European Aviation Safety Agency

Notice of Proposed Amendment 2018-07(A)

Update of ORO.FC — evidence-based training subtask

RMT.0599

EXECUTIVE SUMMARY

The European Aviation Safety Agency (EASA) identified the need to ensure that aviation personnel have the right competencies and training methods to cope with new challenges. This is one of the most significant systemic issues in the European Plan for Aviation Safety (EPAS) 2018-2022.

The objective of this notice of proposed amendment (NPA) is to update the flight crew training requirements to improve pilot competencies. At the same time, it provides additional efficiency in the field of flight crew training and achieves a smooth transition to competency-based training.

The International Civil Aviation Organization (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 recurrent assessment and training of flight crew, which is based on evidence (evidence-based training (EBT)). The EBT project is a global safety initiative whose objective is to determine the relevance of existing pilot training according to aircraft generation. The EBT methodology identifies areas for improvement and allows the re-prioritisation of training topics. 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.

This NPA is a second step in the European rulemaking actions that helps competent authorities, commercial air transport (CAT) operators and approved training organisations (ATOs) to implement EBT. The first step was completed in 2015 with the publication of ED Decision 2015/027/R that provided guidance material to allow the implementation of 'mixed EBT' which maintains the current operator proficiency check (OPC) and licence proficiency check (LPC). This NPA proposes further changes to the Air OPS and Air Crew Regulations to allow the full implementation of EBT, replacing OPC and LPC. This will allow a single philosophy of recurrent training within the airline. Further work is foreseen in rulemaking task (RMT).0599 to allow expansion of EBT to the operator conversion course and initial type rating, while expanding the EBT concept to other types of aircraft (e.g. helicopters and business jets).

The impact assessment (IA) shows that the implementation of EBT on a voluntary basis by the operator is the preferred option in regulating recurrent training and checking of flight crew. It provides an opportunity for the air operator certificate (AOC) holders to implement EBT for recurrent training and checking of the flight crew. The IA illustrates that the proposed rules contribute to significant improvement in safety by strengthening the competencies of flight crews while providing a cost-efficient and socially acceptable framework.

NPA 2018-07 is divided in two parts. The present sub-NPA(A) includes:

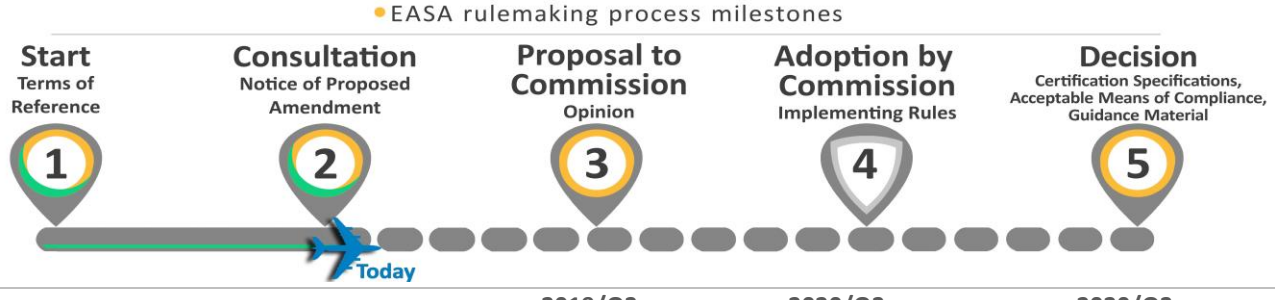
— the presentation of the issue under discussion;

— the impact assessment; and

— the proposed actions to support implementation.

Sub-NPA(B) includes the proposed draft rules (implementing rules, acceptable means of compliance and guidance material.

Action area:	Human factors and competence of personnel		
Affected rules:	Definitions, Part-ARO and Part-ORO of the Air OPS Regulation, Part-FCL and Part-ARA of the Aircrew Regulation (and the associated AMC & GM)		
Affected stakeholders:	Member States, pilots, instructors, examiners, ATOs and operators		
Driver:	Safety	**Rulemaking group:**	Yes
Impact assessment:	Full	**Rulemaking Procedure:**	Standard



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1. About this NPA

1.1. How this NPA was developed

EASA developed this NPA in line with Regulation (EC) No 216/2008[1] (hereinafter referred to as the 'Basic Regulation') and the Rulemaking Procedure[2]. This rulemaking activity is included in the European Plan for Aviation Safety (EPAS) 2018-2022 under rulemaking task (RMT).0599. The text of this NPA has been developed by EASA based on the input of Rulemaking Group (RMG) RMT.0599. This group is divided in the:

(a) Main Group[3], which ensures consistency across the different tasks of RMT.0599. It also develops an aviation blended learning environment (ABLE) concept and deals with other updates of ORO.FC including interoperability solutions;

(b) Evidence-based training (EBT) subgroup[4], that is responsible for developing the EBT concept; and

(c) Helicopter subgroup[5] that is developing and updating the helicopter training requirements including EBT.

This NPA is primarily based on the inputs provided by the EBT subgroup. Due to the novelty of the EBT concept, EASA also consulted the Main group RMT.0599 on a regular basis, organised a workshop[6] with the participation of industry representatives in February 2017 and performed 4 rounds of focus consultation with:

(1) the Netherlands Aerospace Centre (NLR)[7] with regard to instructor concordance and grading;

(2) the Spanish competent authority (AESA)[8] and Iberia[9] for the implementation of the EBT programme;

(3) the Italian competent authority (ENAC)[10] and Alitalia[11] with regard to equivalency of malfunctions; and

(4) CAA Denmark (Trafik)[12] and Thomas Cook Scandinavia[13] on the oversight and follow-up of the EBT programme.

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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) (http://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1467719701894&uri=CELEX:32008R0216).

2 EASA is bound to follow a structured rulemaking process as required by Article 52(1) of Regulation (EC) No 216/2008. Such a process has been adopted by the EASA Management Board (MB) and is referred to as the 'Rulemaking Procedure'. See MB Decision No 18-2015 of 15 December 2015 replacing Decision 01/2012 concerning the procedure to be applied by EASA for the issuing of opinions, certification specifications and guidance material (http://www.easa.europa.eu/the-agency/management-board/decisions/easa-mb-decision-18-2015-rulemaking-procedure).

3 Chaired by Yann Renier (IATA) and Phill Adrian (AIA). Members: Enrique Monzón (AESA España), Rogier Leeflang (IACA), Ståle Rosland (CAA Norway), David Lord (GAMMA). Project management Francisco Arenas Alvariño EASA.

4 Chaired by Phil Cullen (UK CAA). Secretariat Ascanio Russo EASA.

5 Chaired by Tim Rolfe (Heli-offshore).

6 1st Workshop on the Implementation of the Evidence-based Training https://www.easa.europa.eu/newsroom-and-events/events/1st-workshop-implementation-evidence-based-training

7 Focal point: Frederik Mohrmann.

8 Focal point: Carlos Artiles and Enrique Monzón.

9 Focal point: Captain Ignacio Gallego Alemany.

10 Focal point Mario Tortorici and Sandro Apolloni.

11 Focal point: Massimo Giavalisco and Fabio Polloni.

The text of this NPA is hereby submitted to all interested parties[14] for consultation.

1.2. How to comment on this NPA

Please submit your comments using the automated **Comment-Response Tool (CRT)** available at **http://hub.easa.europa.eu/crt/**[15].

The deadline for submission of comments is **31 October 2018.**

1.3. The next steps

Following the closing of the public commenting period, EASA will review all comments.

Based on the comments received, EASA will develop an opinion containing the proposed amendments to Regulation (EU) No 965/2012[16] (hereinafter referred to as the 'Air OPS Regulation') and to Regulation (EU) No 1178/2011[17] (hereinafter referred to as the 'Aircrew Regulation'). The opinion will be submitted to the European Commission, which will use it as a technical basis in order to prepare an EU regulation.

Following the adoption of the regulation, EASA will issue a decision containing the related acceptable means of compliance (AMC) and guidance material (GM).

The comments received and the EASA responses thereto will be reflected in a comment-response document (CRD). The CRD will be annexed to the opinion.

The following future efforts in relation to EBT are foreseen:

— Operator conversion course (OCC) and type rating training for CAT. This activity will ensure a single philosophy of training in the operator. An NPA pertaining to this activity is scheduled to be published in the course of 2021.

— EBT for helicopters and non-commercial complex motor-powered aircraft (NCC). This activity will ensure a single philosophy of training across the industry. This may also allow training data exchange across the industry. An NPA pertaining to this activity is scheduled to be published in the course of 2021.

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12 Focal point Lise-Lotte Olsen Deigaard

13 Focal point: Henrik Lyngse.

14 In accordance with Article 52 of Regulation (EC) No 216/2008 and Articles 6(3) and 7) of the Rulemaking Procedure.

15 In case of technical problems, please contact the CRT webmaster (crt@easa.europa.eu).

16 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) (http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32012R0965&rid=1).

17 Commission Regulation (EU) No 1178/2011 of 3 November 2011 laying down technical requirements and administrative procedures related to civil aviation aircrew pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council (OJ L 311, 25.11.2011, p. 1) (https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1528301490110&uri=CELEX:32011R1178).

2. In summary — why and what

A further analysis of the rationale and objectives addressed by this proposal is provided in the IA Chapter.

2.1. Why we need to change the rules — issue/rationale

The complexity of the aviation system is continuously increasing; also, new technologies are emerging rapidly on the aviation market. Therefore, it is of key importance for the aviation personnel to:

1- have the right competencies through the adaptation of training methods in order to cope with new challenges. This is one of the most significant systemic issues in the EPAS[18], 2016-2020, 2017-2021 and 2018-2022.

2- take advantage of the safety-enhancing opportunities presented by new technologies. (EPAS 2018-2022 Chapter 5.2.2 Human factors and competence of personnel).

2.1.1. Why we need to include EBT in Europe

Aircraft design and reliability has improved steadily and significantly over time; yet, accidents still occur, even in cases when the aircraft and systems were operating without malfunction. It is impossible to foresee all plausible accident scenarios, especially in today's aviation system where its complexity and high reliability mean that the next accident may be something completely unexpected.

In addition to this, the wealth of accident and incident reports and the provision of flight data analysis offer the possibility to identify risks encountered in actual operations and therefore offer the industry with the possibility to tailor training programmes in order to mitigate those risks that flight crew members face in operations.

EBT addresses both elements (prepare the pilot for the unexpected and mitigate operational risks) by moving from task-based training to prioritising the development and assessment of key competencies, leading to a better training outcome. The scenarios recommended in EBT are simply a vehicle and a means to assess and develop competence. Mastering a finite number of competencies should allow a pilot to manage situations in flight that are unforeseen by the aviation industry and for which the pilot has not been specifically trained.

(ICAO Doc 9995 AN/497 'Manual of Evidence-based Training' First edition - 2013 (hereinafter referred to as 'Doc 9995' – Chapter Background).

