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Bridging the Gap: Evaluating Skill Alignment Between Collegiate Aviation Management Programs and Industry Needs

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The aviation industry's dynamic nature demands skilled professionals equipped to navigate complex challenges. Aviation Management, a pivotal discipline encompassing areas such as operations, finance, and safety, plays a critical role in the industry's success. However, the lack of a standardized definition for Aviation Management complicates curriculum design and evaluation, potentially widening the gap between academic preparation and industry expectations. This study examines the alignment between the skills developed in collegiate Aviation Management programs and those required for entry-level industry roles, addressing both technical and interpersonal competencies. Using survey data from current undergraduate students and recent graduates, the study identifies significant disparities in technical skill preparation, particularly in data analytics, programming, and specialized software usage. While students perceive their programs as offering foundational knowledge and networking opportunities, graduates report that additional training beyond their undergraduate education is often necessary to meet industry demands. This research highlights the need for enhanced technical training, integration of industry-relevant tools, and the inclusion of advanced data literacy in curricula. Based on these findings, the study proposes a framework for refining Aviation Management education, offering actionable insights for educational institutions and industry stakeholders.

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Introduction

The aviation industry is a dynamic and multifaceted field requiring skilled professionals to navigate a wide array of complex challenges. While public perception often places focus on the industry's pilots, flight attendants, and maintenance crews, Aviation Management personnel play an equally pivotal role in the industry's success. This discipline encompasses network planning, revenue management, airport operations, airline finance, safety programs, and corporate fields crucial to sustaining the industry's growth. However, Aviation Management lacks a universally agreed-upon definition, posing challenges for educational institutions and industry partners striving to align curricula with industry needs. With collegiate aviation programs serving as the primary pipeline for preparing talent for the industry, the future success of the aviation industry will lie in the hands of newly trained college graduates. As global air travel is projected to double by 2040 (IATA, 2023), ensuring that these future graduates receive the requisite skills and competencies they need to succeed within the evolving industry is critical to the well-being of the entire aviation sector.

Aviation Management programs, first introduced in the U.S. in the 1920s, have evolved but still lack a standardized definition (Phillips, 2004; Lu & Gao, 2023), making curriculum efficacy evaluations an obscure and challenging process. Previous research highlights gaps between the skills taught in Aviation Management programs and skills viewed as important by industry leadership. Morton et al. (2001) and Phillips et al. (2006) found that while upper-level personnel report that recent graduates demonstrate technical proficiency, they often lack confidence, comprehensive industry knowledge, soft skills, and business acumen. More recent studies, such as Peksatici-yanıkoğlu (2019), emphasize that the observed skill gaps in Aviation Management curriculums exist globally but are limited in their applicability to the U.S. context. Additionally, the industry's shift toward digitization and advanced technologies is increasing digital literacy requirements industry-wide, further underscoring the need for a reassessment of Aviation Management education (European Commission, 2015, Bejakovic & Mrnjavac, 2020).

Motivated by the gap in existing literature, we aim to examine the alignment between the skills developed in collegiate Aviation Management programs and those required for success in the modern aviation industry. We also seek to define the core competencies of Aviation Management as a collegiate discipline and identify gaps in education that hinder industry readiness. This study addresses the following research questions:

1. What skills and competencies do students perceive to be taught within their university's Aviation Management program?
2. What are the critical skills and competencies required by the aviation industry for entry-level management positions?
3. Do the skills students perceive to be taught within their undergraduate Aviation Management curriculum match those reported by recent graduates within entry-level positions within the aviation industry? Has the shift toward technology and digitization impacted skill requirements?
4. From the survey responses, how do we define what an Aviation Management program should look like as a collegiate discipline?

We anticipate this study will provide data-driven insights into the degree of alignment between Aviation Management education and industry skill expectations, as reported by current Aviation Management students and recent graduates in entry-level positions in aviation- a first. By identifying skill gaps and proposing a framework and definition for standardizing Aviation Management curricula, the research will potentially benefit educational institutions, industry stakeholders, and aspiring aviation professionals.

The paper is organized as follows: an introduction overviews the study's guiding questions, followed by a review of relevant literature. The methodology employed in this study is then outlined, and the following section presents the findings and analysis. After thoughtful analysis and discussion of the results, concluding remarks are offered, and recommendations for future studies are made. Appendices of all survey questionnaires and recruiting messages are also included at the end of the work.

Literature Review

This study attempts to address the gap in research on evaluating skill acquisition within undergraduate Aviation Management programs and its translation to workforce success. We have identified two primary literature research areas: curriculum research within Aviation Management (Area one) and curriculum research outside Aviation Management (Area two). Four research themes have been identified within Area one: Aviation Management skill acquisition studies, recent studies on Aviation Management curriculums, international research on Aviation Management curriculums/skill acquisition, and literature pertaining to defining Aviation Management. Within Area two, two research themes have been identified: curriculum studies within other aviation disciplines (such as Professional Flight and Unmanned Aerial Systems), and curriculum studies in industries outside aviation. These literature areas and their corresponding subthemes were identified during the review to effectively segment the literature review process. All areas were finalized and not altered after the completion of the review process.

Area 1 – Curriculum Research within Aviation Management

Aviation Management Skill Acquisition Studies

Research has explored skill acquisition in collegiate aviation programs previously, though much of it is outdated or incomplete. A 1998 survey of American Association of Airport Executives (AAAE) managers ranked "Management (general)" as the most crucial field of study for airport management but failed to evaluate student skill acquisition (Prather, 1998). Later, a study conducted by Morton et al. in 2001 (as cited in Worells, 2010) observed that while aviation programs provide foundational skills, graduates often struggle to apply problem-solving, project management, team building, and work analysis in early career stages. While the study does provide specific skills that entry-level personnel struggled to employ within professional settings, the data is now 23 years old and was not collected within the present conditions of the aviation industry.

Phillips et al. (2006) identified deficiencies in business principles and interpersonal skills among Aviation Management graduates, highlighting the value of internships but not analyzing

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the curricula that students were learning at the time. Similarly, Newcomer et al. (2014) noted a disconnect between educational experiences and industry needs, despite an increased preference for college degrees among employers, but does not detail specific aspects or learning areas where the disconnect is occurring. This study (2024) is the first since 2006 to examine both students and recent graduates, aiming to bridge gaps between academic preparation and professional expectations.

