



SHAPING THE FUTURE OF AVIATION

Competency-Based Training and Assessment and Evidence-Based Training





Service above
and beyond

Table of Contents

01

What is CBTA/EBT?

An overview of Competence-Based Training and Assessment and its structured Competency Frameworks (Pilots and Instructors). A description of Evidence-Based Training and its phases for recurrent training implementation.

02

Why CBTA and EBT?

A comparison between CBTA and EBT methodologies, how both complement and inform training practices in curriculum design, goals and assessment methods. A showcase of CBTA transition plans to full EBT implementation.

03

How to apply CBTA/EBT?

A summary of our most successful training delivery processes, instructor courseware programs and CBTA/EBT risk mitigation training programs. Key reflections on the safety benefits of integrating both CBTA and EBT approaches.

Introduction

The aviation industry is undergoing a paradigm shift in how pilots are trained, evaluated, and supported throughout their careers. At the forefront of this transformation are **Competency-Based Training and Assessment (CBTA)** and **Evidence-Based Training (EBT)**—two complementary frameworks designed to move beyond legacy, task-based instruction and toward a data-driven approach to developing resilient pilots.

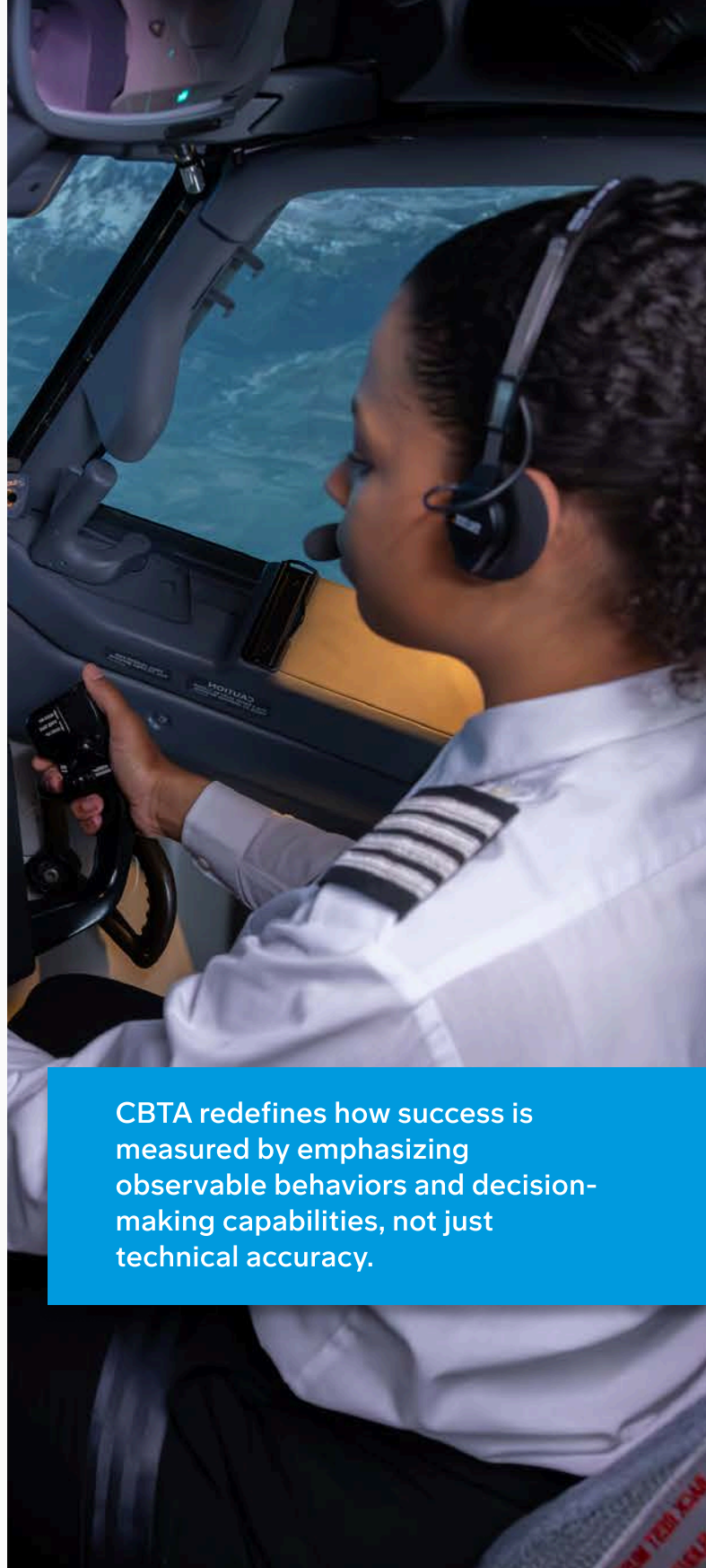
CBTA focuses on observable, measurable competencies that reflect real-world performance. EBT leverages operational data to prioritize relevant successful scenarios, determined from data analysis that represent operational risk. Together, they offer a holistic and adaptive training environment. For airlines, regulators, and training organizations, understanding how these methodologies work independently and in tandem is essential for building a more agile and safety-focused aviation workforce.



