

2-13-2019

# Competency-Based Education: A Framework for Aviation Management Programs

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In recent years, the agencies that accredit collegiate aviation programs have moved to outcomes-based models. These models benefit from defined core competencies that can be used to drive the development of related program goals and student learning outcomes to ensure program consistency and quality. This article provides a brief description of the process that the faculty at a large midwestern university utilized to develop core competencies for its aviation management programs, and the set of competencies that resulted from the process.

## Recommended Citation:

Mott, J.H., Hubbard, S.M., Lu, C-T., Sobieralski, J.B., Gao, Y., Nolan, M.S., & Kotla, B. (2019).  
Competency-Based Education: A Framework for Aviation Management Programs. *Collegiate Aviation  
Review International*, 37(1), (pending). Retrieved from  
<http://ojs.library.okstate.edu/osu/index.php/CARI/article/view/7802/7249>

As regional and professional academic accrediting organizations have moved in the direction of outcomes-based assessment over the past twenty or so years, virtually all of the various stakeholders, including those agencies, employers, and academic institutions, have sought the means to define and assess students' attainment of educational outcomes or competencies for their related academic programs. One of the challenges, however, has been the lack of standardization of the definition of competency-based education (Mintz, 2015).

The Council of Regional Accrediting Commissions (C-RAC) proposed that competency-based education is “an outcomes-based approach to earning a college degree,” and that individual competencies are “statements of what students can do as a result of their learning at an institution of higher education” (C-RAC, 2015, p. 1). For the purposes of this article, the authors suggest that competency-based education may be viewed simply as an educational model in which the achievement of specific, program-related learning outcomes or competencies are prioritized over time spent in the classroom. According to the U. S. Department of Education (USDOE, n.d., p. 1), “transitioning away from seat time, in favor of a structure that creates flexibility, allows students to progress as they demonstrate mastery of academic content, regardless of time, place, or pace of learning.” Hence, if the transition to outcomes-based learning and assessment is to be made successfully, it is important to develop a deep understanding of the particular competencies that form the core of the program in question. These competencies, once determined, will then form the framework for all learning activities associated with the program, and will provide a continuity across related courses.

The Aviation Management program in the Purdue School of Aviation and Transportation Technology was developed in the mid-1980s to fulfill a need for students interested in a career in aviation but wishing to focus on management competencies rather than the technical competencies and certification requirements found in the Professional Flight or Aeronautical Engineering Technology curricula. This program also served for a period of time as a vehicle for an approved Federal Aviation Administration (FAA) airway science curriculum under the FAA's Air Traffic Collegiate Training Initiative. Like the other school programs, Aviation Management began as a two-plus-two program; however, it has operated as a four-year program since the School ended the issuance of associate's degrees roughly five years ago. This model facilitates cooperation with partner programs at community colleges and other schools, which is consistent with other programs in agriculture and engineering at the University.

During the first few years of the program, air traffic control was given a major emphasis. As the program developed, this emphasis was expanded to give students opportunities to study several areas within the broader field of aviation management. Most importantly, two specialty areas were added to the curriculum – airline management and airport management. In the fall of 2007, air traffic control was dropped as a separate focus area, although students may still elect to participate in the FAA Collegiate Training Initiative program. Current students take a capstone course that allows them to work on an individual basis with a faculty member specializing in their area of interest. As with most management-related programs, Aviation Management leverages course offerings from other schools, particularly those of Purdue's Krannert School of

Management. The aviation faculty builds upon the knowledge acquired by students in basic courses and guides students as they apply that knowledge to the unique needs of the aviation industry.