Recent Studies on Aviation Management Curriculums:

Recent publications provide insights into Aviation Management curricula but lack a direct focus on skill acquisition. Watkins et al. (2016) explore how the discipline-specific blend of education, certification, and experience (ECE) that industry managers possess influences the knowledge, skill, and abilities (KSAs) that they prefer to see in future employees. While the study does fill a gap in Aviation Management curriculum research literature, it does not detail what those specific desired skills are for each discipline and does not address previously identified gaps in student preparation. Mott et al. (2019) discussed competency-based curriculum models for future aviation education and does propose a compelling "Emerging", "Developing", and "Proficient" framework for acquiring skills in collegiate Aviation Management curriculums, but it does not detail what coursework or specific Aviation Management skills would correspond to these development levels, and if these skills were relevant to success within entry-level positions post-graduation. These studies highlight the need for targeted research on curriculum effectiveness in preparing students for industry demands.

International Research on Aviation Management Skill Acquisition and Curriculum Education:

International studies have expanded the scope of Aviation Management education research in more recent years, though it often focuses on specialized contexts. While examining University-Industry Collaborations (UICs) in Turkey, Peksatici-yanıkoğlu (2019) found a sharp mismatch between the student skills acquired in college programs and those that were most in demand by Turkish industry partners. Fanjoy and Gao (2009) analyzed aviation education in China but focused on pilot training more than managerial disciplines. In Europe, Pavel et al. (2020) proposed integrating the U.N. Sustainable Development Goals (SDGs) (2015) into Aviation Management coursework and did so at a Romanian university, but did not assess the SDG's practical application in the industry. Along similar lines, a Ukrainian and Polish study highlighted the need to incorporate the Standards and Recommended Practices of ICAO into Aviation Management curriculums, but it did not detail whether generated solutions were made in partnership with industry, and if so, whether students were benefitting from their involvement within the respective projects (Isaienko et al., 2018).

Several publications before the COVID-19 pandemic highlight the need for international aviation programs to re-evaluate aviation curriculums to grapple with high unemployment rates, economic instability, and the industry's inability to place students within entry-level postgraduate positions within corporations. A 2016 publication by Lappas and Karousis focused on the fallout from a large-scale 2014 McKinsey survey performed within central Europe on the regions' discrepancy between faculty/staff perception of student readiness and corporate perceptions of

student readiness. The publication suggested new modes and focus areas for collegiate aviation programs to consider implementing, considering only one-third of European students and companies believe that students possess the skills needed to succeed within the industry upon graduation (Mourshed et al., 2014).

Despite valuable contributions, these studies provide limited insights into effective skill acquisition for Aviation Management students in global contexts.

Literature Pertaining to Defining Aviation Management:

Efforts to define Aviation Management remain inconsistent. Phillips (2004) noted the discipline's unclear identity, which is often viewed as secondary to Professional Flight programs. Even in the present-day U.S. aviation collegiate environment, there is little publication regarding attempts to define Aviation Management and no agreed-upon definition of the discipline- the same can be said for Aviation Management programs across the globe (Peksatici-yanıkoğlu, 2019, Lu & Gao, 2023)**.** While Earnhardt et al. (2014) highlighted a growing industry preference for degree-holding candidates, the paper does not provide how the definition of the discipline should evolve due to the observed paradigm shift. Internships have been emphasized as critical to defining program quality (Lindseth, 1996; Worrells, 2010), yet the implementation of work-based learning programs remains challenging. Kaps and Ruiz (1997) suggested frameworks for ideal curriculum but did so without linking them to industry-required skills.

The absence of a unified definition and clear curriculum standards underscores the need for further research into how Aviation Management programs can better align with industry needs in hopes of creating standards in the future.

Area 2 – Curriculum Research Outside Aviation Management

Curriculum Studies of Other Aviation Disciplines

The post COVID-19 pandemic travel recovery has caused staffing shortages, prompting aviation organizations to hire aggressively while exposing weaknesses in graduate preparedness. Post-pandemic publications in other aviation disciplines outside of Aviation Management addressed a "new normal" in aviation education, but few explored actionable curriculum reforms (Yiu et al., 2021). Emerging research highlights in flight training features technologies like Extended Reality (XR) for improving learning outcomes (Flores & Ziakkas, 2023), though further testing is needed (Ahram et al., 2023). The broader industry has also seen an emphasis on reshaping training methodologies and certifications to meet new demands for pilots (Bureau of Transportation Statistics [BTS], 2023). Studies in Australia and Malaysia emphasized partnerships between Professional Flight programs and national air carriers to create industry-centric curricula for pilots (Thatcher & Michaelides-Mateou, 2016, p. 83; Mohamad & Aboudahr, 2021).

Aviation fields have experienced significant advancements in technology that have catalyzed opportunities to reshape curriculum. Unmanned Aerial Systems (UAS) curricula now emphasize competency-based learning, safety protocols (Polack & Van Kampen, 2020; Lercel & Hupy, 2020), and data literacy (Zhang & Stewart, 2019). Maintenance and engineering programs

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are increasingly incorporating simulation tools (Bernard et al., 2021) and AI applications (Wang et al., 2016) while leveraging interactive classroom environments to enhance engagement (Shakour et al., 2019; Starr et al., 2024).

Curriculum Studies Outside Aviation:

Research in other disciplines offers valuable parallels for understanding skill acquisition and curriculum design. Lee and Cho (2023) emphasized the critical role of curricula in equipping students with industry-relevant knowledge and skills, highlighting the need for continuous improvement to meet evolving industry standards. Similarly, Lichtenstein et al. (2010) explored how engineering students balance gaining practical skills with educational enrichment, revealing a disconnect between academic preparation and industrial demands. Students often switch to business or other STEM programs to gain more marketable skills, suggesting that curriculum misalignment can be severe enough to drive post-graduation career pivots.

Studies in business education underscore the importance of critical thinking and practical skill development within curricula. Braun (2004) identified a gap between university teachings and industry expectations and proposed a structured approach to integrating critical thinking into business curricula.

Summary of Literature Reviews

After a thorough research review, a literature gap exists in comparing skills learned in present-day U.S. collegiate Aviation Management curricula to those needed in entry-level aviation workforce positions, despite similar studies being recently conducted abroad in the recent past. Domestic research has been completed on the topic previously, but not since 2006. Results also find that skill-based training, curricula, research, and partnerships continued to be more widely observed within Professional Flight and Aeronautical Engineering degrees as opposed to Aviation Management. This is likely attributed to both career pathways requiring federal certification before industry entry is permitted. Furthermore, this observed research gap could also be attributed to a continued lack of definition for what Aviation Management ought to be as a collegiate discipline.

Methodology

Survey Development

This study utilized a mixed-methods approach, employing an online survey to collect qualitative and quantitative data from two cohorts: current undergraduate Aviation Management students and recent graduates from Aviation Management students (within five years). The mixed-methods design allowed for cross-sectional data analysis while also providing an opportunity to collect sentiment behind responses by asking respondents to qualify their opinions on different areas of their education and experience. The survey included a mix of open-ended questions, multiple-choice, "select all that apply," and Likert-scale items to encourage detailed and accurate responses.