[18] https://www.easa.europa.eu/easa-and-you/safety-management/european-plan-aviation-safety

2.1.2. Safety recommendations (SRs) — outcome of the EASA safety assessment

The following safety recommendations (SRs) addressed to EASA from aircraft accident investigation report(s) published by the designated safety investigation authority[19], are considered during this RMT.

FRAN-2013-017	The French Accident Investigation Board recommends that EASA, in coordination with manufacturers, operators and major non-European aviation authorities ensure that go-around training integrates instruction explaining the methodology for monitoring primary flight parameters, in particular, pitch, thrust then speed.
Evaluation of the SR	This NPA addresses the SR through the transposition of Appendices 2 to 6 to Doc 9995 where are all the following are required at a frequency of twice per year (frequency A): — the training topics: • monitoring, cross-checking, error management, mismanaged aircraft state; and • go-around management; and — the manoeuvres training on: • go-around, all engines operative; • go-around, all engines operative followed by a visual circuit, manually flown; and • go-around, all engines operative during flare/rejected landing.

FRAN-2013-018	The French Accident Investigation Board recommends that EASA, in cooperation with the national civil aviation authorities and major non-European aviation authorities, ensure that during recurrent periodic training, training organizations and operators give greater importance to the assessment and maintenance of the monitoring capabilities of public transport pilots.
Evaluation of the SR	This NPA addresses the SR through the transposition of Appendices 2 to 6 to Doc 9995 where the training topic: 'Monitoring, cross-checking, error management, mismanaged aircraft state' is required at a frequency of twice per year (Frequency A)

FRAN-2013-022	The French Accident Investigation Board recommends that EASA review regulatory requirements for initial and periodic training in order to ensure that go-arounds with all engines operating are performed sufficiently frequently during training.
Evaluation of the SR	This NPA addresses the SR through the transposition of Appendices 2 to 6 to Doc 9995 where are all the following are required at a frequency of twice per year (frequency A): — the training topic 'Go-around management'; and — the manoeuvres training on: • go-around, all engines operative: high energy, initiation during the approach at 150 to 300 m (500 to 1000 ft) below the missed approach level

[19] Regulation (EU) No 996/2010 of the European Parliament and of the Council of 20 October 2010 on the investigation and prevention of accidents and incidents in civil aviation and repealing Directive 94/56/EC (OJ L 295, 12.11.2010, p. 35) (http://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1479716039678&uri=CELEX:32010R0996).

	off altitude; • go-around, all engines operative followed by a visual circuit, manually flown; and • go-around, all engines operative: during flare/rejected landing.

FRAN-2013-033	The French Accident Investigation Board recommends that EASA, in cooperation with the national civil aviation authorities and major non-European aviation authorities, ensure that the risks associated with dispersion and/or channelized attention during the go-around, to the detriment of the primary flight parameters, be taught to crews.
Evaluation of the SR	This NPA addresses the SR through the transposition of Appendices 2 to 6 to Doc 9995 where are all the following are required at a frequency of twice per year (frequency A): — the training topics: • monitoring, cross-checking, error management, mismanaged aircraft state; and • go-around management; and — the manoeuvres training on: • go-around, all engines operative: high energy, initiation during the approach at 150 to 300 m (500 to 1000 ft) below the missed approach level off altitude; • go-around, all engines operative followed by a visual circuit, manually flown; and • go-around, all engines operative: during flare/rejected landing.

FRAN-2013-035	The French Accident Investigation Board recommends that EASA, in coordination with manufacturers, operators and major non-European aviation authorities, study whether to extend these measures to other procedures requiring high workload in a short time frame.
Evaluation of the SR	This NPA addresses the SR through the transposition of Appendices 2 to 6 to Doc 9995 where training topic 'Competencies non-technical (CRM)' and 14 other example scenarios where the competency 'workload management' is trained, are required at a frequency of twice per year (frequency A), (crew resource management (CRM) includes communication, leadership and teamwork, problem-solving and decision-making, situation awareness, and workload management)

FRAN-2014-005	The French Accident Investigation Board recommends that EASA, in coordination with national authorities, make changes to the training requirements for pilots so as to include periodic reminders on the effects of contaminants such as ice on stall and loss of control on take-off.
Evaluation of the SR	This NPA addresses the SR through the transposition of Appendices 2 to 6 to Doc 9995 where training topic 'adverse weather' is addressed at a frequency of twice per year (Frequency A). Furthermore, for CAT, EASA is taking benefit of this recurrent training and checking scheme to mandate recurrent flight crew upset prevention and recovery training (UPRT) (see ED Decision 2015/012/R, published on 4 May 2015). The related AMC1 ORO.FC.220&230 identifies icing and contamination effects as key components of the upset prevention training programme, and recurrent training now covers all upset aspects over a period not exceeding 3 years. In EBT, these provisions still apply.

FRAN-2015-062	[unofficial translation]: EASA should define the terms on how an operator can set up a risk-based training as described in Doc 9995. [French] [original text] - L'AESA définisse les modalités permettant à un exploitant de mettre en oeuvre la formation basée sur les risques telle que précisée dans le doc OACI 9995 de l'OACI. [Recommandation 2015-062]
Evaluation of the SR	This NPA addresses the SR through the transposition of Doc 9995. Furthermore, ED Decision 2015/027/R[20], published on 16 December 2015, enables the implementation of EBT according to the principles established in Doc 9995 taking into account the European Union regulatory framework.

FRAN-2015-063	[unofficial translation]: EASA promotes CAT operators to consider issues related to CRM and wind shear in the EBT scenario. [French] - L'AESA incite les exploitants de transport aérien commercial à prendre en compte des problématiques relatives au CRM et au cisaillement de vent dans la conception des scénarii EBT. [Recommandation 2015-063]
Evaluation of the SR	This NPA addresses the SR through the transposition of Doc 9995. Furthermore, ED Decision 2015/027/R, published on 16 December 2015, contains new GM to support the implementation of EBT by operators, to be conducted in flight simulation training devices (FSTDs), according to the principles established in Doc 9995. The GM is associated with the existing points (a), b) and (f) of ORO.FC.230 'Recurrent training and checking' and ORO.FC.A.245 'Alternative training and qualification programme' (see Organisation Requirements for Operators - Flight Crew (ORO.FC) of the Air OPS Regulation. CRM and wind shear are specifically addressed in the recurrent assessment and training matrices in Doc 9995, to which the new GM refers.

[20] https://www.easa.europa.eu/document-library/agency-decisions/ed-decision-2015027r

2.1.3. ICAO amendments

Following the work initiated by the Flight Crew Licensing and Training Panel (FCLTP)[21], in 2006 ICAO published Doc 9868 'Procedures for Air Navigation Services — Training (PANS-TRG)' — a document that contains procedures for the development and implementation of a competency-based training programme to support the Annex 1[22] requirements. This was followed in 2013 by an amendment of the aforementioned document for the introduction of EBT, which was accompanied by Doc 9995. The intention was to provide guidance to civil aviation authorities (CAAs), operators and ATOs on the recurrent assessment and training of pilots referred to in ICAO Annex 6 'Operation of Aircraft' and ICAO Annex 1 'Personnel Licensing', 1.2.5 'Validity of licenses'. Finally, through Amendment 2 to Doc 9868 (also issued in 2013), procedures for EBT were introduced in order to provide a means of assessing and training key areas of flight crew performance in a recurrent training system. In addition, more detailed guidance on qualifications of the instructor was provided.

2.2. What we want to achieve — objectives

The overall objectives of the EASA system are defined in Article 2 of the Basic Regulation. This proposal will contribute to the achievement of the overall objectives by addressing the issues outlined in Chapter 2.

The objective of this NPA is to update the flight crew training requirements to improve assessment and training of human factors; in particular, the personnel competence. At the same time, it provides additional efficiency in the field of flight crew training while achieving a smooth transition to competency-based training.

The specific objectives of this proposal are to:

(a) maintain the high aviation safety level by:

  (1) ensuring that the recurrent training and checking programmes are adequate to provide pilots with the necessary knowledge, skills and attitude to be competent in their job— under this objective, EASA proposes in this NPA new provisions to implement EBT as a first step towards the full implementation of competency-based training across Subpart FC of Part-ORO; and

  (2) addressing the SRs outlined in Section 2.1.2 'Safety recommendations';

(b) remain in compliance with ICAO by ensuring that the European rules align with the latest amendments outlined in Section 2.1.3 'ICAO amendments', especially with regard to the EBT; and

(c) contribute to the production of efficient regulations by adapting the necessary training standards and rules to ensure that the level of safety can only be positively affected by:

  (1) introducing performance-based regulation principles;

  (2) ensuring consistency of training-related rules across the applicable parts of Annex III (Part-ORO) to the Air OPS Regulation and Annex I (Part-FCL) to the Aircrew Regulation; and

[21] Meeting held in Montreal, from 8 to 19 December 2003.

[22] International Standards and Recommended Practices ICAO — Annex 1 to the Convention on International Civil Aviation — Personnel Licensing.

(3) ensuring the correct balance between implementing rules (IRs) and AMC & GM on the subject issue.

2.3. How we want to achieve it — overview of the proposals

Doc 9995 contains a complete competency framework ('core competencies') with competency descriptions and related behavioural indicators, encompassing what was previously known as both technical and non-technical knowledge, skills and attitudes. This way, the training content is aligned with the actual competencies necessary to operate safely, effectively and efficiently in a CAT environment.

Following this rationale, EASA decided to contribute to the development of regulations that ensure that pilot training and checking is adequate to provide a pilot with the necessary knowledge, skills and attitude (KSA) to recognise and manage unexpected and unusual situations.

Traditional approaches to training development involve the decomposition of jobs into tasks. For each task, there is a related objective, an assessment and associated elements in a training plan. A limitation of this approach is that each task must be taught and assessed. In complex systems or when jobs evolve rapidly, it may not be possible to teach and assess each task. Moreover, learners may demonstrate the ability to perform tasks in isolation without being competent in their job.

Competency-based assessment and training on the other hand are based on the concept that competencies are transferable. In the design of a competency-based assessment and training programme, a limited number of competencies are defined and used across a variety of activities and contexts.

As new technologies emerge and the complexity of the aviation system increases, the existence of a competency framework is of key importance in order for pilots to be trained on complete and relevant set of competencies. This competency framework should allow pilots to operate more safely, effectively and efficiently in a CAT environment. Furthermore, should allow the training community to adapt their training methods in order to manage unexpected events that are unforeseen through reactive analyses. Mastering a finite number of competencies should allow a pilot to manage situations in flight that are unforeseen by the industry and for which the pilot has not been specifically trained.

In 2014, ICAO established the Competencies Task Force. The task force proposals contained an amended set of definitions for terms related to competencies, a description of how competency-related concepts relate to one another and a generic methodology to design competency-based assessment and training. Furthermore, the ICAO AN-WP/8962 established that many competency frameworks were task-orientated. The task force also addressed the inconsistencies among these different competency frameworks. In addition, it described the relationships between keys concepts in competency-based assessment and training, and outlined the general principles and procedures to be followed in the design and implementation of competency-based assessment and training.