01 What is CBTA/EBT?

Competency-Based Training and Assessment (CBTA) focuses on developing and measuring pilot competencies that go beyond technical proficiency. This approach enhances technical skills and but also fosters critical non-technical competencies such as problem-solving and decision-making. Both are vital for effective risk management in aviation.

At its core, CBTA is designed around the International Civil Aviation Organization (ICAO) pilot competencies: the recognized technical competencies plus human-centered competencies, such as **workload management, situation awareness, problem-solving, communication, and leadership and teamwork.**



CBTA redefines how success is measured by emphasizing observable behaviors and decision-making capabilities, not just technical accuracy.



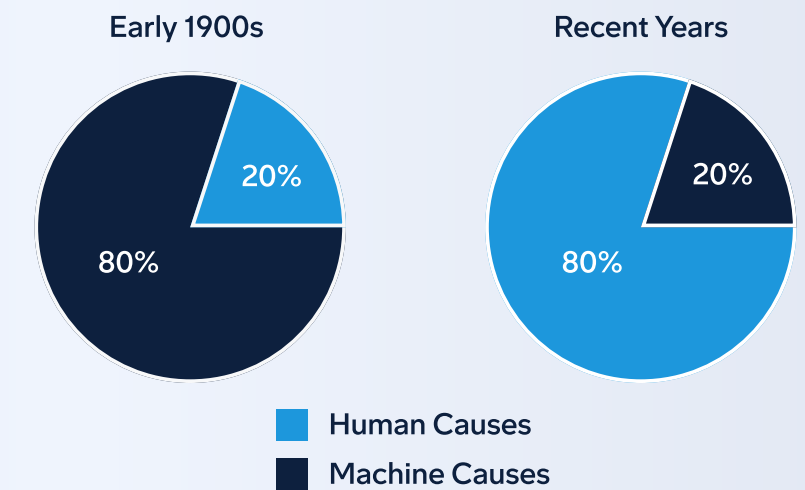
At Boeing, CBTA methodology is integrated into type rating, recurrent and training programs. It shifts the instructional style from lecture-based to a facilitative approach, introducing early exposure to manual handling and integrating real-world scenario applications. Assessment within CBTA uses objective criteria to evaluate both technical and non-technical skills, supporting a more holistic view of pilot performance.

The Boeing CBTA program supports airlines transitioning to CBTA and EBT and can be applied to airlines following a traditional task-based training and Advanced Qualification Program (AQP) or an Alternative Training and Qualification Program (ATQP). Boeing is redefining training by incorporating CBTA through enhanced training curriculum and consultation expertise for airlines transitioning to this safety-enhancing training philosophy.

Shift Toward Human Factors in CBTA

As aviation technology has advanced, the main cause of accidents has shifted from machine failures to human error. In response, CBTA focuses on developing critical human competencies like communication, decision-making, and situational awareness.

This human-centered approach prepares pilots for today's complex operational environments, where soft skills are key to enhancing safety.



Competency Framework in CBTA

In CBTA, structured competency frameworks guide pilots and instructors to foster continuous improvement and operational excellence. CBTA emphasizes that core pilot competencies such as flight path management, problem-solving, and leadership—are not standalone skills, but interconnected essentials for safe and effective performance. These competencies evolve through real-world experience and are reinforced through targeted training.

