UNIVERSITY OF WATERLOO

December 3, 2018

Dear Committee Members:

Canada has the third largest aerospace sector in the world generating $29.8B in annual revenues, 211,000 direct and indirect jobs, and 5% of jobs in the North[i]. Yet, Canadian aviation is facing a variety of critical challenges.

International Pilot Supply

The global air transport industry is growing at an unprecedented rate – with airlines projected to double the number of aircraft and amount of passenger traffic by 2036. This will require 620,000 new pilots to fly large commercial aircraft internationally – 80% of these new pilots are youth who have not yet begun training. Today, half of flight operators in Canada state that finding qualified pilots is a significant challenge with regional airlines reporting flight cancellations due to lack of flight crew in their busy months. The pilot shortages are projected to worsen in the future.

Canadian flight training units (FTUs) produce about 1,200 new commercial pilots each year. Yet, considering international students and foreign entities that train in Canada to serve their home markets, only about 500 new pilots join the Canadian industry each year. Canada needs 7,000 to 10,000[ii] new pilots by 2025, resulting in a projected shortage of at least 3,000 pilots[iii] (*for reference, Air Canada currently employs about 3,500 pilots*).

Despite the tremendous need for pilots, about half of flight training students drop out of training before completion. Student pilots must earn licenses and ratings that cost approximately $75,000 (yet can climb to over $150,000 with tuition and other student costs). Student loans do not cover flight costs in most provinces.

Traditionally, newly graduated pilots would complete an *'hours building'* phase of their career, working as a flight instructor or supporting Northern/speciality operations. Although wages for these positions were relatively low, after 2-5 years they had sufficient experience to apply for higher-paid and desirable pilot positions in airlines or corporate aviation. In recent years, the pilot shortage has reduced or eliminated this phase of a pilot's career, as regional airlines are increasingly recruiting students directly from school.

Overall, growth in aviation has resulted in critical threats, including a scarcity of pilots to support flight instruction and operations that serve remote and Northern communities.

The Next Generation of Aviation Professionals (NGAP) – An Holistic Approach

Although there is a tremendous need for pilots, it is important to recognize that pilots are only one of several aviation professional groups that are experiencing a shortage. The sector is interconnected – pilots cannot complete their missions in isolation. They rely on maintenance professionals who ensure their aircraft are fit to fly, air traffic controllers who ensure safe and efficient separation from obstacles and other aircraft, airport operators to maintain landing surfaces and terminals, flight attendants for cabin safety, and regulators who oversee the entire sector, among many others.

In 2009, a group of concerned academics, professionals, and industry associations began exploring this issue within the International Civil Aviation Organization (ICAO). This work grew to become the 'Next Generation of Aviation Professionals' (NGAP) programme, which the ICAO Assembly indicated is a global priority to ensure a sustainable air transport system. The NGAP programme seeks to *attract*, *educate*, and *retain* young professionals within aviation careers – and emphasizes an holistic approach (that considers the range of professional groups) rather than a profession-specific approach that attempts to address the issue by considering only one group (such as pilots alone).

Recognizing that 80% of the aviation workforce needed by 2036 are currently young people, within the NGAP programme we encourage the integration of aviation education early in the elementary and secondary school curricula. Aviation education aligns well with Science, Technology, Engineering, and Math (STEM) initiatives. Flight is an engaging way to illustrate the application of STEM disciplines to a growing industry with many employment opportunities.

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Retention of young professionals within the aviation sector is higher with a holistic educational approach[iv]. For example, only approximately 50% of young people who begin pilot training successfully enter the workforce as a professional pilot. If they have only been taught about the role of 'pilot', when unsuccessful they typically leave the aviation sector entirely. Young professionals are more likely to move into a parallel aviation profession (such as aviation- or air-traffic-management) if they are educated holistically about the range of professional opportunities within aviation.

Competency-Based Education

In 2002, in recognition of the aviation industry's need to produce more qualified pilots, the international Flight Crew Licensing and Training Panel (FCLTP) was formed. They began to use the term 'competency-based' as opposed to traditional aviation training which is based upon an 'hours-based' approach[v]. It is common knowledge that not all hours have an equal impact on experience – yet licensing standards count *hours* towards licensing. This is problematic as a training and licensing system based on time fundamentally cannot be completed any faster. Likewise, an hours-based approach limits credit for new and more effective training methodologies (including the use of advanced simulation to replace in-aircraft training flights). ICAO has published competency frameworks for pilots, mechanics, air traffic controllers, and flight attendants.

The FCLTP established the 'multi-crew pilot license' (MPL) framework, which is currently used in other countries to produce pilots capable of functioning as an airline first officer only 18 months after beginning training. The MPL may not be a good fit for Canada, but we can benefit from the lessons learned to develop regulatory approaches that allow approved training organizations more flexibility so that they can incorporate advanced training methods and equipment and apply those hours towards licensing.