Several specialized educational opportunities exist for aviation management students. First, Purdue University is one of 36 schools in the nation that historically participated in the FAA's Collegiate Training Initiative Program; students successfully completing a group of FAA-approved courses within the Purdue curriculum were eligible for alternate pools in the FAA air traffic controller hiring process, thereby improving their probabilities of selection. While recent FAA hiring procedures have reduced these opportunities, the competencies acquired from the program nevertheless are important for student success. A second opportunity is to finish coursework that will prepare a student to satisfactorily complete the Certified Member examination offered by the American Association of Airport Executives (AAAE). This serves to add value for those graduates seeking employment in the airport management career area. A third option for students is to earn academic minors. Many minors now exist for aviation management students. Two of these are in Management and Computer Information Systems. The Management minor is offered by Purdue's School of Management, and participation is highly encouraged by aviation faculty and advisors due to the practicality and relevance of the courses that comprise it. Purdue's Department of Computer and Information Technology offers the Computer Information Systems minor, and it is beneficial to students who want to enter the aviation industry in an information technology area. Students have also successfully completed minors in complementary disciplines that are compatible with their career goals, including minors in Hospitality and Tourism Management and in technical writing. In addition, a number of university-industry partnerships exist to enhance the quality of the program and to broaden student educational opportunities.

As a land grant institution founded under the Morrill Act, Purdue is the agricultural and mechanical university for the State of Indiana, and the School's mission is a reflection of the missions of the Polytechnic and Purdue University in serving *the citizens of Indiana, the United States, and the world through discovery that expands the realm of knowledge, learning through dissemination and preservation of knowledge, and engagement through exchange of knowledge.* The goal of the Aviation Management program, accordingly, is to produce aviation management graduates who are prepared to serve as aviation professionals with an understanding of aviation as an integrated transportation system, as well as a broad-based knowledge of the aviation industry. Student learning is advanced by discovery and engagement activities that enhance economic and social development with emphasis on airline, airport and air traffic control management. It is expected that program graduates have developed and demonstrated the ability to think clearly and analytically, and possesses effective skills in communication, leadership and organization. In addition, the expectation is that they are prepared to compete in a number of occupational areas within the aviation industry, including those areas emphasized by the program as noted above.

The Council of Regional Accrediting Commissions (2015) identified three approaches that competency-based programs may take: a course/credit-based approach, a direct assessment approach, and a hybrid approach. In a course/credit-based approach, the demonstration of the competencies is incorporated into a conventional curriculum that comprises a set of courses that

need to be completed to earn credits towards a degree or credential. The programs based on this approach usually enroll students in traditional academic terms and award credit for courses upon successful completion. Students may choose to accelerate their learning and receive credit for the course after they have demonstrated the mastery of the competencies by passing a summative assessment. Institutions may choose to create two academic transcripts such that one displays the credits earned by the student and includes a grade point average, and the other specifies the competencies achieved (C-RAC, 2015).

The direct assessment approach represents a subset of competency-based education that is not based on semesters or academic terms, or on credits. Under this approach, conventional courses are disregarded and both the evaluation of student achievement and the award of a degree or the credential are based exclusively upon the demonstration of competencies. Programs based on the direct assessment approach allow students to progress through a course at their own pace rather than follow the traditional academic term pattern (USDOE, 2016, p. 1-2). A student may acquire the requisite competencies from multiple sources and at various times in addition to participating in the learning experiences provided by the institution. The duration of learning may differ for each student. The direct assessment methodology provides for alternative approaches to teaching and learning (Southern Association of Colleges and Schools Commission on Colleges [SACSCOC], 2013, p. 2).

Since this approach does not follow a conventional pattern by which grades are assigned and there is a limited timeframe to complete the courses offered, the transcript generated by the institutions following it indicate only the competencies achieved rather than grades or credit hours earned. Credit-hour equivalencies are established for direct assessment-based programs for student learning outcomes. The institutions may choose to issue a transcript that displays the course/credit equivalencies along with a competency transcript (C-RAC, 2015). Institutions are expected to do the following when establishing credit-hour equivalencies:

- Place emphasis on amount of learning that occurs rather than on the time required.
- Draw upon previously defined policies for credit hour allocation that are consistent with federal regulations.