2.4. What are the expected benefits and drawbacks of the proposals

Studies[23] show that the effective implementation of EBT should bring a significant contribution to aviation safety by strengthening the competencies of flight crews and empowering them to handle abnormal and unexpected situations safely. It is expected that the safety benefit of EBT would be demonstrated over time by continually improving a system targeted at focused learning. The implementation of the EBT programme should ensure a level of safety at least equivalent to that provided by compliance with ORO.FC.230 of Annex III (Part-ORO) of the Air OPS Regulation and Appendix 9 to (Part-FCL of the Aircrew Regulation. Safety benefits should be expected through a qualitative approach, using competencies to develop resilience by exposure to varying and challenging situations.

The level of education and training of personnel within AOC holders is expected to be improved due to EBT. The EBT concept is designed to maximise learning and minimise formal checking. Where checking is required, it should evolve towards measuring the process of managing situations rather than only the outcome of this process. This will lead to a substantial change towards providing more learning opportunities, by recognising the expectation that professionals should continuously strive to learn and develop their capabilities, rather than only being focused on demonstrating performance according to minimum regulatory standards. The pilots will be assessed and their licences will be revalidated based on evidence from EBT evaluation modules and development of competencies throughout the EBT programme, instead of an LPC. Therefore, the proposal is expected to have positive social impact on the stakeholders (pilots, and organisations). Negative social impact is expected for the examiners whose workload would be reduced due to the revalidation of the licences not based on a single simulator session, but based on the evidence, gained through the EBT system. Reduced workload might affect negatively the current role, position and the number of examiners. Although the amount of training in EBT remains unchanged, the role of the trainer will be now performed under the privileges of type rating instructor (TRI) licence, instead of type rating examiner (TRE) licence.

The cost-benefit analysis (CBA) for a medium/large operator with 1 000 pilots concludes that the implementation of EBT in recurrent training and checking of flight crew is a cost-effective solution. It is expected to cost 0.32 % of a medium/large operator's turnover which is 0.03 % more than the expenditure that same operator makes for running traditional recurrent training and checking for its pilots (very low negative economic impact in terms of costs). In addition, it has the potential to generate significant economic benefits and to introduce an estimated saving of EUR 900 per pilot/year which represent around EUR 900 000 saving per year for the operator which represents 0.02 % of the operator's turnover. The profitability indicators show that the return of investment is generated shortly after 3 years of EBT implementation, considering that competent authorities grant full economic alleviations to the operator. The CBA for a small operator with 100 pilots supports the overall positive economic results. Similarly, to the medium/large operator, EBT has the potential to reap significant economic benefits and to introduce an estimated saving of EUR 1 000 per pilot/year which represents around EUR 100 000 saving per year for the operator. The profitability indicators show that the return of investment is generated 4 years after EBT implementation, considering that competent authorities grant economic alleviations to the operator. The net benefit represents around

[23] There are numerous books and studies that support the benefits of competency based training — Doc 9995, Doc 9868 'PANS TRG', IATA Data report for EBT, IATA EBT implementation Guide and in the educational system: 'A review of twenty years of competency-based training in the Australian vocational education and training system' (author Erica Smith).

0.1 % of the annual turnover of a small operator. Despite that, a small operator may encounter difficulties in EBT implementation that are exhaustively analysed in the RIA.

The requirement for inspectors to be competent in the approval of and the oversight over EBT programmes would result in increased competent authority's costs for staff training in the short term that will be offset with normalisation of the workload in the consecutive years in EBT oversight. In addition, the workload and the relative costs for the competent authority are expected to decrease with the time, as there might be a greater take-up of the EBT programmes by AOC holders. As EBT implementation supports performance- and risk-based oversight, the overall impact on the competent authority is considered very low negative in the first years and neutral in the consecutive years.

Finally, the regulatory impact assessment (RIA) illustrates that the proposed rules for voluntary implementation of EBT by AOC holders contribute to maintaining a high level of aviation safety while providing a cost-efficient and socially acceptable framework. The expected benefits and drawbacks of the proposal are summarised below. For the full impact assessment of alternative options, please refer to the IA.

3. Impact assessment (IA)

3.1. What is the issue

Rapid technological changes and a diverse, dynamic and competitive operating environment create a need for effective and efficient training aligned with the needs of the job. Traditional approaches to training development involve decomposition of jobs into elements or tasks. For each task/element, there is a related objective, an assessment, and the associated elements in a training plan. A limitation of this approach is that each task/element must be taught and assessed. In complex systems or when jobs evolve rapidly, it may not be possible to accommodate all these elements. Moreover, learners may demonstrate the ability to perform any number of tasks without being competent in their job. In that context, pilots need to be exposed to the unexpected in a learning environment, and be more challenged and immersed in dealing with complex situations, rather than repetitively being tested in the execution of specific predefined manoeuvres.

Furthermore, the checking of flight crew does not measure sufficiently the process of managing situations, as it is mainly focused on the outcome of the process by demonstrating performance according to minimum regulatory standards. Hence, it lags behind in providing more learning opportunities and fails to meet the expectation that professionals should continuously strive to learn and to develop their capabilities.

Competency-based training is a performance orientated approach in the assessment and training, putting emphasis on performance standards and their measurement and developing training with regard to the specified performance standard[24]. Competency-based training has been successfully used across many industries. It is based on a job-related performance that encompasses technical task-related skills and non-technical performance. The EBT approach to competency-based training is to ensure that flight crew's performance is captured across a range of observable behavioural indicators, thus guaranteeing that what is trained and checked is relevant to the job.

3.2. Regulatory background and evolution

EASA started in September 2015 RMT.0696 'Implementation of evidence-based training within the European regulatory framework' and created an EBT Task Force to develop interim guidance material (GM) in order to promote a standardised and consistent means for the implementation of EBT within the existing rule structure. This first step was completed with the publication of ED Decision 2015/027/R (published in December 2015) containing GM1 ORO.FC.230 and GM1 ORO.FC.A.245. RMT.0696 followed an accelerated process within the existing regulatory system to bring forward the safety benefits of EBT, by maintaining the existing IRs and AMC, in order to provide a robust safety net until more experience in the EBT concept is gained.

RMT.0696 was planned as an interim step preceding RMT.0599 to gain EBT implementation experience and thus identify certain difficulties and inconsistencies that will need to be addressed through RMT.0599.

[24]. ICAO DOC 9995 Definition

Presently, EASA Member States (and other States that have elected to adhere to the European aviation IRs) do not have a regulatory framework that lends itself to the full implementation of EBT. In fact, within the current regulatory framework, it is only possible to achieve mixed EBT implementation[25].

Data analyses[26] reveal the difficulties encountered by pilots when faced with surprising or unexpected situations. The commercial aviation system has a high level of safety reliability, but there remains a resistant rate of serious and fatal accidents. The availability of substantial data allows a systemic improvement, mostly through reactive redesign, improved operations, training and maintenance/airworthiness activities. This improvement though will result in lead to a decreased rate of serious and fatal accidents, which will become less predictable over time due to the difficulty in predicting the root cause. Since complex linear models could not provide answers to these events, alternative explanations are needed. They can be seen as due to an unexpected combination or aggregation of conditions or events.

The continuous development of pilot core competencies is seen as an effective means to address what will be unexpected and ultimately unforeseeable, the so-called 'black swan' events. One of the key facets of EBT is learning enabled through exposure to unexpected, dynamic and challenging situations. Exposure during training to variable and dynamic threat conditions should help pilots develop and improve their ability to handle unforeseen events. With variability of exposure, confidence should be developed through the repetitive deployment of core competencies under many different conditions and across the aircraft flight envelope. 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 'PANS-TRG' (Chapters 5 and 6). In May 2013, ICAO published Doc 9995 which contains the details of a new approach to recurrent training and checking of flight crew. As part of RMT.0599, EASA commits to the development of a dedicated regulation to enable the full deployment of EBT programmes in accordance with the Doc 9995 philosophy.

The implementation of EBT within the European aviation regulatory framework is a paradigm shift, assessing crew performance across a range of core competencies, rather than checking performance in managing prescribed events. Training topics drawn from comparative risk analyses are used as a vehicle for developing and assessing core competencies. Given the paradigm shift proposed by competency-based programmes like EBT, one of the principal challenges for implementation is the adaptation of the current instructor and examiner population to the concept. With this in mind, competent authorities and operators implementing EBT should focus on the development of instructor and examiner competencies.

The safety risk assessment and analysis of fatal aircraft accidents worldwide for the period 2001-2011 shows that in more than 50 % of these accidents the action of the flight crew was the primary causal factor (CAA UK, 2013). This analysis shows that flight crew handling skills were a factor in 14 % of the accidents, whereas flight crew non-technical skills were a factor in more than twice as many (32 %). It is generally accepted that further improvements in flight safety require a comprehensive review of pilot training (IATA, 2013), and the accident statistics show that the emphasis of this training should be placed on the development of both the non-technical as well as the technical pilot skills.

[25] Mixed EBT implementation means that only some portion of the recurrent assessment and training is dedicated to the application of EBT.

[26] IATA, Data Report for Evidence-based Training, First Edition, August 2014

Traditional (legacy) recurrent training requirements for pilots operating with airlines are, largely, not relevant to the operation of modern multi-crew transport category aeroplanes (IATA, 2011) and have not kept up with the development of the operating environment. The current requirements are largely based on the evidence of accidents involving early-generation jet aircraft (IATA, 2013) and do not reflect the risks of the today operating environment.

Operators and industry bodies have recognised that the legacy training processes do not guarantee that the trained pilots are competent, or they do not adequately address 'human factors' issues (IATA, 2013). Therefore, the implementation of EBT should be a first step towards the full implementation of a competency-based training framework in all aspects of flight crew training and licensing.

The following SRs pertain to specific accidents/incidents. RMT.0599 will ensure that they are taken into account in the scope of the recurrent EBT and checking, either as regards training events during the recurrent training, i.e. 'equivalence of malfunctions', or enhancing training for a specific core competency:

FRAN-2013-017: The French Accident Investigation Board recommends that EASA, in coordination with manufacturers, operators and major non-European aviation authorities ensure that go-around training integrates instruction explaining the methodology for monitoring primary flight parameters, in particular pitch, thrust then speed.

FRAN-2013-018: The French Accident Investigation Board recommends that EASA, in cooperation with the national civil aviation authorities and major non-European aviation authorities, ensure that during recurrent periodic training, training organizations and operators give greater importance to the assessment and maintenance of the monitoring capabilities of public transport pilots.

FRAN-2013-022: The French Accident Investigation Board recommends that EASA review regulatory requirements for initial and periodic training in order to ensure that go-arounds with all engines operating are performed sufficiently frequently during training.

FRAN-2013-033: The French Accident Investigation Board recommends that EASA, in cooperation with the national civil aviation authorities and major non-European aviation authorities, ensure that the risks associated with dispersion and/or channelized attention during the go-around, to the detriment of the primary flight parameters, be taught to crews.

