Journal of Air Transportation World Wide Vol. 2, No. 1 – 1997

# Curriculum Design Issues in Developing a Doctor of Philosophy Program in Aeronology

**Jeffrey A. Johnson**
**Bowling Green State University, OH**

## ABSTRACT

A Ph.D. degree program in the non-engineering aeronautical/aerospace sciences (aeronology) will likely be required in the near future to meet the increasing demands for qualified faculty, administrators, and industry representatives within the aviation/aerospace field. Since there is no known Ph.D. degree program dedicated exclusively to a non-engineering aeronautical/aerospace science discipline worldwide, a study was conducted to design and propose a Ph.D. curriculum model based upon two curriculum models a research/practitioner model and a practitioner model. A survey questionnaire was sent to 105 U.S. University Aviation Association (UAA) institutional members to solicit their professional expertise. The study found that support for each of the two curriculum models was approximately equal although overall support for both models was not overwhelmingly high. However, a majority of the respondents did support several curriculum design attributes in developing a new Ph.D. program. These attributes included a computer science requirement, an oral communication requirement, a core program requirement, and a global education awareness requirement.

## INTRODUCTION

In a global economy, new technologies are constantly changing the products and services in the aviation/aerospace industry at phenomenal rates. Today's state of the art equipment seemingly is made obsolete by new and improved technological methods of tomorrow. If American aviation/aerospace employers expect to remain competitive, their employees must remain adept in the face of changing trends in technology. In providing employers with highly skilled graduates, it is imperative that aviation/aerospace programs become equipped with the necessary tools to stay abreast of changing trends in the field and incorporate these changes into their curricula.

Despite technological advances in the aviation/aerospace industry, there is a notable absence of an aviation/aerospace doctoral program in the U.S. and there are no known programs abroad. The benefits of a Ph.D. program in aeronology are numerous. Not only will a newly developed Ph.D. program benefit the aviation/aerospace industry, a new doctoral program in aeronology will provide an

This article has been generated from a doctoral dissertation entitled An Analysis of Curriculum Design in Developing a Doctor of Philosophy Program in Aeronology completed in 1997 at Bowling Green State University. The editor wishes to acknowledge the efforts of all the individuals who made this study possible the UAA institutional members who completed the survey questionnaire.

Journal of Air Transportation World Wide Vol 2 No 1 1997 Page



avenue for collegiate aviation faculty members to advance in teaching excellence, promotion, and tenure, and will increase their ability to procure grant monies. Hirshberg (1992) asserted that keeping faculty current in their field and knowledgeable about the latest teaching and learning (Brady, 1991) techniques and technological changes/innovations is vital for high quality instruction and educational excellence.

## BACKGROUND

The impetus for this study was derived from several other studies conducted since 1993 pertaining to non-engineering doctoral programs. A master's thesis, The Feasibility of Developing a Professionally Accredited Non-Engineering Aeronautical/Aerospace Science Doctoral Degree Program in U.S. Universities by Johnson (1993), provided preliminary information by surveying 101 University Aviation Association (UAA) institutional members to determine the feasibility of developing a non-engineering doctoral program by assessing present educational needs and anticipating future needs. Two doctoral dissertations, Perceptions of Aviation Educators Concerning Aviation Practitioner's Concepts of Curricular Needs in an Aviation Doctoral Program: A Modified Delphi by Kaps (1995) and A Doctoral Degree in Aviation Science: The Need, Curriculum Content, and other Considerations as Perceived by Aviation Educators Holding Doctoral Degrees by Beck (1996), provided significant information related to content issues in the development of an aviation doctoral program. Beck's study sought to determine what content areas should be included in an aviation doctoral program and the type of program that should be established as perceived by aviation educators holding a doctoral degree. Recommendations included additional research in examining different approaches to organizing curriculum for a doctoral program in aviation. The purpose of Kaps' study was to identify the perceived content of an aviation doctoral degree by aviation professionals, and to obtain and define any consensus between aviation professionals and educators. Interestingly, findings suggested the possibility that aviation educators may not have a basic understanding of the needs and concerns of aviation practitioners.

