ICAO TRAINING REPORT

NEWS AND FEATURES ON CIVIL AVIATION-RELATED TRAINING DEVELOPMENTS - VOL. 7 - NO. 3

ATTRACTING, EDUCATING AND RETAINING THE NEXT GENERATION

How one pilot's journey is inspiring women and youth to pursue STEM education

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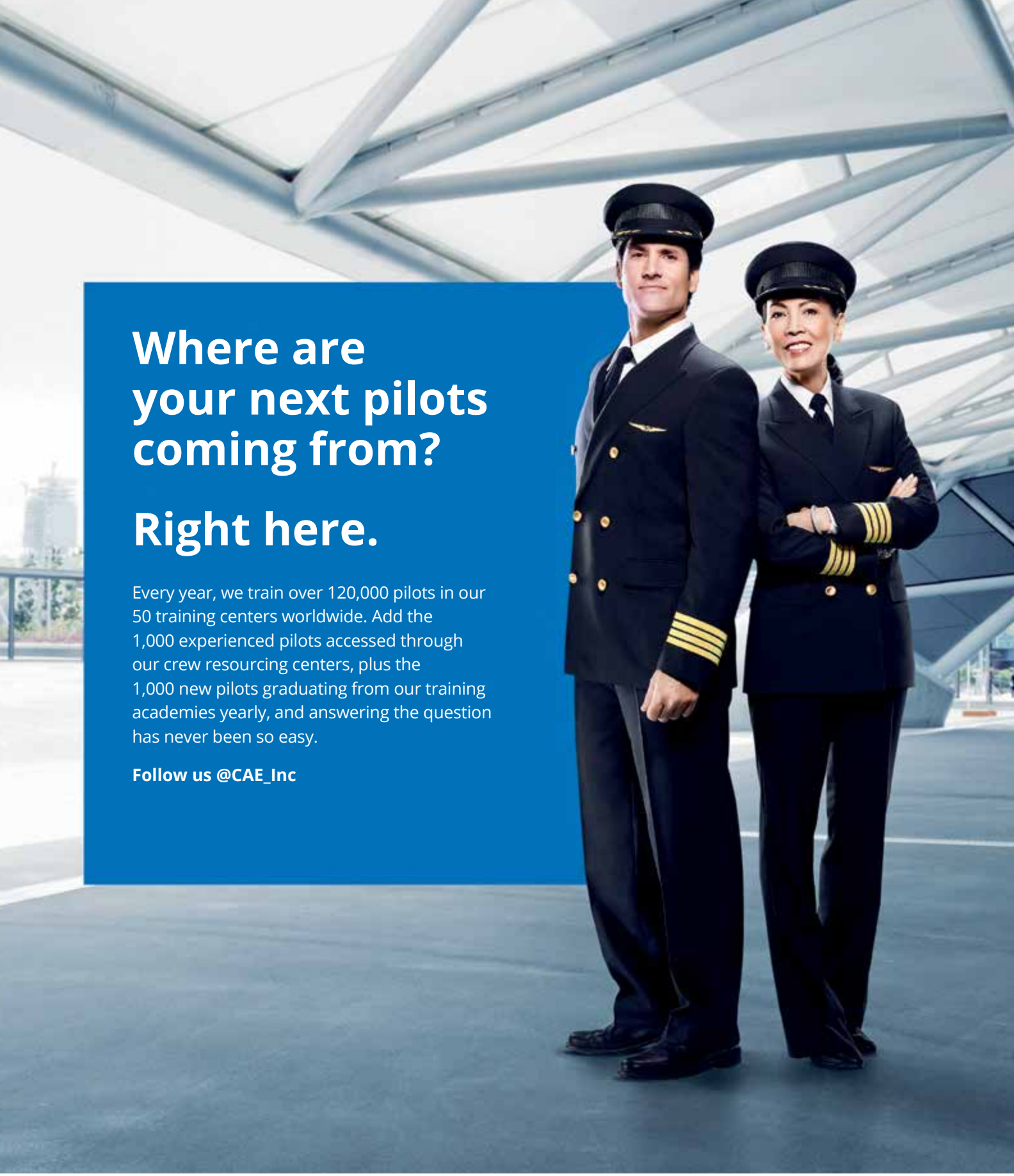

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As this magazine went to print, final preparations were underway for ICAO's 2017 Next Generation of Aviation Professionals (NGAP) Global Summit which is being held at ICAO Headquarters. It is an exciting time for aviation. This industry supports 63.5 million jobs around the world today, contributing more than 2.7 trillion dollars annually to the global GDP, carrying more than half of the 1.4 billion tourists who cross international borders every year.

As these numbers double over the next 15 years, we will be competing with other industry sectors for up-and-coming talent. We need to ensure future air transport growth is managed and optimized by the best and brightest aviation professionals. The technologies, skills and approaches used to develop them will evolve significantly different from what they are today - what will the next generation need to be successful? How can we support States as they embark on their own NGAP strategies and implementation actions?

We need to work together to ensure there will be enough dedicated, qualified professionals to manage the anticipated growth of the global air transport network. Ensuring aviation operations are safe, secure and ICAO-compliant plays a key role in economic development and the ability of all States to attain the United Nations' Agenda 2030 Sustainable Development Goals. ICAO launched the Next Generations of Aviation Professionals (NGAP) initiative to support work related to human resources planning data; to identify and support initiatives that reach out to the next generation; and to find ways to harmonize training regulations. Recently we sat down with members of the NGAP team to get updates on their progress in these areas.

Where do we stand today in regards to attracting, educating and retaining young aviation professionals?

STEPHEN – I have no doubt that in the next 20 years, the technology, skills, and approaches that we see in the aviation sector will be significantly different than they are today. The workforce driving the sector will equally evolve within this period, and so should the strategies to attract, educate, and retain them. Since 2009, ICAO, under its Next Generation of Aviation Professionals (NGAP) initiative, has been working with Member States, international and regional organizations, academia and industry to address the forecasted shortage of aviation professionals and ensure there is a sufficient skilled workforce to handle future sectoral demand. As part of this, ICAO is also ramping up its outreach to schools, and universities – all of which remain key audiences for generating and sustaining interest in the sector.

How are you preparing the industry for the challenges of attracting young aviation professionals?

STEPHEN – Through the NGAP initiative and several other collaborative engagements, we are improving and widening recognition for the young generation's critical role in the sustainable growth of our industry. These engagements are beginning to create a shared understanding of the situation across international and regional organizations, industry, and the education sector. Everyone must work together to ensure the safe and efficient operation of the air transportation system. In doing so, we are also effectively demonstrating an awareness of how critical the involvement of the younger generation is to the future of an industry that contributes to the achievement of ICAO's aspirational goals. Consequently, a number of key stakeholders are uniting in a variety of strategies targeted at directly engaging young people in order to guarantee the future of a sector which transported 3.8 billion passengers in 2016 alone.

Tell us about some of the major achievements of the NGAP Programme.

MICHIEL – Recognizing the importance of engaging the next generation in order to ensure a sustainable aviation system, the NGAP initiative was elevated to an ICAO Programme in 2015. ICAO leadership of this important programme was recognized by ICAO Member States with the adoption of an Assembly Resolution in 2016, A39-29: Next Generation of Aviation of Professionals, and with the incorporation of NGAP in the ICAO Global Aviation Safety and Global Air Navigation Plans, as well as the ICAO Business Plan.

ICAO is expanding the NGAP Programme to cross all the Strategic Objectives of ICAO, and the Regional Offices are becoming actively involved in promotion and outreach.

To-date NGAP has held two Global Symposia (March 2010 and December 2014); eight NGAP Regional Symposia (2011 to 2013), developed a 20-year forecast to assist States in quantifying human resources requirements (Doc 9956) and an Internship Toolkit; developed a Fundamentals of the Air Transport System course and an Aviation Training and Education Directory; collaborated with the International Pilot Training Association (IPTA) to create outreach videos, gather data on pathways, barriers, and best outreach practices for pilot careers; and issued regular NGAP Outreach publications to support and promote NGAP. Similarly, there have been excellent national and regional examples of NGAP at work, such as in Sri Lanka, Singapore and with the Young African Aviation Professionals Association, in Cameroon.

ICAO is actively promoting outreach activities to engage the next generation. ICAO provided support to Shaesta Waiz, Afghanistan's first female civilian pilot, as she undertook a solo round-the-world flight to raise awareness for greater global access to Science, Technology, Engineering and Math (STEM) education for women and youth. We continue to provide support and promote global outreach programmes, promote STEM education, and raise awareness of NGAP issues at international and regional events.

ICAO is also reaching out to other UN agencies to coordinate and collaborate on gender issues and the promotion of STEM education to youth, and in particular, young girls. By working with our UN counterparts, we can capitalize on the strengths of each other's initiatives to jointly promote our common goals: empowering girls and women and ensuring adequate education for all youth. For us, these goals are paramount to creating the necessary foundation for our future workforce.

What are the interventions that can be taken by stakeholders, including ICAO, to inspire, engage and empower girls and women in pursuing their dreams (careers?) in aviation?

DAWN – ICAO's commitment to gender equality is emphasized by the adoption of Assembly Resolution A39-30: ICAO Gender Equality Programme promoting the participation of women in the global aviation sector, which is also in support of the United Nations 2030 Agenda for Sustainable Development. Sustained and concerted action is required at all levels of industry to improve capacity for data collection on genders in aviation, the findings of which must be turned into short, accessible briefings targeting different audiences, including policy-makers, industry, and academia. The problem of a shortage of competent personnel must be addressed in the context of women and girls' empowerment. Aviation, in return, stands to benefit from their contributions to the sector, since they offer a diversity of viewpoints, capabilities and perspectives that have often been lacking.

ICAO, together with the International Aviation Women's Association (IAWA), launched an Aviation Scholarship for professional women in the sector, with the objective of enhancing the development of women in aviation. Though a great initiative, the effort to further progress gender equality and female representation should aim to encourage young female professionals to apply for internships, technical and managerial positions within ICAO, and at as many other related organizations as possible. Again, interest in the sector can be generated through mentoring opportunities that are dedicated to girls in elementary and high schools. As the UN Secretary-General stated on International Women's Day earlier this year: "Now we must move from ambition to action."

What do you envision for the way forward, and how do you think NGAP as a programme within ICAO could be improved to better reflect the needs and concerns of States and the aviation industry in general?

CATALIN – We must encourage the international civil aviation community to continuously support the ICAO NGAP Programme as a forum that facilitates the exchange of best practices and information about initiatives that are being implemented by industry, governments and academia. Coordination and collaboration at a global level is necessary to promote this work. This includes continued support by our voluntary workforce, as well as with funding from stakeholders to support various initiatives.

As a key driver of this process, ICAO is determined to continue its work with stakeholders to intensify awareness of the impending shortages of personnel, and to promote cooperation and coordination within the global aviation community to attract, educate and retain the next generation of aviation professionals.

ICAO, in cooperation with partners and stakeholders, will develop guidance and tools that can help States devise a holistic approach towards addressing the problem of the shortage of competent personnel. This guidance, coupled with an updated Forecast on Aviation Professionals which will be published in 2018, will assist States to develop their national NGAP Strategy and Action Plan.

It is also critical to reach out to academia and youth to promote aviation as a profession and to make education more accessible to students. The continued promotion of STEM education is critical to ensuring the necessary foundation for students to be successful in aviation.

