

Developing the Next Generation of Aviation Professionals through Aviation Curriculum

Chalermkiart Feongkeaw*

Graduate School, Kasem Bundit University, Bangkok, Thailand 10250

*Corresponding author e-mail: lecoqchezmoi@gmail.com

Received: July 11, 2023

Revised: October 29, 2023

Accepted: November 21, 2023

Abstract: The article aims to propose curriculum development which can generate next aviation professionals for the aviation industry. The perspectives, from critical work to curriculum vice-versa, respond to the need of regulatory bodies concerned as well as industry. The human performance-related considerations of the International Civil Aviation Organization (ICAO) are mainly employed to merge with three-core domain of aviation professionals forming the responsive curriculum in aviation education at undergraduate level. The pathway of aviation professionals for employability derived from curriculum development and complex professional tasks. However, curriculum development as well as learning process design towards the integration of strands (e.g., human factors), aviation function (e.g., cargo operations) together with laws and regulations in aviation by means of organizing into three major curriculum components: objectives, content or subject matter, and learning experiences must be blended and integrated.

Keywords: Next generation, Curriculum development, Human performance-related considerations, Three core domain of aviation professionals

Introduction

Commercial aviation is a key part of all transportation systems in every country in the world and a major contributor to economic prosperity of each country. As a result, the policy makers of each government take a keen interest how to invest a human capital, which is an intangible asset or quality and can be classified as the economic value, achieving such as prosperity. Although the commercial airlines were largely freed from government economic controls in many countries, state agencies continue to have important oversight responsibilities, regulated by the International Civil Aviation Organization (ICAO), for aviation safety, and the public still expects government to pay special attention to how the aviation industry is faring. The novel coronavirus pneumonia (COVID-19) broke out at the end of 2019 and spread quickly throughout the world. This major public health emergency led to a dramatic change all over the world, affecting all aspects of social life, including education (Naciri et al., 2020; Van & Parolin, 2020). The coronavirus disease pandemic also had a devastating impact on the aviation industry globally as nearly all air travel came to a halt in late March and April 2020. All scheduled international flights were suspended and several countries also implemented bans on domestic air travel in an attempt to contain the spread of COVID-19 (IATA, 2020; CAREC, 2021).

Due to the incident, many aviation workers were laid off, causing many airlines to shut down. Though the COVID-19 pandemic gradually declined, the aviation market has still been on a tear. COVID-19 coping has urged companies, not unless aviation companies, to operate in new ways to face supply chain interruptions, shifts in customer demand, and risks to workforce health. The organizational ability to respond to critical contingencies is crucial to a Chief Executive Officer and business leaders in the perspective of continuing business. By the beginning of 2023, the world economy has been recovering. The travelers start to return but there was a lack of a large number of working people in the aviation business. Shortages of aviation professionals mean exceptional opportunities for students. Boeing estimates that by 2035, North America alone will need 112,000 new pilots and 127,000 new

aviation technicians (AOPA, 2022). To fill what is lacking in the aviation labor market, it is a matter of educational institutions to equip both the new and next generations of aviation professionals through curriculum. The task of curriculum development is ultimately building a relationship between content/subject matter and the working world. Thus, aviation curriculum must be designed to form the students for careers in these and other in-demand aviation fields. The curriculum is the first step, offering students comprehensive aviation study options that fit in career and technical education pathways: pilot, aerospace engineering, unmanned aircraft systems/drones) and so on. In this article, the author stresses the undergraduate level in aviation education.

Aviation Professionals: Perspectives from Regulatory Bodies

The foundation of the aviation system is safety, which involves the trust that all who operate within the system to do their part. The complexities of the system require a workforce that is highly educated, trained, and experienced (Byers, 2016). As mentioned above, to survive the pandemic, airports and airlines have significantly reduced their workforce. According to Oxford Economics, the aviation industry has lost over 2.3 million jobs since 2019, 21% less than before the pandemic. However, the aviation industry faces a recruitment and retention crisis due to staff reductions and some airline workers have found new jobs during the pandemic (HRForecast, 2023). A holistic view of the organization and workforce scenario planning can help aviation businesses plan capacities better if they have the entire picture of the internal market and consider all of the factors.