In considering how to evaluate the skill acquisition of current undergraduate students and recent graduates, ascertaining qualitative survey results that lacked meaning was of concern. While there are many rudimentary competencies that can make someone skilled (such as logical thinking or problem-solving capabilities), these competencies are often qualitative and hard to measure. However, these competencies are typically utilized when working with a technical program, such as MS Excel, a programming language, or another similarly complex platform. With each program having a more pre-defined capability, skills can be more readily qualified within these applications and can translate into more meaningful survey results.

When building a questionnaire-based survey with open-ended questions, it is critical to write questions with the audience in mind. There are four main types of questions that can be asked within a proper questionnaire: attributes, attitudes, beliefs, and behaviors (Defense Technical Information Center [DTIC], 2005, p. 36). Surveys usually begin with attribute questions that collect basic demographics of the respondents, followed by attitude questions that ask respondents how they feel about certain aspects of the topic in question (DTIC, 2005, p.37). After these questions, the survey design should focus on the beliefs held by the respondent before closing by asking them about how their beliefs and attitudes have influenced their specific behaviors. Jolene Smyth discusses the importance of ordering the questions from general to specific so that respondents are less likely to summarize their previous responses (Smyth, 2016, p. 229). The team used separate surveying pages to aid respondents in separating specific aspects of their Aviation Management experience from their overall judgment of programs while following the attribute, attitude, belief, and behavior approach.

Employing simple visual design strategies can further assist the survey's effectiveness in revealing sentiments on experiences in education and industry. The team employed grouping, an approach within a tailored survey design developed by Dillman et al. (2014). Their research discusses how grouping specific questions on differing pages helps continuity in the respondent's survey experience, strengthening their retrieval for response (Dillman et al., 2014, p. 217). While multiple pages were used within the body of the current student and recent graduate surveys, each page was grouped to facilitate active recall during the survey response.

Additionally, to reduce the number of participants that would leave the survey without submitting, only the demographic questions were required. The effect this had on the samples is discussed in *Results* and *Future Study*.

Survey Distribution

Two surveys were assembled to evaluate if the current skills that Aviation Management students perceive to be learning within their undergraduate curriculums match those reported as essential to post-graduation success by recently graduated Aviation Management students. Both surveys were designed in cooperation with the Purdue University Institutional Review Board (IRB) and were approved for dissemination on 18 March 2024. Additionally, the team completed extensive methodological work before survey dissemination to ensure the maximum number of responses would be elicited from both survey populations. The survey was released on 28 March and remained open until survey closure on 17 April (20 days). To address challenges in reaching the target group of Aviation Management students and recent graduates of Aviation Management

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programs, the team devised an outreach plan to both university officials and personal networks (Lefever et al., 2007, p. 575). The team contacted 92 universities with an accredited four-year Aviation Management program on 3/28/2024 and 4/3/2024. After messaging campaigns on LinkedIn were completed and email messages were sent to 95 aviation colleges, a total survey population of n=89 was generated, with 59 respondents answering the undergraduate Aviation Management skill acquisition survey and 30 respondents completing the Aviation Management Recent Graduate survey. Of note, only five universities responded to our initial email confirming that they would share the survey with their student population by the closure of the survey, resembling a target university participation rate of 5.43%. However, the survey team knows that students who attended universities whose administrators did not respond to the survey distribution email still responded to the survey. While this data is still genuine, neither survey population is sizable enough to mitigate the self-selection (voluntary) response bias in this experimental design. According to Farrokhi and Mahmoudi-Hamidabad (2012), both surveys needed 60 respondents to eliminate the voluntary response bias from the study. Thus, the results of this survey should be viewed with caution.

Data Collection and Survey Content

The survey collected responses on various topics, including skill acquisition, academic experiences, and workplace relevance of skills obtained in college. Additionally, student respondents were asked about skill strength with a suite of technical platforms: Excel, SQL, R, Tableau, Python, Diio Mi, SABRE, ArcGIS, ProDIGIQ, and CH-Aviation. The list was compiled based on a literature review of prevalent technical applications being utilized within the aviation space along with researcher experience in the industry. Ratings on educational experience, relevance of education in the workplace, and proficiency in skills taught were collected on an ordinal scale. These are ranked with ten as the best outcome and one as the worst. The measure of central tendency used for the ordinal data collected is the median- it is not as sensitive to extremes and does not require characteristics on a numerical scale (Fink, 2003, pp. 39-42). To comply with IRB regulations, all survey questions were optional to give respondents the freedom to answer only questions they felt comfortable with answering. Thus, variance in respondent sample size was expected to be observed between questions. Due to this optional answering format, it was implied that respondents would submit their responses if their overall survey was submitted as incomplete. Data from incomplete survey responses were handled on a question-by-question basis. If a respondent elected to answer a question, the response would count toward the response sample size for the question. If the respondent did not choose to answer the question, the respondent would not be included in that question's sample size count.

After survey participants arrived at the landing page for the survey, they were directed to a brief screening questionnaire that would determine if they were eligible to take one of two surveys: the current Aviation Management survey or the recent Aviation Management graduate survey. Eligibility was determined based on the participant's occupation (student or recent or recent graduate) and recent graduate graduation year (2019 and later). For the full verbatim of the screening survey, see Appendix C.

Institutional Review Board (IRB) Application

The study received a Category 2 review exemption (research that only includes interactions involving educational tests and survey procedures) through the Purdue University Human Research Protection Program (HRPP) and the Purdue University IRB (HRPP, 2020). In addition to proving that the survey was to be used for educational test purposes only, the research team also needed to provide documentation that would verify that the study design, methodology, and procedure would not induce bias and would also not induce unintentional harm to the human subjects who complete the survey (HRPP, 2018).

To avoid convenience sampling while contacting aviation universities, email communication to University Officials for survey distribution to undergraduate bodies was recommended by IRB. This allowed for the mitigation of convenience sampling and identical survey distribution within each Aviation Management institution contacted. While social media messaging channels were utilized to distribute the study, recipients of the message through these channels will not be incentivized to complete the survey in any way, placing the entirety of the burden of promotion of the study upon the researchers themselves (HRPP, 2014, p. 5).

Results

Sample Overview

The study collected responses from a total of 89 participants, including 59 current undergraduate Aviation Management students and 30 recent graduates. While the response rate of 5.43% is known for the university messaging, it is not possible to determine the response rate of students, as the population of current and former Aviation Management students cannot be accurately determined. Participants represented a range of academic classifications, with seniors comprising the largest group among undergraduates (39%). Most respondents were Aviation Management majors, with some also pursuing secondary majors such as Professional Flight or business-related fields. To protect student identity, the university of the respondent was not recorded. Thus, the ratio of student respondents from the university conducting the research (Purdue) to those not attending Purdue could not be calculated.