Aviation's strength and success as an industry is rooted in its skilled workforce. If we are to protect what we have achieved, we need to work together and continue to build momentum into the future. ■

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DREAMS SOAR WHEN GIRLS PURSUE STEM EDUCATION

Dreams Soar's mission is to partner with strong female role models to share and promote the importance of STEM education so that they can dream big and achieve more. The success of Dreams Soar is attributed to their "dream team", a group of passionate, hard-working student leaders, professionals and partners, who have made an enormous commitment to inspiring the next generation.

When the Wright Flyer first took off from Kitty Hawk, North Carolina on 17 December 1903, the world cheered with amazement as they witnessed the first powered aircraft soar through the sky. Among the crowds of people who watched the Wright Brothers success, was a generation of women who silently longed to experience flight.

Women in aviation date back to 1910, when Blanche Scott was allowed to taxi an aircraft when it mysteriously lifted 40 feet off the ground. Once airborne, Scott gently landed the aircraft safely, making her the first woman to pilot an aircraft solo. Also in 1910, Raymonde de Laroche became the first woman to earn a pilot's license in France, making her the first certified female pilot in the world (Early Aviator, 2003). As women bravely took on the skies during the dawn of aviation, their role changed significantly during World War II, especially in the United States. During the war, women were flying almost every type of military aircraft, ferrying them across the Atlantic Ocean to deliver them in Europe (NPR, 2010).

Today, women make up 7% of the total pilot population, with only 5% of female airline pilots worldwide (Gender Gap Grader, 2014). These figures of women in the aviation industry have remained stagnant in the past decade with little evidence of a fruitful future. Why is there such a shortage of women pilots, engineers, and technicians in the world? This is a question Shaesta Waiz, Founder and President of Dreams Soar, Inc., tackled through her non-profit organization when she made it her mission to change these numbers, globally.

MADRID, SPAIN
A group of elementary students take a selfie during the Madrid outreach event.

PERCENTAGE OF FEMALE PILOTS IN VARIOUS COUNTRIES:

FINLAND	12%
SWEDEN	8.20%
FRANCE	7.60%
JAPAN	5.60%
MEXICO	2.30%
BRAZIL	2.20%

SOURCE: Gender Gap Grader, 2014

PERCENTAGE OF FEMALE STUDENT PILOTS IN VARIOUS COUNTRIES:

JAPAN	12.90%
INDIA	12.50%
UNITED STATES	12%
NIGERIA	8.80%
FRANCE	7%
BRAZIL	6.20%
AUSTRALIA	4.10%
MEXICO	2.90%
EGYPT	1%

SOURCE: Gender Gap Grader, 2014

In May 2017, Waiz departed from Daytona Beach, Florida in a single-engine Beechcraft Bonanza aircraft, flying solo around the world to inspire the next generation of Science, Technology, Engineering and Math (STEM) and aviation professionals. The Dreams Soar global flight included 30 stops in 20 countries across five continents. The flight route covered approximately 25,000 nautical miles in a single engine aircraft, with the objective to empower the next generation to overcome the barriers inhibiting women and minorities from flying and pursuing careers in STEM.

As Waiz piloted the aircraft solo, the Dreams Soar team was on the ground working around the clock handling matters related to the international outreach events, fundraising, logistics, social media, risk management, and aircraft maintenance/insurance around the world. With this collective teamwork and a strong partnership with the International Civil Aviation Organization (ICAO), and other dedicated partners, Dreams Soar was able to host 32 outreach events along the route, globally inspiring 3,000 children directly, encouraging them to pursue careers in STEM and aviation.

“Inspiring 3,000 children worldwide was a great accomplishment for Dreams Soar, however we still have a long way to go with our efforts. Working alongside key organizations like ICAO, I feel confident we will make an even greater impact on the next generation,” Waiz shared when the global journey officially came to a conclusion on 4 October 2017. “The biggest lesson I learned is that women need more role models in STEM and aviation to prove that we can be successful in these exciting fields.” When she completed that last flight, Waiz became the youngest woman in history to fly solo around the world in a single-engine aircraft.

With the goal of increasing the number of STEM and aviation professionals, ICAO partnered with Waiz and Dreams Soar in their movement to raise awareness on sustainable development, empowering women and promoting global access to STEM and aviation education for youth. Each stop was unique, focussing on the local environment, opportunities and challenges of STEM/aviation education in that location. ICAO’s support of Dream Soar, along with the support of ground teams and partner organizations, brought together dynamic female STEM and aviation leaders through panel discussions, presentations, school visits and other venues.

No stranger to life’s obstacles, Waiz was born in a refugee camp in Afghanistan. Her family fled to America when she was an infant

ATHENS, GREECE
A group of high school students gather for a picture after having a tour of Shaesta's aircraft.

MONTRÉAL, CANADA
Children meeting Charlie the bear, who was Shaesta's "co-pilot" during her journey around the world.

THE DREAMS SOAR ROUTE

The Dreams Soar route final count included 30 stops in 22 countries on five continents totaling almost 25,000 nm flown, with 32 outreach events inspiring over 3,000 young girls and boys to reach for the stars with STEM. Each stop was strategically selected based on the need for STEM outreach.

to escape the brutal Soviet-Afghan war. She developed an interest in aviation at the age of 18 that led her to study at Embry-Riddle Aeronautical University. As a student, she founded the Women's Ambassadors Program in 2011 to increase female enrollment at the university. In less than three years, under Waiz's leadership, the program successfully helped increase female enrollment from 13 to 22 percent.

In 2014, Waiz founded Dreams Soar Inc., a non-profit organization, to inspire the next generation of STEM and Aviation professionals. Dreams Soar began with the Dream Team at its core, a group of university students who applied their STEM education and talents towards building the foundation of the Dreams Soar initiative. Shaesta then added support from a Board of Directors and Advisory Council with seasoned professionals with industry experience, and made her dream a reality by partnering with strong female role models along her route so that together, they could promote the importance of STEM and aviation education around the world.

For more information about Dreams Soar or to learn how to become a partner and support this initiative or make an online donation, visit dreamssoar.org. ■

KABUL, AFGHANISTAN
The United Nations hosted Shaesta in Kabul where she had the opportunity to speak with young girls about her Dreams Soar global flight.

HAYWARD, CALIFORNIA
After crossing the pacific ocean and landing in California, Shaesta visited her middle school in Richmond, California and spoke to students about believing in their dreams and working hard to soar.

MUMBAI, INDIA
One of the Mumbai outreach events was held at an all-girls orphanage where the young girls shared their dreams with Shaesta.

DUBAI, UAE
An outreach event hosted by the UAE General Civil Aviation Authority (GCAA), Emirates Airlines and Etihad Airlines.

SELETAR, SINGAPORE
"Say Airplane for the camera", elementary students gather together for a picture at the Singapore outreach event.

ATTRACTING AND INFORMING THE NEXT GENERATION OF AVIATION PROFESSIONALS:

THE ONLINE 'FUNDAMENTALS OF THE AIR TRANSPORT SYSTEM' COURSE

DR. SUZANNE KEARNS
She is an Associate Professor who teaches, researches, and writes about aviation topics at the University of Waterloo. She is the creator and author of the FATS course. Dr. Kearns is also the author of an upcoming textbook associated with the FATS course titled 'Fundamentals of International Aviation' which will be published by Routledge in early 2018.

> "...this means that more than half of the young people who choose an aviation programme do not successfully complete the programme requirements..."

THE NEXT GENERATION OF AVIATION PROFESSIONALS (NGAP)

International aviation represents a massive and complex industry that is crucial to our global economy and way of life. A diverse group of professionals, working in a variety of jobs, make up the rich fabric of aviation.

In recent years, various personnel forecasts have been produced with striking similarities: the projected growth of air traffic will require a steady stream of competent young professionals to enter the aviation industry, one that will probably exceed the capacity of the current global training pipeline.

When ICAO's General Assembly designated the Next Generation of Aviation Professionals (NGAP) programme as a Global Priority in 2016, they sent a clear signal to the industry that to meet future demands we need to explore and invest in methods to recruit and retain the next generation today.

ATTRITION: AN ONGOING CHALLENGE

We have an established global training network that does an excellent job of efficiently and safely guiding young people along their transition into professional roles. Although several training methodologies, instructional design strategies, and technologies support this process (and are a topic for discussion in themselves) a crucial side issue is rarely discussed: attrition. Within aviation education programmes, it is not unusual to have an attrition rate higher than 50%. This means that more than half of the young people who choose an aviation programme do not successfully complete the programme requirements – perhaps for lack of financial resources or due to difficulties learning the material.

Attrition also occurs after training is complete, when young people get their first experiences of aviation careers and decide that they aren't well suited to the lifestyle or logistics of that role. All too often, when young professionals choose not to complete or continue with their first career choice, they leave the aviation industry entirely to explore other opportunities (rather than seeking another role within the aviation sector).

Gone are the days when we can be satisfied with this status quo. To support the future growth of the industry, we must support every learner who has the

TOPICS COVERED IN THE FUNDAMENTALS OF THE AIR TRANSPORT SYSTEM COURSE

capacity to achieve competence, so they can find their place within aviation. This may mean suggesting an alternative occupation which they might not have previously considered.

TRADITIONAL TRAINING PROCESS

It's helpful to pause for a moment and reflect upon how training is traditionally conducted within the aviation industry. In general, we teach young people to become competent in a specific profession within a specific country. Consider that we train someone to be a pilot in Singapore, an air traffic control officer in China, or a maintenance engineer in Australia, among many other possibilities. For most professionals, several years of job-specific education are completed before one earns the privilege to enter an operational role. Once in that role, they often expand their horizons to learn how their profession is conducted differently in other countries thereby developing a rich understanding of other professions in the aviation industry.

With the growth projected in aviation, a challenge with the traditional approach will be that the career path of the next generation of aviation professionals may be very different from their predecessors. They may accept job opportunities in foreign countries and perhaps even experience moves between several different job roles.

To maximize retention within our industry, we need to rethink the traditional methods of early aviation education so that young people can make informed career choices (earlier) that best align with their interests and ambitions.

Rather than ab initio training with a narrow focus (on a specific profession within a specific country) that grows to a broad understanding after NGAPs enter the workplace, it is possible to flip this traditional approach and make a young person's first introduction to aviation education a broad international perspective on all of the interconnected professional groups. This approach could provide a foundation of industry awareness to help the next generation make an informed professional choice as they embark on their education, and support retention of talented young people within the aviation industry (so they know there are a range of careers within the sector).

FUNDAMENTALS OF THE AIR TRANSPORT SYSTEM

This goal presents an enormous logistical challenge! How can we teach the next generation of aviation professionals, distributed around the world, about international aviation? Taking on this challenge, ICAO partnered with the University of Waterloo on the 'Fundamentals of the Air Transport System' (FATS) eLearning course. FATS is an asynchronous course (meaning without a direct connection between the learner and the instructor) which allows for the course to be completed by anyone around the world who has an interest in aviation.

The course contains nine modules that cover the following topics: 1) air law; 2) aircraft; 3) operations; 4) navigation; 5) airports; 6) security; 7) environment; 8) accidents; and 9) safety. Each narrated module ranges between 45 and 90 minutes in duration, profiling aviation professionals who work within that sector. Modules incorporate a variety of media, using a combination of imagery, videos, and interactive cases, to allow learners to explore sector-related challenges and opportunities. Each module concludes with a review quiz, targeting the key learning objectives and allowing learners to test their understanding.