Lastly, the hybrid approach is a combination of the course/credit based and the direct assessment approaches in which students are permitted to attain their degrees or credentials through a conjunction of direct assessment of competencies and of credit hours (C-RAC, 2015). The hybrid approach utilizes direct assessment for satisfying the requirements of one portion of the program and credit hours for the remainder of the program.

For the purposes of approval of competency-based education programs by their respective accrediting agencies, a systematic approach is followed in each of the three cases (C-RAC, 2015):

- For course/credit-based programs, when an institution offers a course using the credit-based approach, it must be approved by its regional accreditor as a substantive change. Post approval, the accreditor will provide the necessary guidance regarding the submission for approval of future competency-based programs.
- For direct assessment programs, institutions must submit their plans to their accreditor for approval as a substantive change before implementation. As per federal regulations, the accreditor is required to review the qualifications and sufficiency of faculty resources to maintain the program, and to evaluate the institution's methodology for determining credit hour equivalency.
- For hybrid programs, institutions must submit their plans for approval from their respective accrediting agency as a substantive change before proceeding with its implementation.

According to a report of the National Postsecondary Education Cooperative Working Group on Competency-Based Initiatives in Postsecondary Education (USDOE, 2002), “competency-based initiatives seek to ensure that students attain specific skills, knowledge, and abilities considered important with respect to whatever they are studying or the transitions for which they are preparing” (p. 9). While different competency-based educational models may take different approaches, the utilization of competencies through the implementation of any of these models requires that three different yet interactive components be developed:

1. A description of the competency,
2. A means of assessing the competency, and
3. A standard by which a student is judged to be competent.

It is the first of these components on which the remainder of this article is focused.

### **Identification of Core Competencies**

Aviation Management programs at Purdue University are predominantly practical in nature; because of this, it is important that they stay current, which can be challenging due to the rapid rate of change extant in the air transportation industry. In addition to fundamental theories related to management and operation, the program aspires to equip students with the necessary skills and knowledge to ensure success, whether students' post-graduation plans are related to employment or to further education.

Researchers in various industries have advocated competency-based education for decades. Monjan and Gassner (1979) address a wide range of topics in competency-based education, ranging from program design to outcomes measurement. They raise the important point that the curriculum must reflect the industry's definition of competency, which emphasizes the requirement of a close connection between academia and industry. More recently, Kearns, Mavin, and Hodge (2018) explored the application of competencies specifically related to aviation education. These researchers addressed education and training for professional pilots,

air traffic controllers, cabin crew and aircraft maintenance technicians, recognizing that such training must comply with regulatory standards. The *de facto* impact of regulatory compliance is that government regulatory agencies define educational competencies for flight crew, technician and controller training. Many of the competencies related to aviation management disciplines such as airline operations, revenue management and airport management are not regulated by the government, which allows a broader curriculum design based on the dynamic framework in industry and practice. As a result, there is a critical need to identify these competencies.

Purdue University's Board of Trustees adopted in 2014 a plan to transform its College of Technology, in which the former Department of Aviation Technology resided, into the Purdue Polytechnic Institute. All of the programs housed in this Institute would place a new emphasis on transformative, innovative educational methods using a learn-by-doing approach. The rationale for this transformation was formulated by Gary Bertoline, Dean of the College (Bertoline, n.d.):

The twentieth century was built on the idea of the industrial age. Students were rewarded for having answers, not asking questions. We are now in the digital age. It's a very different skill set, and the expectations for graduates by business and industry are very different. (p.1)

One of the ten transformational goals set by the Polytechnic Institute was the move toward competency-based programs. The intent of this goal is the empowerment of students by providing them with direct and measurable learning objectives which emphasize creation, application, integration, and transfer of knowledge. Students receive rapid, differentiated support from faculty, who serve more as mentors and less in their traditional roles of deliverers of content.

In keeping with this transition to a competency-based educational model and given an understanding of the respective missions of the University, the Polytechnic, and the School, the aviation management faculty and the Industry Advisory Board for the Aviation Management program engaged in a series of meetings during the spring and fall semesters of 2018. The purpose of these meetings was to identify a set of core and sub-level competencies that would constitute the framework for the program as it continues to evolve with regard to new faculty and courses.