Pilot competencies are a **shared mental model** between pilots. They work as a standard for human centered operating procedures, going beyond mere task completion to foster teamwork, work management and awareness.

Boeing CBTA adapted framework utilizes the following:



The Instructor Competency Framework:

For instructors, CBTA extends this foundation by developing their ability to assess, instruct and manage the learning environment effectively. By aligning pilot and instructor competencies (Instructor and Examiner Competences – IECs), CBTA offers a consistent, performance-driven approach that supports lifelong learning and elevates the overall quality and safety of aviation training.

The IECs support an adult learning paradigm that considers self-reflection and how eager pilot trainees are to learn, how relevant the training is to them, the need for facilitation and mentorship, the importance of connecting what they learn to real-life experiences, and trainees' motivation to get better. **The five IECs include the following:**



PILOT COMPETENCIES

The foundation for instructors is to be able to demonstrate aptitude in the pilot competencies in their own operations and in their training.



MANAGEMENT OF LEARNING ENVIRONMENT

Instructors must take steps to maximize attention, minimize distractions and to foster productive training as possible.



INSTRUCTION

Instructors develop trainees' competencies, by applying different instructional methods (such as facilitation, discover without assistance) that continuously encourage trainees to meet the training objectives.



INTERACTION WITH TRAINEES

Instructors must encourage an open, facilitative and welcoming training environment where trainees feel comfortable to ask for help and express their needs, concerns and questions.



ASSESSMENT AND EVALUATION

Instructors must be adept at CBTA/EBT assessment through a systematic process using: evidence observed during training, root-cause analysis of performance through observable behaviors (OBs), and data documentation to improve trainee learning and training curriculum.

Comparing CBTA and Traditional Pilot Training Approaches

Boeing CBTA differs from traditional training by focusing on pilot competencies beyond task proficiency. It is student-centered, using real operational data and performance-based assessments to build resilient, well-rounded pilots. Traditional training is instructor-led, task-based, and relies on fixed testing criteria without continuous performance feedback. CBTA is more adaptive, data-driven, and aligned with modern aviation needs.

The Benefits of CBTA		
	Traditional Training ↓	CBTA ↓
Curriculum	Three primary technical training elements: handling skills, automation management and application of procedures	Nine Pilot Competencies and TEM (Threat and Error Management) framework
Goal	Check against a task list, with hours-driven training and test-based learning objectives	Develop competent and resilient pilots, with broad scope of human factors and non-technical development areas
Instructor	Instructor-centered	Trainee-centered, using facilitation techniques to support pilot competency and confidence
Assessment	Event-based, measurement determined by fixed, predetermined criteria of numeric flight path deviation and tolerances	Enhanced measurement of standards: pilot performance determined by objective, observable criteria
Licensing	Requirements based on negative outcomes - incidents/accidents	Relevant licensing system based on factors that contribute to successful safe operations
Metrics/ Data	Limited metrics, with no prescribed framework and limited data integration	Comprehensive metrics based on evidence, sustaining monitoring/enhancement of training systems with actionable SMS (Safety Management System)

Building-Block Progression in CBTA Courseware Design

The Pilot Competency Framework serves as the foundation for courseware development. This structured, building-block approach begins with application of knowledge, typically introduced through systems training.

In Boeing type rating courses, manual flight path management is emphasized early, using high-fidelity training devices to build core technical skills. As trainees advance, the courseware integrates automation, procedures, and non-normal scenarios to enhance workload management, situational awareness, and decision-making. Finally, communication, leadership and teamwork are layered throughout the program, reinforcing the collaborative skills necessary for safe and effective crew performance.

This comprehensive training progression aligns with real-world operational demands.



Threat and Error Management in CBTA

At the heart of CBTA is the integration of Threat and Error Management (TEM)—a proactive framework for preventing incidents by preparing pilots to recognize, manage and recover from operational risks. In this model, pilot competencies are applied to effectively identify, mitigate, and respond to external threats, internal errors and undesired aircraft states.

Through predictive and reactive monitoring, pilots are trained to anticipate and avoid threats, trap errors, mitigate consequences and recover when necessary. TEM is not just a concept but a core element of CBTA, reinforcing a safety culture that prioritizes preparedness, communication and sound decision-making throughout every stage of flight.