Considerations

For a sustainable future for Canada's aviation sector, please consider the following requests:

- Access to student loans for pilot flight training costs,
- Loan forgiveness for time served as a flight instructor or a pilot in Northern communities (*as is in place for medical professionals serving the North*)[vi],
- As only about 5-7% of pilots are women and there is little ethnic diversity, pathways to support women and minorities in aviation careers,
- Holistic and STEM-connected aviation education beginning at the primary and secondary school levels,
- Exploration of 'competency based' training methodologies, which can improve the efficiency of ab initio (early) pilot training and regulatory 'credit' for hours of training conducted within flight simulation devices towards licensing criteria.

Although meeting the needs of today is a challenge, it is also important to recognize that Canada has an opportunity to capitalize upon the growth of the aviation sector to position itself as an international leader in this field. Canada is home to universities and colleges, aircraft manufacturers, operators, and aviation training organizations that are among the best in the world. Uniting these strengths under a national aviation-innovation strategy could cement our standing as a country of chief importance in global aviation[vii].

With sincere thanks,

Dr. Suzanne Kearns
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Vice Chair, Next Generation of Aviation Professionals Programme, ICAO (Volunteer Role)

Encl.

[i] Transport Canada. (2018). Government of Canada marks National Aviation Day 2018. Retrieved May 17, 2018, from https://www.newswire.ca/news-releases/government-of-canada-marks-national-aviation-day-2018-674860173.html
[ii] Note: 7,000 estimate assumes existing fatigue rules. 10,000 estimate is based upon the proposed fatigue regulations being implemented.
[iii] CCAA. (2018). Labour Market Information Report: Aviation and Aerospace Industries. Ottawa: Canadian Council for Aviation and Aerospace.
[iv] Kearns, S. K. (2018). *Fundamentals of international aviation*. Routledge Publishing.
[v] Kearns, S. K., Mavin, T. J., & Hodge, S. (2016). *Competency-Based Education in Aviation: Exploring Alternate Training Pathways*. Routledge Publishing.
[vi] Government of Canada. (2016). *Apply for Canada Student Loan forgiveness for family doctors and nurses*. Retrieved May 17, 2018, from https://www.canada.ca/en/employment-social-development/services/education/student-loan-forgiveness.html
[vii] ICAO. (2016). Council States 2016-2019. Retrieved May 17, 2018, from https://www.icao.int/about-icao/Council/Pages/council-states-2016-2019.aspx

Summary of Requests for Consideration

- Access to student loans for pilot flight training costs,
- Loan forgiveness for time served as a flight instructor or a pilot in Northern communities (*as is in place for medical professionals serving the North*),
- As only about 5-7% of pilots are women and there is little ethnic diversity, pathways to support women and minorities in aviation careers,
- Holistic and STEM-connected aviation education beginning at the primary and secondary school levels,
- Exploration of 'competency based' training methodologies, which can improve the efficiency of ab initio (early) pilot training and regulatory 'credit' for hours of training conducted within flight simulation devices towards licensing criteria.

Excerpts from Letters of Support

**The following quotes are from a package of letters of support for government consideration of the pilot supply issue (solicited May-June of 2018). Full letters are available upon request.*

"Loans are not an option, banks will not loan to a student with minimum wage." "While working, I was doing school and was a member of the university soccer team, finding balance was difficult … I became malnourished, sleep deprived, isolated from family, and built up stress and anxiety. No student should go through this. At UW we have some of the brightest minds in the field, yet we feel neglected due to financial barriers… I may have to switch programs unless I find resources to help cover costs for the aviation program" **Aviation Student, University of Waterloo.**

"I have begrudgingly started to use the word 'crisis' as we continue to see every sector of the new aviation industry scoop up pilots from the beginning of the supply chain." **Dan Glass, President of Mitchinson Flight centre, Saskatoon.**

"The simple issue is that airlines snatch up junior level instructors before they even have the time to advance…" **Ottawa Flying Club**

"Flight schools across the country report backlogs of students wishing to begin flight training but are unable due to the shortage of instructors." **Darren Buss, Vice President, Air Transport Association of Canada**

"We have hired more than 750 pilots since 2015 and over 400 in 2017 alone" "Training costs for this type of occupation is borne primarily by the individuals until they are hired at a company like Jazz. By this time the high cost of flight school has either discouraged individuals from completing their training or burdened them with a high debt load" **Captain Cal Purves, Jazz**

"This shortage is seeing scheduled carriers cancelling flights as qualified pilots are being recruited "up and out" of small and regional operators into the more lucrative positions offered at a national or even international level." "We are facing a crisis as there is not the requisite level of new pilots entering the system to sustain the pilot 'pipeline'". "…this pilot shortage will have severe and critical impacts not only on our economy and operators, but on our remote and Indigenous communities" **Heather Bell, BC Aviation Council**