Although designing and implementing an effective curriculum provides unique challenges to educators, another salient issue that became readily apparent during the study was the lack of widespread identity concerning the postsecondary aviation/aerospace field. As suggested in an article entitled Aviation Science? Collegiate Aviation? Aeronautics? Aerospace Science? Introducing Aeronology in Resolving Identity Issues by Johnson (1997):

> Identity in the academic setting is of paramount importance and affects many variables. The identity problem creates havoc for educators and students alike. One area affected by identity is student recruitment. Consider a prospective aviation student aspiring to become an airport manager. The student looks at several aviation programs at five institutions and finds the following in the school catalogs: aeronautical

Journal of Air Transportation World Wide Vol 2 No 1 1997 Page



> technology, aerospace science, aeronautical studies, aviation science, airway science, civil aviation, aviation administration, aviation computer science, and aviation maintenance management. In contrast, a prospective psychology student aspiring to become an industrial psychologist will probably be able to identify a specific industrial psychology program under the auspices of the psychology department. (p. 7)

By combining recognized terms to develop a new term that accurately reflects postsecondary aviation as an academic discipline, Johnson (1997) developed the term aeronology for consideration to the academic community, and defined it as "the study of the non-engineering aspects of aviation, aeronautics, and aerospace sciences and technologies" (p. 7). An advantage of using the term aeronology is that it distinguishes the academic study of aviation, aerospace, etc., from the pervasive nature of the field. Perhaps in time, the term aeronology may provide a platform of perceptual stability in the public eye.

## METHODOLOGY

### Subjects

The population for this study includes all of the U.S. University Aviation Association institutional members. In February 1996, the University Aviation Association membership list indicated there were 105 U.S. institutional members. Each of these institutional members represents a postsecondary institution that offers an aviation/aerospace program. Concerning the subjects, several key assumptions were made during the study: (a) The UAA institutional members were appropriate representatives who are experts in the non-engineering aviation/aerospace sciences; (b) the data generated from the experts can be utilized to design a curriculum for a new Ph.D. program in conjunction with content-based studies in the field; (c) the experts were current in academic matters who were able to understand the present needs and reasonably make assumptions about future needs in aviation/aerospace field; and (d) the experts responded to the questionnaire in a sincere manner using their professional, educational, and experiential expertise.

### Research Instrument

The measuring instrument utilized to collect the data was a survey questionnaire developed specifically for the study. The questionnaire was distributed by mail to all 105 U.S. member institutions. A Likert scale was utilized for 20 statements in the questionnaire. This type of scale indicates the extent of agreement or disagreement with a particular statement of an attitude, belief, or judgment (Tuckman, 1988). The Likert-type statements used the scale 1 Strongly Disagree, 2 Disagree, 3 Somewhat Disagree, 4 Somewhat Agree, 5 Agree, and 6 Strongly Agree. The phrase Don't Know (DK) was used in order to provide the respondents a suitable means to answer a statement if it generated confusion, was insufficient, was beyond the area of the respondents' expertise, or simply

Journal of Air Transportation World Wide Vol 2 No 1 1997 Page



could not be answered. The phrase No Opinion (N/O) was also included in the questionnaire in case the respondents did not have a belief that reflected the other statements. Although reported in the study, Don't Know (DK) and No Opinion (N/O) responses were excluded in determining significant relationships between variables. Gay (1992) points out that a minimum return rate of approximately 70.0 percent needs to be obtained or the validity of the conclusions will be weak. A usable return rate of 75 responses (71.4 percent) was achieved for the study.

## DATA ANALYSIS

Descriptive and inferential statistics were used in the computations. An analysis of the data generated by the survey questionnaires was accomplished using Statistical Package for Social Sciences (SPSS) (1995). Prior to developing tables for the data, a chi-square test was used and it was found that the data were extremely skewed or the expected frequency for many of the cells were less than five. As a result, the cells were collapsed into a 2x2 table and Fisher's Exact Test was performed in order to find any significant relationships (SPSS Reference Guide, 1990) instead of using a chi-square.

### Demographics

The survey questionnaire also solicited demographic information from the respondents. Specific characteristics included sex, age, highest degree held, Federal Aviation Administration (FAA) certificates/rating held. The demographic information was collapsed into two categories. Because the degree of agreement statements were combined (e.g., Strongly Disagree with Somewhat Agree), prudence in interpreting the data is recommended. Rounding errors for the data should also be considered.