"We're moving away from lecture-style training to a facilitative model that emphasizes human factors, communication, and real-time decision making."

TRENT SMITH

SENIOR MANAGER OF LEARNING DESIGN, BOEING

What is Evidence-Based Training (EBT)?

EBT is a regulator-approved recurrent training program based on CBTA.

EBT is designed around three key elements, in line with CBTA guidelines. Notably, EBT emphasizes the importance of linking industry and operational evidence to create actionable and comprehensive training scenarios for pilots. This includes defining specific events and determining the frequency of exposure to these scenarios.

The EBT process consists of three main elements:

- 1 Evaluation:** Trainees do an initial assessment to determine their needs.
- 2 Maneuver Training:** Trainees are put through a series of maneuvers to demonstrate their proficiency.
- 3 Scenario-Based Training:** Trainees conduct a series of training events following normal procedures, while being introduced to non-normal scenarios.

Phases of EBT Recurrent Training Implementation

The EBT implementation for recurrent training progresses through three phases. It begins with a CBTA overlay that uses CBTA principles but is not yet a formal EBT program. **From here it proceeds to:**

Level 1 (Mixed EBT) retains traditional checks (LPC/OPC) under EASA rules.

Level 2 (Baseline EBT) introduces standardized instructor training and uses data to enhance the training system.

Level 3 (Enhanced EBT) builds further by integrating operator-specific data to tailor training to real-world operational needs, marking the most advanced stage of EBT adoption.

02 Why CBTA and EBT?

The demand for more resilient, adaptive and safety-conscious pilots has never been higher. As aviation traffic continues to grow globally, so do the complexities and risks involved in flight operations. Traditional training methods, which often emphasize rote memorization and rigid checklists, do not adequately prepare pilots to handle dynamic real-world scenarios.

CBTA and EBT respond to this challenge by offering more targeted, effective and holistic approaches to pilot development. CBTA focuses on equipping pilots with essential competencies such as critical thinking, problem-solving and interpersonal skills, which are vital for navigating unexpected challenges on the flight deck. In contrast, EBT uses operational data to tailor training content to the specific risks and scenarios that pilots may encounter in their unique environments.



Complementary Frameworks

CBTA

- Develops Pilot Competencies as a shared mental model
- Emphasizes performance standards (as observable behaviors)
- Enhances measurement system
- Emphasizes training (versus checking), facilitation and coaching
- Is used in type rating, recurrent and instructor training
- Requires instructor CBTA qualification and concordance
- Requires data collection to enhance training

EBT is a CBTA Program

- Operational data defines development of pilot competencies
- Identifies specific training topics (which are the context for development of the pilot competencies); training topics and topic frequency published from analysis of safety and training data
- Evaluator standards based on data outcomes or airline-specific risk data