FRAN-2013-035: The French Accident Investigation Board recommends that EASA, in coordination with manufacturers, operators and major non-European aviation authorities, study whether to extend these measures to other procedures requiring high workload in a short time frame.

FRAN-2014-005: The French Accident Investigation Board recommends that EASA, in coordination with national authorities, make changes to the training requirements for pilots so as to include periodic reminders on the effects of contaminants such as ice on stall and loss of control on take-off.

FRAN-2015-062: [unofficial translation]: EASA should define the terms on how an operator can set up a risk-based training as described in Doc 9995. [French] [original text] - L'AESA définisse les modalités permettant à un exploitant de mettre en oeuvre la formation basée sur les risques telle que précisée dans le doc OACI 9995 de l'OACI. [Recommandation 2015-062]

3.2.1. Who is affected

The following stakeholders are affected by the proposed changes of RMT.0599 in recurrent training and checking of pilots:

CAT operators — Full deployment of EBT by the AOC holders will require some changes regarding the recurrent flight crew training and checking (OPC and LPC) in order to accommodate the training under the new philosophy. The impacts will differ for operators who are currently providing legacy recurrent training (under the existing 'prescriptive' requirements) and for those who implemented the alternative training and qualification programme (ATQP). The latter ones are considered much more advanced and close to the implementation of EBT.

Competent authorities — Within the new regulatory proposals and the EBT framework, competent authorities are responsible for approval of EBT recurrent pilot training and regulatory oversight.

Pilots — Pilots would be the 'end users' of the new provisions. However, their role is analysed from the perspective of the impacts for the AOC holders who would undertake necessary changes to shift the recurrent training and checking to the EBT model. Therefore, although pilot data is used, this data is anonymous and pilots are not individually analysed.

Instructors and examiners, according to Subparts J and K of Part-FCL of the Aircrew Regulation and most notably TRIs and TREs. Although RMT.0599 is not directly addressed to instructors and examiners (RMT.0596 'Review provisions for examiners and instructors (Subpart J & K of Part-FCL) is going to integrate the EBT provisions for instructors and examiners in Part-FCL), it affects directly the roles and positions of instructors and examiners and therefore the impact on them is analysed in the current document.

3.2.2. How could the issue/problem evolve

As a matter of example, in the last decade, safety investigation authorities (SIAs) have issued 99 SRs related to flight crew training. These SRs were issued as a result of the investigation of 55 occurrences (accidents, in most of the cases) involving a CAT aeroplane operation with a maximum take-off weight (MTOW) above 5 700 kg. In said occurrences, the SIAs judged the training provided to the flight crew inadequate, inefficient or insufficient for the flight crew to recognise flight deviations and to handle them safely. In almost all cases, the crew received the training in accordance with prescribed requirements at the time of the occurrence.

If no action is taken, these safety issues may remain unaddressed.

Traditional approaches to training could not solve the outlined issues. As mentioned, legacy training involves the decomposition of jobs into elements or tasks, which must be taught and assessed. This approach has certain limitations, because in complex systems or when jobs evolve rapidly, it may not be possible to accommodate all these elements. Moreover, learners may demonstrate the ability to perform any number of tasks without being competent in their job.

The adaptability and flexibility of human work, however, is also a reason behind the failures that occur, although it is rarely the actual cause behind those failures. Actions and responses are almost always based on a limited rather than a complete analysis of the current conditions, i.e. a trade-off between thoroughness and efficiency. Still, since this is the normal mode of acting, normal actions can, by definition, not be wrong. Failures occur when this adjustment goes away, even though both the actions and the principles of adjustment are technically correct.

In order to respond to these challenges, continuous development of pilot core competencies is seen as an effective means to address them. EBT enables exposure to unexpected, dynamic and challenging situations to variable and dynamic threat conditions, which should help pilots develop and improve their ability to handle unforeseen events. This should be done through the repetitive deployment of core competencies under many different conditions and across the aircraft flight envelope.

It is acknowledged that EBT will provide a more flexible and efficient framework as operators will provide flight crew training that will:

— address the core competencies; and

— consider specific risks they face and thus be tailored to their needs.

3.3. What we want to achieve — objectives

The objectives of the European Union (EU) in the field of civil aviation are defined in Article 2 of the Basic Regulation. This RMT will contribute to the achievement of these objectives by addressing the issues outlined above.

The specific objectives of this proposal are to:

(a) maintain the high aviation safety level by:

(1) ensuring that the recurrent training and checking programmes are adequate to provide pilots with the necessary knowledge, skills and attitude to be competent in their job— under this objective, EASA proposes in this NPA new provisions to implement EBT as a first step towards the full implementation of competency-based training across Subpart FC of Part-ORO; and

(2) addressing the SRs outlined in Section 2.1.2 'Safety recommendations';

(b) remain in compliance with ICAO by ensuring that the European rules align with the latest amendments outlined in Section 2.1.3 'ICAO amendments', especially with regard to the EBT; and

(c) contribute to the production of efficient regulations by adapting the necessary training standards and rules to ensure that the level of safety can only be positively affected by:

(1) introducing performance-based regulation principles;

(2) ensuring consistency of training-related rules across the applicable parts of Annex III (Part-ORO) to the Air OPS Regulation and Annex I (Part-FCL) to the Aircrew Regulation; and

(3) ensuring the correct balance between implementing rules (IRs) and AMC & GM on the subject issue.

3.4. How it could be achieved — options

The analysis of the most controversial issues was followed by a definition of the policy options regarding the implementation of EBT for the recurrent training and checking. The following options have been identified to address the issues presented above.

Table 1: Initial list of policy options

Option	*Short title*	**Description**
0	No policy change	Continuation of legacy training or ATQP for the conduct of recurrent training and checking to flight crew. In addition, ED Decision 2015/027/R[27] developed interim guidance material (GM) in order to promote a standardised and consistent means for the implementation of EBT within the existing rule structure. It allows therefore mixed EBT implementation where EBT is implemented only for a certain portion of the recurrent assessment and training. The risks and the problems stay unresolved, as mentioned in the issue analysis.
1	Voluntary EBT	It provides an opportunity for the AOC holders to take a decision to implement the EBT system for the recurrent training and checking of the flight crew, including LPCs and OPCs. It means that the operator will shift from following the existing 'prescriptive' (legacy) training or ATQP to EBT recurrent training and checking. This option has three sub-options:
1.1	*Implement EBT within the current licence revalidation process*	*It envisages a traditional LPC and renewal/revalidation of the licence according to the current system (1 module LPC and 3 other modules of EBT). During the LPC simulator check, pilots undergo a check of prescriptive manoeuvres according to Appendix 9 to the Aircrew Regulation.* *This option maintains the current examination system, performed by the TREs based on the simulator results.*
1.2	*Implement EBT with revalidation of licence restricted to the AOC holder*	*It envisages that the licence will not be revalidated, but it will have a restricted validation within the AOC holder. It will not be signed by an examiner, but by an AOC holder. This sub-option restricts the exercise of the privileges of the pilot licence in that particular AOC holder.*
1.3	*Implement EBT with separation of the administrative action of revalidation of licence from the technical assessment/check of the pilots*	*This option envisages a separation of the administrative work for revalidation of the pilot licence from the technical work for assessment of the pilot.* *The administrative work will be maintained and performed by the TREs, as the current system suggests. TREs will continue to revalidate the licence; however, not based on the simulator results, but based on evidence provided by EBT. This option guarantees that pilots will be assessed and their licences will be revalidated based on additional evidence from EBT evaluation modules. The assessment will be disconnected from the revalidation of the licence and this would ensure a more objective revalidation process.* *The revalidation of the licence will be signed by the TREs and the validity of the licence will be maintained for 1 year (as currently).* *The TREs will be the nominated person of crew (or the deputy(ies)) as they have the responsibility of the EBT programme, meaning they are responsible for the*

[27] https://www.easa.europa.eu/system/files/dfu/ED%20Decision%202015-027-R%20-%20Explanatory%20Note%20.pdf

Option	*Short title*	**Description**
		evidence provided by EBT. *The technical part will be performed by the AOC TRIs based on the concept of the continuous monitoring of the pilots' performance.*
2	Mandatory EBT	This option envisages mandatory EBT for all operators and discontinuation of the legacy training. Implementation of mandatory use of competency-based training in all flight crew training performed by an AOC holder. Furthermore, for those types of aircraft subject to EBT (see Appendix 2 to Doc 9995), its implementation would be mandatory by removing the current prescriptive rules, thus making EBT the only alternative to ATQP. In terms of content, this policy option has the same features and description as policy option 1. However, it is defined as a separate alternative, because it refers to mandatory EBT.

Based on an initial analysis of the options, the following sub-options have been discarded due to the reasons mentioned below:

Table 2: List of discarded policy sub-options

Sub-option	*Title*	*Rationale for being discarded*
1.1	Implement EBT within the current licence revalidation process	— Retaining LPC in its current form does not support the full EBT competency-based training according to Doc 9995. — Assessing the performance of the pilots based on the simulator prescriptive manoeuvres results in the LPC does not consider the whole EBT concept.
1.2	Implement EBT with revalidation of licence restricted to the AOC holder	— It implies restricted validation of the licence to the particular AOC holder (similar to the MPL type rating). — It may lead to potential problems with third-country authorities (in the SAFA inspections) because there might be a risk of grounding the aircraft, as their licence will not have any validation period. — The pilots will not be able to work for another AOC holder because the revalidation will be only for the AOC holder for whom they are working. This may have potential negative social and economic costs and might lead to administrative burden. — It would deteriorate the level playing field between the AOC holders. — The role of the examiners would disappear, thus leading to serious negative social and economic impact. — There is legal uncertainty in the Member States' national legal systems because the revalidation of the licence is a public service attested by a public document issued by the competent authorities.

The final list of retained policy options is presented in the table below.

Table 3: Final list of policy options

Option	***Short title***	**Description**
0	No policy change	Continuation of legacy training or ATQP for the conduct of recurrent training and checking to flight crew. In addition, ED Decision 2015/027/R developed interim guidance material (GM) in order to promote a standardised and consistent means for the implementation of EBT within the existing rule structure. It allows therefore mixed EBT implementation where EBT is implemented only for a certain portion of the recurrent assessment and training. The risks and the problems stay unresolved, as mentioned in the issue analysis.
1	Voluntary EBT	It provides an opportunity for the AOC holders to take a decision to implement the EBT system for the recurrent training and checking of their pilots and to shift from following the existing 'prescriptive' (legacy) training or ATQP to EBT. It envisages a separation of the administrative work for revalidation of the pilot licence from the technical work for assessment of the pilot. The administrative work will be maintained and performed by the TREs, as the current system suggests. TREs will continue to revalidate the licence; however, not based on the simulator results, but based on evidence provided by EBT. This option guarantees that the pilots will be assessed and their licences will be revalidated based on additional evidence from EBT evaluation modules. The assessment will be disconnected from the revalidation of the licence and this would ensure a more objective revalidation process. The revalidation of the licence will be signed by the TREs and the validity of the licence will be maintained for 1 year (as currently). The technical part will be performed by the AOC TRIs based on the concept of the continuous monitoring of the pilots' performance.
2	Mandatory EBT	This option envisages mandatory EBT for all operators and discontinuation of the legacy training. Implementation of mandatory use of competency-based training in all flight crew training performed by an AOC holder. Furthermore, for those types of aircraft subject to EBT (see Appendix 2 to Doc 9995), its implementation would be mandatory by removing the current prescriptive rules, thus making EBT the only alternative to ATQP.