Of the 75 respondents, 32 (42.7 percent) possessed a master's degree as the highest degree held, 59 (78.7 percent) were employed at a public institution, and 34 (45.4 percent) held a faculty position as a tenured assistant, associate, or full professor. Seventy-four members (98.7 percent) were male and 31 members (41.3 percent) were 51-60 years of age. In the respondents' highest degree field of study, education (all areas) was the most prevalent at 32 members (42.7 percent) followed by aeronautical studies/aviation at eight members (10.6 percent) respectively.

### Significant Relationships

The data from Strongly Disagree to Somewhat Agree designations (1-4) were collapsed together while the data from Agree and Strongly Agree (5-6) were placed together to collectively form the dependent variable. The following section illustrates ten significant relationships in tabular form found between the Likert-type statements and the demographic information.

The data in Table 1 show that a significant relationship exists between the degree of agreement and disagreement and the respondents' highest degree obtained. Twenty-nine out of 46 individuals (63.0 percent) with either an associate's, bachelor's, or master's degree agreed or strongly agreed with a requirement for professional certification requirements before applicants are admitted into the Ph.D. program. Only nine out of 28 individuals (32.1 percent) with the doctorate or other degree agreed or strongly agreed to professional certification requirements for admitted applicants.

**Table 1**
**UAA Member Opinions about Certification Requirements for Admission to a Ph.D. Program in Aeronology by Highest Degree Held**

A successful non-engineering Ph.D. program in aeronautical/aerospace science should have professional certification requirements before applicants are admitted into the Ph.D. program.

| *Statement* | *Associate's, Bachelor's and Master's Degree* | | *Doctorate and Other* | | *p-value for Fisher's Exact Test* |
|---|---|---|---|---|---|
| | # | % | # | % | |
| Strongly Disagree-Somewhat Agree | 17 | 37.0 | 19 | 67.9 | |
| Agree/Strongly Agree | 29 | 63.0 | 9 | 32.1 | |
| Total | 46 | 62.2 | 28 | 37.9 | .016* |

*p < .05.

In Table 2, a significant relationship exists between the degree of agreement and disagreement and the highest degree obtained by respondents in their views of a prescribed work experience requirement. Twenty-six out of 45 individuals (57.8 percent) with either an associate's, bachelor's, or master's degree agreed or strongly agreed with a work experience requirement before applicants are admitted into the doctoral program. Eight out of 28 individuals (28.6 percent) with the doctorate or other degree agreed or strongly agreed to prescribed work experience requirement for prospective applicants.

**Table 2**
**UAA Member Opinions About Minimum Work Experience Requirement for Admission to a Ph.D. Program in Aeronology by Highest Degree Held**

A successful non-engineering Ph.D. program in aeronautical/aerospace science should have a minimum amount of relevant work experience as an admission requirement for prospective doctoral students.

| *Statement* | *Associate, Bachelor's and Master's Degree* | | *Doctorate and Other* | | *p-value for Fisher's Exact Test* |
|---|---|---|---|---|---|
| | # | % | # | % | |
| Strongly Disagree-Somewhat Agree | 19 | 42.2 | 20 | 71.4 | |
| Agree/Strongly Agree | 26 | 57.8 | 8 | 28.6 | |
| Total | 45 | 62.2 | 28 | 37.9 | .018* |

*p < .05.

Table 3 shows a significant relationship between the degree of agreement and disagreement and the highest degree obtained by respondents in their responses to incorporating a practitioner-based model in the curriculum of a newly developed Ph.D. program. The practitioner-based model seemed to have been favored by individuals without a doctorate degree. Twenty-one out of 36 individuals (58.3 percent) with either an associate's, bachelor's, or master's degree agreed or strongly agreed with a practitioner-based model. Only eight out of 26 individuals (30.8 percent) with the doctorate or other degree agreed or strongly agreed to the incorporation of a practitioner-based model in the curriculum.