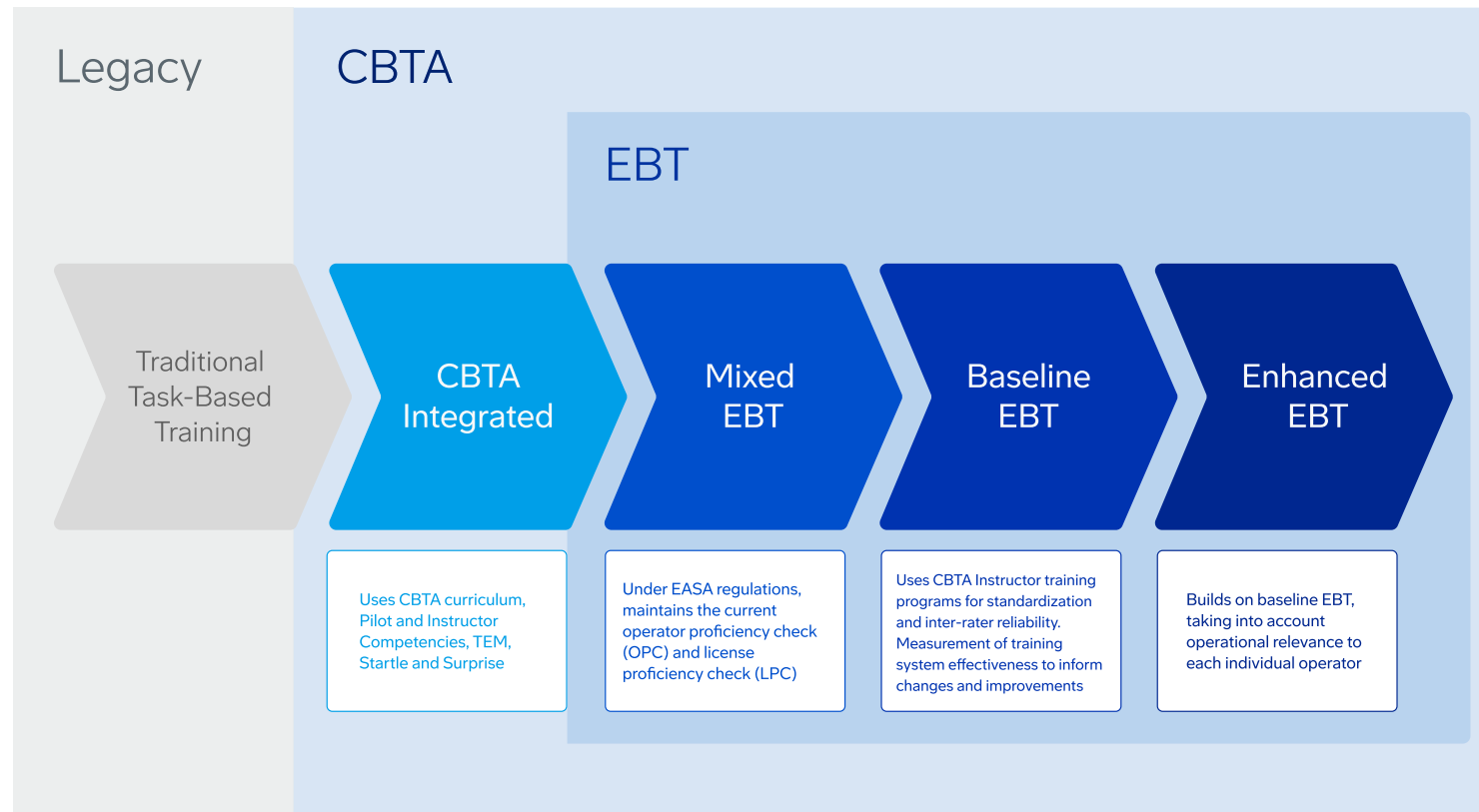
Note: EBT is currently only approved by EASA for recurrent training. EBT is defined by progressive implementation guidelines that govern program sophistication and approvals.

“CBTA/EBT is the pathway to resilient pilots and enhanced flight safety.”