The International Air Transport Association (IATA) released data in March 2023 (2023) that there was strong growth in air travel demand: global traffic, measured in revenue passenger kilometers (RPK), grew by 54.2% year-on-year. The figure represents an 88% recovery from the level in March 2019, the last year before the start of the pandemic. This implied that the need for more manpower who should be professionals being skillful at all transferable talents needed to operate as an aviation staff member in the aviation business is necessary. It has been recognized by the international aviation community that there will be an anticipated shortage of skilled aviation professionals in the near future. In order to address this important issue, the International Civil Aviation Organization (ICAO) launched the Next Generation of Aviation Professionals (NGAP) initiative to ensure that enough qualified and competent aviation professionals are available to operate, manage and maintain the future international air transport system. ICAO argued (2023) in the “Next Generation of Aviation Professionals” program that the lack of harmonized competencies in some aviation disciplines and a lack of awareness by the “next generation” of the types of aviation jobs available further compounds the challenge. As part of the Next Generation of Aviation Professionals (NGAP) program, ICAO working with stakeholders to create greater awareness of the impending shortages of personnel, to forecast both global and regional personnel needs, and to assist the global aviation community in attracting, training, educating and retaining the next generation of aviation professionals.

As safety is the primary mission of aviation, ICAO (2016) offers human performance-related considerations in the following areas:

A. Initial training, competence and/or adaptation of new/active operational staff (e.g., SMS, CRM, HF etc.), initial training means all courses of instruction conformed to aviation annexes of ICAO in order to prepare an individual for licensure or certification in each task concerned.

B. New roles and responsibilities and tasks to be defined and implemented, all job descriptions for each position and outline the essential responsibilities and requirements which state skills required to perform a specific role. A detailed job description cover how success is measured in the role so it can also be used in performance evaluation.

C. Social factors and management of the cultural changes linked to increased automation.

According to the ICAO guideline above, it can be assumed that common ground exists for shaping aviation education, even to a limited extent, between human performance and courses offered. Therefore, the knowledge set designed in line with the human performance approach for aviation professionals showed through the strands to the intended outcomes which lead to the formulation of an effective curriculum (see Table 1). In other words, the effective curriculum has been identified to be key in shaping professionals.

Table 1. Strands to Intended Outcomes

Strands	Courses Offered	Outcomes
A. Initial training	<ul style="list-style-type: none"> - Safety Management System (SMS) - Crew Resource Management (CRM) - Human Factors (HF) - Aviation Security (AVEC) - Hygiene and Sanitation in Aviation*¹ 	<ol style="list-style-type: none"> 1. Define the main concepts of process in each course. 2. Describe the benefits of such processes in aviation business. 3. Apply all concepts at work.
B. Tasks based	<ul style="list-style-type: none"> - Automation¹ - Risk Management¹ - Aerodrome Operations² - Ground Handling² - Air traffic Control Operations² - Commercial Flight Operations² - Inflight Service Operations² - Maintenance Engineering² 	<ol style="list-style-type: none"> 1. Define the main concepts of automation, risk management, and practical job. 2. Achieve job by application to concepts of automation, risk management and practical jobs.
C. Social factors linked to job	<ul style="list-style-type: none"> - ICT Literacy - Leadership - Communication - Customer Service - Teamwork - Emotional Intelligence - Problem Solving - Decision-making - Foreign Languages (advantageous) 	<ol style="list-style-type: none"> 1. Define the main concepts of each course. 2. Select and apply the concept needed during practical tasks.