**Table 3**
**UAA Members Opinions About Incorporating a Practitioner-Based Model in a Ph.D. Program in Aeronology by Highest Degree Held**

A successful non-engineering Ph.D. program in aeronautical/aerospace science should incorporate a practitioner-based model in the curriculum.

| *Statement* | *Associate, Bachelor's and Master's Degree* | | *Doctorate and Other* | | *p-value for Fisher's Exact Test* |
|---|---|---|---|---|---|
| | # | % | # | % | |
| Strongly Disagree-Somewhat Agree | 15 | 41.7 | 18 | 69.2 | |
| Agree/Strongly Agree | 21 | 58.3 | 8 | 30.8 | |
| Total | 36 | 58.1 | 26 | 41.9 | .041* |

*p < .05.

In Table 4, there is a significant relationship between the degree of agreement and disagreement and the license status of the respondents in their views of a master's degree requirement. Forty-one out of 61 individuals (67.2 percent) with one or more licenses agreed or strongly agreed with a master's degree requirement. Only two out of nine individuals (22.2 percent) without any licenses agreed or strongly agreed. Caution is advised in interpreting the results as only nine respondents do not have any licenses compared with 61 respondents who have one or more FAA licenses.

**Table 4**
**UAA Member Opinions about Master's Degree Requirements for Admission to a Ph.D. Program in Aeronology by FAA Licenses Held**

A successful non-engineering Ph.D. program in aeronautical/aerospace science should have a requirement for students to obtain a master's degree before being admitted to the doctoral program.

| *Statement* | *Respondents who possess FAA license(s)* | | *Respondents with none* | | *p-value for Fisher's Exact Test* |
|---|---|---|---|---|---|
| | # | % | # | % | |
| Strongly Disagree-Somewhat Agree | 20 | 32.8 | 7 | 77.8 | |
| Agree/Strongly Agree | 41 | 67.2 | 2 | 22.2 | |
| Total | 61 | 87.1 | 9 | 12.9 | .023* |

*p < .05.

Although Table 5 indicates there is a significant relationship, caution is suggested in interpreting the data because most of the respondents who do not possess a private pilot license have a commercial pilot license or higher. Out of the 61 respondents who do not possess a private pilot license, nine have no licenses at all (review Table 4) while the remaining 52 respondents have a commercial pilot license or higher. This can be attributed to, for example, a private pilot upgrading a certificate to commercial standards. In contrast, only 14 respondents reportedly have a private pilot license.

**Table 5**
**UAA Member Opinions about Master's Degree Requirements for Admission to a Ph.D. Program in Aeronology by Possession of a Private Pilot License**

A successful non-engineering Ph.D. program in aeronautical/aerospace science should have a requirement for students to obtain a master's degree before being admitted to the doctoral program.

| *Statement* | *Respondents who possess a Private license* | | *Respondents who do not* | | *p-value for Fisher's Exact Test* |
|---|---|---|---|---|---|
| | # | % | # | % | |
| Strongly Disagree-Somewhat Agree | 5 | 35.7 | 5 | 8.2 | |
| Agree/Strongly Agree | 9 | 64.3 | 56 | 91.8 | |
| Total | 14 | 18.7 | 61 | 81.3 | .016* |

*p < .05.

The data in Table 6 show that a significant relationship exists between the degree of agreement and disagreement and the respondents' Airline Transport Pilot (ATP) license status. Most of the respondents who possess an ATP license support professional certification requirements. There are 18 out of 26 individuals (69.2 percent) that have an ATP license who agreed or strongly agreed with a requirement for professional certification requirements before applicants are admitted into the Ph.D. program. Of those who do not have an ATP license, 20 out of 48 individuals (41.7 percent) agreed or strongly agreed to professional certification requirements.

**Table 6**
**UAA Member Opinions about Professional Certification Requirements for Admission to a Ph.D. Program in Aeronology by Possession of an ATP License**

A successful non-engineering Ph.D. program in aeronautical/aerospace science should have a requirement for professional certification requirements before applicants are admitted into the Ph.D. program.

| *Statement* | *Respondents who possess an ATP license* | | *Respondents who do not* | | *p-value for Fisher's Exact Test* |
|---|---|---|---|---|---|
| | # | % | # | % | |
| Strongly Disagree-Somewhat Agree | 8 | 30.8 | 28 | 58.3 | |
| Agree/Strongly Agree | 18 | 69.2 | 20 | 41.7 | |
| Total | 26 | 35.1 | 48 | 64.9 | .030* |

*p < .05.