SUPPORTING A SUSTAINABLE FUTURE IN AVIATION

To support the sustainable development goals (SDGs) of 'quality education' and 'reduced inequalities', the online delivery of the course will allow access to anyone with an internet connection around the world. Perhaps the most exciting aspect of this course is that it will be offered for **free** – all of the educational content will be available at no cost. This ensures that young people, who might not have the resources to pay for training, have an opportunity to engage with the aviation industry and explore professional

opportunities. For those who choose, a USD100 fee can be paid to access the final exam in the course. When learners achieve a passing score on the exam, they will be electronically issued an ICAO/University of Waterloo certificate, as a credential to begin building their professional portfolio.

CONCLUSION

The Fundamentals of the Air Transport System (FATS) course will be available on the ICAO website in late 2017. This course will be a tool that young professionals can use to find the aviation career that is best aligned with their interests and ambitions – while also serving as a resource to adults who are transitioning into the aviation industry from other sectors, and current aviation professionals who desire to learn more about how aviation works internationally. ■

ICAO AND THE UNIVERSITY OF WATERLOO LAUNCH THE NEW eLEARNING COURSE

On 8 November 2017, ICAO's Secretary General, Dr. Fang Liu (centre left) and the President of the University of Waterloo, Dr. Feridun Hamdullahpur, signed a Memorandum of Understanding (MoU) in support of a new joint educational programme. Pictured with Dr. Liu is Mr. Meshesha Belayneh (far left) ICAO's Deputy Director in its Technical Cooperation Bureau and the Chief of its Global Aviation Training Office, while President Hamdullahpur is accompanied by Dr. Jean Andrey (right), the Dean of the school's Faculty of Environment.

The first initiative under the new agreement is the launch of an eLearning course at the ICAO Next Generation of Aviation Professionals (NGAP) Global Summit, on the Fundamentals of the Air Transport System.

Stressing the importance of making more and more young people aware of the diverse career opportunities in air transport globally, especially in light of forecast sectoral growth, Secretary General Liu emphasized that the new partnership represents an important additional step toward addressing future shortages of highly-skilled aviation personnel. ■

ARTIFICIAL INTELLIGENCE AND THE FUTURE OF WORK

Redefining how people will work with technology

KRISTINA SCHNEIDER
She is the Senior Director, Operations and Learning Services at Aviation Strategies International (ASI) in Montréal, Canada, overseeing the activities of the ASI Institute. She manages the operations and educational technology for the Global ACI-ICAO Airport Management Professional Accreditation Programme (AMPAP) and joined the team of ICAO TRAINAIR PLUS Training Development Course Instructors in 2012, and as Training Instructor in 2015.

Artificial Intelligence—or AI—involves the engineering and programming of computers to perform tasks that would normally require human intelligence. While AI applications vary in sophistication and impact, machines have surpassed automation to actually learn from examples without being explicitly programmed for their intended output.

Speculations about the impact of AI on life as we know it, run the gamut from utopian dreams to dystopian nightmares. Singularity theory subscribers expect that through machine learning, AI will surpass human cognitive intelligence, thus creating a superintelligence resulting in immeasurable changes for humanity. Though many see this as desirable, distinguished scientist Stephen Hawking warns that such advancements will allow computers to develop autonomous intelligence and overtake humans, posing a threat to our very existence.[1]

While to date, major AI advancements have been made in terms of perception and cognition, it is only the tip of the digital transformation iceberg. As with many megatrends, the future is mostly uncertain, so it is crucial to formulate the right questions. In the overlapping fields of talent management and talent development, the top of mind question is to what degree machines will replace humans in the workforce, and as a consequence, how will that impact future employment needs?

THE FIRST WAVE OF ASSISTED INTELLIGENCE

Machines have already replaced many jobs that were once performed by humans. Menial and repetitive work that requires little-to-no analytical thinking skills, was the first to be phased out. The now-ubiquitous automatic teller machine began replacing

bank tellers in the late 1980s. While there was much uncertainty with regards to job security, in many cases employees stayed on board and were given the opportunity to develop other skills sets, which brought more value to the banks. The aviation industry has also benefited from automation, with the rise of self-service systems for passenger check-in, bag drop off, and border control, eliminating the need for many frontline airline, airport, and customs employees.

The technological advancements that make it possible to swap out machines for humans in the examples above fall on the narrow side of the AI spectrum, which means that the machines operate within a limited pre-defined coded and predictable range. It is easily foreseeable that similar jobs will be increasingly replaced by machines. While there was much uncertainty during the early days of automation, decades of these transformations have demonstrated that increasing talent development has, in many cases, allowed for workers to enhance their skillset and perform more valuable jobs. Nevertheless, in some industries, millions of workers have been left behind.

According to the National Centre for Education Statistics, enrollment in degree-granting postsecondary institutions increased by 21 percent between 1994 and 2004, and increased another 17 percent between 2004 and 2014.[2] All the while, the United States (US) population growth rate has been slowly declining. While it might not be the only factor for the increasing demand of a more competitive skillset, the near vacuum of positions for unskilled workers has surely created an incentive.

Though these figures are based on US statistics, trends are being observed globally – but not always with a positive outlook. The Massachusetts Institute of Technology (MIT) Technology Review conducted a survey with human resources executives in Asia, which indicated 70 percent of respondents were under the assumption that significant job losses were imminent in Asia in the face of advancing AI. They attributed this to the fact that a high percentage of the work force were occupying low-skilled jobs in comparison to more developed economies.[3]

THE SOPHISTICATION OF AI TOWARDS AUGMENTED INTELLIGENCE

In what some are hailing as the second machine age, AI capabilities are being pushed through supervised learning systems, which allow for a machine to receive large data set examples of what the correct answer might look like for a particular problem.[4] The deep learning algorithms employed through such initiatives are generating predictions and recommendations that are yielding important advancements in several industries such as finance, security, and medicine. Such decision making scenarios are currently being tested in the aviation field, with Boeing projecting testing pilotless aircrafts by 2018.[5]

This stellar advancement opens up a plethora of questions from ethics to liability. In our field of talent management and development, concerns are growing as well. However, AI may also potentially solve a problem. The ICAO Next Generation Aviation Professional initiative put forward some startling statistics: airlines will need to add 25,000 new aircraft over the next twenty years to meet growing traffic demands, which will more than double the current worldwide fleet. This means that in less than a decade, there will be a need for 480,000 new technicians to maintain these aircraft and over 350,000 pilots to fly them.[6] The rapid development of AI capabilities—along with the requisite policy and regulation—could provide an important piece of the solution to the predicted talent shortage. However, it is not the case in all areas of aviation. The question of whether or not there will be enough jobs to gainfully employ everyone, is front of mind for many organizations in many industries.

EMBRACING AI DISRUPTION

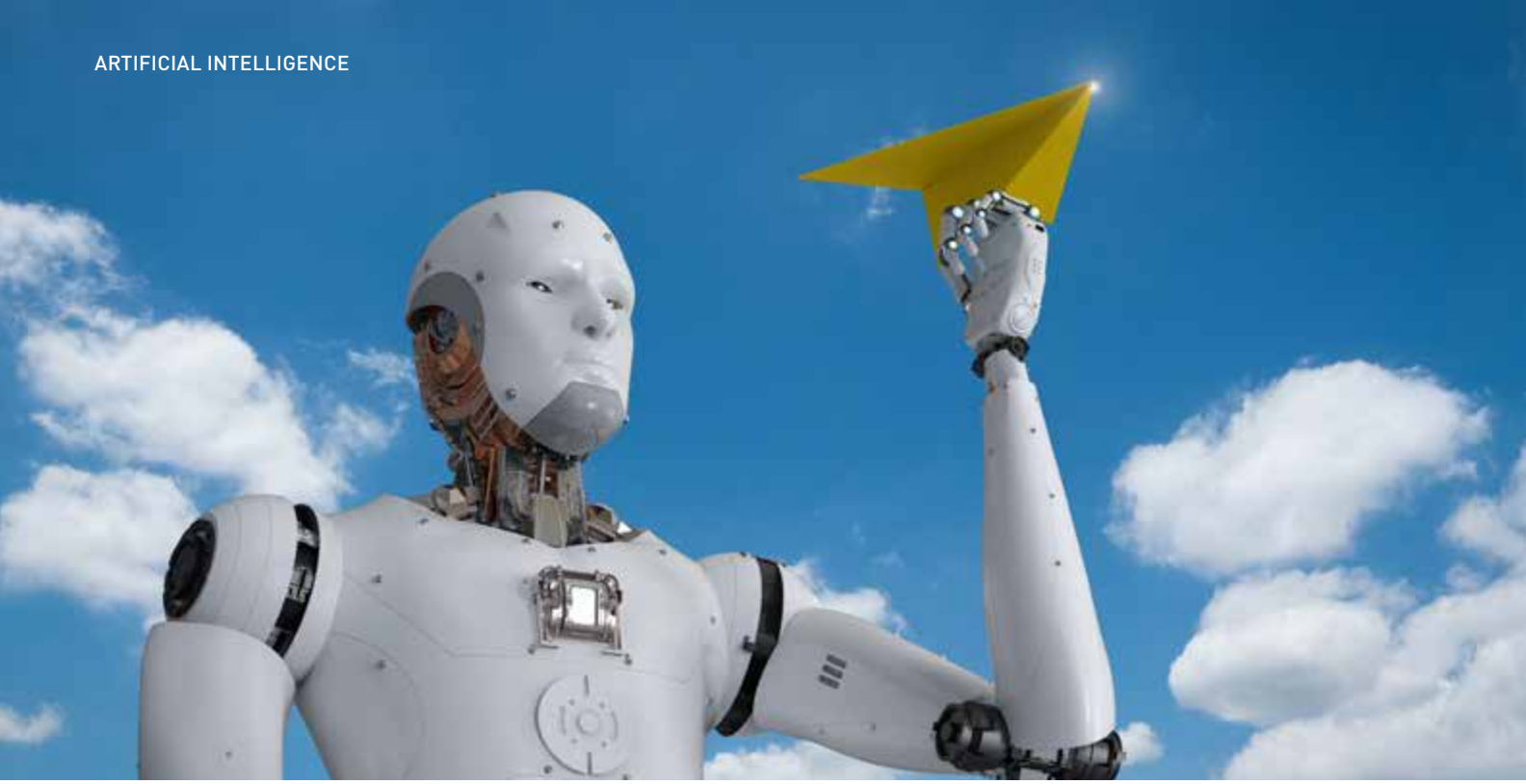
Advancements in AI will create disruption at many levels, and more specifically, will impact how humans interact with machines. Accenture, an international business consultancy, has leveraged automation to increase employee capacity, allowing them to focus on higher level and higher touch advisory services. Accenture reports that as a result, both revenue and business service offerings have increased.[7]

As a recent report produced jointly by the Human Resources Professionals Association and Deloitte Canada suggests, “human capability is wide and shallow. We can do a great many tasks, but none perfectly. AI, on the other hand, is narrow and deep: great at specific tasks, but within a limited range.”[8] The report suggests that such contrasting core differences could yield remarkable synergies, enabling human-machine collaboration, and increasing overall productivity.

AI DRIVEN TALENT MANAGEMENT AND DEVELOPMENT

Within the practices of talent management, AI is enhancing the candidate selection process. While efficiencies are immediately evident with regard to processing large sets of data to predict optimal candidates, there is also the potential for reducing the bias in the hiring and promoting processes, so long as machines are taught to do so.