3.5. Methodology and data

3.5.1. Data collection

This RIA is performed based on several sources:

— Questionnaires to the operators representatives of which participate in the RMG

Six AOC holders provided data on their experience in commencing and/or running mixed EBT recurrent training and checking, starting from a different basis. As mentioned in the issue analysis, within the current regulatory framework, it is only possible to achieve mixed EBT implementation[28]. Due to the novelty of the EBT approach in the EU context, there is not extensive expertise in the EASA Member States operators/ATOs for its implementation. Information was, therefore, sought also outside the EU. In the analysis of the responses to the questionnaires, an important distinction was made with regard to the type of recurrent training and checking the operator had before they implemented mixed EBT. Some operators before the implementation of mixed EBT, performed legacy training, others provide ATQP to their pilots. In addition, the size of the operator has also been considered in estimating the impacts. The analysis, therefore, recognises different impacts for small/medium operators in starting and running EBT.

— Questionnaire to other operators who implement EBT for recurrent training and checking

Apart from data from the RMG, complementary sources (e.g. data from other operators) were sought to ensure that different business models and operators who have initiated a shift towards EBT are represented. Hence, the analysis of the expected costs and benefits is based on real cases.

— Questionnaire to the competent authorities

Data regarding the impact of EBT on the workload, fees, charges and internal work was analysed from EU and non-EU competent authorities. They were contacted as part of or through the RMG members, some of whom were representatives of competent authorities.

3.5.2. Methodology applied

The RIA is developed by combining different impact assessment tools:

Cost Benefit Analysis (CBA): it is applied for the economic impacts, because the data on benefits and costs was sufficiently quantified and monetarised. The method entails identification and evaluation of the expected economic benefits and compliance costs for the industry to implement EBT. The outcome is expressed in terms of net present value (NPV), cost-benefit ratio and year of return of investments in EBT. Apart from the advantage of measuring and quantifying the net benefits, the CBA is also chosen due to its quality to quantify the costs and benefits over time. This is considered highly relevant, because the benefits of EBT are unevenly distributed in the years of the EBT implementation and the CBA captures that feature. However, the CBA is performed mainly for the economic impacts. There is no quantification of the safety impacts, because of the limitations of data currently available. Consequently, safety impacts will be qualitatively assessed. The reference period in the CBA is 10 years

[28] Mixed EBT implementation means that only for a portion of the recurrent assessment and training there is application of EBT.

(2018-2027) and the analysis is made following the European Commission guidelines for the CBA[29]. The CBA is performed in several steps:

STEP 1 — Estimation of the costs of recurrent legacy/prescriptive training and checking implementation (baseline scenario)

STEP 2 — Estimation of the costs (one-off and recurrent) for preparation and implementation of EBT

STEP 3 — Calculation of the difference between costs for EBT recurrent training and checking and legacy recurrent training and checking (delta of EBT costs)

STEP 4 — Distribution of the one-off and recurrent costs for EBT, as well as recurrent costs for legacy training in 10 years' time

STEP 5 — Quantification and monetisation of the economic benefits of EBT, e.g. alleviations envisaged in the regulatory proposal for operators who might be granted with these privileges upon the discretion of the competent authority's decision. Distribution of the economic benefits in 10 years' time

STEP 6 — Comparison of the economic benefits and costs for EBT. Calculation of cost-benefit ratio and year of return of investments in EBT

Multi-criteria analysis: multi-criteria analysis allows comparison of all options by scoring them against a set of criteria (safety, social, economics…) through a common qualitative scale. This method allows a trade-off between different impact assessment criteria, e.g. low scores on one criterion may be compensated by high scores on another. MCA covers a wide range of techniques that aim at combining a range of positive and negative impacts into a single framework to allow easier comparison of scenarios. The scoring of the impacts uses a scale of – 5 to + 5 to indicate the negative and positive impacts of each option (i.e. from 'very low' to 'very high' negative/positive impacts).

Table 4: Scale with scoring of the impacts

Positive impact	**Score**	**Negative impact**	**Score**
+ 5	Very high positive impact	– 5	Very high negative impact
+ 4	High positive impact	– 4	High negative impact
+ 3	Medium positive impact	– 3	Medium negative impact
+ 2	Low positive impact	– 2	Low negative impact
+ 1	Very low positive impact	– 1	Very low negative impact
0	Neutral	—	—

[29] http://ec.europa.eu/smart-regulation/better_regulation/documents/com_2015_215_en.pdf

For the economic impacts, the above scale is further detailed with the scores using the budget of the CAs and the turnover of the airlines (for the EASA MS geographic area). The CBA provides the outcome of the economic impact of the regulatory options. These impacts can be measured in relative share against the budget or turnover of a stakeholder group.

Table 5: Definition for the economic scale

			COMPETENT AUTHORITIES	**AIRLINES**
		Turnover (M€) 2016	2 800	220 000
QUALITATIVE DESCRIPTION	Score	Turnover impact		
VERY HIGH IMPACT	+/- 5	> +1.5%	>42.0	>3316.5
		]1 to 1.5 %[	42.0	3316.5
HIGH IMPACT	+/- 4	]0.8 to 1 %[	28.0	2211.0
		]0.6 to 0.8 %[	22.4	1768.8
MEDIUM IMPACT	+/- 3	]0.4 to 0.6 %[	16.8	1326.6
		]0.2 to 0.4 %[	11.2	884.4
LOW IMPACT	+/- 2	]0.1 to 0.2 %[	5.6	442.2
		]0.05 to 0.1 %[	2.8	221.1
VERY LOW IMPACT	+/- 1	]0.02 to 0.05 %[	1.4	110.6
		]0 to 0.02 %[	0.6	44.2
NEUTRAL	0		0.3	22.1

Case studies: Due to the complexity of the issue and the existence of different business models for operators[30], it is difficult to represent all different models and analyse their impact. Therefore, it is suggested to illustrate the impact through examples of the impacts for the options mentioned above. Hence, there are two examples of operators who undertake EBT. One is a small size operator (with a small fleet and 100 pilots) and the other one is a medium/large operator (with a medium fleet and 1 000 pilots). For larger operators, the medium fleet/1 000 pilots can be easily extrapolated with simple maths (e.g. 1 000 pilots multiplied by 10 — 10 000 pilots). All assumptions regarding the type of the operators are presented below.

Impacts analysed: The present RIA analysed the impacts considering several criteria: safety, social, economic. These criteria follow the main objectives of the Basic Regulation. The analysis of the 'General aviation and proportionality issues' is not kept as General Aviation is not affected as their aircraft types are not currently included in EBT. Therefore, General Aviation is not in the scope of this proposal[31] and proportionality issues are analysed in the economic impacts. The proposed approach ensures that the impact is assessed only once, avoiding any risks of double counting.

— In addition, it is important to note that each option was analysed separately, considering the baseline. The assessment of the impacts took into consideration potential costs and benefits having in mind the baseline scenario. However, as policy options 1 and 2 are very similar in terms of content (both bear the same elements and regulatory proposals), the differentiation

[30] Point to point operator (P2P), Hub and Spoke operator (H&S), Operators running mainly long-haul and/or and short-haul flights or combination of them, etc.

[31] RMT.0599 may study the extension of EBT to General Aviation in 2019.

between them is mainly in the way EBT will be implemented by the stakeholders: in the first case on a voluntary basis, in the second case as a compulsory requirement.

3.6. What are the impacts

3.6.1. Safety impact

Option 0 — No policy change

Safety risks continue to exist as mentioned in the issue analysis. The exposure to the safety risks will remain and the current safety level will be maintained. Therefore, the safety level score is assessed as neutral (score 0).

Option 1 — Voluntary EBT

Due to the nature of EBT, it is difficult to assess its safety impact. However, there is evidence showing that the proper implementation of EBT will significantly improve aviation safety by strengthening the core competencies of flight crew and helping them to handle abnormal and unexpected situations safely.

There have been several research studies as regards the development of the EBT concept and its implementation assessment. In the context of this RIA, it is worth mentioning the Man4Gen Study[32], which showed the transferability of the core competencies between scenarios. This conclusion would reinforce the idea that training the flight crew in core competencies, rather than in executing specific manoeuvres, enables them to handle a wider range of scenarios with higher levels of resilience.

In addition, the experience of operators that have implemented EBT or training methodologies with similar goals (i.e. ATQP, the Federal Aviation Administration Advanced Qualification Program – AQP) shows that flight crew are better prepared to take over highly-automated operations and to apply a more consistent and quick decision-making in those moments with high workload. These operators have also noticed the positive feedback from the flight crew being trained with those training methodologies, as they feel better prepared, especially with regard to the performance of the line-orientated evaluation (LOE). The data[33] shows that the remedial training for flight crew who fail in the LPCs and OPCs is reduced by half (50 %) after the implementation of mixed EBT. Apart from a significant benefit from a safety perspective, this also has a positive economic implication.

It is expected that the safety benefit of EBT would be demonstrated over time by continually improving a system targeted at focused learning[34]. The implementation of the programme should ensure a level of safety at least equivalent to that provided by compliance with ORO.FC.230 of Appendix 9 to Annex I (Part-FCL) to the Aircrew Regulation, by continuing to focus on legacy items of check, albeit within a different structure. Safety benefits should be expected through a qualitative approach, using core competencies to develop resilience by exposure to challenging situations.

This option would have the potential to deliver a significant improvement in safety. An EBT programme is intended to identify operational risks by using multiple sources of operational data to determine the

[32] www.man4gen.eu
[33] Based on the feedback by operators who implemented full EBT worldwide, 2008-2015, EASA questionnaire 2016
[34] IATA, Data Report for Evidence-based Training, 2013.

prioritisation of training topics linked to a competency-based training framework. As examples[35], 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.

— Crew 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 involves 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 improve 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.

In addition to the improvement from an increased take-up of EBT, aircraft operators would be able to develop less complex training programmes, tailored to the identified risks, and to implement the principles of competency-based training in all training programmes. The overall result would be better training of the pilots involved and a lower flight-crew-related accident rate in the future. Although, the implementation of EBT within this option is voluntary, it is expected that a significant number of operators will apply EBT due to the benefits it renders. Hence, the safety impact of Option 1 is scored as +2 (low positive impact).