A consensus modeling approach was utilized to facilitate the process of developing both the core and sub-level competencies described herein. A high level of participation among both the faculty and industry representatives, all leaders in their respective areas, was obtained. Focus groups and documentary reviews were utilized as a means of gathering data to facilitate the collective identification of core competencies. Qualitative triangulation was applied to the resulting data to ensure its validity and reliability. In this context, the triangulation process involved the integration of competencies identified by three distinct groups: six faculty from the School's aviation management program, who provided a critically-important internal perspective from the educators directly involved with the program; two faculty from the Aeronautical Engineering Technology program, who provided an external input needed for the validation; and seven representatives from the aviation industry who employ graduates from the institution and

who are, in some cases, graduates of the program themselves. Additional industry representatives reviewed the core and sub-level competencies after they were finalized in multiple break-out sessions during the Industry Advisory Board meeting in the fall semester of 2018 in order to register their consensus and made any needed adjustments to the proposed set of competencies.

The resulting core and sub-level competencies that emerged from this iterative process are described below.

## **Leadership**

Successful aviation management graduates demonstrate leadership in executive positions at airlines, airports, and a variety of other aviation and aerospace organizations, including government agencies such as the Transportation Security Administration and the National Transportation Safety Board. To ensure that future graduates have the leadership skills required for success in these executive roles, program faculty and industry representatives have identified leadership as a core competency and are developing associated student outcomes to measure student progress.

Leadership requires a combination of analytical and interpersonal skills, as well as the ability to identify the context for action, and adapt quickly to changing circumstances. An innovative leader must be able to generate, develop and implement ideas, programs and initiatives in the context of a systematic process (Singer, 2014). Specifically, leaders must:

1. Generate favorable ideas and build a team to develop the ideas,
2. Work with the team to refine ideas and accurately estimate the value and costs of ideas,
3. Evaluate ideas using predefined criteria and objectives,
4. Identify the best ideas and develop supporting budgets and funding, and
5. Successfully deliver a final product that results from the ideas.

Leadership requires both independent skills and interpersonal skills that facilitate group processes and organizational success. Leaders must effectively identify and communicate how activities foster achievement of organizational goals and support the underlying organizational mission and vision. Identifying effective ways to communicate and motivate not only team members, but also a variety of internal and external stakeholders, is critical for success.

Leadership may be characterized by strategic thinking, planning, and flexibility, as well as the capability to envision success, communicate steps for success, and motivate the team to achieve success. Leadership may start with self-governance, evidenced through individual tasks that require planning, communication, execution and integrity. Building on self-governance, successful leadership then broadens to include not only personal presence, but also team presence and organizational presence (Eblin, 2018).

A critical component of leadership is ability of to focus on the system problem, rather than the immediate problem at hand (McClain, 2013). This is reinforced by military leadership

models as well as by academic models. Developing student capabilities for systems thinking is a critical competency for leadership roles. Systems thinking includes the ability to effectively identify the situational context, as well as organizational and cultural components that affect the problem and can be leveraged to implement a successful solution.

Reflecting these important ideas, the leadership sub-level competencies in Aviation Management have been identified as follows:

1. Fostering actions towards achieving vision, mission, and goals of a project or activity;
2. Facilitating group processes; and
3. Utilizing situation, context, and cultural aspects of organizations effectively.

### **Subject Matter Excellence**

Management is essentially the allocation of resources, including human, financial and physical, with the objective of achieving an optimal return for all stakeholders. While management in the context of general business is already sufficiently complex, aviation management further complicates this task by introducing operational, safety and regulatory compliance elements into its domain. Being a safety-critical industry from the outset, the air transportation industry has employed comprehensive regulations, rules, and policies for decades to manage these compounding objectives and to achieve a safe and orderly growth of air traffic. Therefore, subject matter excellence in the context of aviation management suggests compliance throughout all hierarchies in the air transportation system.