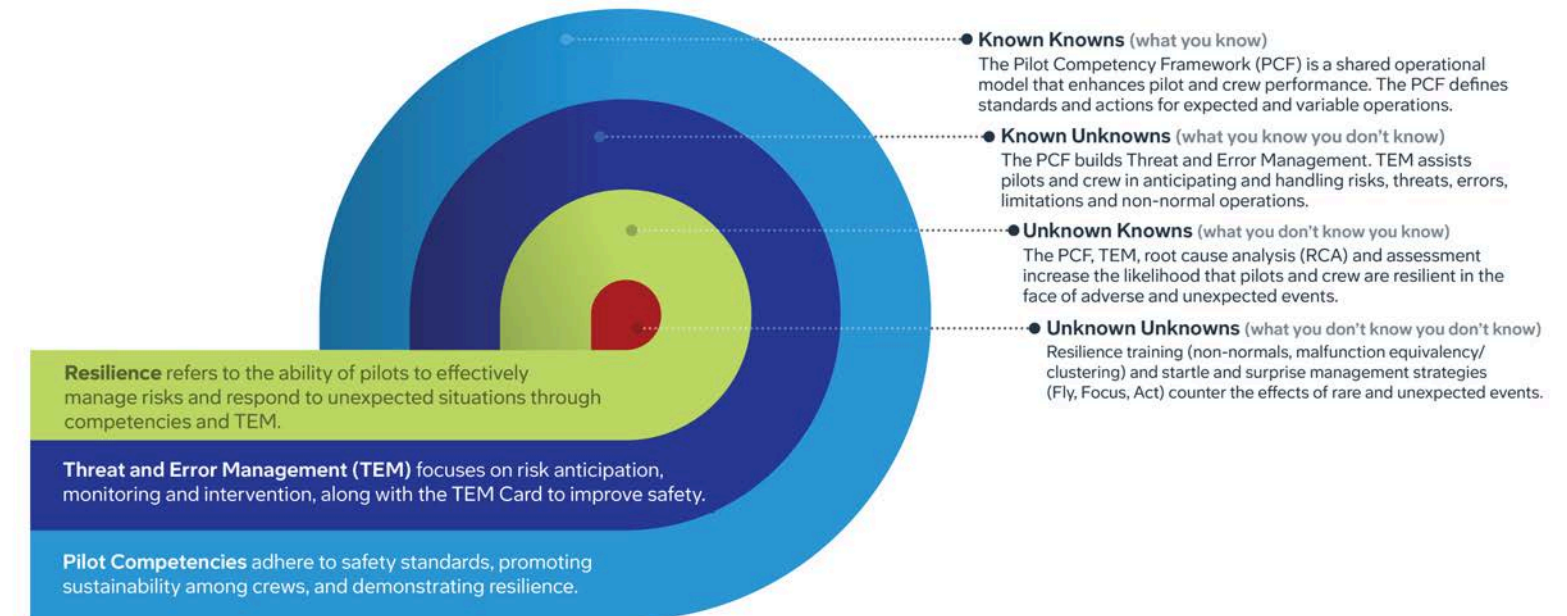
STUART GRUBER
SENIOR AIRLINE TRAINING DEPLOYMENT MANAGER, BOEING

CBTA and EBT Transition Framework

There is an evolutionary path from traditional legacy task-based training toward more modern, performance-driven methodologies. CBTA and EBT show how training organizations progress through several stages starting with CBTA Integrated, where CBTA principles are introduced alongside legacy methods. The next stage, Mixed EBT, blends CBTA with initial elements of EBT. In Baseline EBT, CBTA is fully embedded and supported by evidence-based practices. The final stage, Enhanced EBT, represents a future state. This progression emphasizes the industry's shift toward training models that prioritize real-world competencies, instructor calibration and data-driven decision-making to enhance safety and operational readiness.



Boeing Resilience Model



The knowledge categorization of *Knowns and Unknowns framework* has its roots in Greek philosophy (Socrates), and is based on the work developed in the 1950s in psychology (Luft and Harrington, 1955) for the tool *Johari's Window*. The model is a graphic 2x2 matrix of interpersonal skills that classifies knowledge in relation to observable behaviors and motivation (un)known to others.