In the field of talent development, computer-assisted learning is not a new phenomenon, AI will provide a wider range of possibilities in this practice. The critical and time consuming needs assessment phase has both the potential of being faster and more accurate through the analysis of not only an organization’s data — website, plans, reports — but also market place and industry data. Another big data puzzle is the measurement of learning and development impact: with so many variables affecting performance, one of



the greatest challenges is being able to draw a direct correlation between a development activity and performance improvement. AI allows for the rapid analysis and cross-referencing of an unlimited amount of information, translated into quantitative reports.

At the individual level, AI can enhance learner engagement and personalize the delivery of knowledge by gaining an understanding of what motivates them, and adapting both the content and the delivery. In addition, smart interfaces are providing real-time contextual performance support to enhance service-level quality and efficiency, as well as provide on-the-job training.

Despite this, adding AI to the mix can create some unprecedented problems. One of the emerging concerns is around the "interpretability" of a machine's decision, since humans struggle to understand how a system has reached its decision.[9] As examples, the over-reliance or misunderstanding of autopilot maneuvers, and the degradation of manual flight skills has complicated the matter in the case of some recent emergency situations.[10] Many more similar cases are to be expected as humans and machines collaborate to accomplish tasks.

ADAPTABLITY IS THE KEY

AI is not only replacing humans in certain jobs, but it is actually changing the nature of work. From a larger perspective, the field of education requires re-examination and re-engineering as the skillsets required going forward are very different than the ones for which we are currently preparing people.[11]

Adaptability at the individual, organizational, and societal level are essential for navigating the rapidly evolving technological landscape. While there is value in embracing AI rather than fearing it, foresight and governance, along with a good dose of skepticism, will serve us well. ■

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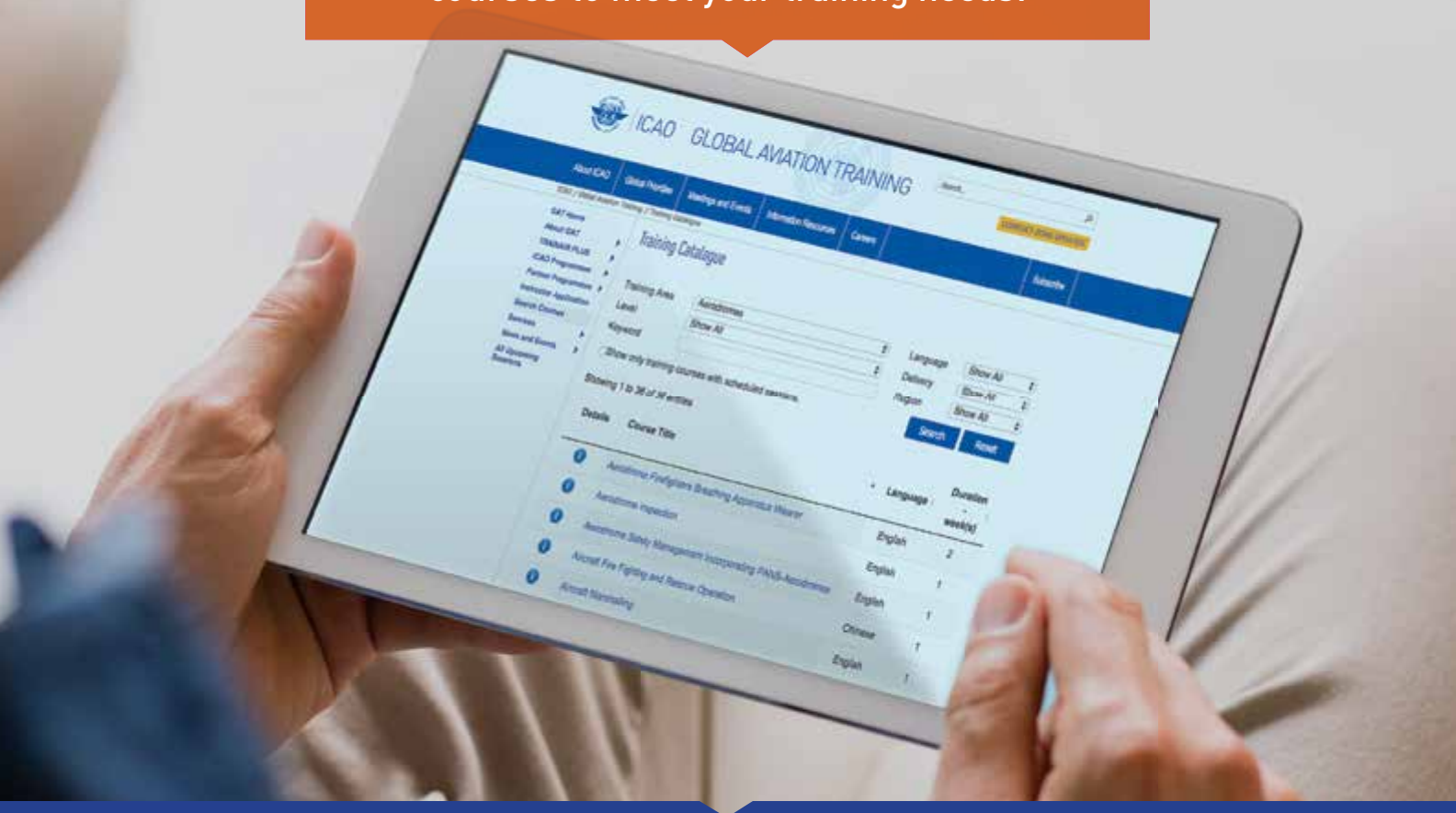

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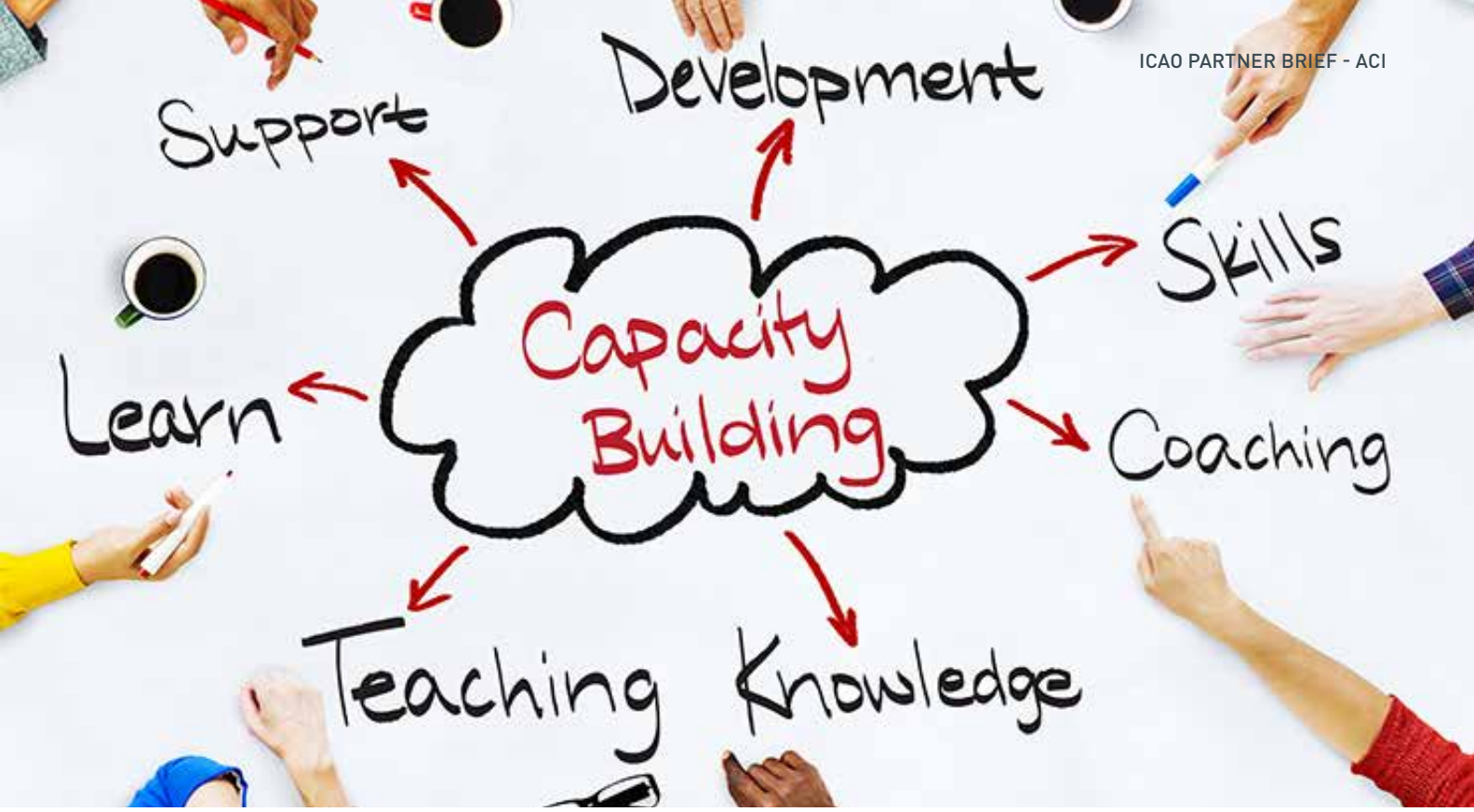

AIRPORT CAPACITY BUILDING – THE ACI APPROACH

KEVIN CARON
He is the Head of the Global Training and Developing Nations Airport (DNA) Assistance Programme for ACI World. He serves on the ACI-ICAO Airport Management Professional Accreditation Programme (AMPAP) Steering Committee as ACI Team Leader. Prior to ACI, Kevin spent eight years with the Montréal Airports Authority (Aéroports de Montréal) before joining IATA in 2003, where he held two training management positions in security and airports.

We often talk about the incredible value of training: when it is done right, it results in motivated employees who contribute to the success of our business, be it an airport, airline, air navigation service provider or civil aviation authorities'.

I would propose we consider a more holistic approach to training and contemplate the term "capacity building". Ensuring we are on the same page, I would point to the United Nations Development Programme (UNDP) definition and then adapt their approach to the ways ACI provides capacity building to its members.

The UNDP defines capacity building as a "...long-term continual process of development that involves all stakeholders; including ministries, local authorities, non-governmental organizations, professionals, community members, academics and more. Capacity building uses a country's human, scientific, technological, organizational, and institutional and resource capabilities. The goal of capacity building is to tackle problems related to policy and methods of development, while considering the potential, limits and needs of the people of the country concerned."

They further refine this definition into three levels that we have adapted at ACI to make this relevant to our role in serving our members.

1. EMPLOYEE LEVEL

This requires the encouragement of conditions that allow individual participants (at all levels) to build and enhance knowledge and skills. This is defined by the various tools

that learning and development professionals have at their disposal, such as training, staff exchanges and mentoring to name a few.

To meet this need, ACI provides both classroom and online airport education and the training programmes that were outlined in our last ICAO Training Report article. Under the auspices of capacity building we have two other programmes that help develop the talent in our members.

The **Airport Excellence (APEX) Programme** conducts peer reviews based on ICAO Standards and Recommended Practices (SARPs) in safety and security, by sending airport experts from around the world to conduct a one-week on-site review. In addition to the value of peer review, this programme has the additional benefit of allowing colleagues (both visiting and local) to learn from each other, fostering both professional and personal friendships that last well past the review itself!

