix A provides an overall summary of the respondent airports.

The research confirmed the ``obvious'' points of hubs being larger and experiencing additional delays. The hub airports averaged almost seven million more

Note: Delays from 1 = ``No Delays'' to 3 = ``Delays are a daily problem''

TABLE 2
Airports Expansion of Busiest U.S. Airports, 1996.

Is your airport expanding?	*% Yes*	*% No*
Total	84.9	15.1
Hub	94.4	5.6
Non-Hub	81.8	18.2

passengers a year than non--hubs. Also, they had a much higher number of fifteen minutes or longer delays each year.

Based on the findings about size of hub airports and the number of delays, the issue of expansion is extremely important to hub airports. Therefore, one could reason that hub airports would consider expansion to be a critical issue. The second research question compares airport expansion.

H2: Hub airports are more likely to expand capacity than non--hub airports.

Table 2 indicates the vast majority of airports (84.9 percent) report that they

Primary Reason	Hub	Non-Hub
Anticipated growth	5	36
Reduce delays	12	2
Attract new carrier	0	2
Modernize facilities	0	5
Not Expanding	1	10
Non-response	0	1

are currently expanding their infrastructure. However, there is not a significant difference between hub and non--hub airports (P=.1989). Therefore, it appears that all airports are very likely to be in the process of expanding their capacity.

This finding does not appear logical given the comparisons in delays and passenger volumes in hub versus non--hub airports. However, it may be because non--hub airports are being proactive in addressing capacity problems. They hope the current expansion will allow them to avoid the delays experienced by hubs due to the increasing number of passengers. Another possible explanation is that the non--hub airports are attempting to become hub airports by providing incentives to airlines to either relocate or add flights.

Since most of the airports are adding capacity, there may be subtle differences between the reasons or funding for the expansion.

H3a: There are no differences between airports' reasons to expand.

H3b: There are no differences in funding sources between hub and non--hub airports.

There is a significant difference between hub and non--hub airports' reasons for expanding (P=.0000). The hub airports are attempting to reduce delays at their locations. The non--hub airports are constructing capacity for future increases in passengers. Also, seven of the non--hub airports are building to either modernize their facilities or to attract an airline to add service at their location.

Source	Total %	Hub %	Non-Hub %	P-Value
Federal Government	34.5	32.1	35.2	.7036
Bonds	26.3	23.6	27.2	.6421
Airline Fees	13.9	22.0	11.1	.0782
Passenger Facility Charges	12.2	10.4	12.9	.7080
Industry	8.1	10.0	7.5	.5955
State Government	5.5	2.6	6.5	.1235

TABLE 4
Evaluation of Alternatives to Reduce Airport Congestion, 1996

No hub airports are adding capacity for either of those reasons. Table 3a summarizes the airports' primary reason for expansion.

The other part of the research question addresses the sources of funding for airport expansion. While there appeared to be some minor differences between hub and non--hub airports, there was not a significant difference among sources at the .05 level. However, hub airports were more likely to fund expansion with money collected from the airlines at the .10 level. Table 3b presents an overview of the various sources of funding.

In Table 3b, the only area with a statistical difference (at the .10 level) was the use of airline fees. Currently, hub airports generate less of the revenue from airlines on a percentage basis. This presents a possible opportunity as a future revenue source. However, this may also be due to concessions given by the airport to attract or keep the airline's hub operations.

Reduce landing intervals	4.327	4.412	4.354	.936
Add runway(s)	4.108	4.765	3.875	.048
Restrict landings	3.106	3.059	3.122	.629
Build new airport	2.683	2.529	2.739	.420
Raise landing fees	2.615	2.588	2.625	.356
Shift operations to another airport	2.318	1.471	2.630	.016
Provide alternatives to air travel	2.318	2.765	2.152	.190

Note: Ranked as 1=``strongly against'' to 5=``strongly for''

TABLE 5
U.S. Airports Willing to Provide Incentives to Attract Service, 1996

The overall results of this research question are mixed. There is a significant difference between hub and non--hub airports' reasons for expanding. Even though they are adding capacity for different reasons, there is not a significant difference between the sources of funding for that expansion with one exception.

Although there are different reasons for expansion, most of the airports are building to either reduce current or future delays. Therefore, the next research question examines alternatives to expansion as a method to reduce current and projected congestion.

H4: Hub and non--hub airports differ about methods preferred to reduce congestion at their location.

Two questions presented seven options to reduce delays. The first asked the airports to rank order the seven options from best to worst. The second required the respondents to evaluate the same seven options using a five point Likert scale with one being ``strongly against'' to five being ``strongly for.''

The survey questions identified the same overall order for the options. Only the Likert results are presented to save space. Table 4 shows the airports' views of the alternatives.