The full listing of survey questions that the Current Undergraduate and Recent Graduates sampling populations were asked can be found in Appendix A and B, respectively. Questions 1-4 on the Current Undergraduate survey, along with Questions 1-3 and 5 from the Recent Graduates survey, provided demographic information. As discussed in the methodology, all survey questions, except those for demographics, were optional.

Current Student Survey Results

The sample size for undergraduate students totaled 59 students. However, only 45 students completed the end of the survey, meaning 14 respondents entered but did not complete the survey. In terms of academic classification, there were five freshmen, six sophomores, 10 juniors, 23 seniors, and one 5th-year senior, see **Figure 1.**

Figure 1

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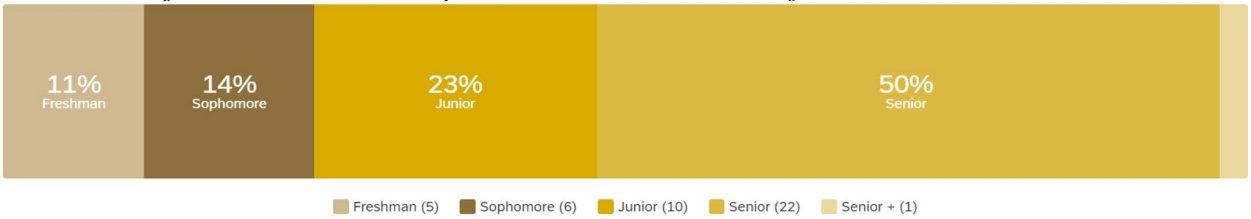
Breakdown of Current Student Respondents' Academic Classification



Question 5: In your own words, how would you define Aviation Management?(open-ended)

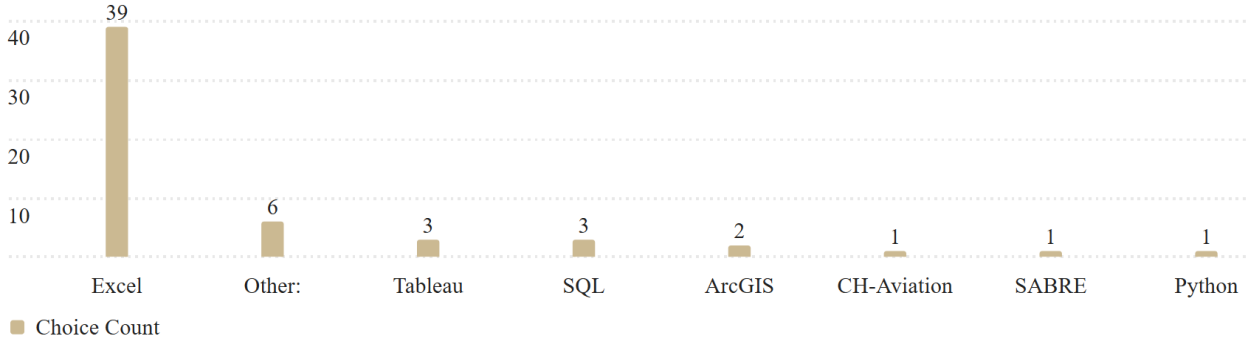
Students described Aviation Management as the "business" side of the aviation industry, frequently using terms like leadership, operations, finance, and regulations. Responses were notably detailed, reflecting students' ongoing exploration of the field. One student highlighted the breadth of the field, including areas like "finance, operations, regulations, strategies, airport knowledge, airline knowledge, and economic knowledge."

Question 6: What technical applications/platforms have you used within your Aviation Management program? (Not including internship/work experience) (options listed: Excel, SQL, R, Tableau, Python, Diio Mi, SABRE, ArcGIS, ProDIGIQ, CH-Aviation, Other:)

Microsoft Excel emerged as the most widely used application (see *Figure 2)*, with 70% of respondents (n=41) indicating using it within their coursework. Advanced tools like SQL, Tableau, and ArcGIS were less commonly used, with only 14% of students reporting exposure. No students indicated using ProDIGIQ, R, and, notably, Diio Mi, despite its relevance among operators in aviation. All three were listed as options but were omitted from the bar chart due to zero responses being obtained from respondents.

Figure 2

Counts of Technical Skills Used Within Aviation Management Undergraduate Programs



Note. n = 59. "Diio Mi," "ProDIGIQ," and "R" were excluded since they had a choice count of 0.

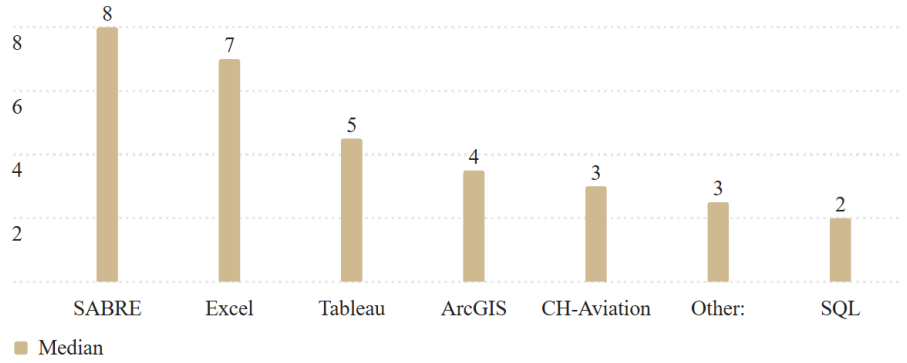
Question 7: On a scale of 1-10, how comfortable do you feel with the skills you listed? (1 being not comfortable at all, 10 being extremely comfortable) (Options listed: dependent on respondent's selections in Question 6)

Respondents were asked to rate their comfort level for skills they selected in Question 6 (refer to *Figure 2* for choice counts). As seen in *Figure 3*, more students reported the highest comfort level with Excel, giving it a median rating of 8 out of 10. Other tools, such as Tableau

and SQL, received comfort ratings below 5, underscoring an extension of the exposure gap with technical proficiency beyond Excel as well.

Figure 3

Median Comfort Level for Students' Technical Skills Learned From Aviation Management Programs



Note. "Diio Mi," "ProDIGIQ," "Python," and "R" were excluded since they had a choice count of 0. While SABRE had the highest median, it only represents three students who reported using it (5% of the group that answered Question 6).

Question 8: Which of the following applications/platforms would you like to have included in your Aviation Management program? (Options listed: Excel, SQL, R, Tableau, Python, Diio Mi, SABRE, ArcGIS, ProDIGIQ, CH-Aviation, Other:))

The most requested additions to the curriculum were Python, Tableau, and SQL, each selected by more than 50% of the 27 respondents. SABRE, Excel, and ArcGIS followed closely, with over 33% wanting each, indicating a desire for greater emphasis on industry-specific software and advanced data analytics. Platforms like CH-Aviation, ProDIGIQ, and Diio Mi had 19%, 11%, and 4%, respectively.