A second initiative is the **Executive Leadership Exchanges Programme (ELEP).** This new programme is being led by ACI's five regional HR and Leadership Committees and is targeted at executive-level staff. ELEP—which will be launched in 2018—will aim to have airports exchange executive staff to allow for peer-to-peer learning over a fixed period.

2. AIRPORT ORGANIZATION LEVEL

This involves supporting airport members, via committees and programmes, in the process of enhancing their specific activities such as customer experience, safety, security. The organizational capacity building approach is used by airports to develop internally so they can better fulfill their defined mission.

Standing committees – These committees are mandated by the ACI Governing Board to provide guidance and council, and help shape current policy issues for Governing Board endorsement in their areas of expertise. They are also required to assist the Governing Board, Executive Committee and Secretariat. The committees consist of airport and industry members with specific knowledge and expertise in areas of Airport IT, Economics, Environment, Facilitation & Services, Safety & Technical and Aviation Security.

Programmes – ACI has several programmes that benefit from this organizational level such as the previously mentioned Airport Excellence (APEX) and Global Training.

3. AIRPORT CUSTOMER LEVEL

This supports the establishment of a more interactive public administration that learns equally from its actions and from the feedback it receives from the travelling public (i.e. the customers they serve).

"In addition to the value of peer review, this programme has the additional benefit of allowing colleagues (both visiting and local) to learn from each other fostering both professional and personal friendships that last well past the review itself!"

ACI's Customer Experience Programme, the Airport Service Quality (ASQ), is the world-renowned and globally established benchmarking programme that measures passengers' satisfaction whilst they are travelling through an airport. The ASQ programme provides research tools and management information to better understand passengers' views and what they want from an airport's products and services.

On top of the ASQ and employee survey programme, there are yearly ASQ forums which enable airport experts to exchange ideas with other industry experts on new and emerging trends in customer experience.

As you can see in our approach to capacity building, we have chosen to take several different approaches to provide as many learning opportunities as possible for both the individual and the airport member. The key to our success and on-going relevance is to remain agile and flexible by continually re-evaluating how to best serve our members with current and future trends that can affect our members. With this approach, ACI has embarked on a voyage that will set a course for increased success in achieving airport excellence for the foreseeable future. ■

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AUGMENTING THE NEXT GENERATION OF AVIATION PROFESSIONALS BY TRAINING WITH HOLOGRAMS

PROFESSOR LORI BROWN
She is the ICAO Next Generation of Aviation Professionals programme Outreach Chair, a member of the International Aviation Pilot Association (IPTA) outreach workstream, a Professor and researcher at Western Michigan University, College of Aviation and a Fellow of the Royal Aeronautical Society. She is an Airline Transport Pilot and has trained Ab-initio cadet pilots for Delta Airlines, British Airways, KLM, and UAE, as well as pilots for national and international government agencies.

The Next Generation of Aviation Professionals (NGAPs) who are entering the aviation industry today, represent a new generation of learners. To engage and meet their needs, the aviation community has been harnessing innovative technologies to look beyond tradition training methods and enhance workforce practices.

Fig. 1. Mixed Reality technology and devices like the Microsoft HoloLens are transforming aviation training and operations for the next generation workforce.

One technology which is increasing in popularity and aviation use is the integration of mixed reality (MR) using holograms and digital computing headsets. Although virtual and augmented reality (AR) are not new technologies, mixed reality (MR) allows us to overlay digital content in our real-world environment, and promises to transform the way we train NGAP to operate and maintain aircraft. This can provide a mobile cost-effective solution to enhance real-world environments, create virtual simulations, accelerate learning and increase retention.

The operation and maintenance of modern aircraft calls for an understanding of several interrelated human and machine components that require practice and immersion. This immersive experience can be created or enhanced with augmented reality (AR) or virtual reality (VR). Relevant to the task-at-hand, they both have the ability to engage NGAP, allowing the student to practice, give real-time feedback, improve the efficiency of skills transfer and increase knowledge retention. Where they differ, is the perception of our presence, the ability to work untethered, and the ability to train crews.

Virtual reality (VR) is able to transpose the user through closed visors or goggles, which block out real-world surroundings. VR can be useful for singular operations, such as reviewing a special qualification airport to allow the pilot to experience the terrain and surroundings before actually flying the approach; learning a procedure or checklist; and practicing maintenance or other operational functions. On the other hand, MR blends virtual reality content with the real-world and allows the user to interact with the content using hand gestures or voice commands.

Most significant for aviation training, is the fact that—unlike with VR—the user is not shut away from their surroundings with mixed reality. Whether or not you happen to be

Fig 2. Japan Airlines HoloLens turbofan engine maintenance training

sharing a physical space, mixed reality allows you to see, listen, and talk to others while everyone involved sees the same holograms simultaneously. As a result, users can interact with virtual content while continuing to be in touch with the real life around them. Operational tasks (such as aircraft maintenance) can also be augmented with procedures, checklists and manual information to create a hands free environment.

This experience is achieved by wearing MR headsets like the Microsoft HoloLens. MR adds interactive computer-superimposed holographic enhancements to a user's real-world environment. This technology also allows for remote instruction for crews and maintenance technicians, which could be a game changer for the entire industry.

Fig. 3. Air New Zealand using HoloLens to enhance the customer experience.

MR Technologies are currently widely used in the medical, oil, space and automotive community and have recently been adapted for operational use by the aerospace industry at many companies (Lockheed Martin, Pratt & Whitney, Bell Helicopter, Air New Zealand, TAE Aerospace, and Japan Airlines, to name a few.)

While manufacturers and operators have already experienced the benefits of augmented and mixed reality, the use of MR in aviation training is a recent innovation. Little research has been published on its efficacy when compared to conventional training methods. A study in the medical arena concluded that advanced training methods and 3D environments can be one option for improving performance, reducing errors and enhancing safety (Kluge, et al., 2014). To evaluate the benefits of MR to engage NGAP and enhance aviation training, Western Michigan University (WMU), College of Aviation (USA) has created a HoloLens application called JetXplore. WMU is currently using mixed reality in the classroom to teach aircraft systems subjects.

Fig. 4. The Virtual CFM34-3B Turbofan in the Classroom at Western Michigan University

The application was developed for aviation operations and procedures training (normal and abnormal) for the CRJ-200 regional jet, B787, A380 and SR20 aircraft, to bridge the gap between classroom and flight simulation; engage NGAP; and allow students to practice in a fully immersive environment. The interactive

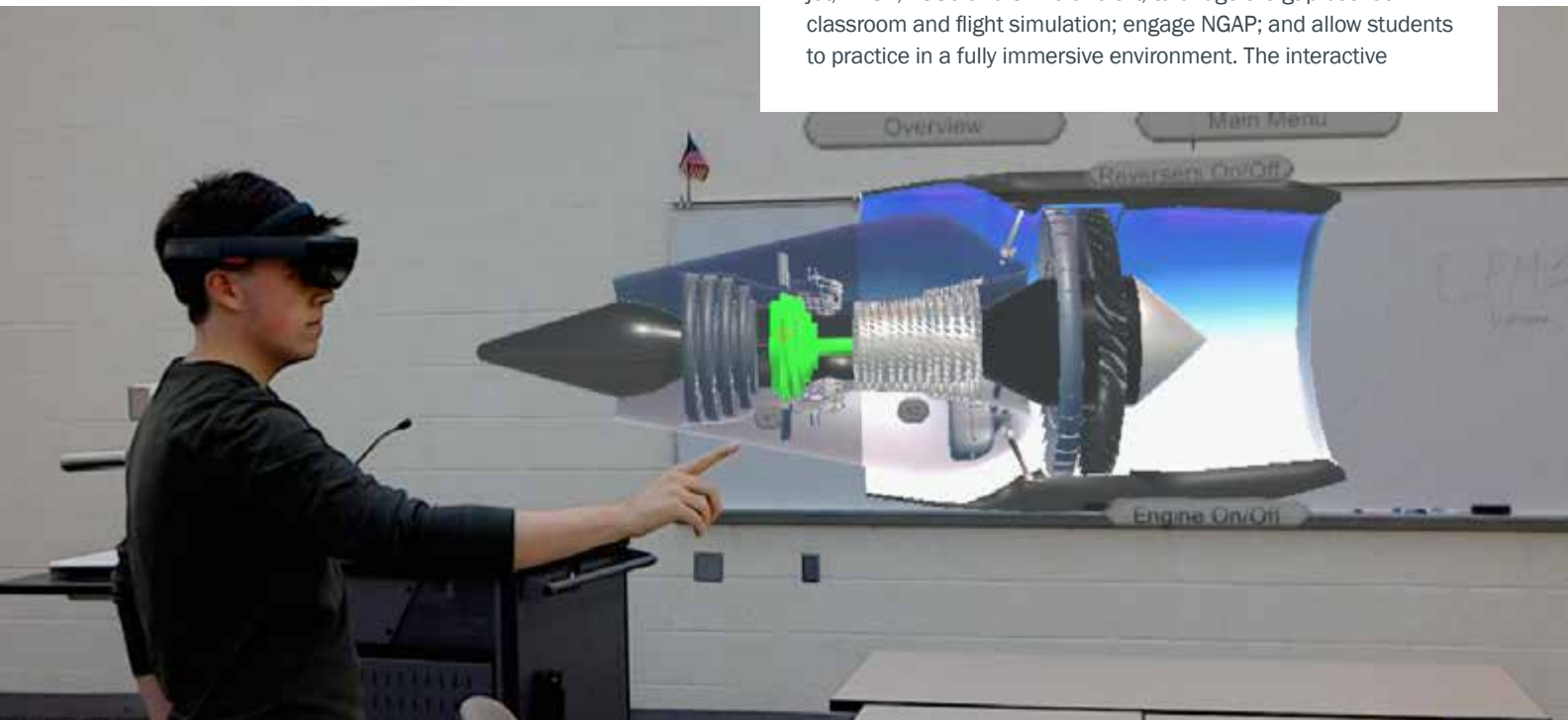


Fig. 5. WMU Bombardier CRJ200 Holographic training using JetXplore and HoloLens

JetXplore application includes customized scenarios, turbofan engines and 360-degree interactive cockpits to teach aircraft systems, flows, checklists and allow students to practice quick reference handbook (QRH) malfunctions. Beyond customizing the JetXplore application for the virtual environment, a significant goal of this project is to explore subjective presence as it affects task performance, to reduce the gap between expensive simulators and the classroom.

The pedagogical material development has been extended to outreach activities and integrated AR micro-simulations in the classroom as interactive 3D knowledge objects. Using Bloom's Taxonomy in the cognitive domain, 3D learning objectives can be refined to create more meaningful student outcomes, and mapped to reflect expected assessment and student proficiency in technology-driven training environments.

The Microsoft HoloLens MR devices and immersive headsets are at the forefront of immersive technologies and, rather than replace existing simulators, it can enhance them. Engaging with the holograms by walking around, interacting and even modifying them, can lead to higher motor excitability and increased working muscle memory. We can safely simulate dangerous or difficult to replicate scenarios; require trainees to actively participate in exercises; evaluate based on performance or relevant tasks with data transmitted to a company's training department or instructor; virtually create new equipment without expense or space-accommodating additions, and allow training anywhere, any time, with MR headsets.

With this in mind, it can be suggested that MR offers the potential for deeper knowledge retention in aviation training, while actively engaging NGAP.