[35] IATA, Data Report for Evidence-based Training, 2013

Option 2 — Mandatory EBT

This option would provide a higher level of safety as it would ensure that all flight crew training for AOC holders is conducted in a competency-based framework tailored to the risks identified in operations. It is therefore scored with +3 (medium positive safety impact).

Based on the analysis above, the safety impact assessment is visualised as follows:

Table 6: Safety impacts per option

Criteria	*Option 0* *No policy change*	*Option 1* *Voluntary EBT*	*Option 2* *Mandatory EBT*
Safety (for the operator)	Safety level is maintained.	**Improved safety** Safety will improve due to better training focused on the operational risks. The flight crew would be better prepared to take over highly-automated operations and to apply a more consistent and quick decision-making in moments with high workload, leading to an expected decrease in the flight-crew-related accident rate in the future.	
Safety (for the industry)		**Low positive** For the EU industry: Due to the nature of the implementation (on a voluntary basis), the deployment of EBT may not encompass the whole market.	**Medium positive** For the EU industry: Medium positive safety impact, because it would apply to the whole industry.
	0	**+2**	**+3**

3.6.2. Environmental impact

Not applicable.

3.6.3. Social impact

Option 0 — No policy change

No social impact is anticipated from Option 0. The social impact score is 0 (no impact/neutral).

Option 1 — Voluntary EBT

This option has the following social impacts:

— Positive impact on consultancies and companies with EBT expertise: It is expected that the number of consultancies and companies with EBT expertise would increase as they would expand their business and might increase the number of employees. Positive effects would be

generated for the training developers and training providers because many aircraft operators would need to develop/build on expertise and extend knowledge in the field.

— Positive impact on AOC holders and flight crew: The level of education and training of personnel of AOC holders is expected to be raised due to EBT. The EBT concept is designed to maximise learning and minimise formal checking. Where checking is required, it should evolve towards measuring the process of managing situations rather than only the outcome of this process. This will lead to a substantial change towards providing more learning opportunities, by recognising the expectation that professionals should continuously strive to learn and increase their capabilities, rather than only being focused on demonstrating performance according to minimum regulatory standards. The pilots will be assessed and their licences will be revalidated based on additional evidence from EBT evaluation modules. In addition, EBT is focused on the deployment of core competencies[36] and on the process of using them to mitigate challenging situations, rather than on the measurement of simple outcomes in the performance of standard manoeuvres. Based on the improved skills and competencies, EBT might also have also a potential positive effect on the flight crew career development. Another positive impact lies within the proposed changes for revalidation of the flight crew licences. It is suggested that there would be separate processes for the administrative work for revalidation of the pilot licence and for the technical work for assessment of the pilot. The administrative work will be maintained and performed by the TREs, as the current system suggests. TREs will continue to revalidate the licence; however, not based on the simulator results, but based on evidence provided by EBT. This option guarantees that pilots will be assessed and their licences will be revalidated based on additional evidence from EBT evaluation modules. Therefore, the revalidation process would be more objective and that might result in additional positive social benefit for the flight crew.

— Positive impact on TRIs/TREs: They would be positively affected by this option, because they will receive competency-based training that would improve their knowledge and skills. The line check of the flight crew ('line evaluation' in EBT terminology) will require an EBT instructor, while so far it is performed by a nominated person. That change would result in strengthening the role of the TRIs as they need to perform the line evaluation in EBT.

— Negative impact on TREs: The workload and the volume and scope of the work performed by the TREs would be reduced as the revalidation of the licences will not be based on a single simulator session; it will be based on the evidence gained through the EBT system. The reduced workload might affect negatively the current role, position and the number of examiners. Although the amount of training in EBT remains unchanged, the role of the trainer will be now performed under the privileges of the TRI certificate, instead of the TRE certificate.

— Positive impacts on competent authorities: The inspectors at the competed authority will be positively affected because they would improve their knowledge by following EBT training and/or participating in all phases of the implementation of EBT by the operator and by overseeing the training of TRIs/TREs.

Based on the analysis above, the overall social impact of Option 1 is scored as +2 (low positive).

[36] 'Competency-based training is the approach used to deliver the content of EBT programmes' (Doc 9995, Chapter 7)

Option 2 — Mandatory EBT

The above-mentioned impacts are valid for Option 2 as well, but this option is expected to trigger much higher positive social impact (medium positive impact +3), because the benefits explained above will be reaped by all operators (higher population), flight crew, etc. In addition, it would result in more opportunities for development of the EBT developers and providers and thus positively affect employment.

Table 7: Social impacts per option

Criteria	*Option 0 No policy change*	*Option 1 Voluntary EBT*	*Option 2 Mandatory EBT*
Social impact	No social impacts	**Low positive** Improvement in the skills, knowledge of all stakeholders; more objective revalidation licence process, based on evidence provided by EBT. Some negative impacts for TREs whose volume of work for licence revalidation will decrease.	**Medium positive** Same impacts for all stakeholders as in Option 1, but for all AOC holders, flight crew, EBT training developers/providers, etc. Some negative impacts for TREs whose volume of work for licence revalidation will decrease.
	0	+2	+3

3.6.4. Economic impact

3.6.4.1 Option 0 — No policy change

No impact.

3.6.4.2 Option 1 — Voluntary EBT

The economic impacts are analysed for operators and for EASA Member States' competent authorities. As mentioned in the methodological note, a CBA is performed to assess the costs and benefits of EBT implementation.

3.6.4.2.1 Economic impact for the operators

The current section is based on two case studies:

— Case study 1: Economic impacts for a medium/large operator

— Case study 2: Economic impacts for a small operator.

The current section explains in detail the assumptions and calculations for these case studies.

Both case studies are prepared for operators that run legacy/prescriptive recurrent training and checking and need to go through the whole preparation process for EBT implementation. The cases do not analyse the transition costs for an operator who is currently running ATQP recurrent training to shift to EBT, because ATQP operators are much more advanced in the implementation of competency-based training and the efforts for them to deploy EBT would be much less in comparison to a legacy training operator. Therefore, the case studies refer to a situation that is much more common and would entail all types of costs (that could be quantified). It is assumed that the ATQP operator would

get benefit from the full CBA, which illustrates the type of compliance costs and expected economic benefits.

Case study 1: Economic impacts for a medium/large operator

This case study is conducted with the following assumptions:

General assumptions

— The airline is not a flight-time-limited airline (e.g. the pilots do not reach the maximum yearly flight time hours, i.e. 1 000 in 12 months according to ORO.FTL.210).

— The airline is a day-duty-limited airline (e.g. the limitation of the pilots is by number of duty days available).

— The airline is running both long-haul and short-haul flights. For simplicity reasons, the flight crew is assumed to carry out short-haul flights.

— Number of pilots (captains and first officer): 1 000

— Number of instructors/examiners: 100, indicatively 10 % of the pilot population

— Number of line checks per year: 600 line checks of all 1 000 pilots which are performed in 600 line check working days

— Number of FSTD sessions (hereinafter referred as 'simulator sessions'): 2 800 simulator sessions of OPC/LPC per year for all pilots at the company (500 crews, 4 sessions per crew which are in total 2 000 sessions per crew; a coefficient of 1.4 is applied to calculate the realistic number of simulator sessions due to the inefficiency in terms of number of pilots undertaking simulators, e.g. not always the captain and the first offers are coupled in the simulator session)

— 1 FTE = 180 working days

— The crew need to travel to the main base/headquarters, where the training is carried out.

— Duration for the development and update of the training programme under the legacy training: 80 working days.

— Fees and charges for approval of the recurrent training programme: EUR 8 400 (source UK CAA fee rate)

— Refresher training for TRIs/TREs:1 working day.

— The annual remuneration of a nominated person for crew training (training manager) is EUR 200 000 per year (full cost for the operator, including gross salary plus the social security contributions for the operator).

— The annual remuneration of an instructor/examiner is estimated at EUR 200 000 (full cost for the operator, including gross salary plus the social security contributions for the operator).

— The annual remuneration of a pilot is estimated at EUR 200 000 (full cost for the operator, including gross salary plus the social security contributions for the operator). It is calculated based on the average remuneration of a captain and a first officer per year.

— The annual remuneration of a captain performing the line check is estimated at EUR 200 000 (full cost for the operator, including gross salary plus the social security contributions for the operator).

— The annual remuneration of a trainer performing the ground training is estimated at EUR 100 000.

Assumptions regarding the OPC and the LPC

— There are 1 LPC and 2 OPC per year per crew and 1 training session per year per crew. In total, there are 4 sessions per year (equivalent to 4 working days). For 3 years, it is considered that the baseline operator provides 48 hours of simulator per crew.

— The simulators are located at the operator's main base/headquarters. There are costs for pilots travelling to the main base/headquarters. 50 % of pilots are travelling to the main base/headquarters for simulator exercise. A coefficient of 0.5 is considered to capture this assumption. For the sake of the exercise, it is assumed that the headquarters is in Spain. The per diem rate taken is for Spain (currently EUR 280 per day[37]).

— TRIs/TREs perform OPC/LPC every 6 months (2.1 days). In total, they are engaged for 4.2 days per year per pilot, because TREs need to do right hand seat qualification or other type of courses.

— Ideally, when OPC and LPC are rostered, one TRI/TRE conducts OPC and LPC in 2.1 days every 6 months (4 days in total per pilot). In reality, the flight crew are coupled for the OPC and LPC. If the people are coupled, within the same day two pilots undergo the OPC and LPC. Therefore, a coefficient of 0.6 is considered.

— The cost for simulator per session is EUR 1 200 per crew.

Assumptions regarding the ground training:

— Ground training is 1 day per year per pilot.

— A trainer conducting ground training is involved for 1 day for 4 pilots. For 1 000 pilots, trainers are engaged for 250 working days.

— The per diems for travel to the main base for the ground training is 3 days per pilot per year (including 2 days for travelling per year per pilot and 1 day for training). 50 % of all pilots are travelling to the main base. A coefficient of 0.5 is used to capture that assumption.

— Assumptions regarding remedial training:

— Remedial training for OPC/LPC is provided to 2.6 % of the pilots/FO who failed in OPC and LPC checks, e.g. 26 pilots.

— Remedial training for line check is provided to 0.25 % of the pilots/FO who failed in line checks, e.g. 2.5 pilots per 1 000 pilots. Since it is negligible, it is not considered in the analysis.

— After the remedial training, the pilots pass OPC, LPC.

— It is assumed that the pilots in remedial training need to fly to the main base to do the OPC/LPC.

[37] https://ec.europa.eu/europeaid/sites/devco/files/perdiem-rate-20150318.pdf

STEP 1 — Estimation of the costs in implementing recurrent legacy/prescriptive training and checking (baseline scenario)

The starting point in analysing the impacts of EBT implementation is defining the current costs in implementing legacy/prescriptive recurrent training and checking for flight crew. The table below illustrates the costs for an operator running such training and checking.

