

Implementation of evidence-based training (EBT) within the European regulatory framework

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EXECUTIVE SUMMARY

ICAO, in a joint effort with the International Air Transport Association (IATA), the International Federation of Air Line Pilots' Associations (IFALPA) and other industry partners, developed a new paradigm for competency-based training and assessment of flight crew, which is based on evidence (evidence-based training (EBT)). The EBT project is, therefore, a global safety initiative whose objective was to determine the relevance of existing pilot training and to identify the most critical areas of pilot training according to aircraft generation. For that reason, ICAO published Doc 9995 'Manual of Evidence-based Training' (first edition 2013) and other related documentation.

The EBT methodology identifies areas for improvement and allows the prioritisation of critical and relevant training topics which will guide the development of suitable EBT programmes. EBT is intended to enhance the confidence and capability of flight crews to operate the aircraft in all flight regimes and to be able to recognise and manage unexpected situations.

The changes proposed in this Decision will help National Aviation Authorities and CAT operators implement ICAO Doc 995 in the current European regulatory framework. The Guidance Material introduces EBT provisions for operator flight crew training. It addresses the implementation of a mixed EBT programme, allowing the conduct of Licence and Operator Proficiency Checks.

The text of this Decision has been developed by EASA and the EBT task force in order to facilitate the safety benefits of EBT without delay and in anticipation of RMT.0599 'Evidence-based and competency-based training'. For that reason, EASA followed an accelerated procedure where it consulted its relevant advisory bodies, the EBT task force, the French and United Kingdom EBT groups and performed a focus consultation.

Since the draft regulatory text has been widely consulted with relevant stakeholders, no public consultation of the draft proposal was conducted.

It is expected that the implementation experience to be gained after the publication of this Decision will likely serve to reveal most of the difficulties and inconsistencies that need to be addressed in the current regulatory framework during the subsequent rulemaking task RMT.0599 'Evidence-based and competency-based training'.



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1. Procedural information

1.1. The rule development procedure

The European Aviation Safety Agency (hereinafter referred to as the 'Agency') developed this Decision in line with Regulation (EC) No 216/2008¹ (hereinafter referred to as the 'Basic Regulation').

The text of this Decision has been developed by the Agency and the EBT task force in response to the request of the Agency's Executive Director and in anticipation of RMT.0599 'Evidence-based and competency-based training'. In order to facilitate the safety benefits of EBT without delay, the Agency followed an accelerated procedure. Nevertheless, and before the publication of this Decision, the Agency conducted a) a focused consultation with some NAAs and operators not previously included in the EBT task force, b) a consultation with two national EBT groups (chaired by their respective competent authorities), which included a number of operators of the respective countries, and c) it consulted the draft proposal with its advisory bodies² through CIRCABC³. Therefore, the regulatory text was widely consulted and, as a consequence, no public consultation of the draft proposal was conducted.

This Decision contains the guidance material (GM) developed by the Agency and the EBT task force experts.

1.2. Structure of the related documents

Chapter 1 contains the procedural information related to this Decision. Chapter 2 explains the background and technical content of this Decision. The text of the new GM is annexed to the Decision.

¹ Regulation (EC) No 216/2008 of the European Parliament and of the Council of 20 February 2008 on common rules in the field of civil aviation and establishing a European Aviation Safety Agency, and repealing Council Directive 91/670/EEC, Regulation (EC) No 1592/2002 and Directive 2004/36/EC (OJ L 79, 19.3.2008, p. 1).

² The EU/EASA Member States through the Rulemaking Advisory Group (RAG), the Thematic Advisory Groups (TAGs), the industry through the Safety Standards Consultative Committee (SSCC) as well as its Subcommittees.

³ Communication and Information Resource Centre for Administrations, Businesses and Citizens (<https://circabc.europa.eu/faces/jsp/extension/wai/navigation/container.jsp>).



2. Explanatory Note

2.1. Introduction

The EBT project is a global safety initiative whose objective was to determine the relevance of existing pilot training and to identify the most critical areas of pilot training according to aircraft generation. The outcome of this initiative was the publication of ICAO Doc 9868 'Procedures for Air Navigation Services — Training (PANS-TRG)' (Chapters 5 and 6) and ICAO Doc 9995 'Manual of Evidence-based Training'.

Data analyses conducted for the EBT project corroborate independent evidence from multiple sources, which include flight data analyses, reporting programmes and a statistical treatment of factors reported from an extensive database of aircraft accident reports. Both processes and results were peer-reviewed by pilot training experts from airline operators, pilot associations, civil aviation authorities and original equipment manufacturers in order to ensure transparency and to bring a qualitative and practical perspective. During the study, critical core competencies were examined both in technical and non-technical areas, thus offering the opportunity to train and assess flight crews according to a defined, useful and comprehensive set of measurement criteria.