Air transportation is a customer-oriented industry facing numerous challenges within the context of daily operations. With over 43,000 flights per day in domestic airspace (FAA, 2018), an enormous amount of data is generated. The traffic volume, coupled with numerous changes that result from uncertainties introduced by weather and mechanical issues, constantly presents front-line practitioners with problems to solve with little-to-no time for preparation. The ability to make critical and timely decisions based on evidence, knowledge, and experience is the key to solving such operational challenges and facilitating a smooth flow of air traffic through the national air transportation system.

The actual operational environment in air transportation is challenging since data is often incomplete and conflicting. The ability to identify patterns and indicating variables in the presence of noise is a valuable skill that foster advances within the industry. Critical thinking skills to support the ability to identify meaningful information from complex data have been identified by the aviation management faculty members and by the Industry Advisory Board members to be essential for all aviation management students.

The air transportation industry is composed of various entities, including airlines, airports, and other essential suppliers. These business entities all share a similar goal, which is to maximize returns to their respective shareholders while fulfilling operational objectives. While it still holds that the primary mission of air transportation is the transport of passengers and freight from origin to destination, the nature of the journey has become far more diverse in recent years. The satisfaction of the rapidly-evolving associated demands of passengers and shippers



suggests that related businesses can generate higher revenues from ancillary services in addition to that generated from core operations. This business acumen has been demonstrated by many global carriers to be the key for financial success and has provided indispensable support to such companies during adverse market environments (Qantas, 2018).

The related sub-level competencies for the subject matter excellence core competency have therefore been identified as:

1. Implementing and managing effective safety, health, and environment systems, using applicable laws, regulations, standards, and codes;
2. Effectively solving problems and making decisions;
3. Thinking critically; and
4. Possessing a satisfactory level of business acumen.

### **Ethics and Integrity**

Integrity and ethical behavior are the foundation of mutual trust and serve as a basis for producing graduates who have the capacity to serve as organizational leaders. Managers in various aviation organizations, including airlines, airports, non-governmental and governmental entities are relied upon to conduct themselves in an ethical manner to ensure the safe and efficient flow of people and commerce around the world. Ethics and integrity are necessary core competencies for any successful aviation manager, and the School has developed objectives to enable students in the program to better understand these issues and to act accordingly in their professional careers.

In recent decades, ethics has become a more complex issue in aviation as the world has become more interconnected (Hoppe, 2018). An agreed-upon measure of ethical behavior is difficult to establish on a global scale; however, the benefits of such agreement and understanding are substantial. Unethical organizations are neither economically nor socially sustainable (Andrews, 1989).

Every organization requires ethical behavior and integrity as central components (Cowings, 2012). Ethics refers broadly to the understanding of right and wrong, and behaving ethically requires an individual to act in a way consistent with what is perceived as right. The recognition of unethical behavior is also key. Integrity is the ability of an individual to do the right thing even when not being monitored. A combination of these two concepts is essential to fostering an environment that is conducive to the nurturing of ethical behavior. Ethical behavior has several pillars developed by Andrews (1989):

1. The ethics of the individual,
2. The effect of the organization as an ethical environment, and
3. The actions developed by the organization to encourage ethical behavior.

To develop the ethics of the individual, students assess their own ethical proficiency inside and outside of the classroom environment. Through carefully analyses of ethical dilemmas, the individual can ascertain the effects of the organization as well as understand the

social impacts of particular actions. Understanding the connection between the individual's ethics, organization and society as a whole improves the related procedures and policies of any organization.

In the aviation sector, unethical behavior can not only harm an organization's profitability, but can also negatively impact safety in what is widely recognized to be a high-consequence industry. Whether the aviation manager oversees maintenance, flight operations, safety, employee scheduling, airport operations, or aircraft leasing, proactive recognition of the impacts of ethical and unethical behavior is paramount to the success of the organization. With proper understanding of ethical issues and the ability to identify ethical behavior and to act with integrity, the graduate will be well-suited for a successful career as leader in the aviation industry.