Unlike other advanced technologies, HoloLens is intuitive and offers a natural means of interaction. There's no mouse, wire or touch-screen. All you need are simple gestures to create and alter holograms, your voice to communicate with apps, and your eyes to navigate and analyze. The JetXplore application allows students to use the real movements in the flight deck when interacting with push buttons, toggles, dials or thrust levers, to ensure no negative training is taking place and improve muscle memory.

"Whether or not you happen to be sharing a physical space, mixed reality allows you to see, listen, and talk to others while everyone involved sees the same holograms simultaneously."

Fig. 6. WMU student practicing an engine start malfunction scenario in the classroom

Technologies like these bring forth a new medium for aviation training, a new paradigm of mixed reality. For the first time, we have the ability to take the analog world and superimpose digital artifact, creating mixed reality aviation simulations. Instructors can be anywhere and trainees can bring extremely realistic holographic images of say, a giant B787, A380 or turbofan engine directly into their home, training facility, school, university, or anywhere else training is taking place, which allows them to interact with the object to learn and practice procedures, preflight actions and other information needed to operate or maintain equipment.

While not everyone has the luxury of having technologies like the HoloLens in the classroom, most of us do have a smart phone. With image recognition technology we are able enhance our current and future print media and 'overlay' our own experiences such as checklist, 3D models, video, procedures or interactive training modules. This is similar to an invisible QR code which is mapped to a corresponding image or URL. Currently, WMU Professor Lori Brown and colleagues at Purdue are creating an aircraft systems textbook with augmented reality overlays to allow students to interact with the images in the textbook. The students simply download the application (similar to a QR code reader) and use the camera in their phone or tablet to see the hidden content.

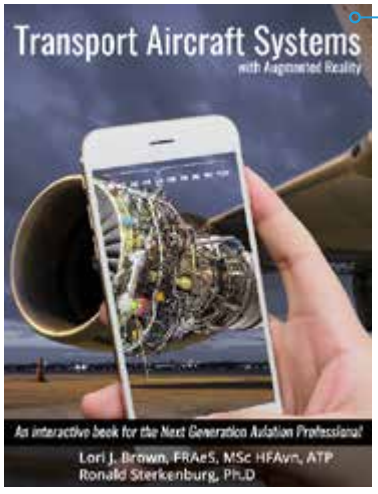


Fig. 7. New Aviation Textbook with Augmented Reality

This technique can also be used by airlines and training providers to overlay content, such as video of procedures or flows over checklists or manual information. Furthermore, the process benefits from the advantage of 3D. Aviation training can break free of 2D limitations, making it easier for people to visualize a finished project, reduce design errors, save time, and allow facilities to open faster.

Companies that rely on engineers and technicians in their workforce also stand to benefit greatly from the immersive potential of AR and MR. As this potential becomes more and more realized, engineers both operationally and from a training perspective may see their entire industries transformed by mixed reality. Where the traditional aviation training model leans heavily on memorization, the educational system is shifting the focus from what students learn to how well students can apply knowledge. As we redefine the aviation training environment through technology and innovation we can prepare NGAP to meet current workplace expectations and prepare for the challenges of tomorrow. ■

For more information, you may contact Lori.Brown@wmich.edu.

WHERE DO TODAY'S AIRLINE PILOTS COME FROM?

Every year CAE works with more than 300 airlines and trains more than 120,000 pilots, connections that give them unique insights into both market and industry needs. After analyzing the requirements and projected growth in passenger air traffic, CAE revealed their insight to the broader industry through the Airline Pilot Demand Outlook publication they released in June 2017. Though we are sharing excerpts from their 10-year analysis here, the full publication is available online: www.cae.com/civil-aviation.

In 2016, approximately 20,000 pilots entered the airline profession around the world from three main sources:

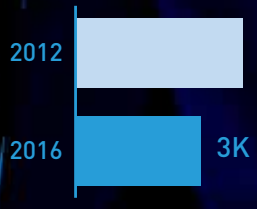
PILOT SUPPLY*

AIRLINE-FOCUSED FLIGHT TRAINING ACADEMIES

Some 6,500 pilots hired in 2016 were trained at professional academies that work directly with airlines to identify and meet their recruitment needs. These academies focus on creating professional pilots and, in general, over 90% of their graduates become airline pilots.

UNIVERSITIES, MILITARY & BUSINESS AVIATION

Approximately 3,000 pilots came from military, business jet or university backgrounds. Some universities offer undergraduate programs in combination with commercial pilot training. However, a small portion of these individuals pursue a career as airline pilots.



SMALL REGIONAL FLIGHT CLUBS & SCHOOLS

Some 10,500 pilots came from smaller independent training organizations generally located at smaller airports and serving both recreational and commercial pilots. Less than 70% of these trainees become airline pilots.

PILOT/ AIRCRAFT RATIOS

The number of pilots required per aircraft is primarily determined by aircraft utilization and related regulations.

All commercial aircraft require at least one licensed captain and a second pilot, who is either a captain or first officer, in the cockpit. To maximize aircraft utilization, airlines need to adequately crew their aircraft. The majority of today's airlines fly fleets of regional aircraft, narrow-body jets and wide-body jets to serve a variety of short-, medium- and long-range routes with aircraft size and seat capacity optimized to match passenger demand.

Over the last 10 years, the increase in aircraft utilization resulting from efficiency improvements has driven a slight growth in the average crew ratio and is expected to remain at a similar level over the next decade.

Regional aircraft

Regional aircraft (typically 19 to 100 seats) are used mainly to link smaller markets to hub-and-spoke networks as well as shorter point-to-point routes. Regional pilots typically fly 30-minute to two-hour routes and rarely operate late at night. A crew will usually fly several sectors a day before reaching their daily flight time, duty time or operational limit.

Narrow-body jets

Narrow-body jets (typically 100 to 220 seats) are widely used by network carriers and lowcost carriers (LCCs) on short- and mediumhaul routes of up to five to six hours, including overnight 'red eye' services.

Today, narrow-body jets represent 55% of the global in-service fleet. This number is expected to grow to over 60% during the next 10 years.

Wide-body jets

Wide-body jets (typically 220-plus seats) are primarily used for longer range non-stop domestic and intercontinental routes. New generation aircraft are enabling airlines to profitably link more distant mid-sized citypairs with non-stop services. These more fuel-efficient wide-body aircraft can fly more than 15 hours non-stop and require the addition of relief pilots to meet regulations and reduce crew fatigue.

AVERAGE NUMBER OF PILOTS PER AIRCRAFT IN 2016*

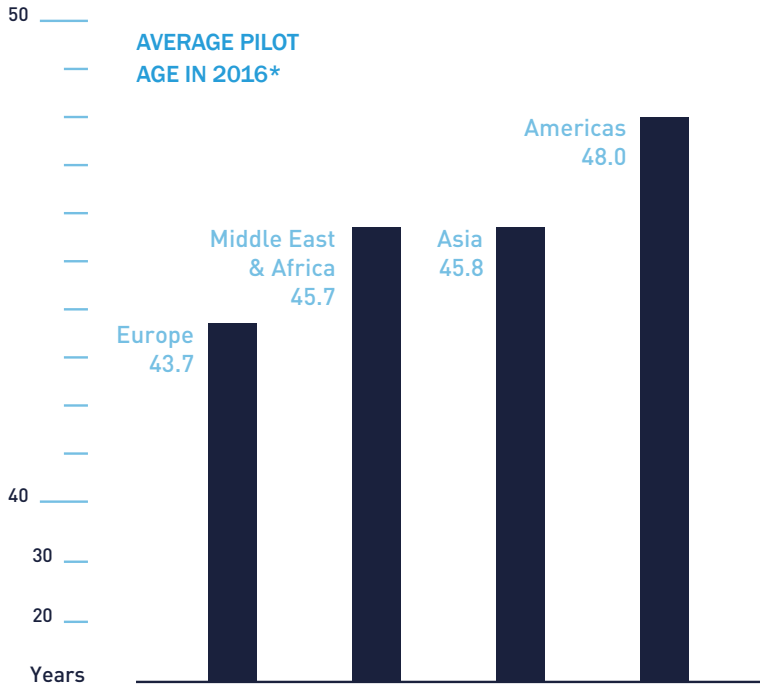
** Based on CAE analysis*

PILOT RETIREMENT AND ATTRITION

Most national regulators impose a mandatory retirement age of 65 for airline pilots. Other reasons for leaving the workforce include early retirement, the pursuit of a non-flying career, loss of medical fitness, etc.

The Americas have the highest average pilot age. North America's high percentage of senior pilots reflects significant recruitment activity in the 1980s and 1990s as airline deregulation expanded the industry and major hubs were developed. The recent consolidation of network carriers and their focus on efficiency slowed new hiring. Europe has seen an influx of younger professional pilots over the past 15 years which can be partially attributed to the rapid expansion of LCCs. In addition, many experienced European pilots have moved to the more rapidly growing Middle East and Asia-Pacific regions. This has left Europe with the youngest average pilot group of any region.

As experienced captains retire, a chain reaction of pilot upgrades and new hires is triggered. For example, the departure of an experienced wide-body captain creates the need to upgrade a first officer to fill the vacant seat. This then creates downward pressure on airlines to develop and upgrade more first officers and captains.



** Based on CAE analysis*

FILLING TOMORROW'S COCKPITS

Selecting the right fit

Airlines are not just looking for first officers to fill the right seat. They're looking for candidates with the potential to become captains within their organizations. As an industry, we must continuously improve and adapt our assessment and selection processes for different regions and airlines to reflect pilot competency requirements.

Careful matching of individual aptitude with airline needs will allow airlines to identify candidates today who can evolve into their future captains.A thorough screening and selection process performed early in the training process has proven to be very successful in identifying candidates with the right mix of language proficiency, flying skills and attitude to evolve into high-quality pilots.

In addition to identifying future potential captains, airline requirements can be used to assess if the candidate, whether an aspiring cadet or a direct entry pilot, will be able to flourish within the airline's culture. For example, one airline might need a pilot willing to travel for extended periods prior to returning home, while another airline might only offer daily short-haul return flights. An in-depth mapping of airline needs along with a multifaceted assessment of each candidate can correctly match the right candidate with the right airline.

Airlines are also developing programs to tap into an underrepresented labour pool – female pilots. These programs encourage young women to consider an aviation career and provide airline sponsorship for flight training. Women currently represent less than 5% of airline pilots.

As the assessment and selection process improves, we're seeing lower dropout rates and higher placement rates. Ensuring the right fit is allowing candidates to flourish while increasing retention rates.

DEVELOPING TOMORROW'S AIRLINE PILOTS

While onboarding 255,000 new first officers, the industry also needs to transition 180,000 pilots into captains by 2027.

The aviation industry continues to raise the bar for pilot training and increase its expectations of pilots. At the same time, we're seeing much faster promotions to captain.

A few years ago, it was common to see a co-pilot spend eight to ten years working in the right seat before becoming captain. Today, first officers are given the opportunity to upgrade with much less seniority than in the past. In fact, it's not uncommon to see a pilot taking full command of an aircraft after only a few years as a co-pilot. This steeper pilot learning curve places additional stress on the current training system. It's becoming a challenge to train to the new standards in the time allocated. As a result, the need for remedial training is increasing.

Although remedial training is a valid mitigation tactic, it impacts operations as pilots are removed from line flying to undergo addition training. To adapt to today's realities and ensure pilot readiness, we must improve training effectiveness.