Table 8: Baseline scenario: costs for an operator to run legacy (prescriptive) recurrent training and checking for flight crew

type of costs	type of costs	coefficient rate	Baseline: Legacy training (calculated for a medium/large operator/year)				
			working days per year	FTE per year	unit cost EUR per year	total unit cost (per pilot/instructor year) in EUR (FTE* unit cost)	total cost for the operator (per year) in EUR
1. Update of the recurrent training programme	recurrent		80	0	200 000	88 889	88 889
1a.Approval of recurrent training programme (fees and charges)	*fixed, recurrent*					8 400	8 400
2. Costs for instructors/examiners for refresher training (1 day per instructor/examiner)	recurrent		1	0.01	200 000	1 111	111 111
3. OPC and LPC							
3.1 Cost for OPC & LPC (4 sessions per year in 4 days per pilot/ year)	*recurrent*		4	0.02	200 000	4 444	4 444 444
3.2 Per diems for travelling and doing OPC and LPC (4 days per pilot/year)	*recurrent*	*0.5*	8		280	2 240	112 000
3.3 Costs for TRI/TRE per year to conduct OPC and LPC (1 instructor/examiner for 2 days every 6 months, in total 4 days per year per pilot)	*recurrent*	*0.6*	4	0.02	200 000	4 444	2 666 667
3.4 Cost for the simulators (EUR 1 200 per session/crew) 2 800 sessions for 1 000 crew per year	*recurrent*		2 800		1 200		3 360 000
4. Line check/Line evaluation of competence							
4.1 Cost for line check (1 day line check per pilot; 600 line checks for all 1 000 pilots)	*recurrent*		600	3.33	200 000		666 667
5. Ground training							
5.1 Cost for a trainer for 1 day ground training (250 days for all 1 000 pilots)	*recurrent*		250	1.39	100 000	138 889	138 889

type of costs	**type of costs**	**coefficient rate**	**Baseline: Legacy training (calculated for a medium/large operator/year)**				
			working days per year	**FTE per year**	**unit cost EUR per year**	**total unit cost (per pilot/instructor year) in EUR (FTE* unit cost)**	**total cost for the operator (per year) in EUR**
5.2 Cost for ground training per pilot (alternative occupancy for 1 day training)	*recurrent*		1	0.01	200 000	1 111	1 111 111
5.3 Allowance/per diem for travel of crew to the main base/headquarters for ground training (the trip is 2 days per year per pilot/FO + 1 day for the training).	*recurrent*	*0.50*	3		280	840	420 000
6. Remedial training							
6.1 Cost per crew to do OPC & LPC (4 sessions per year plus days for travelling to the simulator - 4 days in addition (one day before the simulator, 1 day after it is finished); in total 8 days	*recurrent*						115 556
6.2 Per diem for the pilot to do OPC & LPC (allowances for 8 days per pilot for travelling, stay, perform checks, back)	*recurrent*						2 912
6.3 Costs for TRI/TRE per year to conuct OPC and LPC (in total 5 days per year per pilot)	*recurrent*						69 333
6.4 Cost for simulators (EUR 1 200 per session/pilot; 4 sessions per pilot/year)	*recurrent*						87 360
Total costs							**13 403 339**
Turnover of the operator with 1 000 pilots							**4 567 000 000**
% of costs for recurrent training as regards the operator's turnover							0.29 %

STEP 2 — Estimation of the costs (one-off and recurrent) for the preparation and implementation of EBT

As a second step, the costs for the preparation and implementation of EBT are calculated. These costs are incurred considering the following assumptions:

— All general assumptions regarding the operator, explained in Step 1, are valid for EBT.

— The implementation of EBT requires in most of the cases the same type of recurrent costs as for the legacy/prescriptive training. Therefore, the recurrent costs from the traditional model (e.g. for OPC, LPC) are kept with the same amounts and same origin in the EBT model.

— In addition, there are supplementary costs for the preparation, adoption and implementation of EBT. These estimated costs are analysed as one-off and additional recurrent costs due to the deployment of EBT as follows:

- The operator is using an external consultant for 20 days to help develop the EBT competency framework and EBT programme and to train the training manager.
- The consultant trains instructors to deliver EBT: each instructor is trained for 3 working days. 1-day training for the consultant costs EUR 1 300. All 100 instructors are trained for 30 days.
- The instructors/examiners are engaged for 4 days in EBT training (3 days training and 1 working day competency assessment (one-off costs). These days are calculated as part of the EBT costs, because they refer to the alternative occupancy of the TRI/TREs (instead of providing instructions/examining, they are engaged in training).
- The operator's training manager is conducting EBT training for 20 days (one-off cost).
- The operator's training manager is developing an EBT programme for all flight crew for 100 days (one-off cost).
- The operator is purchasing an IT assessment tool to support the implementation of EBT. The tool will be used for electronic reporting/statistical analysis for EBT training, for safety reporting programmes, monitoring of pilot performance. It costs EUR 100 000 (one-off cost).
- Costs for maintaining licences for IT tool are EUR 10 000 per year.

— All other recurrent costs and assumptions, identified for the legacy training are valid for EBT (costs for OPC, LPC, line check, ground training, and remedial training).

The table below illustrates the costs for the preparation and implementation of EBT (one-off costs and recurrent costs).

Table 9: Estimated costs for an operator to provide EBT recurrent training and checking for flight crew

Type of estimated costs	**EBT estimated costs (calculated for a medium/large operator/year)**					
	type of costs	**working days per year**	**FTE per year**	**unit cost EUR per year**	**total unit cost (per pilot/ instructor/ examiner/year) in EUR (FTE* unit cost)**	**total cost for the operator (per year) in EUR**
1. Preparatory costs						
1a.External assistance in setting up the EBT framework to develop the competency framework and develop training programme	*one-off*					100 000
1b.Training of EBT project team (manager)	*one-off*	20	0.11	200 000		22 222
1c.Development of EBT programme by training manager	*one-off*	100	0.56	200 000		111 111
1d.Update of the recurrent training programme	*recurrent same as for legacy training*	80	0.44	200 000		88 888
1e.Approval of recurrent training programme (fees and charges)	*recurrent same as for legacy training*					8 400
1f.Costs for consultants to train instructors to deliver EBT training and assessment (10 classes for 10 instructors — 3 days per instructor)	*one-off*	3		1 300	3 900	390 000
1g.Training of instructors for EBT (3 days per instructor) alternative occupancy and 1 day competency assessment per TRI/TRE	*one-off*	4	0.02	200 000	4 444	444 444
1j.Costs for instructors/examiners for refresher training for EBT (1 day per instructor/examiner)	*recurrent same as for legacy training*	1	0.01	200 000	1 111	111 111
2. Purchase of equipment (IT tool: electronic reporting/statistical analysis) for EBT training (for safety reporting programmes, monitoring of pilot performance)	one-off					200 000
2a. Costs for maintaining licences for IT tool	*recurrent new for EBT*					10 000
3. OPC and LPC / EBT modules						

Type of estimated costs	**EBT estimated costs (calculated for a medium/large operator/year)**					
	type of costs	**working days per year**	**FTE per year**	**unit cost EUR per year**	**total unit cost (per pilot/ instructor/ examiner/year) in EUR (FTE* unit cost)**	**total cost for the operator (per year) in EUR**
3.1 Cost for OPC & LPC (4 sessions per year in 4 days per pilot/ year)	*recurrent same as for legacy training*					4 444 444
3.2 Per diems for travelling and doing OPC and LPC (4 days per pilot/year)	*recurrent same as for legacy training*					112 000
3.3 Costs for TRI/TRE per year to conduct OPC and LPC (1 instructor/examiner for 2 days every 6 months, in total 4 days per year per pilot)	*recurrent same as for legacy training*					2 666 666
3.4 Cost for the simulators (EUR 1 200 per session/crew) 2 800 sessions for 1 000 crew per year	*recurrent same as for legacy training*					3 360 000
4. Line check/Line evaluation of competence						
4.1 Cost for line check (1 day line check per pilot; 600 line checks for all 1 000 pilots)	*recurrent same as for legacy training*					666 666
5. Ground training						
5.1 Cost for a trainer for 1 day ground training (250 days for all 1 000 pilots)	*recurrent same as for legacy training*					138 888
5.2 Cost for ground training per pilot (alternative occupancy for 1 day training)	*recurrent same as for legacy training*					1 111 111
5.3 Allowance/per diem for travel of crew to the main base/headquarters for ground training (the trip is 2 days per year per pilot/FO + 1 day for the training).	*recurrent same as for legacy training*					420 000
6. Remedial training						
6.1 Cost per crew to do OPC & LPC (4 sessions per year plus days for travelling to the simulator - 4 days in addition (one day before the simulator, 1 day after it is finished); in total 8 days	*recurrent same as for legacy training*					115 555

Type of estimated costs	**EBT estimated costs (calculated for a medium/large operator/year)**					
	type of costs	**working days per year**	**FTE per year**	**unit cost EUR per year**	**total unit cost (per pilot/ instructor/ examiner/year) in EUR (FTE* unit cost)**	**total cost for the operator (per year) in EUR**
6.2 Per diem for the pilot to do OPC & LPC (allowances for 8 days per pilot for travelling, stay, perform checks, back)	*recurrent same as for legacy training*					2 912
6.3 Costs for TRI/TRE per year to conduct OPC and LPC (in total 5 days per year per pilot)	*recurrent same as for legacy training*					69 333
6.4 Cost for simulators (EUR 1 200 per session/pilot; 4 sessions per pilot/year)	*recurrent same as for legacy training*					87 360
Total						**14 581 216**
Average turnover of the operator with 1 000 pilots						4 500 000 000
% of costs for recurrent training as regards the operator's turnover						**0.32 %**

STEP 3 — Calculation of the difference between costs for EBT recurrent training and checking and legacy recurrent training and checking (delta of EBT costs)

As already illustrated in Step 1 and Step 2, there are many types of EBT recurrent costs that would be the same as for the legacy training. Therefore, a delta (difference) between the EBT one-off and recurrent costs and legacy training recurrent costs is made to exemplify the real impact in terms of additional costs for EBT implementation. The table below shows the difference (the delta).