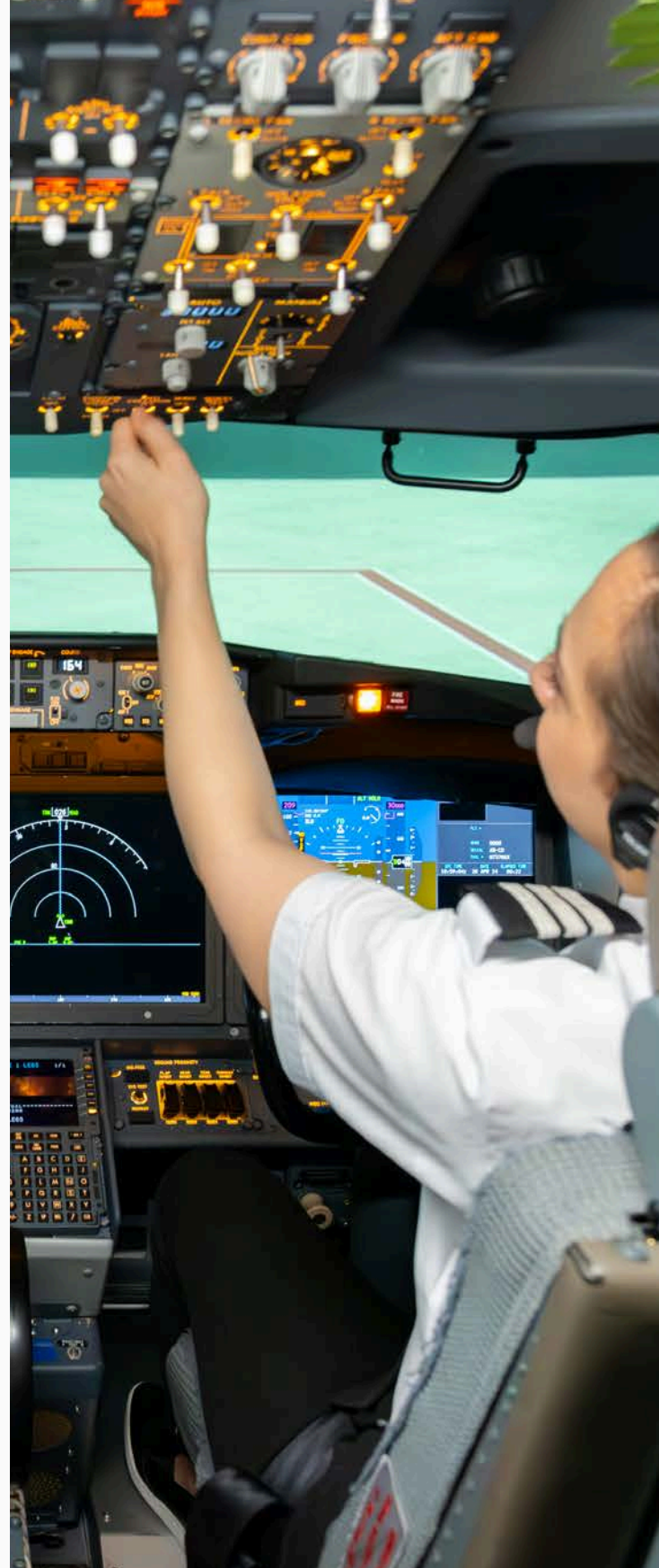
Another similar classification scheme used in curriculum development (Boeing Building Resilience) is the learning model of four stages of Competence published in 1960s, which also describes the process of progressing from unconscious state of incompetence to conscious states of competence.

03

How to apply CBTA/EBT?

Training delivery refers to the methods and processes used by airlines to train their personnel, including pilots and instructors. The goal of training delivery is to enhance training outcomes. Deliberate training delivery methods equip instructors and pilots with the necessary knowledge, skills and attitudes (KSAs).

Training delivery is a multifaceted process that encompasses several essential elements to develop competent and safe pilots. Key components include a structured curriculum, effective instructional methods, and the integration of advanced simulation technologies. Among these, instructor standardization and calibration play a critical role in maintaining consistency and quality across training delivery.



Standardization aligns all instructors to the same training methodologies and assessment criteria when delivering training, which helps to create consistent training experiences and assessments for all trainees.

- | | |
|---|----------------------|
| Standardization | Scenarios |
| Transparent Learning Outcomes | Mentoring |
| Clear CBTA Training Expectations/Objectives | Training Tools/Media |
| Training Aligned to Airline Safety Values/Goals | Facilitation |
| Tailored Training for Individual Need | Continuous Support |
| Safe Learning/Operational Environment | Evaluation/Feedback |

Together, these elements foster cohesive delivery of training, enhance the reliability of training outcomes, and ultimately contribute to the safety and proficiency of pilots at the airline.

Strengthening Instructor Competence for CBTA/EBT

Instructor development is foundational, emphasizing facilitation and coaching techniques over directive instruction to better support pilot learning and performance.

To successfully transition toward CBTA and EBT, instructors must be equipped with both foundational knowledge and consistent assessment practices.

Boeing instructor development framework supports this journey through three key programs:

IOC

The **Instructor Orientation to Competencies** introduces instructors to core CBTA concepts, emphasizing pilot and instructor competencies through facilitated discussions and scenario-based video analysis.

CIT

CBTA Instructor Training builds upon this foundation, preparing instructors not only to apply CBTA principles but also to deliver IOC themselves, reinforcing standardization and inter-rater reliability.

ICAP

The **Instructor Concordance Assurance Program** ensures consistency by measuring alignment among instructors against a defined gold standard, identifying performance gaps and guiding targeted retraining efforts.