Emerging training and technology innovations that integrate training data with line performance data can help build such an approach.

ADAPTIVE TRAINING DELIVERY:
By providing an instructor with data-driven training insights, the instructor can adapt the training session to be more effective. This yields tools the instructor can leverage to objectively assess pilot performance. Through a better understanding of the pilot's profile, the instructor is able to adapt training and delivery to better address the competency gaps. A word of caution: not all senior pilots are effective instructors. We must look for instructors with the right mix of teaching and communication skills to ensure we provide the most effective training. ■

SHAPING TOMORROW'S AIR TRANSPORT

PASCAL REVEL
He is the Special Counsellor (Strategy/Partnerships) to the President of ENAC in France. Previously he was the Director of Civil Aviation for the French Southwest Region at the Directorate General of Civil Aviation (DGAC) - Bordeaux Airport, serving as State State representative at the Bordeaux Airport Board of Administrators. Prior to that experience he was the Vice-President of ENAC.

In workforce-driven industries, the availability of qualified personnel is essential to successful growth and development. Since beginning operations in 1948, École Nationale de l'Aviation Civile (ENAC) has been educating men and women in the civil aviation sector in virtually all technical specialties, from air transport pilots and air traffic controllers, to technicians and engineers.

Though initially focused on national needs, ENAC quickly expanded its activities in the international community, taking a first step with French-speaking countries. In the 1960's ENAC began cooperating with French-speaking African States, under the auspices of agreements with the Agency for Aerial Navigation Safety in Africa and Madagascar (ASECNA), a supra-national air navigation service provider (ANSP) in the region. Technology improvements and cost reductions in the 1970's and 1980's lead to the exponential growth of air transport which became a mass transportation system worldwide. ENAC acknowledged that the globalization process was underway and decided to take an important step towards more international cooperation by gradually translating the majority of its educational programmes into English.

In parallel, ENAC expanded its work globally, signing dozens of partnership agreements with other academic and training institutions, mostly in Europe, North America and Asia. In Europe, the Partnership of a European Group of Aeronautics and Space Universities (PEGASUS) network was jointly created by ENAC and its main European partner universities, contributed significantly to the visibility of aviation education in many circles outside the educational world itself. PEGASUS made it possible to bridge the gap between continents and developed a cooperation with the American Institute of Aeronautics and Astronautics (AIAA) in North America, Russia and China, who recently created Aerospace College Alliance of Sino Universities (ARCAS), the Chinese equivalent of the PEGASUS network.

ICAO Secretary General Dr. Fang Liu (left) and the Director of France's École Nationale de l'Aviation Civile (ENAC), M. Marc Houalla (centre), signed the Memorandum of Understanding covering the development and delivery of new educational programmes and training activities within the framework of the ICAO TRAINAIR PLUS Programme. The signing was attended by the Permanent Representative of France on the ICAO Council, Ambassador Philippe Bertoux (far right), and Meshesha Belayneh (far left) ICAO's Deputy Director, Technical Cooperation Bureau and Chief of its Global Aviation Training Office. The first outcome of the new partnership will be a Master's Programme in Aviation Safety Management, which is expected to launch in 2018.

While partnerships may differ from one place to another in terms of their scope, ambitions and various alliances (including industry), they all attest to the high value of collaboration. Working together across State boundaries allows for a better understanding of aviation training needs and for anticipating the competences that will be necessary for the next generation of aviation professionals.

Examples of this include the educational projects that ENAC has been conducting in China since 2001. Beginning with a few professional training programmes in the area of aviation safety, airworthiness, flight operations and aircraft maintenance, ENAC was asked to create and develop a full-scale school of aviation engineering in Tianjin. The Sino-European Institute of Aviation Engineering eventually opened in 2007 and is now fully operational, delivering around 100 engineering graduates to the industry every year since 2013. ENAC also developed pilot training for Chinese airlines and other higher education programmes with prestigious Chinese universities in Beijing (Qinghua University, Beihang University, etc.) and Hong Kong. Currently China is one of the fastest-growing aviation countries in the world.

Other aviation authorities and other stakeholders benefit from ENAC B2B programmes. ENAC delivers ATCO and ATSEP training for the Airports Authority of India, providing participants with the opportunity to take up management positions and boost their careers. In Brazil, ENAC will soon begin delivering high-end courses in air transport and air traffic management to executives and senior managers from the three governmental aviation bodies.

Recently, ENAC partnered with McGill University on an unprecedented Global Aviation Leadership programme that is specifically designed for future decision makers in the aviation industry. Delivered on a part-time basis, this new programme will allow students from all over the world to complete a McGill Graduate Certificate in Aviation Leadership, as well as an Advanced Master in Strategic Aviation Leadership from ENAC, without taking a leave from their current jobs.

In more recent years, after recovering from the world economic crisis of 2008-2009, air transport has been boasting tremendous growth and record profits. This has lead to increased pressure on the labor market, and the fear that some aviation professions will suffer from shortages in the years to come. ICAO recognized this potential threat when it established the NGAP initiative.

Even before joining the network of ICAO Regional Training Centers of Excellence and the TRAINAIR PLUS programme, ENAC was committed to supporting NGAP. In October 2017, ICAO and ENAC signed a comprehensive Memorandum of Understanding (MoU) to jointly deliver educational programmes that bestow an academic diploma. Building up on these partnerships and the existing regional initiatives, it is the right time to consider a new initiative at ICAO level, that would encompass academia and training institutions, to bridge the gap between aviation professions and university programmes and address the future manpower needs of aviation.

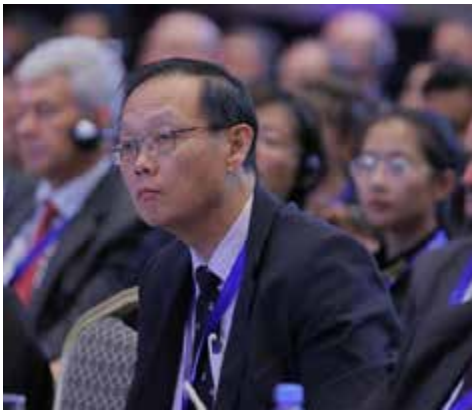
Ultimately, one objective will always remain constant – to better train the next generation of aviation professionals and give them the relevant competencies they will need for tackling future issues in aviation. This is key to ensuring that air transport economic growth will continue while we increase safety, security and the preservation of our natural environment. ■

From 9 to 11 October 2017, the Regional Aviation Training and TRAINAIR PLUS (TPP) Symposium was held in Astana, in the Republic of Kazakhstan. The Global Aviation Training (GAT) event, which was hosted by the Kazaeronavigatsia Republican State Enterprise (RSE), welcomed more than 300 participants from 59 Member States.

HIGHLIGHTS FROM THE 2017 REGIONAL AVIATION TRAINING & TRAINAIRPLUS SYMPOSIUM IN ASTANA

GAT TPP Symposiums provide an international forum where participants can exchange the best aviation training practices and debate training-related issues. At the Astana Symposium, the latest training trends, techniques, and tools that are currently available around the world, were shared. The event served as a forum for bringing together the various stakeholders in the field of aviation training and human resources development, so that they can build effective communication links. The event included two workshops, five panel sessions, 18 presentations, one speed networking session and a workshop summary closing.

During the panel sessions, speakers (led by a moderator) debated training-related themes that included: the global and regional outlook of aviation training; how to attract, train and retain aviation professionals; how to calculate the return on investment (ROI) of training and how to use the TRAINAIR PLUS Programme to strengthen the competencies of aviation personnel in a State; and innovative tools and technologies that are available in aviation training, among other topics. ■



TRAINAIR PLUS FULL AND ASSOCIATE MEMBERS WHO RECEIVED OFFICIAL CERTIFICATES AND PLAQUES AT THE 2017 REGIONAL SYMPOSIUM

ANGOLA	Centro Aeronáutico de Instrução (CAI)	Associate
ALGERIA	Etablissement National de la Navigation Aérienne (CQRENA)	Associate
HONG KONG	Hong Kong International Aviation Academy (HKIAA)	Associate
ZAMBIA	Zambia Air Services Training Institute (ZASTI)	Associate
TANZANIA	Civil Aviation Training Centre (CATC)	Associate
QATAR	Qatar Aeronautical College (QAC)	Full
UAE	Gulf Centre for Aviation Studies (GCAS)	Regional Training Centre of Excellence
NETHERLANDS	Joint Aviation Authorities Training Organisation (JAA TO)	Regional Training Centre of Excellence
MOROCCO	Academie Internationale Mohamed VI de l'Aviation Civile (AIAC)	Regional Training Centre of Excellence

THE NGAP IMPLEMENTATION WORKING GROUP: ESTABLISHING COMPETENCY FRAMEWORK WORKSHOPS AND PROCEDURES FOR TRAINING MANUALS

MARY S NELSON
She is the division manager for the International Training Division of the FAA Academy in Oklahoma City, OK. Mary serves on the International Civil Aviation Organization (ICAO) Next Generation Aviation Professional (NGAP) programme management team and chairs the Implementation Working Group.

There are many issues associated with attracting and educating the next generation of aviation professionals that are of immediate interest to airlines, air navigation service providers (ANSPs), airports, manufacturers, training providers, universities, and CAAs. Ensuring there are enough qualified and competent aviation professionals to meet aviation demands, is an important activity that falls under ICAO's mission to ensure No Country is Left Behind.

ICAO launched the Next Generation of Aviation Professionals (NGAP) programme in 2009, as a means for addressing the forecasted shortage of aviation professionals. The NGAP Task Force brought together a consortium of stakeholder organizations with specific NGAP issues that needed to be addressed. These stakeholders were willing to commit resources to support NGAP initiatives – ICAO is enormously grateful for the financial support and human resources contributed by the many organizations and individuals who are helping to achieve NGAP objectives and expected results.

Establishing an Air Traffic Management (ATM) working group was one of the early initiatives of the Task Force. The ATM completed the development/revision on the Procedures for Air Navigation Services –Training Manuals and Competency Frameworks Training (PANS –TRG, Doc 9868) in 2014.

In 2015, the NGAP Implementation Work Group (IWG) was created to develop roll-out strategies and foster collaboration to promote the use of competency-based provisions developed in the competency and training groups. Additionally, the IWG was tasked with:

- Developing a three-year plan of events to promote the implementation of competency-based approaches for the technical competencies addressed by the NGAP Task Force; and
- Identifying and supporting the production of publication material for the promotion of competency-based approaches

Specifically, the IWG sought to bring about awareness, and to inform and implement the work the Air Traffic Management (ATM) Work Group completed. When the ATM Workgroup completed its work, the IWG began developing guidance materials for a workshop that

"Ensuring there are enough qualified and competent aviation professionals to meet aviation demands, is an important activity that falls under ICAO's mission to ensure No Country is Left Behind."

would introduce Member States to a Competency-based Training (CBT) model that incorporated these publications:

- Procedures for Air Navigation Services - Training (DOC 9868);
- Air Traffic Control (ATCO) Training Manual (Doc 10056); and
- Air Traffic Safety Electronics Personnel (ATSEP) Training Manual (Doc 10057)

THE TARGET AUDIENCE FOR THE WORKSHOP INCLUDED:

- Personnel from training organizations, ANSPs and Civil Aviation Authorities (CAAs) responsible for the management of ATSEP and ATCO training;
- CAA personnel responsible for the management of ATSEP and ATCO regulation, auditing and oversight of training;
- CAA personnel responsible for conducting audits and oversight of ATSEP and ATCO training;
- ATSEP/ATCO, course developers, instructors and assessors; and
- Training managers, regulators, and other personnel involved in the delivery of ATSEP and ATCO training

THE OVERALL PRESENTATION SCHEDULE:

The workshop runs over three days, with the first day of the common to both ATSEP and ATCO. For the second day and the morning of the third day, ATSEP and ATCO attend separate sessions, with the two groups rejoining for a common session on the afternoon of the third day.