"Unless we are miraculously able to find qualified flight instructors, we will have to limit the amount of new students we can take on this year and turn away…work" **Colette Morin, Glacier Air**

"Opening the door for females and minority groups gives Canada access to a large number of potential pilots, and creates a more diverse, balanced work force" **Wendy Tayler, Alkan Air**

"Canada produces the best pilots in the world. Our pilots are globally mobile and in demand" "Domestic carriers of all sizes are competing globally for our pilots" "Pilot development is a national priority and should be considered at the national level, thereby ensuring that all Canadian in all regions have access to affordable, quality flight training." **Eric Edmondson, Air Georgian**

"The pilot shortage is particularly acute at regional/short-haul airlines, such as Porter. Pilots are gravitating toward major airlines in record numbers, as larger airlines aggressively recruit from a continuously-replenished pool of pilots from smaller carriers. Eventually, the pool will shrink, leaving small carriers without adequate staffing." **Robert Deluce, Porter Airlines**

Brief on Competency Based Training, from Skies Magazine, Dec/Jan 2018/2019 Issue

IN THE JUMPSEAT

Training the next generation of aviation professionals

By Dr. Suzanne Kearns

International aviation is growing at an unprecedented rate.

The International Civil Aviation Organization has projected that by 2036, the global aviation sector will need 620,000 new pilots, 125,000 new air traffic controllers, and 1.3 million new aircraft maintenance personnel. Eighty per cent of this workforce is currently represented by young adults who have not yet begun training.

Education is a key element of meeting the industry's need for competent professionals. Each year, Canadian flight training units produce about 1,200 pilots and college programs produce about 600 maintenance technicians, yet demand is outpacing training capacity.

To produce the professionals required to meet future demand, we need to reflect on existing training practices and carefully consider the integration of new instructional methodologies. One of these is competency-based aviation education.

It is generally recognized that a focus on hours of training (such as a pilot's flight hours) does not necessarily reflect proficiency or skill. Most would agree that some hours can dramatically impact the way you think, act, and feel—while others may have no impact at all. It is logical that what occurs ******during****** those hours is more important than the ******hours****** themselves.

So why has the aviation industry historically equated hours of training to competence? We have a long history of regulating a specific number of training hours per licence or certificate. As challenges have arisen and new needs are identified, we often respond by 'throwing a few hours of training' at the problem. The advantage of hours is that they are easy to count—and therefore a useful metric that provides a snapshot of experience.

The downside of an hours-based educational system is that it is not as adaptive to individual needs and has limited flexibility for advanced training tools.

Imagine you are a student who has mastered a technique—yet the regulations require you to continue practicing it for five more hours. This is an inefficient use of training resources and it causes frustration from students who may benefit from applying those practice hours to their weaknesses.

Likewise, why would an aviation training unit invest in new technologies (such as simulators) to help students achieve competence more quickly if those students are still required to complete the same number of training hours?

The challenge of a training system based on 'time' is that there is no way to expedite the process. You fundamentally cannot make hours pass any more quickly.

However, there is another reference for aviation training and licensing, which is 'competence.'

Competency-based training (CBT) uses professional competence as the benchmark for determining when training is complete, rather than hours.

CBT can be a confusing concept. The following three-tiered definition can help clear up confusion:

Brief on Competency Based Training, from Skies Magazine, Dec/Jan 2018/2019 Issue

- **Competence** describes the skills, knowledge, and attitude required to function in a professional role.
- **Competencies** are written statements (usually drafted by a group of experts) that describe competence.
- **Competency-based training** is an educational program that uses competencies as the primary reference for training completion.

A competency-based approach offers several advantages over traditional hours-based methods, as training becomes more personalized and adaptive. As the 'competencies' are the reference for when training is complete, once a student demonstrates competent performance they can progress to the next topic area. This allows students to move quickly through content they understand—and focus additional time on areas that they find challenging. Training organizations that have advanced equipment, such as flight simulators, can often capitalize on this technology for a greater proportion of a competency-based curriculum.

When considering the three-tiered definition, notice that between each level there is an aspect of human interpretation. If you think about your job—and you were asked to write 'competencies' (written statements defining all of the knowledge, skill, and attitude-based attributes of your work)—you can imagine that once your pen meets the paper you are likely to lose some of the intricacies of your professional competence. This creates a gap between actual competence and written competencies.

Likewise, after competencies are written, educational programs are designed that use competencies as the reference for when learners have completed training. The training application also requires a step of human interpretation—as training managers, instructors, students, and regulators may have different interpretations of the meaning of the competencies. This can create another gap in the chain between true competence and CBT.

Overall, competency-based training represents a new licensing and training philosophy that has both strengths and limitations. CBT principles may allow training to be more closely aligned with real-world skills, become flexible and adaptive to student needs, and capitalize on the use of new training tools.

However, this approach must also be applied cautiously to ensure the quality of the existing training system, avoid over-simplification, and ensure the consistency of training.