* Due to COVID-19 Pandemic

¹Recommended to Next Generation of Aviation Professionals

²Applicable to the Job Position

Source: Author (2023)

However, Kearns (2020) claimed that the three main themes of the next generation of aviation professionals have been identified: to attract, educate and retain. To reach what Kearns described the characteristics of new generation, equalizing gender imbalance, sustainability, outreach concepts, engagement strategies, marketing and communication, outreach within emerging versus developed markets, and aviation education. When it comes to aviation education, curriculum is a critical component. Curriculum provides a structure for instruction, guides learning, and ensures that learners are being taught the same material. It also allows education providers to teach material at a level that is appropriate for the learners they are teaching. Hence, developing curriculum to adjoin aviation education must

be formed to provide aviation professionals in the industry. How do education providers design curricula to prepare graduates for a VUCA (volatility, uncertainty, complexity, ambiguity) world, equip them with the knowledge and skills of their profession and give them a competitive advantage in a globalized and competitive aviation industry? These issues are emerging as compelling challenges for universities today.

Curriculum Development for Aviation Professionals

Aviation education began early in the 20th century just after the first successful powered flight of the Wright brothers (Barata & Neves, 2017; Infoplease, 2021). Aviation education through a schedule of the education process or a plan for learning, a so-called curriculum, has responded to the increased global demand for aviation industry. The term curriculum has a different meaning, form and purpose for different scholars. The curriculum is described as an accumulation of knowledge and learning experience in different learning environment (Uphoff, 1982; Oliva, 2009). Moreover, there are several opportunities for praxis (putting theory into practice) to occur in the aviation education, as such education occurs both in the classroom and in the mock-up room, including internship (Conrad & Harris, 2007; Wiggins & Stevens, 2008). Aviation teaching and learning has a demonstrable positive impact on the graduate employability of higher education learners. This is particularly the case if it is integrated into the curriculum rather than experienced as an add-on or included in finite curriculum elements. However, integration of virtual or simulated experience into curriculum is a significant and challenging undertaking in curriculum design, and in the facilitation of learning experiences. Aviation education is managed in the disciplinary area, and in external accreditation requirements to deal with. As mentioned in prior topic, it may conclude that the new generation of professionals should enter the work market not only with the notions of human performance recommended by ICAO, but also a diversified profile.

The supply of aviation courses has grown considerably over the last decade and has been met by increasing student demand. Nevertheless, most job positions require highly qualified employees with some experience of aviation. A fundamental statement, therefore, emerges for stakeholders, particularly aviation educators, in the aviation industry: the aviation courses are supposed to be producing highly-skilled graduates for those positions in the industry, thus enhancing their employment opportunities. In order to provide highly qualified employees having the required adequate and specific competence for employment through the education system, it is therefore imperative to develop curriculum to meet the required qualifications. The educators should keep in mind that the aviation education on demand at the undergraduate level is designed to operate in concert with industry and provide workers who have the right qualifications to be aviation service providers. A number of issues that need to be addressed included implementing a work-related curriculum are incorporated by aviation professionalism and curriculum development.

For curriculum developers in all academic disciplines, knowing and mastering various curriculum models is vital, as well as understanding its foundations, principles and issues are necessary. Moreover, in the Thai context after the issuance of many national curricula in which the educational institute required their own curriculum, so all of the curriculum developers, particularly the top management at the institute, and mastering the curriculum development models is a must. Ornstein & Hunkins (2018) contended that curriculum development encompasses how a curriculum is planned, implemented and evaluated, as well