The IWG raises awareness through various articles, conferences, events, and websites. They hold many face-to-face meetings around the globe, including monthly telecom meetings to discuss and share developed guidance materials, syllabus, schedules and assignments.

With several group exercises throughout the three-day event, the workshop provides an opportunity for participants to analyze the advantages of competency-based approach. With approximately 70 participants, the first NGAP workshop was held in June 2016 at ICAO Headquarters in Montréal.

NGAP WORKSHOP, JUNE 2016 IN MONTRÉAL

Since the launch, workshops have been delivered at each of the ICAO Regional offices with positive engagement and feedback from all participants:

SEPTEMBER 2016

MEXICO CITY, MEXICO

STATES REPRESENTED:
Bahamas, Cuba, Curazao, Haiti, Jamaica, Mexico, and Saint Lucia

ORGANIZATIONS:
Corporacion Centroamericana de Servicios de Navegacion Area (COCESNA), and Colegio De Controladores Aereos De Mexico (COCTAM)

- 44 participants attended the workshop at the ICAO Mexico: North American, Central American and Caribbean (NACC) Office.
- The workshop delivered in Mexico City was presented in English and translated into Spanish.

JUNE 2017

BANGKOK, THAILAND

STATES REPRESENTED:
Afghanistan, Cambodia, Hong Kong, China; Macao, India, Japan, Lao PDR, Malaysia, Maldives, New Zealand, Philippines, Singapore, Sri Lanka, Thailand, and Turkey

- 72 Participants attended the workshop at the ICAO Bangkok: Asia and Pacific (APC) Office.

NOVEMBER 2016

LIMA PERU

STATES REPRESENTED:

Argentina, Brazil, Colombia, Ecuador, Panama, Paraguay, Peru, and Uruguay

- 43 Participants attended the workshop at the ICAO Lima: South American (SAM) office.

MARCH 2017

DAKAR, SENEGAL

STATES REPRESENTED:

Cabo Verde, Gambia, Ghana, Guinee, Liberia, Niger, Senegal, Togo

ORGANIZATIONS:

The Agency for Aerioal Navigation Safety in Africa and Madagascar and the Aeronautical Airport Operations Development Company Meteo organizations

- 44 participants attended the workshop at the ICAO Dakar: Western and Central African (WACAF) Office. In addition, the workshop delivered in Dakar was presented in English and French.

JULY 2017

NAIROBI, KENYA WORKSHOP

STATES REPRESENTED:

Algeria, Angola, Ghana, Kenya, Nigeria, Seychelles, South Africa, Tanzania, Uganda, Zambia, and Zimbabwe

- 55 participants attended the workshop at the Nairobi: Eastern and Southern African (ESAF) Office.

OCTOBER 2017

PARIS WORKSHOP

STATES REPRESENTED:

Austria, Belgium, Croatia, Denmark, Georgia, Germany, Greece, Hungary, Ireland, Italy, Lativa, Luxembourg, Macedonia, Morocco, Netherlands, Norway, Poland, Portugal, Romania, Russia, Spain, Sweden, Switzerland, Turkey, United Kingdom (UK), Ukraine

- 74 participants attended the workshop. Eurocontrol hosted the workshop in Luxemburg. ■

THE FINAL WORKSHOP IN THIS FIRST ROUND OF WORKSHOPS WILL BE DELIVERED IN CAIRO, EGYPT, IN MARCH 2018.

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Federal Aviation Administration Flight Standards Training Division AFS-500

International Air Transport Association (IATA)

University of Waterloo

NORTH AMERICA CENTRAL AMERICA THE CARIBBEAN (11)

BARBADOS
The Barbados Civil Aviation Training Centre

CANADA
The ASI Institute, A Division of Aviation Strategies International

CUBA
Centro de Adiestramiento de la Aviación (CAA)

DOMINICAN REPUBLIC
Academia Superior de Ciencias Aeronáuticas (ASCA)

EL SALVADOR
Instituto Centroamericano de Capacitación Aeronáutica (ICCAE) de COCESNA

JAMAICA
Civil Aviation Authority Training Institute (CAATI)

MEXICO
Centro Internacional de Instrucción de Aeropuertos y Servicios Auxiliares. Ingeniero Roberto Kobeh González

TRINIDAD AND TOBAGO
Trinidad and Tobago Civil Aviation Authority Civil Aviation Training Centre

UNITED STATES
Delex Systems, Inc.

Federal Aviation Administration (FAA) Academy

The Washington Consulting Group (WCG), Inc. The Technical Training Group

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URUGUAY
Instituto de Adiestramiento Aeronáutico - DINACIA

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Instituto Universitario de Aeronáutica Civil (IUAC)

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Wallonie Aerotraining Network (WAN)

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As of 21 November 2017.

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EUROCONTROL Institute of Air Navigation Services

NETHERLANDS
Joint Aviation Authorities Training Organisation (JAA TO)

RUSSIAN FEDERATION
Institute of Air Navigation (IAN)

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International Fire Training Centre (IFTC) Serco

NATS Training Services

AFRICA (18)

ALGERIA
Établissement National de la Navigation Aérienne (CQRENA)

ANGOLA
Enana-EP/ Centro Aeronáutico de Instrução

BOTSWANA
IAS Aviation Academy

CAMEROON
Ecole Régionale de Sécurité Incendie (ERSI)

ETHIOPIA
Ethiopian Aviation Academy (EAA)

Ethiopian Civil Aviation Training Centre (ECATC)

KENYA
East African School of Aviation (EASA)

MAURITIUS
Airports of Mauritius Co Ltd. Aviation Training Centre

MOROCCO
Académie Internationale Mohamed VI de l'Aviation Civile (AIAC)

Loumed Cabin Crew Training Center (LCCTC)

NIGER
Ecole Africaine de la Météorologie et de l'Aviation Civile (EAMAC)

NIGERIA
Nigerian College of Aviation Technology (NCAT)

SENEGAL
Ecole Régionale de la Navigation Aérienne et Management (ERNAM)

SOUTH AFRICA
Air Traffic and Navigation Services (ATNS) – Aviation Training Academy

SUDAN
Sudan Academy for Aviation Sciences and Technology (SUDAFAST)

TANZANIA
Civil Aviation Training Centre (CATC)

TUNISIA
Académie Tuniso-Française de Formation en Sûreté de l'Aviation Civile (AFSAC)

ZAMBIA
Zambia Air Services Training Institute (ZASTI)

MIDDLE EAST (10)

EGYPT
Egyptair Training Academy

Egyptian Aviation Academy (EAA)

IRAN (ISLAMIC REPUBLIC OF)
Civil Aviation Technology College (CATC)

JORDAN
Queen Noor Civil Aviation Technical College (QNCATC)

KUWAIT
Australian College of Kuwait (ACK)

LEBANON
Middle East Airlines Training Center

QATAR
Qatar Aeronautical College (QAC)

SAUDI ARABIA
Saudi Academy of Civil Aviation (SACA)

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GAL ANS Training Centre

Gulf Center for Aviation Studies (GCAS)

ASIA/PACIFIC (25)

AUSTRALIA
ASSET Aviation International

BANGLADESH
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Civil Aviation University of China (CAUC)

Hong Kong International Aviation Academy (HKIAA)

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Aeronautical Safety College (ASC)

MALAYSIA
Malaysia Aviation Academy (MAvA)

MONGOLIA
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NEPAL
Civil Aviation Academy of Nepal (CAAN)

NEW ZEALAND
Airways New Zealand Training Centre

PAKISTAN
Civil Aviation Training Institute (CATI)

PHILIPPINES
Civil Aviation Training Center Civil Aviation Authority

REPUBLIC OF KOREA
Civil Aviation Training Centre of Korea Airports Corporation (KAC)

Incheon Airport Aviation Academy (IAAA)

SINGAPORE
Singapore Aviation Academy (SAA)

SRI LANKA
Civil Aviation Training Centre (CATC)

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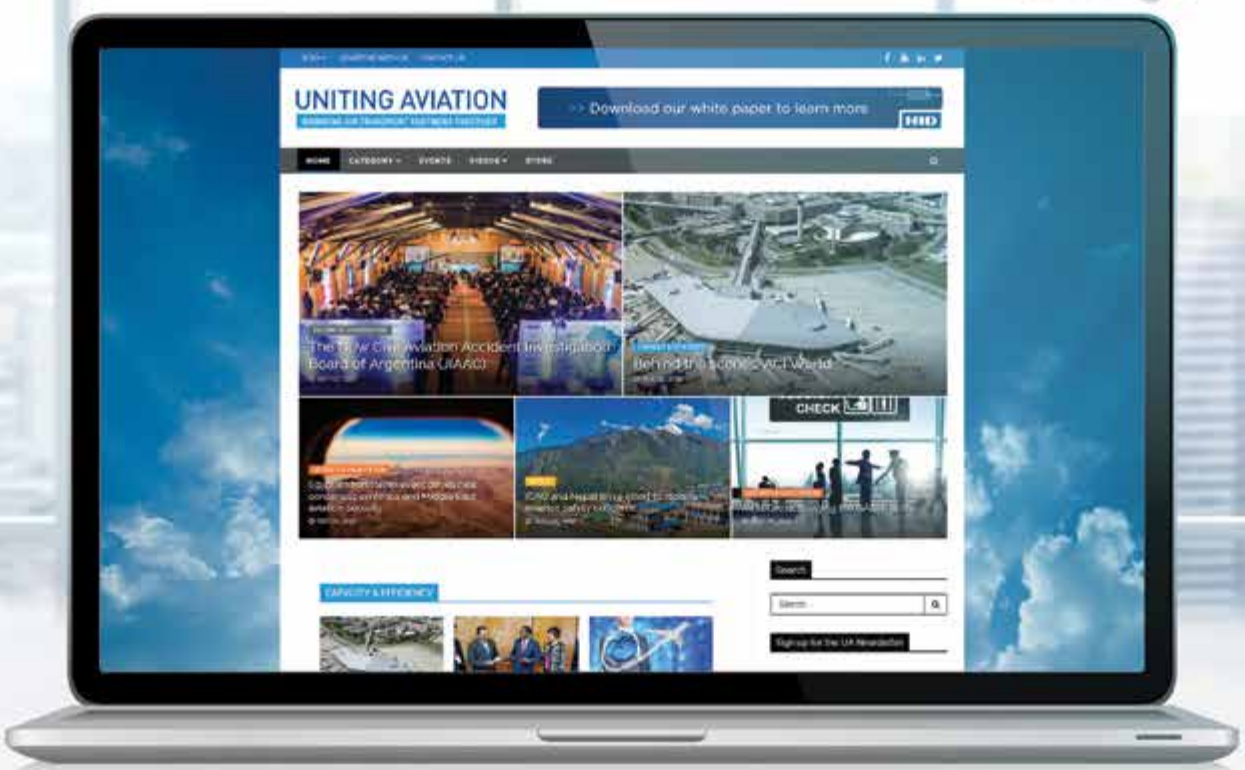

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