Table 7 shows a significant relationship between the degree of agreement and disagreement and the respondents' instructor license status. There are 29 out of 43 individuals (67.4 percent) that have an instructor's license who agreed or strongly agreed with professional certification requirements. Of those who do not have an instructor's license, nine out of 31 individuals (29.0 percent) agreed or strongly agreed to professional requirements. Caution in interpreting the data in Table 7 is advised because most of the individuals who possess an ATP license (see Table 6) also possess an instructor's license.

**Table 7**
**UAA Member Opinions about Professional Certification Requirements for Admission to a Ph.D. Program in Aeronology by Possession of an Instructor's License**

A successful non-engineering Ph.D. program in aeronautical/aerospace science should have professional certification requirements before applicants are admitted into the Ph.D. program.

| *Statement* | *Respondents who possess an Instructor's license* | | *Respondents who do not* | | *p-value for Fisher's Exact Test* |
|---|---|---|---|---|---|
| | # | % | # | % | |
| Strongly Disagree-Somewhat Agree | 14 | 32.6 | 22 | 71.0 | |
| Agree/Strongly Agree | 29 | 67.4 | 9 | 29.0 | |
| Total | 43 | 58.1 | 31 | 41.9 | .002* |

*p < .05.

The data in Table 8 illustrate a significant relationship between the degree of agreement and disagreement and the respondents' tenure or tenure-track status. Perhaps surprisingly, a greater percentage of respondents in non-tenure track positions supported requirements for performance-based assessments for doctoral students, portfolios, anecdotal records, etc. Sixteen individuals out of 21 (76.2 percent) in non-tenure track positions agreed or strongly agreed with the requirements while only 16 out of 40 tenured or tenure-track individuals (40.0 percent) agreed or strongly agreed.

**Table 8**
**UAA Member Opinions about Performance-Based Assessments of Students in a Ph.D. Program in Aeronology by Tenure Status**

A successful non-engineering Ph.D. program in aeronautical/aerospace science should have performance-based assessments of doctoral students, portfolios, anecdotal records, and/or the use of multimedia.

| *Statement* | *Tenured and Tenure-Track Respondents* | | *Non-Tenure Track Respondents* | | *p-value for Fisher's Exact Test* |
|---|---|---|---|---|---|
| | # | % | # | % | |
| Strongly Disagree-Somewhat Agree | 24 | 60.0 | 5 | 31.3 | |
| Agree/Strongly Agree | 16 | 40.0 | 16 | 76.2 | |
| Total | 40 | 65.6 | 21 | 34.4 | .014* |

*p < .05.

In Table 9, a significant relationship was found to exist between the degree of agreement and disagreement and the respondents' time of employment at their present institutions. Nineteen out of 33 individuals (57.6 percent) employed 10 years or less agreed or strongly agreed with the optional foreign exchange or collaboration programs while five out of 31 individuals (16.1 percent) employed 11 or more years agreed or strongly agreed.

**Table 9**
**UAA Member Opinions about Foreign Exchange or Collaboration Programs for Students in a Ph.D. Program in Aeronology and Years Employed at Present Institution**

A successful non-engineering Ph.D. program in aeronautical/aerospace science should have optional foreign exchange programs and other forms of collaboration opportunities with international schools that offer non-engineering aeronautical/aerospace science graduate programs.

| *Statement* | *Respondents Employed 10 years or less* | | *Employed 11 years or more* | | *p-value for Fisher's Exact Test* |
|---|---|---|---|---|---|
| | # | % | # | % | |
| Strongly Disagree-Somewhat Agree | 14 | 42.4 | 26 | 83.9 | |
| Agree/Strongly Agree | 19 | 57.6 | 5 | 16.1 | |
| Total | 33 | 51.6 | 31 | 48.4 | .001* |

*p < .05.

Table 10 illustrates a significant relationship between the degree of agreement and disagreement and the respondents' time of employment at their present institutions. Most of the respondents employed 10 years or less were more inclined to support requirements for performance-based assessments for doctoral students, portfolios, anecdotal records, etc. Twenty-three out of 34 individuals (67.6 percent) employed 10 years or less agreed or strongly agreed with the requirements while nine out of 27 individuals (33.3 percent) employed 11 or more years agreed or strongly agreed.