Sub-level competencies that have been determined for the ethics and integrity core competency are:

1. Recognition of ethical issues;
2. Evaluation of different ethical perspectives, concepts, and risks;
3. Fostering of personal responsibility; and
4. Application of ethical perspectives, concepts, and maturity.

## **Communication**

Students graduating from the program are expected to be able to communicate orally, in writing, and through visual and graphical presentations in ways that are appropriate to their fields of study and future careers. Effective communication is founded on information literacy, which involves the ability to use appropriate information to learn and explore ideas, demonstrate understanding of a subject, and convey conclusions effectively. At the embedded outcome level, effective communication assumes basic fluency with such things as grammar, organization and structure. It also focuses on being able to convey ideas concisely in ways appropriate for the context, audience and purpose. At this level, students should recognize that communication occurs within and across communities, such as academic, public or professional, where ideas are formulated, debated, and weighed against one another.

The conveyance of critical information is imperative within the aviation industry, and has been well documented (International Civil Aviation Organization [ICAO], 2015, 2016). Such information must be communicated through multiple channels, including written, verbal, and graphical. The ability to communicate effectively and the related core competency are inextricably connected with competencies in other areas, as well. As Vieira and Santos (2010) described in their study in communication competency for ground and aircraft crews, a high percentage of NASA Aviation Safety Reporting System reports directly or indirectly included problems associated with failures in interpersonal communications (p. 361). Lercel, Steckel, Charles, Patankar, & Vance (2015) placed competence in interpersonal communications as a high priority among those required for aviation maintenance technicians at air carriers, repair stations, manufacturers, and aviation maintenance training institutions, and note that communication is critical for a technician's ability to "relay discrepancy or work order signoffs,

and shift turnovers - two activities where technicians must effectively communicate in detail the work they have completed or the work needing completion” (p. 41-42). Clearly, communication is considered a fundamental required competency impacting safety, airworthiness (ICAO, 2015), and other critical operational outcomes in aviation, as well as a cornerstone for business and management.

Sub-level competencies for the communication core competency may be divided into those associated with written communication, oral and interpersonal communication, and visual communication. Those sub-level competencies related to written communication are:

1. Understanding the context of and purpose for writing, including considerations of the audience and the circumstances surrounding the writing tasks;
2. Utilizing appropriate genre and disciplinary conventions; and
3. Utilizing appropriate sources and evidence.

Sub-level competencies associated with oral and interpersonal communication are:

1. Clear and consistently-observable organizational pattern,
2. Thoughtful and effective choices of language, and
3. Presenting a clear and consistent central message.

Sub-level competencies associated with visual communication are:

1. Clear and consistent organizational pattern,
2. Effective use of graphics, and
3. Presence of a clearly-communicated central message.

## **Teamwork**

The aviation industry is global in nature and requires collaborative synergy from all stakeholders. The ability to work effectively as a team and facilitate teamwork is essential to aviation managers and, by extension, to management students, since successful teamwork can significantly enhance desired outcomes (Lerner, Magrane & Friedman, 2009). It is imperative for future aviation leaders to obtain knowledge and achieve a thorough understanding of the merits of teamwork as preparation for managing a high-performance aviation organization. Group research projects, presentations, assignments, and practical exercises are all good means to help shape these needed abilities, which simultaneously reflect the necessary attributes of course materials and activities.

Numerous researchers in aviation, medical and other high-consequence industries praise teamwork as a fundamental ability of professionals (Lacerenza, Larlow, Tannenbaum & Salas, 2018), which in return encourages collegiate aviation programs to embrace the incorporation of teamwork into pedagogical content. It is critical for aviation managers to facilitate their programs, strategies or initiatives through a collective and collaborative fashion. Teamwork is particularly important in safety management. As Reason (1997) described, accidents can happen due to organizational risks; namely insufficient management, supervision, cooperation, leadership, or the

lack of teamwork, when completing a mission. As an example taken from aircraft leasing, when the decision to lease or renew a fleet or single aircraft is made, that decision typically involves experts from finance, engineering (engine or avionics), flight, marketing, logistics, quality assurance, cabin services, and training centers. To ensure that program graduates are able to make significant contributions, the ability to successfully work as part of a team must be developed before they enter the workforce (Thompkins, 2015).

