



How CAE is becoming a CBTA Training Organization

A look at how CAE uses high-tech solutions, design and data to
improve safety and pilot training standards

2023

Leading the way

CAE's 2023 Aviation Talent Forecast shows a need for 284,000 new civil aviation pilots over the next 10 years to meet the increased global demand.¹

With so many experienced aviation professionals retiring, and the growing need to train the next generation, CAE is leading the effort to elevate the pilot training standard beyond the threshold of "ready to pass a regulatory test" to "being mission ready," through the adoption of Competency-Based Training and Assessment (CBTA) principles. The paradigm shift in pilot training from historically prescriptive methodologies to CBTA recognizes that, although they have delivered an exemplary aviation safety record, current training and licensing standards must evolve to address today's rapidly changing demographics, technology, and operating environments. This shift is also the result of CAE measuring training efficacy using data from training and customers' line operations.

CBTA is defined by the International Civil Aviation Organization (ICAO) as "training and assessment that are characterized by a performance orientation, emphasis on standards of performance and their measurement, and the development of training to the specified performance standards."² With the goal of providing a competent workforce for the sake of a safe and efficient air transportation system, CBTA is a training methodology sustained by robust course design, instructor qualification and data collection—continuously enhancing training efficiency and effectiveness.

With the continuous advancement of aircraft technology and related technical instruction on flying them, pilots require training that enhances their problem-solving, decision-making, situational awareness, communication, leadership, teamwork, and workload management skills. Therefore, the industry must turn to CBTA programs to impart core competencies that complement and maximize a pilot's skills and technical aircraft knowledge.

Because it is impossible to foresee all plausible accident scenarios in aviation, CBTA principles move training towards the development

and assessment of key pilot behaviours that can be used in any given situation. These behaviours are further organized into pilot competencies.

Through a continuum of training devices which present scenario-based exercises at differing levels of fidelity, CBTA emphasizes training for both foreseen and unforeseen situations in the flight deck (i.e., emphasis is placed on managing uncertainty rather than just aircraft systems).

Competency-Based Training and Assessment (CBTA) is applicable to the entire continuum of pilot training, from pilot aptitude testing, pilot initial licensing training, Instructor/Evaluator training and operator training.