as what people, processes and procedures are involved. Curriculum models help designers to systematically and transparently map out the rationale for the use of particular teaching, learning and assessment approaches. Bhuttah et al (2019) also claimed that developing the curriculum is a tough, dynamic process involving different procedures with the intention of improvement in the existing conditions. This complexity is increased by the lack of the distinct ideas or models in the development and curriculum planning. It can be concluded that the models of curriculum development serve as guidelines for constructing curriculum. Since the beginning of the development of curriculum studies as a discipline there were a number of models of curriculum development created by many scholars. Many references describe it clearly, for instance: Tyler (1949), Taba (1962), Kelly (2004), Ornstein & Hunkins (2018), and many more. It is important to assert that sound curriculum development cannot be taken for granted or imitated. It is also worth noting that there are challenges and complexities associated with both curriculum integration and collaborative efforts for curriculum renovation. Developing of undergraduate curriculum, in addition to curriculum development models, took into account the standard criteria of undergraduate curriculum B.E. 2565. was In accordance with the characteristics of professionalism in aviation career required and with the standard criteria of undergraduate curriculum, the professional or practice-based undergraduate program, which aims to produce graduates who are knowledgeable in theory and practice, with the emphasis on professional knowledge, competency and skills required by the professional standards, or the technical competency and skills a particular field developed through internships at organizations or cooperative education, suits the desired goal by stressing process model of curriculum development.

The process in which different components such as formulation of curriculum policy, curriculum planning, implementation and evaluation played an important role in curriculum development. The curricular framework generates components at various levels of decision-making such as the national, and institute levels. It provides a great deal of flexibility to provide space for specificity and contextual realities. Additionally, the framework can help all concerned manage each stage of the curriculum development process: identify the needs of stakeholders, create a clear list of learning goals and outcomes, consider creating a curriculum map, identify the instructional methods, and establish evaluation methods. Thus, the curriculum development to aviation professionals cannot avoid important domains in the process, namely (see Figure 1)

1. *Strands*: these provide students an opportunity to expand their knowledge with courses. This term is used to indicate the ideas in a learning area, e.g., human factors, inflight service operations, communication, each with its own associated goals for learning. They formed an integrated framework of disciplinary knowledge and focus on developing the knowledge and skills of the students. These strands are inextricably intertwined and interconnected.

2. *Function*: a list of actions performed by an employee in a certain position that describes the main duties, roles, and responsibilities of their job. Job functions often appear as a list of daily tasks that an employee completes, for instance, ground staff at the airport work in shifts and have an important role in daily operations: handling passenger queries, cabin cleaning, catering, ticket sales, planning, monitoring and controlling airline flight operations. Each aviation unit supports different types of aviation functions and activities, and thereby contribute to the overall operational capacity and efficiency of the bigger aviation system.

3. *Laws and Regulations*: the compliance with laws and regulations, as well as the policies and ethical codes established by regulatory bodies is crucial and mandated for all

aviation entrepreneurs and working through the international civil aviation organization. Subsequent to this directive, the responsibilities for making and adoption of all annexes, standards and recommended practices for control of aviation operations became a mandatory function. Failure to comply with laws and regulations adversely affects business.

The “three-core domain of aviation professionals” in Figure 1 incorporates knowledge that is essential to aviation students in order to demonstrate wider knowledge and skills that will enable them to operate effectively in and understand the nature of the aviation industry. Consequently, the combination between three-core domain and curriculum development process leads to a next generation of employees working professionally in the aviation labor market.

The implementation of such curriculum may vary depending on how broadly curriculum developers define or employ the term, which refers to the knowledge and skills students are expected to learn, which included learning standards or learning objectives; the units and lessons; the assignments and projects given to students; the books, materials, presentations, and readings used in a course; and the tests, assessments, and other methods used to evaluate student learning. An individual curriculum, for example, would be the specific learning standards, lessons, assignments, and materials used to organize and teach a particular course. (Robinson, 2022; Short & Hirsh, 2023).

To evidently demonstrate how blend all domains through taught curriculum development, in this article, the competency-based curriculum (CBC) is properly selected by commencing with the determination of learning objective and outcome. On account of CBC, the competency aligning to task-based conception (the crucial element of strand linking to CBC) as well as aviation laws and regulations must be attained to form learning objectives and outcomes. For instance, shaping a professional pilot, the curriculum developer would prescribe competencies relevant to the pilot work context including initial courses together with social factors such as problem solving, decision-making and formulating learning objectives and outcomes to reach the pilot performance. Then, sorting out the content or subject matter related to pilot function that meets the learning objective and outcome. At last, taking into account that the curriculum has adopted a competency-based curriculum approach, thus learning experiences seem imperative to be designed in accordance with that approach like cognitive apprenticeship or job shadowing.