Students graduating from Purdue University should be able to work effectively with others in various ways, including working in cross-cultural situations and in a global civil society. Interpersonal skills include the ability to work effectively with others both in professional practice and outside of the discipline, in leadership roles, and as members of a team. Intercultural knowledge is founded on the ability to appreciate and critique multiple perspectives including one's own, and to engage in civil discourse on complex global issues. It requires respect for and responsiveness to the beliefs and practices and cultural and linguistic needs of diverse populations. Students can acquire and practice these skills in ways appropriate to their fields of study and future careers through team projects incorporated into aviation management curriculum.

Accordingly, the associated sub-level competencies for the teamwork core competency are as follows:

1. Facilitation of team member contributions and management of conflict,
2. Development and completion of tasks as an individual contributor, and
3. Development of skills to facilitate immersion with individuals from different cultures.

### **Individual Resilience and Innovation**

Individual resilience is the ability to persevere in the face of adversity and changing circumstances, and innovation is the ability to creatively seek solutions and find opportunities in changing environment. The value of resilience and the importance of being an innovator has become increasingly recognized; "Resilience is not only needed to be developed as an innovator, but just as a human. Life is full of ups and downs, but how you recover and move forward is not just important to how we learn, but how we live" (Couros, 2015, p. 30). Perhaps the concepts derive from age-old concepts that recognize the importance of action, as evidenced by the Chinese proverb, *The person who says it cannot be done, should not interrupt the person doing it.*

Successful aviation management graduates must have the ability to demonstrate resilience and innovation in executive positions at airlines, airports, and a variety of other aviation and aerospace organizations, including government agencies such as the FAA, TSA and NTSB. To ensure that future graduates have the resilience and innovation skills required for success in these executive roles, the School has identified individual resilience and innovation as a core competency and is developing associated student outcomes to measure student progress.

Resilience and innovation are evolving concepts that encompass system identification, resilience objective setting, vulnerability analysis, and stakeholder engagement. The

implementation of this framework is focused on the achievement of three resilience capacities: adaptive capacity, absorptive capacity, and recoverability (Francis & Bekera, 2014). Resilient organizations and innovative organizations tend to share essential core competencies related to adaptability and innovation as well as self-efficacy. These competencies (Breazeale, 2012) include:

1. Being connected to others,
2. Being flexible,
3. Being able to make realistic plans and take action to carry them out,
4. Being able to communicate well with others and problem-solve both individually and with others,
5. Being able to manage strong feelings,
6. Being self-confident,
7. Being able to find purpose and meaning,
8. Being able to see the big picture,
9. Being able to appreciate and use humor appropriately,
10. Being able to take care of yourself, and
11. Being able to care for others physically and emotionally.

All of these components, if properly incorporated as required student outcomes, will produce graduates with the resilience to tackle current as well as future (as yet unknown) problems and challenges. Key activities that foster these competencies include the following:

1. Realizing that process is more important than the end-goal,
2. Design thinking is the way to teach students to solve real-world problems,
3. Engaging students instead of lecturing to them,
4. Developing/encouraging creativity versus content, and
5. Inspiring students to think differently.

Bloomberg (2014) summarized the thoughts of Woods as related to the concept that resilient organizations and innovative organizations share essential core competencies, suggesting that “being able to anticipate, being able to proactively learn,” are at the intersection of these concepts, and noting that “proactive learning means you don’t wait for the big signal, the major event to occur that says ‘Hey! Learn! Change! Revise everything! A big thing happened!’ Because if you wait for a big thing to happen, it’s usually bad” (p. 1). In fact, innovation requires disruption, the “big signal” to which Woods refers, and disruptions are usually surprising. As a result, proactive learning, which could also be called planning ahead, is essential for organizational innovation. How does one design an organization that is both resilient and innovative? Woods suggests “a layered network of human social systems that are able to handle surprise, and not get trapped at a narrow level where locally, everyone is behaving in a reasonable, adaptive way, but when you put them all together it’s completely maladaptive from a broader perspective” (p. 1).