EBT is intended to enhance the confidence and capability of flight crews to operate the aircraft in all flight regimes and to be able to recognise and manage unexpected situations. EBT's objective is to improve manual aircraft control, the management of go-arounds, procedural knowledge of automation and flight management systems (FMSs) in addition to monitoring, cross-checking, error detection and operations in adverse weather.

The development of non-technical performance is an integral part of an EBT programme, and data analyses revealed the significance of certain non-technical competencies in reducing risk in operations. The implementation of EBT will enhance situational awareness in a highly automated and highly reliable system through more effective training and exposure to rapidly developing and dynamic situations.

Data indicates the need for pilots to be exposed to the unexpected in a learning environment, and be more challenged with and immersed in complex situations, rather than being repetitively tested in the execution of manoeuvres.

Data analyses conducted for the EBT project indicate significant differences across what can be considered as three different aircraft generations of jet transport aircraft and two generations of turboprop aircraft. While overlap in training clearly exists, there are quite distinct generational differences in patterns of existing risk that should be addressed during recurrent training and checking.

EBT identifies areas for improvement and allows the prioritisation of critical and relevant training topics which will guide the development of suitable EBT programmes.

The Agency supports the implementation of such change in both the regulation and development of recurrent airline pilot assessment and training.

2.2. Scope

In May 2013 ICAO published Doc 9995 which contains the details of a new approach to recurrent training and checking of flight crew. EBT is the result of a review conducted by representatives of the



aviation industry from 2007 to 2013. The purpose of this document is to describe a process whereby EBT can be implemented by operators and competent authorities whilst complying with the Basic Regulation and its implementing rules, Commission Regulation (EU) No 965/2012, and Commission Regulation (EU) No 1178/2011.

2.3. Background

- The existing international standards and regulations on professional pilot training were originally produced in response to accidents involving early generation jet aircraft. Apart from ‘bolt-on’ additions (usually in the form of manoeuvre-based practices), standards have remained virtually unchanged since inception. During the same period, progressive changes in aircraft design including developments in automation, system integration, reliability and significant changes in the operating environment have demonstrably improved operational safety, but also revealed new operational challenges.
- On 11 February 2014, the Finnish Transport Agency hosted a symposium in Helsinki to present EBT to operators of the region. Discussions with participants and speakers revealed the potential for implementation of the ICAO EBT training programme
- Results from the EBT project demonstrate the safety benefits of a risk-based approach to recurrent training and checking of flight crew. This approach includes taking into account the influence of new aircraft generations which present new challenges.
- An EBT training programme is intended to identify operational risks by using multiple sources of operational data to determine the prioritisation of training topics linked to a competency-based training framework.
- As examples, the analysis of worldwide data revealed consistent and significant risks in the following areas:
 - Flight path — Manual aircraft control: Manual aircraft control skills of pilots can be expected to deteriorate over time as aircraft design improves and the use of automation increases, unless supported by training to maintain and further develop these skills.
 - The unstable approach paradox: Despite the reduction in unstable approaches, the go-around remains a high-risk flight phase, and increased training focus on go-arounds mitigates this risk.
 - Cockpit resource management: According to the Data Report for EBT, flights where outstanding communication and leadership have been observed involve significantly less errors and undesired aircraft states than flights where poor leadership and communication have been observed. This reinforces the need for a continued focus on these skills.
 - Surprise: The effect of the current high levels of operational safety is that the effects of surprise may compound any event. Training to react and recover from surprise events forms a key part of the EBT programme.
 - Prioritisation of training topics: The prioritisation of training topics is the most important result from the data analysis of the EBT report. This process involved the assessment of inputs from multiple data sources and ranking of threats, errors and competencies, as well



as causal factors from incidents and accidents. The process is a key part in translating data into useful training events and scenarios that can be used to assess and develop pilot performance in recurrent training programmes. The process used for the Data Report for EBT is transparent and repeatable and results in a list of prioritised training topics. Three levels of priority (A, B and C, with A having the highest priority) are used to determine the frequency of pilot exposure to the training topics within a 3-year rolling recurrent training programme.

2.4. EBT programme — General

- The EBT programme described in this document refers to recurrent training and checking of flight crew, including licence proficiency checks (LPCs) and operator proficiency checks (OPCs). The EBT programme takes into account the differences between aircraft of different generations and the effect of these differences on training. The aircraft considered are Western-built only. The table below, extracted from ICAO Doc 9995, outlines the categorisation of aircraft into different generations. The operator as agreed by the Competent Authority will include new models in generations according to similar characteristics, for example Airbus A330neo in 'Generation 4 — Jet'.