Question 9: List 5 other skills not described in Questions #6 through #8 that you have learned from your Aviation Management program (free response).

24 students identified a mix of aviation-specific and broader skills. Commonly mentioned aviation topics included aviation law, safety management systems, and airline forecasting. Management skills such as leadership, project management, and networking were also frequently cited, along with business principles like finance, accounting, and market analysis. Data-related skills, such as forecasting and research, were highlighted as well.

Question 10: What skills taught outside your required Aviation Management coursework have you found to be beneficial during your college career? (free response)

Students noted several skills learned outside their core curriculum that were valuable, including leadership, data analytics (Python, SQL, Tableau), and communication skills. Many students credited second majors or extracurricular activities for these competencies, suggesting

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that aviation curriculums alone are not satisfying students' learning ambitions during their post-secondary experience.

Question 11: On a scale of 1-10, how satisfied are you with your educational experience within your school's Aviation Management curriculum (1 being the lowest, 10 being the highest)?

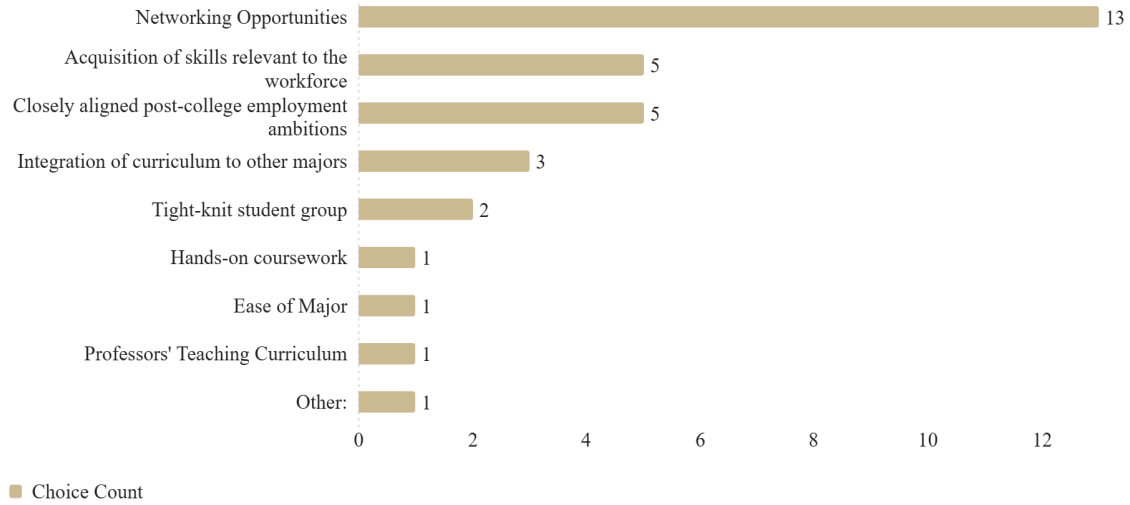
32 students rated their satisfaction with the curriculum at a median score of 7 out of 10, with a standard deviation of 2. The most common score was 8, reported by 12 students, indicating overall moderate satisfaction.

Question 12: What is your favorite part about the Aviation Management curriculum at your school? (Options listed: networking opportunities, closely aligned post-college employment ambitions, acquisition of skills relevant to workforce, Professors' teaching curriculum, ease of major, tight-knit student group, hands-on coursework, integration of curriculum to other majors, other:))

32 students responded to this question. Over a third of respondents chose networking opportunities as their favorite aspect of their respective aviation program (see *Figure 5)*. Combined with responses highlighting workforce readiness and career alignment, students valued the connections and applications their curriculum provided.

Figure 5

Students' Favorite Part of Their Aviation Management Curriculum



Note. The "Other:" response regarded appreciation for obtaining a business degree while also taking "classes relevant to the aviation industry."

Recent Graduates

For the purposes of this study, recent graduates were defined as any graduate of a four-year Aviation Management degree program in 2019 or later. The survey population for recent graduates totaled 14. It is important to note that five individuals who attempted to fill out the survey graduated with an Aviation Management degree before 2018, making them ineligible.

These five people are not included in the count of 14 participants. Additionally, there were six survey participants who were eligible to take the survey but did not advance past the survey screening pages. Additionally, all 14 recent graduates filled out each question that was presented to them in the survey. Regarding major classification, all recent graduates indicated "aviation-management-related degrees" as their primary major. For secondary majors, three individuals stated that they received a second major. Those majors were "art and design," "airline operations," and "organizational leadership."

Question 4: In your own words, how would you define Aviation Management?(free response)

Recent graduates described Aviation Management similarly to current students but used noticeably more concise definitions that reflected their professional experience. A common theme was the combination of business management principles applied to aviation. For example, one respondent defined it as "business management focusing on aviation," while another emphasized its versatility as "the discipline of running and maintaining multiple aspects of aviation-related fields."

Question 5: Select any industry sectors in which you work, or have worked, within the aviation industry. If inclined, please note any company affiliations and job titles. (options listed: air carrier, airport, other aviation sector, outside of aviation)

All 14 respondents listed that they had current or previous industry experience in at least the air carrier, airport, or "other" industries within Aviation. Four respondents stated that they possessed more than one region of expertise. Specifically, the four survey participants stated that they possessed current or former industry experience in two of the above categories.

Question 6: On a scale of 1-10 [with one being the lowest and 10 the highest], how adequate do you believe the skills you obtained from your Aviation Management program are for your current and previous jobs within the industry?

Graduates rated the adequacy of their acquired skills at a median score of 7 out of 10. Scores ranged from 2 to 10, indicating a wide range in perceived preparedness. This suggests that while some graduates felt well-prepared, others noted gaps in their education relative to industry expectations.

Question 7: Name five skills you learned during your Aviation Management degree that you have used in your past or present roles within the industry (Not including internship/work experience during undergraduate education). (free response)

Graduates identified both hard and soft skills gained during their degree. Frequently mentioned skills included Excel, aviation terminology, teamwork, problem-solving, and specific industry knowledge such as FAR Part 139 compliance, NOTAMS, and ARFF. However, responses often characterized these skills as "basic," suggesting room for deeper curriculum development. Of note, first-response patterns were monitored for (a pattern or commonality in answers that were listed first could have indicated cross-industry importance), but none were found.

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Question 8: What skills or applications taught outside your required Aviation Management coursework during your undergraduate education have helped you to succeed in the industry today? (free response)

Graduates credited a variety of additional skills learned outside their required coursework toward their present success in the aviation industry, including communication, public speaking, and collaboration. On the technical side, skills like SQL, Tableau, and Python were commonly mentioned. Many graduates emphasized the importance of internships in developing both types of proficiencies. Interestingly, this grouping of valuable technical skills that recent graduates have learned outside of their post-secondary education aligns highly with the grouping of skills that current students seek to learn but do not receive within their Aviation Management training.