Sub-level competencies related to the core competency of individual resilience and innovation therefore include:

1. The ability to adapt and innovate; and
2. Willingness to engage, along with a belief that the task can be accomplished.

### **Next Steps**

Assessment of competencies requires the development of related student learning outcomes. Once competencies are determined, it is useful to summarize them, along with the related student outcomes, in tabular form. Each of the primary competencies may be presented in a separate table; the related student outcomes may be presented in the table rows, along with criteria for determining whether students' proficiency levels may be categorized as developing, emerging, or proficient. The use of these proficiency level descriptors is recommended to provide a common reference point for assessment purposes (North & Schneider, 1998).

The proficiency level descriptors suggested here provide a delineation of three stages of development of critical aviation management skills that students are expected to acquire as they achieve increasing degrees of proficiency within the program. Ideally, these descriptors should classify student knowledge, skills, and abilities across a spectrum, identifying what the student needs to know and can accomplish upon entering and exiting each of the three levels. They are intended as a guide for both instruction and curriculum development (Torlakson, 2012).

The organization of the proficiency level descriptors represents aviation management skills development across a continuous spectrum of increasing proficiency, starting with basic competencies students possess when they enter the program, and concluding with the lifelong learning in which all aviation professionals engage. The three levels represent three stages of development, describing expectations for knowledge and skills at each level as the breadth of capabilities expands and concepts transition from ideas to practice.

The three suggested proficiency level descriptors for aviation management programs are as follows:

- 1. Emerging:** Students within this category generally make rapid progress, learning basic aviation skills for immediate needs, as well as beginning to employ appropriate academic terminology.
- 2. Developing:** Students within this category are challenged to increase their aviation management skills in an increasingly greater number of situations, and to learn a wider variety of terminology, applying their knowledge and skills in a more cultivated manner appropriate to their level of experience.
- 3. Proficient:** Students within this category continue to learn and apply a range of high-level skills in multiple and varied frames of reference, including comprehension and synthesis related to advanced technical projects. This stage is indicative of a high degree of engagement in required academic tasks across a broad range of content areas.

The student outcomes relative to each of the three descriptors are expected to be described using appropriate Revised Bloom's Taxonomy action verbs (Krathwohl, 2002). For example, the first two Bloom's levels, *Knowledge* and *Comprehension*, would map to the *Emerging* proficiency level descriptor suggested here. Related action verbs are such terms as *define*, *describe*, etc. The mapping of the six Bloom's Taxonomy levels to the three proficiency level descriptors is straightforward.

As the development of the competency-based education model to be employed in the program progresses, program faculty will develop the related student learning outcomes based on the competencies presented herein, using the suggested proficiency level descriptors to delineate the outcomes into measurable categories. Associated leadership competencies will then be measured for the three levels (developing, emerging and proficient) of student achievement.

### **Conclusion**

It is anticipated that the process described in this article of determining program competencies and developing the associated student learning outcomes using the suggested proficiency level descriptors will lead to a more comprehensive and consistent learning process across the courses that comprise the aviation management curriculum. In addition, it is expected that the streamlining of competencies will result in a more robust assessment process. These anticipated advantages will serve to improve the overall quality of education for program graduates and lead to increased satisfaction among all of the stakeholders. It is hoped that the description of this development process and the related core competencies resulting from it will benefit faculty in other aviation programs that wish to move to competency-based educational models. The authors wish to suggest that faculty at other institutions consider the competencies proposed herein for potential adoption, tailoring them as necessary to fit situations unique to their respective programs, and that they also consider adoption of the related competency development process.

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