**Table 10**
**UAA Member Opinions about Performance-Based Assessments for Students in a Ph.D. Program by Aeronology by Years Employed at Present Institution**

A successful non-engineering Ph.D. program in aeronautical/aerospace science should have performance-based assessments of doctoral students, portfolios, anecdotal records, and/or the use of multimedia.

| *Statement* | *Respondents Employed 10 years or less* | | *Employed 11 years or more* | | *p-value for Fisher's Exact Test* |
|---|---|---|---|---|---|
| | # | % | # | % | |
| Strongly Disagree-Somewhat Agree | 11 | 32.4 | 18 | 66.7 | |
| Agree/Strongly Agree | 23 | 67.6 | 9 | 33.3 | |
| Total | 34 | 55.7 | 27 | 44.3 | .010* |

*p < .05.

## CONCLUSIONS AND RECOMMENDATIONS

This study was conducted to design and to propose a curriculum model for a Ph.D. degree program in aeronology based upon the professional expertise from the U.S. University Aviation Association institutional members. Along with the two curriculum models presented in the questionnaire a research/practitioner model and a practitioner model a series of statements related to some aspect of curriculum design were presented to the scholars in the questionnaire.

### Conclusions

The results of the study revealed ten significant relationships between the questionnaire statements and the demographic information. The most commonly reoccurring statement (occurred three times) involved in generating significant relationships was that professional certification requirements (e.g., a commercial/instrument license, accredited by the American Association of Airport Executives) should be required before applicants are admitted into the Ph.D. program. The significance was associated with the following demographic characteristics: highest degree held, possession of an ATP license, and possession of an instructor's license.

The most commonly reoccurring demographic characteristic which generated significance was highest degree held. This characteristic showed significance when related to professional certification requirements, minimum work experiences and incorporating a practitioner-based model.

Scholars actively engaged in the design of a new Ph.D. program need to be very cognizant of identity issues. To assist scholars worldwide in describing the non-engineering aviation/aerospace field as an academic field of study collectively, a new term, aeronology, was developed and incorporated into the study for consideration. Perhaps a Ph.D. in aeronology may be a future reality. However, whether or not this new term will be readily embraced by scholars remains to be seen.

### Recommendations

The results of this study reflect the professional opinions from experienced scholars (over one-half are department chairs and directors) currently employed in the postsecondary aviation/aerospace field. It is anticipated that the findings from this study, combined with other related studies, can be used to assist scholars and industry representatives in developing an effective curriculum for a specific non-engineering aeronautical/aerospace science Ph.D. program. The University of Nebraska at Omaha (1996) has identified a need and, consequently, aviation-related specializations have been established in their existing Ph.D. programs. In considering the need for scholars to design and develop a curriculum, and implement a specific non-engineering aeronautical/aerospace science doctoral program, the following recommendations based upon the findings from this study are made:

Journal of Air Transportation World Wide Vol 2 No 1 1997 Page



1. Scholars should seriously consider using the research/practitioner model as a template in developing specific degree programs based upon a needs assessment. Although neither the research/practitioner-based model nor the practitioner-based-model was overwhelmingly received by the institutional members, the benefits of using a research/practitioner model are indicative because (a) the Ph.D. is the most appropriate academic degree combining scholarly research with practice at the postsecondary level; (b) the research/practitioner model incorporates more research courses necessary for aviation/aerospace scholars to engage in theoretical and applied applications; and (c) the research/practitioner model incorporates an applied inquiry/assessment course—a course that very much reflects society's increasing demands for greater accountability in higher education (Banta, Lund, Black, & Oblander, 1996). The applied inquiry/assessment course will be useful in preparing future aviation/aerospace scholars to continuously question and refine learning outcomes in their classrooms, programs, and institutions.

2. In designing a new Ph.D. program, it is recommended that scholars incorporate a core program requirement. The results of this study indicate a core program requirement was overwhelmingly received by 57 institutional members (76.0 percent). In justifying a core curriculum for home economics, Pestle and Wall (1988) reasoned that "a basic reason for a core curriculum is the heterogeneity of the home economics student body" (p. 44) because home economics doctoral programs attract candidates with diverse backgrounds ranging from the physical and social sciences to the arts and humanities. Like the multidisciplinary background of prospective candidates for home economics masters and doctoral programs, it is anticipated that a newly developed Ph.D. program in the aviation/aerospace sciences will attract candidates with diverse backgrounds as well.