Question 9: What technical applications/platforms do you use today that you also used during your Aviation Management undergraduate program? (Options listed: Excel, SQL, R, Tableau, Python, Other:)

All respondents indicated continued use of Excel in their professional roles. Tableau was the second most used platform, with four respondents mentioning usage in both collegiate and professional settings. Tools like SQL and CAD were noted by a small number of respondents, while Python and R received no mentions, highlighting a potential gap in industry-relevant technical preparation.

Question 10: Outside of readily available applications/platforms, like the ones above, are there any specialized to the aviation industry you have used that you also had while enrolled within your Aviation Management program? (Options listed: Diio Mi, SABRE, ArcGIS, ProDIGIQ, CH-Aviation, Other:)

10 out of 14 (four left the question blank) graduates identified specialized aviation tools like Diio Mi, Sabre, ArcGIS, and Amadeus. Diio Mi and ArcGIS were the most frequently mentioned, with three respondents indicating they had used these tools both during their undergraduate studies and in their current roles.

Question 11: What skills or technical applications have you learned since joining the industry that you wish you had learned during your undergraduate Aviation Management program? (free response)

Graduates overwhelmingly emphasized the importance of SQL and advanced Excel skills, with each being mentioned by half of the respondents. Other skills, such as Tableau, Python, and industry-specific tools, were also highlighted. Responses pointed to a significant gap between the technical skills taught in students' respective undergraduate Aviation Management programs and those demanded by entry-level industry positions. The disparity between the recent graduate and current student responses is discussed and charted in the discussion section.

Questions 12 & 13: Evaluating recent graduates' workplace capability relative to peers and factors contributing to the rating. (1-10 rating, free response)

Graduates rated their workplace capability compared to peers at a median score of 8 out of 10, one standard deviation above their curriculum satisfaction rating. Many attributed their confidence to niche aviation knowledge gained during their studies or prior experiences. However, gaps in technical skills, particularly in data analytics and programming, were frequently cited as a disadvantage compared to peers from non-aviation backgrounds. The notably higher capability rating relative to the median curriculum satisfaction score could also point to Aviation Management students "catching up" to their peers after graduating by learning technical tools and applications on their own time while in the workforce.

Discussion

In general, it should be noted how recruitment challenges, including limited university participation, low response rates, and low sample populations, highlight potential voluntary response bias within results (Farrokhi, 2012, p. 790).

Research Question 1: What do students perceive is being taught within their university's Aviation Management program?

Survey responses indicate that Aviation Management students perceive their program to focus primarily on basic technical skills like Excel, with some exposure to advanced tools such as SQL, Tableau, and ArcGIS. Key findings include:

- Current Student Question 6: 70% reported using Excel, but only 14.2% had access to advanced tools (SQL, Tableau, ArcGIS).
- Current Student Question 7: Of the 52% of the student population that reported being comfortable with Excel, their median rating of platform skill was 8/10. Notably, all other tools scored below 5/10.
- Current Student Question 8: Python, Tableau, SQL, and SABRE were the most requested technical programs to include in Aviation Management curriculums of the future.

Additionally, students report that their respective program gives them opportunities to cultivate soft skills and leverage the university's network to find professional post-graduation opportunities. Key findings include:

- Current Student Question 9: Non-technical skills gained included aviation fundamentals, law/regulations, safety management, leadership, project management, presentation skills, networking, and accounting/finance, with up to 11 students citing similar skills.
- Current Student Question 11: Curriculum satisfaction had a median rating of 7/10, with 8/10 being the most common, suggesting moderate satisfaction.
- Current Student Question 12: Networking opportunities and career-relevant skills were selected by students as their favorite aspects of being within their respective Aviation Management curriculum.

Overall, students perceive their programs as providing foundational aviation knowledge and management skills in an environment conducive to networking but lacking in advanced technical and programming skills, which are highly desired. Similar satisfaction ratings from current students and recent graduates (both obtaining a median score of 7/10) also suggest

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program stagnation since the late 2010s.

Research Question 2: What skills are required to succeed within current entry-level positions in the aviation industry?

Recent graduates surveyed identified Excel, Tableau, and SQL as essential technical skills, alongside critical interpersonal skills such as communication, leadership, public speaking, writing, and teamwork. These findings emphasize the need for both technical proficiency and strong interpersonal abilities in entry-level aviation roles. Also, a vast majority of recent graduates commented that the skills they learned within their undergraduate Aviation Management curriculum were "basic" compared to the skillset they employ to be successful within their present position. Key Findings Include:

- Recent Graduate Question 7: Alongside Excel and other technical programs, knowledge of federal aviation regulations was reported as a skill needed to succeed within the workplace.
- Recent Graduate Question 8: The grouping of technical skills that recent graduates have learned outside of their post-secondary education to be competitive within their respective workforce aligns highly with the grouping of skills that current students seek to learn but do not receive within their Aviation Management training.

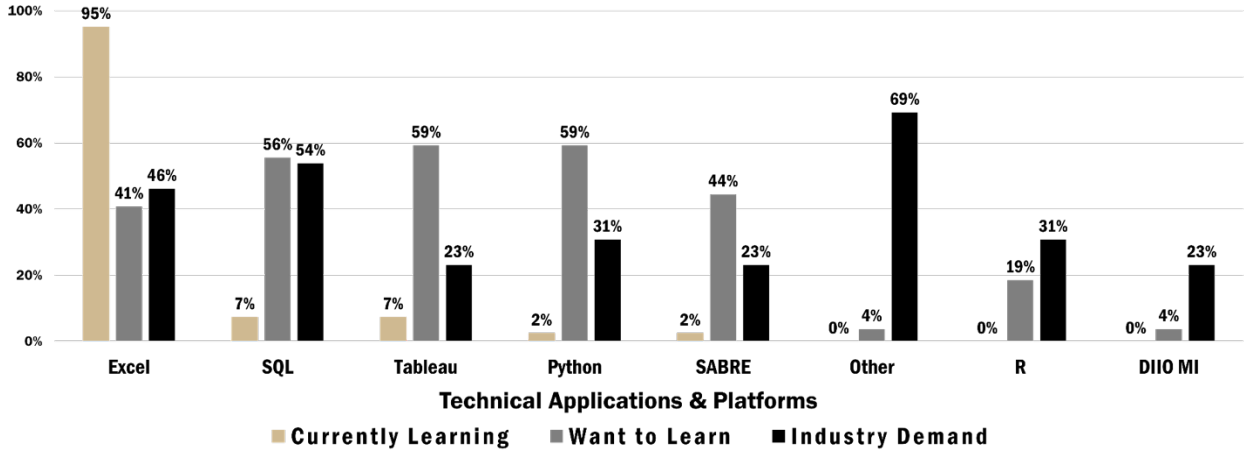
Overall, recent graduates value their time in undergraduate programs but wish that more topic depth and technical skills could have been incorporated into the curriculum.