Furthermore, assessment and evaluation will facilitate improvement of the student pilot before professional roll out, this implies that the selection of learning assessment and evaluation methods has to discreetly carry out (IBE-UNESCO, 2017; Nouraei et al., 2020). The methodical approach that evaluates individuals based on demonstrated skills, behaviors, and knowledge relevant to their roles is competency-based assessment. Hence, the competency indicators are obliged to identify specific aspects of a competency that is transferable across subject areas or contexts.

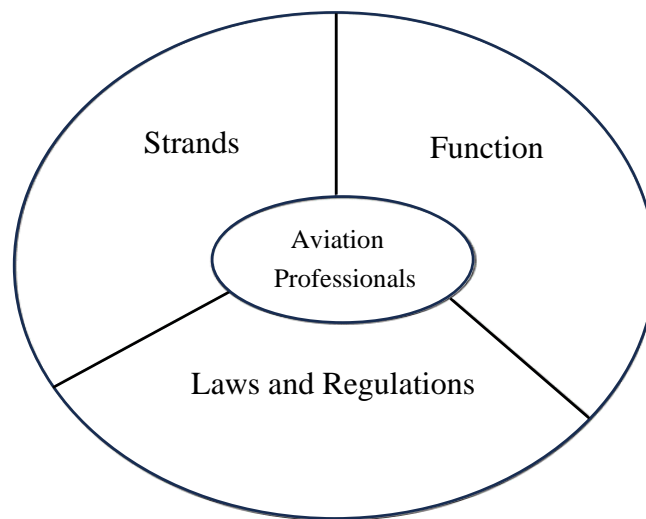


Figure 1. Three-Core Domain of Aviation Professionals
Source: Author (2023)

Conclusion: Ways Forward to Aviation Professionals

For most undergraduate students, connecting what they are learning in the classroom with their job interests and aspirations is vital for to keep them engaged in the material and learning skills that are critical to their success. Universities, therefore, have to prepare them for working in the career sectors. Because there are many considerations and restrictions in the aviation industry, whether to be an international business that is full of regulations from regulatory bodies along with the use of innovation and technology that seems dynamic all the time. Thus, curriculum development must take the foregoing into account. The pathway of aviation professionals focused on curriculum development and complex professional tasks. However, curriculum development as well as learning process design towards the integration of strands, aviation function together with laws and regulations in aviation must be blended and integrated. This concept defined three integration elements applied to curriculum that leads to the next generation of employees who can work professionally in aviation labor market.

Last but not least, the curriculum development is not a one-step process; continuous improvement is a necessity. The development of the curriculum should be assessed periodically and refined based on the assessment data. This may involve making alterations to the design partway through the course to ensure that learning outcomes or a certain level of proficiency will be achieved at the end of the course and respond to professional standards. Curriculum allows students to become more knowledgeable about a broad range of aspects of this global industry, as well as fostering a curiosity about global travel destinations. This can provide a great foundation for employment in aviation. The aviation industry keeps the world moving and a career in this sector promises unique opportunities. Globally, it is expanding so there is always room for newly qualified professionals. So, professionalism is a vital aspect of being a worker as graduates will communicate with their passengers to ensure a safe, efficient and smooth flight. At the undergraduate level, the next generation of aviation professionals can be generated by developing curriculum using the information that covers the context of the aviation industry.