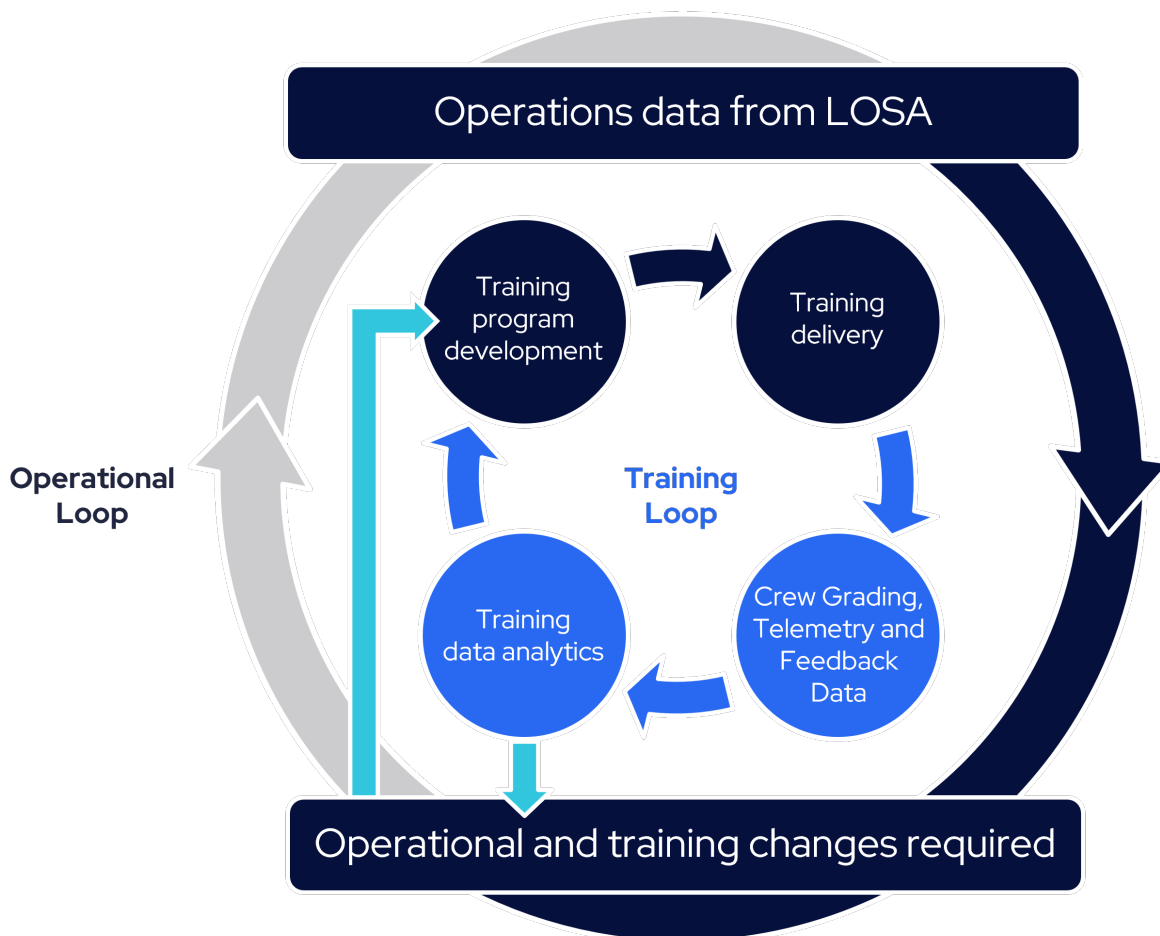
Establishing external partnerships

CAE and The LOSA Collaborative - bridging the gap between operations and training data

As part of its drive to further safety through CBTA principles, CAE partnered with The Line Operations Safety Audit (LOSA) Collaborative to enhance its ability to offer Evidence-Based Training (EBT) curriculum design.³ The aviation industry is data-rich, but separating the noise from meaningful insights that can enhance operational safety can be challenging. LOSA provides resonant signaling by going to the sharp end and conducting observations in everyday operations. With this approach, LOSA gives operators insights into systemic and frontline pilot performance strengths and weaknesses.

As a result of this partnership, CAE can now bring pilot training full circle by closing the loop between operations and training data. This enables us to build a robust data-driven training ecosystem that supports continuous improvement, provides a true measure of the effectiveness of training, and has a positive impact on aviation safety worldwide. (Figure 1)

Figure 1: The Operations and Training Data Loop



LOSA: Line Operational Safety Audit – in partnership with



As part of the partnership, The LOSA Collaborative performs an in-person safety audit of a “normal day in the flight deck” for an operator’s pilots. The insights and data from these audits, combined with CAE’s training data, allows us to offer tailored pilot training programs and benchmarked operational and training performance insights unique to individual operators.

Collecting data and insights from line operations and training is key to the development and assessment of pilot competencies. The Threat and Error Management (TEM) data from CAE-sponsored LOSAs is tagged as “root cause competencies” by trained observers. When used in conjunction with CAE’s training program audit database (that is also structured around TEM and the Pilot Competency framework) it allows for both a measurement of training program efficacy, and as an input to training program design.

The TEM and Competency framework bridge the gap between proactive safety data and training solutions. This combination of insights and deidentified data from line operations (through trained observers) and pilot training sessions (from qualified instructors and simulator telemetry) are a fundamental part of an Integrated Safety Management System to enhance the safety of flight and pilot training effectiveness.

Pilot training comes full circle by combining a LOSA program with data from CAE Rise™



CAE & IATA – developing CBTA program design and delivery capability

At the outset of its journey to being a CBTA Training Organization, CAE partnered with International Air Transport Association (IATA) to develop the industry's first course to train program designers in the implementation of CBTA. This course is a requirement of ICAO Doc. 9868 – Procedures for Air Navigation Services – Training which requires that, "Course developers shall have demonstrated that they...have successfully achieved the ability to develop training in accordance with the features of competency-based approach to training".⁴

As a first step, the CAE **Training Design** leadership team spent one day per week for three months in live training with IATA. The CBTA Design Course itself was divided into two parts: pre-study and instructor-led practical labs. Pre-study consisted of eight to 10 hours of self-study covering the basics of CBTA delivered through the corporate Learning Management System. This was followed by 15 hours of instructor-led review and application exercises, applying the principles of CBTA course design using current tools and systems.

In parallel, the CAE Training Performance team also collaborated with IATA over a period of five months to develop and deliver the CAE CBTA Instructor Course (CCIC), which emphasizes training and assessing pilot competencies, as well as the CAE CBTA Standards Instructor Course (CCSIC), which focuses on the training and assessing instructor and evaluator competencies. The CBTA program design model from ICAO Doc 9868 was used as the framework for the development of these two instructor courses. The Project Lead Group consisted of 17 instructors who developed the program and initially trained Standards Instructors, who will cascade the CBTA methodology to other instructors within CAE.

CBTA training for other-than-recurrent pilot training (i.e., EBT) is in its early days and there are currently no precise regulatory requirements for designing and delivering CBTA-focused training. The IATA-CAE approach is one possible option amongst other alternatives. Feedback from stakeholders, including regulatory agencies worldwide, has been extremely positive and is viewed as meeting the intent of ICAO guidance – setting the standard for industry CBTA instructor training.

CAE & Boeing – expanding CBTA's reach

In June 2023, CAE and The Boeing Company signed an agreement through which CAE will become a Boeing Authorized Training Provider (ATP) and the first to offer Boeing's CBTA curriculum.⁵ With this arrangement, Boeing and CAE will expand accessibility to high-quality, innovative flight training to commercial aviation customers worldwide.

CAE and Boeing are working together to enhance aviation safety. This collaboration will provide pilots access to the technology and curriculum through which they will acquire the skills and knowledge for peak performance in the flight deck.