Research Question 3: Do the skills students perceive to be taught within their undergraduate Aviation Management curriculum match those reported by recent graduates within entry-level positions within the aviation industry? Has the shift toward technology and digitization impacted skill requirements?

The survey revealed a clear disconnect between the skills students perceive to be learning and the present technical skills recent graduates reported needing in entry-level aviation positions. Figure 6 groups the responses from current students (Currently Learning & Want to Learn) and recent graduates (Industry Demand). While students primarily learn basic technical skills like Excel, recent graduates described their current roles as requiring advanced tools such as Python, R, Tableau, SQL, SABRE, Diio, and Alteryx, with 62% of graduates indicating that the data analytics training in their programs was inadequate. A few reported services that airports use to maintain their Part 139 certification as well as airfield security. Many graduates reported learning these advanced skills only after entering the workforce or through courses outside their aviation curriculum. This resulted in more recent graduates commenting on why they did not feel as capable relative to their peers within these technical programs. Of note, while the student respondents did seek more soft skill development opportunities, the gap in soft skills reported by students and soft skills used in the workforce was significantly less than that of technical skills.

Figure 6

Comparison of Technical Skills Between Current Student and Recent Graduate Groups



Note. The number of responses for "Currently Learning," "Want to Learn," and "Industry Demand" were 41, 27, and 14, respectively. "Other" responses included CAD, AviPLAN, FAA's Aviation Environmental Design Tool, & Amadeus.

Additionally, while dwarfed by concerns over technical skill readiness, recent graduates also commented on the vagueness of their Aviation Management college coursework- noting how specific aviation metrics were not covered in curriculums for the sake of breadth. Furthermore, federal regulations were undervalued by students but were identified by 38% of graduates as among the top five skills utilized within their professional roles. Teamwork emerged as a consistent focus across both student and graduate experiences, showing alignment in this area. Interestingly, the gap in skills that was observed within some aspects of recent graduates' Aviation Management curriculum experience did not negatively impact the median satisfaction rating that graduated Aviation Management students gave, as their overall undergraduate experience was influenced by many factors beyond education. Overall, the findings highlight the need for Aviation Management programs to enhance technical training and incorporate more practical, industry-relevant coursework to bridge the gap between academia and industry expectations.

Research Question 4: From the survey responses, how do we define what an Aviation Management program should look like?

Given the qualitative data collection obtained by directly asking both survey populations, "In your own words, how would you define Aviation Management?" four characteristics of a possible definition for Aviation Management as a collegiate curriculum can be identified. Students and graduates consistently highlighted the importance of databases, data analytics, industry metrics, and critical business skills like finance and economics. These insights and consistent results suggest that a well-rounded Aviation Management curriculum should focus on four key elements:

1. Integration of business and management principles to oversee dynamic sectors like airlines, airports, and related entities.
2. Preparation for commercial, operational, and financial aspects of the aviation

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industry, ensuring efficient business operations while maintaining safety and regulatory compliance upon industry entry.
3. Development of data analytics skills to equip students for an evolving and data-driven industry.
4. Emphasis on soft skills such as leadership, teamwork, and communication, integrated into coursework.

While further research with larger populations is needed to validate these findings, the current data provides meaningful insight into designing curricula that prepare students to be successful leaders in the aviation industry.

Conclusions

The results of the surveys demonstrated a mismatch between the skills that current students perceive to be learning within their undergraduate Aviation Management curriculums and those that recent graduates report using within professional roles across the Aviation Industry. Most recent graduate respondents classified the information they learned within their undergraduate Aviation Management program as "basic" compared to the skillset they employ now. At a deeper level, these observed differences in depth also highlight an opportunity for Aviation Management programs to review and alter the theoretical foundation of the curriculum to ensure the theory delivered ensures appropriate skill delivery. While there was an observed rift in the importance of soft skills between current undergraduates and recent graduates (with professionals wishing they had more complete and developed soft skills), the most noticeable difference identified was within technical depth and breadth, contradicting previous studies. The technical abilities provided in undergraduate Aviation Management curricula were only a fraction of the diverse array of software and other technical platforms that recent graduates of Aviation Management programs listed as a skill that was important to their everyday success. Except for a few respondents, Excel was listed as the only technical skill they had been taught within their Aviation Management curriculum. Contrarily, most industry respondents listed numerous technical applications and software programs, such as advanced Excel techniques (such as Visual Basic and Macros), Python, SQL, Tableau, and SABRE, all of which they learned after completing their collegiate degree programs. Interestingly, this same group of technical programs and applications deemed critical to success by recent Aviation Management graduates were like those desired technical skills that Aviation Management undergraduate students want to learn within their undergraduate education. This was further echoed when "integration of hands-on/practical coursework" was the top response to how they believed their program could be improved.

It was also concluded that the lack of a formal definition for Aviation Management did not cause a difference in how current students and recent graduates defined the discipline, hinting that the absence of a formal definition was not the reason for the skill incongruity between Aviation Management students and recent graduates of an Aviation Management program.

The survey received fewer than 60 responses per group, falling short of the recommended threshold to mitigate voluntary response bias (Farrokhi & Mahmoudi-Hamidabad, 2012). To

address this in future studies, the survey's availability period should be extended beyond the three-week window that was used in this study. Additionally, distributing the survey during less demanding academic periods, such as early or mid-semester rather than after spring break or near the end of the term, may improve participation rates. This timing adjustment could encourage both students and university representatives to engage more actively with the study.

The survey reached a limited and potentially non-representative sample, as only five of 92 contacted Aviation Management collegiate institutions confirmed survey distribution. Many responses likely came from Purdue-affiliated students, reflecting the researchers' proximity to the institution. Further hurting sample diversity, the survey could only be opened for three weeks due to the proximity of the end of the academic semester. Future studies should focus on establishing an outreach strategy for a longer timespan to enhance contact with Aviation Management programs nationwide, leveraging updated university directories and targeting specific contacts such as deans, professors, and administrative staff responsible for student communication. After adequate time has passed, ensuring distribution confirmation from these representatives will help verify broader participation and improve the representativeness of the data.

Survey completion rates dropped significantly after the initial questions, with many participants skipping open-response items or providing non-informative answers (e.g., "N/A"). To address this, future survey iterations should Reduce the number of open-ended questions and replace them with multiple-choice, Likert-scale, or "select all that apply" formats to enhance usability and engagement. Additionally, predefined answer options for complex questions (e.g., defining Aviation Management or listing skills) should be considered in future survey methodologies while ensuring the options are concise and relevant. These changes aim to shorten the time required to complete the survey, improve user experience, and increase participant retention.