References

- Aircraft Owners and Pilots Association (AOPA). (2022). *AOPA's High School Aviation STEM Curriculum Brochure*. <https://download.aopa.org/mktgemailfiles/HSSTEMCurriculumBrochure.pdf>
- Barata, J., & Neves, F. (2017). The history of aviation education and training. *Open Journal of Applied Sciences*, 7, p.196-205. doi: 10.4236/ojapps.2017.74017.
- Bhuttah, T. M., Xiaoduan, C., Ullah, H., & Normal, S. (2019). Analysis of curriculum development stages from the perspective of Tyler, Taba and Wheeler. *European Journal of Social Sciences*, 58(1), p.14-22.
- Byers, D. A. (2016). The aviation workforce of tomorrow Where are they needed and where will they come from? *TR NEWS*. <https://onlinepubs.trb.org/Onlinepubs/trnews/trnews304feature.pdf>
- CAREC. (2021). *Impact of COVID-19 on CAREC Aviation and Tourism*. CAREC SECRETARIAT.
- Conrad, D. L., & Harris, J. (2007). Aviation, adult learning and andragogy: A Canadian perspective. In Irene M.A. Henley (Ed.), *Aviation Education and Training*. ASHGATE.
- HRForecast. (2023). *Employee and skills shortages in the aviation industry: How can SWP help prevent and fight it?*. <https://hrforecast.com/employee-and-skills-shortages-in-the-aviation-industry-how-can-strategic-workforce-planning-prevent-and-fight-them/>
- IATA. (2020). COVID-19 Global and Regional Impact-Latest Economic Analysis. *Americas Focus*, 2(20), p.e1-e4.
- IBE-UNESCO. (2017). *The Why, What and How of Competency-Based Curriculum Reforms: The Kenyan Experience*. IBE-UNESCO.
- ICAO. (2016). *Capacity and efficiency: 2016–2030 global air navigation plan*. International Civil Aviation Organization Press.
- ICAO. (2023). *Safety: Next generation of aviation professionals*. International Civil Aviation Organization Press.
- Infoplease. (2021). *Early 20th-Century Developments in Human Flight*. <https://www.infoplease.com/math-science/aviation/early-20th-centurydevelopments-in-human-flight>
- Kearns, S. K. (2020). *Engaging the next generation of aviation professionals*. Routledge.
- Kelly, A.V. (2004). *The curriculum: Theory and practice* (5th Ed.). SAGE Publications.
- Naciri, A., Baba, M. A., Achbani, A., & Kharbach, A. (2020). Mobile learning in higher education: unavoidable alternative during COVID-19. *Aquademia*, 4(1), p. ep20016. <https://doi.org/10.29333/aquademia/8227>
- Nouraey, P., Al-Badi, A., Riasati, M., & Maata, R. (2020). Educational program and curriculum evaluation models: A mini systematic review of the recent trends. *Universal Journal of Educational Research*, 8(9), p.4048-4055.
- Oliva, P. F. (2009). *Developing the curriculum*. Allyn & Bacon.
- Ornstein, A.C., & Hunkins, F.P. (2018). *Curriculum: Foundations, principles, and issues*. (7th Ed.). Pearson Education.
- Robinson, M. (2022). *Curriculum revolutions: A practical guide to enhancing what you teach*. John Catt Educational Ltd.
- Short, J., & Hirsh, S. (2023). *Transforming teaching through curriculum-based professional learning: The elements*. Corwin Press, Inc.
- Taba, H. (1962). *Curriculum development: Theory and practice*. Harcourt, Brace and World.
- The International Air Transport Association. (2023). Air travel growth continues in March. *PRESSROOM*. <https://www.iata.org/en/pressroom/2023-releases/2023-05-04-01/>
- Tyler, R.W. (1949). *Basic principles of curriculum and instruction*. University of Chicago Press.

- Uphoff, J. K. (1982). *Curriculum development: Theory into practice* (2nd ed.). Macmillan Publishing Co., Inc.
- Van, L. W., & Parolin, Z. (2020). COVID-19, school closures, and child poverty: a social crisis in the making. *The Lancet Public Health*, 5(5), p. e243-e244.
- Wiggins, M., W., & Stevens, C. (2008). *Aviation social science: Research methods in practice*. MPG Books Ltd.