Yes	18	5	13
No	56	19	37

The most popular choice is to reduce the landing interval between aircraft. This would increase the efficiency of airports and reduce congestion. The second most popular choice is the construction of additional runways. This option is much more popular with the hub airports than with the non--hub airports. The other alternative that has a significant difference is to shift traffic from airports with numerous delays to other airports. The concept of shifting traffic is much more popular with the non--hub airports that believe they would gain additional airline service during the expanse of the hub airports.

A last research question addresses what airports will offer to attract airline services. Since there are significant differences over the desire to relocate traffic, it is important to examine if non--hub airports are actively pursuing traffic from hub airports.

H5: Non--hub airports are more likely to offer incentives to attract new air carriers than hub airports.

Considering the previous research questions, it would seem likely that the non--hub airports would want to attract service. Along the same vein, the hub airports would not want to add service and the corresponding increases in traffic and delays. The research does not support this theory. Table 5 presents the findings of the airports that are willing to provide incentives to attract airline service.

The majority of airports are unwilling to provide incentives to attract service. This is also true of both hub and non--hub airports. Furthermore, there was not a statistical difference between the two groups' responses (P=.6277). Almost twenty--five percent of the airports are willing to provide incentives. Hubs are

almost as willing to provide incentives as non--hubs. airports. This does not appear logical given the problems of capacity and delays currently faced by hub airports. The probable cause of this apparent inconsistency is that airport officials want to protect and add to the size of their airports regardless of possible congested--related consequences.

The five research questions examine the differences and similarities of hub and non--hub airports in a number of settings. The demographic data identifies that the hub airports are significantly larger and experience more delays.

Despite the differences, there are a number of similarities between the hub and non--hub airports. The second and third research questions find that both types of airports are expanding and funding that expansion from similar sources. However, the third research question also identifies a significant difference in the reason that airports expand: hubs to reduce delays, non--hubs to meet future needs.

When additional alternatives are included, again there are similarities and differences between airport types. Both groups agree on many of the options. However, there are differences when runway construction and shifting traffic are examined.

Finally, there are no differences between the groups' willingness to attract airline service. In both groups, a minority of airports is predisposed to provide incentives to entice airlines to shift service to their location.

CONCLUSIONS AND OPPORTUNITIES

The research presents a mixed set of findings. While hubs and non--hubs differ in some areas, they still have much in common. Therefore, it is difficult to draw broad, sweeping conclusions about airports based on type.

The first conclusion is based on the size of hubs. Non--hub airports that become hubs (e.g., Cincinnati, Orlando) are likely to experience tremendous growth and eventually the related problems in capacity and delays. This is an important point that airports attempting to attract service should consider.

Another conclusion that policymakers should consider is the desire of airports to attract service. It may not be appropriate for large hub airports to add more flights until additional capacity is completed. Some smaller non--hub airports are willing to act as hubs. These airports may provide better service and reduce delays throughout the system. Government officials should examine whether this solution would improve travel.

A final point is the level of expansion. Nearly all the airports were in the process of expanding. At the same time, there is not a single new major airport under construction. It appears that Denver International Airport will be the last hub or non--hub airport opened in the foreseeable future. Given this assumption, the methods employed to reduce or prevent delays at existing airports will become more important. It is unclear whether system wide expansion will remain a vi-

able solution in an era of shrinking budgets. Hubs will be particularly affected due to their tendency and preference to build additional runways.

While this study successfully compares the hub and non--hub airports, there are a number of opportunities for future study. There are a number of additional comparisons that may be made between hub and non--hub airports. The effects of hubs on airline ticket prices have already been studied in detail. However, other possible areas would be the impact of customer satisfaction with the airport services, number of delays or number of direct destinations. Also, another possible study is a comparison of the various airports' management structures. Finally, there is an opportunity to study the economic impacts of hubs on local communities, gate rental rate and airline relocation decisions.

In closing, the authors would like to thank all of the airport managers that took the time to respond to the pilot study and the final survey. We appreciate the time and effort provided by these individuals. We hope to continue studying in this area of aviation.

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APPENDIX A
SUMMARY OF DEMOGRAPHICS OF
BUSIEST U.S. AIRPORTS, 1996

Variable	Response	Number N=74	Per-cent
Airport Type:	Hub	18	24.3
	Non--Hub	56	75.7
	Total	74	100.0
Airport Size:	Small (under 1 million enplanements)	15	20.3
	Medium (1 to 4 million enplanements)	31	41.9
	Large (over 4 million enplanements)	28	37.8
Delays:	Few (less .1%)	47	63.5
	Moderate (.1 to 1%)	18	24.3
	Heavy (over 1%)	9	12.2
Region:	Northeast	14	18.9
	Midwest	15	20.3
	South and P.R.	24	32.4
	West and Pacific	21	28.4

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