Generation 4 — Jet	A318/A319/A320/A321 (including neo), A330, A340-200/300, A340-500/600, B777, A380, B787, A350, Bombardier C Series, Embraer E170/E175/E190/E195
Generation 3 — Jet	A310/A300-600, B737-300/400/500, B737-600/700/800 (NG), B737 MAX, B757, B767, B747-400, B747-8, B717, BAE 146, MD11, MD80, MD90, F70, F100, Bombardier CRJ Series, Embraer ERJ 135/145
Generation 3 — Turboprop	ATR 42-600, ATR 72-600, Bombardier Dash 8-400, BAE ATP, Embraer 120, Saab 2000
Generation 2 — Jet	A300 (except A300-600), BAC111, B727, B737-100/200, B747-100/200/300, DC9, DC10, F28, L1011
Generation 2 — Turboprop	ATR 42, ATR 72 (all series except -600), BAE J-41, Fokker F27/50, Bombardier Dash 7 and Dash 8-100/200/300 Series, Convair 580-600 Series, Shorts 330 and 360, Saab 340
Generation 1 — Jet	DC8, B707



— **Development of core competencies**

- The paradigm shift proposed under the EBT programme to use the events as a vehicle for developing and assessing crew performance across a range of core competencies. In addition, EBT shifts the instructor’s focus on the analysis of the root causes to correct inappropriate actions.
- The aim of EBT is to assess and develop performance in **core competencies** by using **behavioural indicators**. This method of assessment and training is different from the methods employed by many operators today. The focus of EBT is specifically on the deployment of these competencies to manage a wide variety of possible operational situations.
- The **core competencies** listed in ICAO Doc 9995 serve as an example. Industry practice and experience indicate that behavioural indicators related to ‘knowledge’ (not defined in Doc 9995) are very useful and may be included as an additional **core competency**:

Competency	Description	Behavioural indicators
Knowledge	Demonstrates knowledge and understanding of relevant information, operating instructions, aircraft systems and the operating environment	<ul style="list-style-type: none"> — Demonstrates practical and applicable knowledge of limitations and systems and their interaction — Demonstrates required knowledge of published operating instructions — Demonstrates knowledge of the physical environment, the air traffic environment including routings, weather, airports and the operational infrastructure — Demonstrates appropriate knowledge of applicable legislation — Knows where to source required information — Demonstrates a positive interest in acquiring knowledge — Is able to apply knowledge effectively

— **Competency-based assessment and grading**

- The implementation of EBT includes the development and use of a competency-based assessment and grading system. Each competency may be rated on a scale according to defined behavioural indicators. The operator should determine which point on the scale indicates the minimum acceptable performance. During the evaluation phase, any **core competency** observed below the minimum should be remediated until acceptable performance is observed.
- The manoeuvres validation phase should be subject to normal repeat and retest requirements where performance below minimum is observed. The main focus of this



phase is to observe the 'Application of Procedures' and 'Aircraft Flight Path Management, automation' or 'Aircraft Flight Path Management, manual control', as indicated in ICAO Doc 9995.

- Achievement of the minimum defined competency levels in the evaluation and manoeuvres validation phase should indicate a pass for the OPC or LPC.

— **Implementation of EBT programmes**

- Operators should implement the baseline EBT programme, which is derived from a rigorous and wide-ranging review and analysis of multiple sources of data over a number of years.
- When the EBT programme was developed, it included a notional 48-hour training in a suitable FSTD for each crew member over a 3-year period. However, to achieve the programme objectives, the duration of the FSTD training may be determined according to the operator's type of aircraft and complexity of operations. The introduction of an EBT programme alone should not be used as a rationale to drive a reduction in the duration of the operator's existing recurrent FSTD training and checking programme.
- Transitions from the baseline to enhanced EBT programme should be undertaken according to the process described in ICAO Doc 9995 Chapter 5.

— **Personnel providing the training**

- A person nominated (refer to ICAO Doc 9995 paragraph 6.3.4) by the operator for the conduct of competency assessments of EBT examiners and instructors should be a person who holds a certificate equivalent to that being assessed, provided that he or she has completed the training and assessment indicated in ICAO Doc 9995 paragraph 6.3.
- ICAO Doc 9995 refers to the assessment of instructor during a practical training session. This is a session conducted in an FSTD as part of an EBT programme, or an equivalent FSTD session (which may involve pilot role-playing) to facilitate standardisation of the examiner or instructor.
- If the practical training session is part of an EBT programme, the session can also be used for revalidation of an examiner or instructor certificate, or to fulfil an operator's or approved training organisation's (ATO) requirement for competency assessment in the delivery of competency-based training.
- ICAO Doc 9995 refers only to instructors for the conduct of EBT. To comply with EU regulations, any items of check completed as part of an EBT programme in compliance with Part-FCL or Part-ORO should be conducted by a type rating examiner (TRE) or synthetic flight examiner (SFE). Any items which do not form part of the equivalent LPC or OPC may be conducted by a type rating inspector (TRI) or synthetic flight instructor (SFI).