Providing CBTA training for CAE employees

CBTA Principles Training for Instructors and Examiners

Within CAE, Computer-Based Training (CBT) modules were created to introduce employees to the concept of CBTA. The training material introduced CAE's 2,000+ instructors to the pilot competency framework, as well as the concept of observable behaviours and the process of observing, recording, and assessing them in the context of that framework.

The instructor and evaluator competency frameworks were introduced with explanatory video vignettes featuring interviews with CAE instructors from around the world and across CAE's Commercial, Business, and Ab-initio training businesses.

All CAE Civil Aviation instructors have been enrolled in the training and more than 1,000 have completed it as of August 2023.

Using the data and other sources of feedback from the initial online course, further instructor-led CBTA training was developed for all CAE instructors. This allowed the next phase of training to be tailored to the expressed needs of CAE instructors.

Data from the introductory training showed that 67% of respondents in the Americas felt that CBTA principles were new to them, while 63% in the Asia Pacific region and only 30% in Europe indicated it was new information. This is not surprising given that the European Union Aviation Safety Agency (EASA) has been incorporating CBTA language into the training environment for several years.

When viewed globally:

- 49% of instructors felt that CBTA principles were new to them. However, the data also showed that only 8% of instructors felt they needed more education before effectively applying CBTA principles in training.
- 82% of instructors felt that they were ready to apply CBTA principles in training, with responses indicating that about 10% may have been overconfident in their assessment of readiness. That said, many instructors may have already had an expert understanding of the material.

A CBTA principles-based Instructor Pilot Performance Monitoring (IPPM) that uses a five-point scale to assess Instructor Performance across the ICAO Instructor – Evaluator Competencies has been implemented across CAE's network over the last 12 months, and indications are that additional, focused training, particularly in the use of facilitation, is likely to have a beneficial effect for most instructors.



Simulator telemetry as a measure of outcome in CBTA

In CBTA, grading of a competency places emphasis both on process and outcome (i.e., observable behaviours and aircraft state). With the ability to collect simulator telemetry data and make it available in real time to the instructor, CAE has been incorporating its CAE Rise™ training system into the CBTA workflow as an instructor support tool. CAE Rise™ in simulator training allows the instructor's focus to remain on pilot behaviours (process), with the knowledge that all outcomes of interest were being captured and flagged. It is also used, when appropriate, as a facilitated debriefing tool.

After the training event, CAE Rise™ makes available Threat, Error, and Outcome data to the training manager for comparison with instructor-assigned pilot grades and for benchmarking across demographic groups of interest and to CAE worldwide fleet data.



Looking forward with CBTA

Given that regulatory acceptance of CBTA for other-than-recurrent training is evolving, CAE is taking a step-by-step approach in the transition of existing curricula. As a first step, existing task-based curricula are being revised to use the language of competencies, observable behaviours (OBs), and TEM. Existing training tasks/elements are mapped to relevant competencies and OBs, with an assessment of relevant competencies required at the end of each simulator lesson. The intent is to gradually familiarize instructors, clients, and regulators with the principles of CBTA.

In parallel, we are bringing our technology leadership position to bear with the use of Artificial Intelligence (AI) to conduct the mapping of tasks, subtasks, aircraft malfunctions, and conditions to the relevant OBs required for a “full” CBTA implementation.

CAE’s commitment to making the world a safer place with the use of high-tech training and operational support solutions is a foundational element fueling its vision to become a CBTA Training Organization. Having formed strategic partnerships with key organizations in the industry, CAE has positioned itself to support other organizations in making the same transition in their training programs. This holistic, future-oriented approach to CBTA has benefited CAE internally and has also been the foundation of new services we have offered to Original Equipment Manufacturers (OEMs) and operational partners in the evolution of their own training programs.

Looking even further into the future, CAE is envisioning the training needs of a major market – Advanced Air Mobility. Electric vertical take-off and landing (eVTOL) aircraft will shape a new era in aviation that will require a wholly new skill set and, as a result, new training focus. Work is progressing with several OEMs to design training for these aircraft based, at the outset, on CBTA principles.

The success of the aviation industry is based upon the confidence passengers have in the safety of the air transport system. In the same way that aircraft have evolved, so too must the training we deliver to pilots – it must prepare and give them the confidence to take decisive action at a critical moment – and CBTA is key to developing the behaviours that result in resilient outcomes and even safer air travel in the future.



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At CAE, we equip people in critical roles with the expertise and solutions to create a safer world. As a technology company, we digitalize the physical world, deploying software-based simulation training and critical operations support solutions. Above all else, we empower pilots, cabin crew, airlines, defence and security forces and healthcare practitioners to perform at their best every day and when the stakes are the highest. Around the globe, we're everywhere customers need us to be with more than 13,000 employees in approximately 250 sites and training locations in over 40 countries. CAE represents more than 75 years of industry firsts—the highest-fidelity flight, mission and medical simulators and training programs powered by digital technologies. We embed sustainability in everything we do. Today and tomorrow, we'll make sure our customers are ready for the moments that matter.