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Appendix A: Survey Questions for Current Undergraduate Aviation Management

Students

1. Academic Year Classification:
    a. Freshman
    b. Sophomore
    c. Junior
    d. Senior
    e. Senior +
2. Primary Major:
    a. Professional Pilot-Related Degree
    b. Aviation Management-Related Degree
    c. Aeronautical Engineering/Technology/Maintenance-Related Degree
    d. Unmanned Aerial Systems-Related Degree
    e. Air Traffic Control-Related Degree
    f. Other: *Text Box*
3. Secondary Major (If applicable):
    a. *Same as #2*
4. Do you have internship/related work experience? Briefly describe your position.
    a. No
    b. Yes: Airline: *Text Box*
    c. Yes: Airport: *Text Box*
    d. Yes: Other Aviation Experience: *Text Box*
    e. Yes: Outside Aviation: *Text Box*
5. In your own words, how would you define Aviation Management?
    a. *Text Box*
6. What technical applications/platforms have you used within your Aviation Management program? (Not including internship/work experience)
    a. Excel
    b. SQL
    c. R
    d. Tableau
    e. Python
    f. Diio Mi
    g. SABRE
    h. ArcGIS
    i. ProDIGIQ
    j. CH-Aviation
    k. Other: *Text Box*
7. On a scale of 1-10, how comfortable do you feel with the skills you listed? (1 being not comfortable at all, 10 being extremely comfortable)
    a. *For each skill selected by the respondent in #6, an integer scale is displayed for the respondent to select their comfort rating*
8. Which of the following applications/platforms would you like to have included in your Aviation Management program?
    a. Excel
    b. SQL
    c. R
    d. Tableau
    e. Python
    f. Diio Mi
    g. SABRE
    h. ArcGIS
    i. ProDIGIQ
    j. CH-Aviation
    k. Other: *Text Box*
9. List 5 other skills not described in Questions #6 through #8 that you have learned from your Aviation Management program.

    a. Skill (1-5): *Text Box*
10. What skills taught outside your required Aviation Management coursework have you found to be beneficial during your college career?
    a. *Text Box*
11. On a scale of 1-10, how satisfied are you with your educational experience within your school's Aviation Management curriculum? (1 being the lowest, 10 being the highest)
    a. *An integer scale is displayed for the respondent to select their satisfaction rating*
12. What is your favorite part about the aviation management curriculum at your school? (Pick One)
    a. Networking Opportunities
    b. Closely Aligned Post-College Employment Ambitions
    c. Acquisition Of Skills Relevant to Workforce
    d. Professors' Teaching Curriculum
    e. Ease Of Major
    f. Tight-Knit Student Group
    g. Hands-On Coursework
    h. Integration Of Curriculum to Other Majors
    i. Other: *Text Box*
13. What would you like to see differently (or improved) within the program? (Select all that apply)
    a. More Detailed Coursework
    b. Integration of Practical/Hands-On Coursework
    c. Higher Research Opportunities
    d. Better Networking Opportunities
    e. Major is too Hard
    f. Major is too Easy
    g. More Business-Focused Courses
    h. Other: *Text Box*

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Appendix B: Survey Questions for Recent Graduates in Aviation Management

1. In what 5-year time period did you graduate from your undergraduate Aviation Management program?
    a. 2018
    b. 2019
    c. 2020
    d. 2021
    e. 2022
    f. 2023
2. Primary Major While Attending?
    a. Professional Pilot-Related Degree
    b. Aviation Management-Related Degree
    c. Aeronautical Engineering/Technology/Maintenance-Related Degree
    d. Unmanned Aerial Systems-Related Degree
    e. Air Traffic Control-Related Degree
    f. Other: *Text Box*
3. Secondary Major While Attending (If applicable):
    a. Professional Pilot-Related Degree
    b. Aviation Management-Related Degree
    c. Aeronautical Engineering/Technology/Maintenance-Related Degree
    d. Unmanned Aerial Systems-Related Degree
    e. Air Traffic Control-Related Degree
    f. Other: *Text Box*
4. In your own words, how would you define Aviation Management?
    a. *Text Box*
5. Select any industry sectors in which you work, or have worked, within the aviation industry. If inclined, please note any company affiliations and job titles. *Note that any identifiable information will be de-identified*.
    a. Air Carrier: *Text Box*
    b. Airport: *Text Box*
    c. Other Aviation Sector: *Text Box*
    d. Outside of Aviation: *Text Box*
6. On a scale of 1-10, how adequate do you believe the skills you obtained from your aviation management program are for your current and previous jobs within the industry? (1 being not at all adequate, 10 being beyond adequate)
    a. *An integer scale is displayed for the respondent to select their adequacy rating*
7. Name 5 skills you learned during your Aviation Management degree that you have used in your past or present roles within the industry. (Not including internship/work experience during undergraduate education)
    a. Skill (1-5): *Text Box*
8. What skills or applications taught outside your required Aviation Management coursework during your undergraduate education have helped you to succeed in the industry today?
    a. *Text Box*
9. What technical applications/platforms do you use today that you **also used** during your Aviation Management undergraduate program? Select all that apply:
    a. Excel
    b. SQL
    c. R
    d. Tableau

    e. Python
    f. Other: *Text Box*

10. Outside of readily available applications/platforms, like the ones above, are there any specialized to the aviation industry you have used that you **also had while enrolled** within your Aviation Management program?
    i. Diio Mi
    j. SABRE
    k. ArcGIS
    l. ProDIGIQ
    m. CH-Aviation
    n. Other: *Text Box*
11. What skills or technical applications have you learned since joining the industry that you wish you had learned during your undergraduate Aviation Management program?
    a. *Text Box*
12. Do you feel more or less capable than your coworkers that you have worked with during your professional career so far? Rate yourself on a scale of 1-10, with 1 corresponding to a feeling of low capability and 10 being a high capability compared to your peers.
    a. *An integer scale is displayed for the respondent to select their felt capability rating compared to their peers*
13. What contributed to your ranking against your peers?
    a. *Text Box*

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Appendix C: Screening Survey

1. Are you a current undergraduate student in an Aviation Management program at a collegiate institution?
    a. Yes: *Participant routed to Current Undergraduate Aviation Management Curriculum Skill Acquisition Survey*
    b. No: *Routed to Question 2*
2. Are you a recent graduate (5 years) of an Aviation Management program at a collegiate institution?
    a. Yes: *Participant routed to Recent Graduate Aviation Management Curriculum Skill Acquisition Survey*
    b. No: *Taken to Exit Screen*
3. Exit Screen: You are not eligible to participate in this survey. We thank you for your time.