3. It is recommended that aeronology scholars require a second area of specialization even though the findings from this study indicate only 30 of the institutional members (40.0 percent) agreed or strongly agreed with a multidisciplinary approach requirement, (e.g., management, instructional design, computer science) that complements the Ph.D. degree. (Note: If the scholars who responded Somewhat Agree are included with the Agree and Strongly Agree responses, the percentage of scholars who support a multidisciplinary approach is increased to 61 percent.) By nature, the aviation/aerospace field is multidisciplinary and it is recommended that aeronology scholars conduct a needs assessment to identify specific content needs at their specific institutions. One option in requiring a second area of specialization may be achieved through a university consortium Ph.D. degree that includes several aviation/aerospace specializations. Some scholars indicate that developing multidisciplinary Ph.D. programs provides a receptive response by a state's board of regents because the program serves many constituents instead of a select few. A multidisciplinary program also provides doctoral graduates with greater flexibility. A problem encountered by avoiding a multidisciplinary approach can be

exemplified by the possibility of an unidentifiable program mission. For example, a newly created Ph.D. program in aeronology focuses on aerodynamics. The question may arise: What does a Ph.D. program in aeronology focusing on aerodynamics prepare graduates to do after graduation. If there is a demand for aviation faculty specializing in teaching flight and academic courses, the Ph.D. degree specializing in aerodynamics may be suitable. If, however, the postsecondary need does not exist for this type of degree, what other avenues of employment do graduates have available to them? Conversely, a student who enrolls in a Ph.D. program in aeronology with an area of specialization in human factors has the flexibility of obtaining gainful employment as a faculty member in a postsecondary setting or a researcher within a private/governmental organization.

## REFERENCES

Banta, T.W., Lund, J.P., Black K.E., & Oblander, F.W. (1996). Assessment in practice: Putting principles to work on college campuses. San Francisco: Jossey-Bass Publishers.

Beck, B. (1996). A doctoral degree in aviation science: The need, curriculum content, and other considerations as perceived by aviation educators holding doctoral degrees. Unpublished doctoral dissertation, University of Arkansas at Little Rock.

Brady, T. (1991, October). A word for aviation educators. Paper presented at the University Aviation Association Fall Conference, Houston, TX.

Gay, L. (1992). Educational research: Competencies for analysis and application (4th ed.). New York: Macmillan Publishing Company.

Hirshberg, D. (1992). Faculty development and renewal: Sources and information. In Maintaining Faculty Excellence (pp. 95–101). Kroll, H. (Ed.). San Francisco: Jossey-Bass.

Johnson, J.A. (1993). The feasibility of developing a professionally accredited non-engineering aeronautical/aerospace science doctoral degree program in U.S. universities (Master's thesis, Embry-Riddle Aeronautical University, 1993). Master's Abstracts International, 32/01, 24.

Johnson, J.A. (1997). Forum: Aviation science? Collegiate aviation? Aeronautics? Aerospace science? Introducing aeronology in resolving identity issues. *Journal of Aviation/Aerospace Education and Research, 7*(2), 7–8.

Kaps, R. (1996). Perceptions of aviation educators concerning aviation practitioner's concepts of curricular need an aviation doctoral program: A modified Delphi. Unpublished doctoral dissertation, Southern Illinois University at Carbondale.

Pestle, R.E., & Wall, V.J. (1988). Doctoral core curriculum: A neglected challenge? *Journal of Home Economics*, *80*, 44–47.

SPSS reference guide. (1990). Chicago: SPSS, Inc.

Statistical Package for Social Sciences (SPSS) 6.1.3 [Computer Software]. (1995). Chicago: SPSS, Inc.

Tuckman, B. (1988). Conducting educational research. New York: Harcourt Brace Jovanovich.

University of Nebraska at Omaha. (1996, November). UNL/UNO graduate program aviation focus [On-line]. Available: http://www.unomaha.edu/~himbergr/gmin.html