Together, these programs provide a structured and scalable approach to instructor readiness, ensuring the successful deployment of CBTA and EBT across airline operations.

"Our instructors undergo continuous observation and quarterly CBTA refreshers to maintain consistency across all training campuses."

SARA MACHA
SENIOR MANAGER OF FLIGHT TRAINING, BOEING

Building a Competency-Driven Ecosystem with CBTA/EBT

The CBTA/EBT Program is a comprehensive, system-wide transformation that aligns pilot training with real-world operational demands through data, engagement, and structured management. At its core, the program shifts focus from task-based instruction to a competency-based approach, starting with updates to the operations manual, engaging regulators and designing a tailored transition plan. Boeing supports airlines in identifying the right types of data, collection methods and meaningful analysis—enabling benchmark comparisons and deeper insights beyond raw metrics.

By integrating the Safety Management System (SMS) with training systems, management competencies are elevated, risks are proactively mitigated, and training needs are accurately addressed. Airline instructors play a key role in this transition through the CBTA-focused training progression, while pilots benefit from performance management and more relevant recurrent training.

Through continuous cascade and assurance, the program ensures long-term impact. The result is a fully-integrated training environment where all stakeholders—from instructors to executives—are aligned on delivering safer, smarter and more resilient operations.

The CBTA Deployment Program is a structured milestone-based framework that supports airlines through the transition toward Mixed and Baseline EBT. This step-by-step approach sustains consistent, scalable implementation—whether an airline has 2 or 2,000 instructors—while fostering long-term self-sufficiency. As with any cultural and operational shift, the CBTA journey takes time, but Boeing mentorship helps airlines at every stage. To learn more about CBTA implementation plans, please visit: services.boeing.com

CBTA/EBT is a risk mitigation program.

CBTA and EBT are advanced, effective, data-driven risk mitigation programs that enable airlines to deliver training aligned with operational needs. Unlike traditional task-based training, CBTA/EBT uses scenario-based learning to address real airline risks and improve pilot performance.

Boeing is developing key tools that work together to optimize training outcomes:

PTA

Boeing Performance and Training Advisor provides actionable insights by integrating training and safety data, reducing the adaptation time for CBTA programs from months to days.

BGA

Boeing Grading App standardizes grading with embedded CBTA logic, enhancing consistency and reducing instructor workload.

BTL

Boeing Training Library manages and delivers training content, allowing for targeted customer engagement, such as CBTA Deployment programs and Maintenance Training.

Together these tools facilitate a transition to flexible, responsive training programs that improve pilot resilience and safety in operations.

Safety Benefits of CBTA/EBT

CBTA is a foundational element of Boeing Global Aerospace Safety strategy, aimed at transforming pilot training to meet the demands of a rapidly growing aviation industry. Traditional, repetitive training models no longer suffice in producing resilient pilots capable of managing unpredictable and high-stress scenarios.

Instead, CBTA and EBT focus on building confidence and adaptability through tailored, data-driven training programs that address specific operational risks unique to each airline. This approach enhances pilot performance and integrates safety and training functions to ensure that training content directly mitigates known airline risks.

Through this model, Boeing supports airline leadership—from the Chief Operating Officer to the Head of Training—in shifting from a compliance-based model to one grounded in continuous safety improvement and management assurance.





Final Thoughts

The transition to CBTA/EBT is not just a regulatory requirement—it is a strategic opportunity to reshape pilot training around safety, performance, and operational relevance. These methodologies are more than instructional tools; they are enablers of a broader cultural transformation that values continuous improvement, evidence-based decision-making and resilient performance under pressure.

Airlines that successfully implement CBTA/EBT will be better positioned to manage operational risk, foster crew collaboration, and ensure consistent instructional quality across their networks. As Boeing continues to support this evolution through structured deployment programs, instructor development, and data-integrated tools, the path forward becomes clear: deliver training that is not only compliant but also agile, tailored and deeply aligned with the realities of flight.

**The future of pilot training is here—
and it is competency-based,
evidence-informed and safety-driven.**

LEARN MORE:

Boeing Global Services Marketing

P.O. Box 3707
Seattle, WA 98124-2207

services.boeing.com

Copyright © 2025-2027 Boeing. All rights reserved.