— **Malfunction clustering**

- According to the EBT philosophy, failures of aircraft systems and associated procedures are assessed as major according to their impact on crew performance.
- Refers to ICAO Doc 9995 paragraph 3.8.3 and AMC1 ORO.FC.230(a)(4)(i)(A).
- Demonstrated proficiency in the management of one malfunction is then considered



equivalent to demonstrated proficiency in the management of the other malfunctions in the same group. Malfunction characteristics should be considered in isolation from any environmental or operational context.

— **Development and use of malfunction clusters**

The following is intended to guide operators in the analysis of aircraft malfunctions and their use in the EBT programme:

- Compile a list of all aircraft malfunctions.
 - Consider only malfunctions available in the FSTD(s) to be used.
 - Filter any malfunctions which do not place significant demands on a proficient crew member.
 - Consider the remaining malfunctions in isolation from any environmental or operational context.
 - Classify and group malfunctions according to the 5 characteristics:
 - immediacy,
 - complexity,
 - degradation of aircraft control*,
 - loss of instrumentation*,
 - management of consequences.
 - When more than one characteristic is identified, the malfunction may be included in several groups. In this case, only one characteristic may be selected for the purpose of the programme development. Once the analysis is completed, the operator should ensure that at least one malfunction with each characteristic is included in the EBT programme at the frequency indicated in ICAO Doc 9995 Appendices 2–6.
- *Note:* In general, the management of aircraft malfunctions is considered as a crew performance, but where the characteristics ‘Degradation of aircraft control’ and ‘Loss of primary instrumentation’ are considered, each pilot should have the opportunity to perform the role of pilot flying (PF).
- In addition, recurrent training should incorporate training areas of special emphasis (TASE) as described in the operational suitability data (OSD) within the 3-year recurrent training cycle. When special areas of events training are described in the OSD report, they should be incorporated in the 3-year recurrent training cycle.
 - Once the malfunction clustering is completed, required abnormal and emergency procedures check items can be selected to comply with the requirements of Commission Regulation (EU) No 1178/2011 (LPC).
 - Abnormal and emergency procedures check items may also be included where applicable as part of the manoeuvres validation phase.
 - The following table serves as an example only. It is not complete and does not represent a



specific aircraft type.

Malfunction	Immediac y	Complexit y	Degradation of aircraft control	Loss of instruments	Management of consequences
All engine flame-out	✓	✓	✓	✓	✓
Unreliable airspeed	✓	✓		✓	✓
Flaps drive/fault/locked		✓	✓		
ELEC AC Bus fault		✓		✓	
Smoke aft cargo	✓	✓			✓
L/G SYS Disagree/gear Disagree		✓			
Engine fire	✓				✓
Fuel leak					✓

2.5. Safety recommendation

This decision addressed the safety recommendation FRAN-2015-023 from BEA allowing a mixed implementation of EBT in future training programmes and recurrent training.

2.6. Adaptation of ICAO Doc 9995 to EU regulations

As part of RMT.0599, the Agency commits to the development of a dedicated regulation to enable the full deployment of EBT programmes in accordance with the philosophy defined in ICAO Doc 9995.

2.7. Overview of the amendments

Decision 2015/027/R contains the following amendments:

- a) 'GM1 ORO.FC.230 Recurrent training and checking' has been added.
- b) 'GM1 ORO.FC.A.245 Alternative Training and Qualification Programme' has been added.



3. References

3.1. Related regulations

- Commission Regulation (EU) No 965/2012 of 5 October 2012 laying down technical requirements and administrative procedures related to air operations pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council (OJ L 296, 25.10.2012, p. 1)

3.2. Affected decisions

- Decision 2014/017/R of the Executive Director of the European Aviation Safety Agency of 24 April 2014 on Acceptable Means of Compliance and Guidance Material to Part-ORO (OPS — Annex III)

3.3. Reference documents

- ICAO Annex 1 (Personnel Licensing) and Annex 6 (Operation of Aircraft) to the Chicago Convention on International Civil Aviation, signed at Chicago on 7 December 1944
- ICAO Doc 9868 'Procedures for Air Navigation Services — Training (PANS-TRG)'
- ICAO Doc 9995 'Manual of Evidence-based Training'
- IATA/ICAO/IFALPA 'Evidence-Based Training Implementation Guide'
- IATA 'Data Report for Evidence-Based Training'