Table 10: Difference between costs for an operator when providing EBT and when providing legacy recurrent training and checking

type of costs	**EBT costs (EUR/year)**	**Legacy training costs (EUR/year)**	**Difference**
1. Preparatory costs			
1a.External assistance in setting up the EBT framework to develop the competency framework and develop training programme	100 000		100 000
1b.Training of EBT project team (manager)	22 222		22 222
1c.Development of EBT programme by training manager	111 111		111 111

type of costs	EBT costs (EUR/year)	Legacy training costs (EUR/year)	Difference
1d.Update of the recurrent training programme	88 889	88 889	0
1e.Approval of recurrent training programme (fees and charges)	8 400	8 400	0
1f.Costs for consultants to train instructors to deliver EBT training and assessment (10 classes for 10 instructors, 3 days per instructor)	390 000		390 000
1g.Training of instructors for EBT (3 days per instructor) — alternative occupancy and 1 day competency assessment per TRI/TRE	444 444		444 444
1j.Costs for instructors/examiners for refresher training for EBT (1 day per instructor/examiner)	111 111	111 111	0
2. Purchase of equipment (IT tool: electronic reporting/statistical analysis) for EBT training (for safety reporting programmes, monitoring of pilot performance)	100 000		100 000
2a. Costs for maintaining licences for IT tool	10 000		10 000
3. OPC and LPC / EBT modules			0
3.1 Cost for OPC & LPC (4 sessions per year in 4 days per pilot/year)	4 444 444	4 444 444	0
3.2 Per diems for travelling and doing OPC and LPC (4 days per pilot/year)	112 000	112 000	0
3.3 Costs for TRI/TRE per year to conduct OPC and LPC (1 instructor/examiner for 2 days every 6 months, in total 4 days per year per pilot)	2 666 667	2 666 667	0
3.4 Cost for the simulators (EUR 1 200 per session/crew) 2 800 sessions for 1 000 crew per year	3 360 000	3 360 000	0
4. Line check/Line evaluation of competence			0
4.1 Cost for line check (1 day line check per pilot; 600 line checks for all 1 000 pilots)	666 667	666 667	0
5. Ground training			0
5.1 Cost for a trainer for 1 day ground training (250 days for all 1 000 pilots)	138 889	138 889	0
5.2 Cost for ground training per pilot (alternative occupancy for 1 day training)	1 111 111	1 111 111	0

type of costs	EBT costs (EUR/year)	Legacy training costs (EUR/year)	Difference
5.3 Allowance/per diem for travel of crew to the main base/headquarters for ground training (the trip is 2 days per year per pilot/FO + 1 day for the training).	420 000	420 000	0
6. Remedial training			0
6.1 Cost per crew to do OPC & LPC (4 sessions per year plus days for travelling to the simulator - 4 days in addition (one day before the simulator, 1 day after it is finished); in total 8 days	115 556	115 556	0
6.2 Per diem for the pilot to do OPC & LPC (allowances for 8 days per pilot for travelling, stay, perform checks, back)	2 912	2 912	0
6.3 Costs for TRI/TRE per year to conduct OPC and LPC (in total 5 days per year per pilot)	69 333	69 333	0
6.4 Cost for simulators (EUR 1 200 per session/pilot; 4 sessions per pilot/year)	87 360	87 360	0
Total	**14 581 116**	**13 403 338.67**	**1 177 778**
Incl. total one-off costs only for EBT			**1 167 778**
Incl. total recurrent costs only for EBT			**10 000**
Turnover of the operator with 1 000 pilots	**4 567 000000**		
% of costs from the operator's turnover	**0.32 %**	**0.29 %**	**0.03 %**

Based on the data above, the one-off (initial investment costs) will be around 1,167 million euros and the recurrent costs will be around EUR 10 000. In total, the additional costs for an operator to prepare and implement EBT are estimated at 1,177 million euros, which represents a 0.03 % increase in comparison to the operator's annual turnover. That increase has a very low negative impact, according to Table 5: Definition for the economic scale.

STEP 4 — Distribution of the one-off and recurrent costs for EBT as well as recurrent costs for legacy training

The above-mentioned costs are distributed unevenly within 1-2 years' time depending on the business model of the operator. For the sake of the case study, it is assumed that:

— There are 2 years for EBT preparation. The first preparatory year, the operator runs legacy training and starts EBT one-off costs (training of a manager to be EBT manager and consultancy to develop EBT framework and training programme). The second preparatory year, legacy

training is still running, while the rest of the EBT one-off costs are executed (development of EBT programme, purchase of assessment IT tool, and training of instructors for initial course of EBT).

— The year when the EBT starts is year 3, after all the one-off costs for EBT are incurred. Every consecutive year (from year 4+), EBT is running as envisaged with the recurrent costs, explained above.

— The model is prepared for a 10-year period.

Table 11: Costs for EBT implementation in a 10-year period

	years		***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***
	Short description	Baseline: Legacy training	Preparatory year	Preparatory year:	First year of EBT implementation — discontinue legacy training,	Second year of EBT implementation — discontinue legacy training	Third year of EBT (all EBT costs incurred)	Fourth year of EBT (all EBT costs incurred)	Fifth year of EBT (all EBT costs incurred)	Sixth year of EBT (all EBT costs incurred)	Seventh year of EBT (all EBT costs incurred)	Eighth year of EBT (all EBT costs incurred)
1	**Total costs**	**13 403 339**	**13 525 561**	**14 448 894**	**13 413 339**	**13 413 339**	**13 413 339**	**13 413 339**	**13 413 339**	**13 413 339**	**13 413 339**	**13 413 339**
	One-off investment costs for EBT											
2	Training of a EBT training manager (20 days to develop competency framework) (one-off)		22 222	0	0	0	0	0	0	0	0	0
3	Consultancy to train the training manager and develop EBT framework and training programme (one-off)		100 000	0	0	0	0	0	0	0	0	0
4	Training of instructors to deliver EBT (costs for consultants and daily wages of the instructors) (one-off)			834 444	0	0	0	0	0	0	0	0
5	Purchase of IT tool (one-off)			100 000	0	0		0	0	0	0	0
6	Develop EBT recurrent training programme by the training manager (one-off)			111 111								
	Recurrent costs for legacy training/EBT											
7	Legacy training (recurrent costs)		13 403 339	13 403 339	0	0	0	0	0	0	0	0

	years	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***
8	Update of EBT recurrent training programme by the training manager (recurrent, same cost as for the legacy training)	0	0	88 889	88 889	88 889	88 889	88 889	88 889	88 889	88 889
9	Costs for instructors/examiners for refresher training for EBT (1 day per instructor/examiner) (recurrent, same cost as for the legacy training)			111 111	111 111	111 111	111 111	111 111	111 111	111 111	111 111
10	Approval of the changes in the recurrent training programme by the CA (recurrent, same cost as for the legacy training)			8 400	8 400	8 400	8 400	8 400	8 400	8 400	8 400
11	EBT modules (former OPC and LPC) (recurrent, same cost as for the legacy training)	0	0	10 583 111	10 583 111	10 583 111	10 583 111	10 583 111	10 583 111	10 583 111	10 583 111
12	EBT line check (recurrent, same cost as for the legacy training)	0	0	666 667	666 667	666 667	666 667	666 667	666 667	666 667	666 667
13	EBT ground training (recurrent, same cost as for the legacy training)	0	0	1 670 000	1 670 000	1 670 000	1 670 000	1 670 000	1 670 000	1 670 000	1 670 000
14	EBT remedial training (recurrent, same cost as for the legacy training)	0	0	275 161	275 161	275 161	275 161	275 161	275 161	275 161	275 161

	years	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
15	Costs for maintaining licences for IT tool (recurrent, new cost for EBT)	0	0	10 000	10 000	10 000	10 000	10 000	10 000	10 000	10 000
16	**delta EBT costs in comparison to legacy training costs** *Line 2-line 6 correspond to years 2017 and 2018 and line 7-line 15 for the other years)*	**122 222**	**1 045 556**	**10 000**	**10 000**	**10 000**	**10 000**	**10 000**	**10 000**	**10 000**	**10 000**

STEP 5 — Quantification and monetarisation of the economic benefits in EBT, e.g. alleviations, envisaged in the regulatory proposal for operators who might be granted with these privileges upon a competent authority decision.

The implementation of EBT is expected to bring economic benefits as follows:

— Line check: Two years after EBT implementation, an operator may be allowed to extend the line check, i.e. a pilot's line check requirement is reduced from 1 per year to 1 every two years. The benefit is that the operator is saving the costs it pays annually for the line check of all flight crew.

— Ground training: A pilot's safety equipment procedure (SEP) training requirement is reduced from 1 per year to 1 every two years. The benefit is saving the daily wage of the flight crew. In addition, less CRM training is expected due to the integration of non-technical competencies in the EBT programme (1 day per pilot/year to 1 day per pilot/3 years).

— Saving due to the decrease in percentage of pilots who fail in OPC/LPC: Saving in daily wages of flight crew for the time that they do not fly.

— Indirect saving (flexibility): A reduction in pilot workload is expected due to the flexibility to run simulator sessions outside the peak flying months. The benefit is assumed to be circa 1 % of the annual wage of a pilot saved, multiplied by the number of the pilots who would be available to fly instead of going to simulator.

Some of these economic benefits are already known and granted to the ATQP operators. Currently, the ATQP and its alleviations bring a return on investment in a period of about seven years[38].

These benefits may be granted to the operators after at least 2 years of EBT implementation upon the decision of the competent authority. The latter needs to approve the type and the timing of the alleviations.

In the case study, it is assumed that:

— The operator will fully reap the economic benefits (as mentioned above) 2 years after EBT implementation has been approved by the competent authority. This expectation is based on the historical data on granting alleviations to operators running ATQP.

— 2 years after EBT implementation, there are less operators' flight crew failures in OPC/LPC (20 % decrease in remedial training, e.g. 2.08 % of pilots fail in comparison to the level before EBT implementation (2.6 % failure rate in OPC/LPC).

— 3 years after EBT implementation, there are 40 % less operators' flight crew failures in OPC/LPC (e.g. 1.56 % of pilots fail in comparison to the level before EBT implementation (2.6 % failure rate in passing OPC/LPC)).

— 4 years after EBT implementation, there are 50 % less operators' flight crew failures in OPC/LPC (e.g. 1.3 % of pilots fail in comparison to the level before EBT implementation (2.6 % failure rate in passing OPC/LPC)). That level is kept until the end of the analysed 10-year period.

— All general assumptions regarding the operator are kept in the model.

[38] The return of investment depends on the complexity of operations, the type of aircraft, the approval process, etc.

Regarding the case study, the economic benefits are quantified as follows:

— Savings due to decrease in percentage of pilots failing in OPC/LPC

The benefit is calculated based on the difference between the costs for the operator on the remedial training (EUR 275 160.89) minus the actual costs for the operator due to the decreased percentage of pilots who fail in OPC/LPC (the operator pays remedial training only for 2.08 % of pilots, that is EUR 220 128.71). The difference of the two amounts is generated as a saving for the operator.

— Line check: the costs for the line check are reduced by half (EUR 666 666.67/2= 333 333.33)

— Ground training: the costs for the ground training for all pilots (alternative occupancy for 1 day training per pilot) are reduced by half (EUR 1 111 111.11/2 = 555 555.56)

— Indirect saving (flexibility): although EBT requires a bigger volume of FSTD training per year, this training may be done when the production of the airline is less (outside peak seasons, such as in summer). This flexibility allows a saving of an estimated of 1 % of the annual wage of a pilot, multiplied by the number of the pilots who would be available to fly instead of going to simulator, e.g. (EUR 200 000*1 %*100= EUR 200 000)

Based on these assumptions and explanations, the economic benefits are monetarised in the table below.

Table 12: Economic benefits of EBT implementation in a 10-year period

	years		***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***
	short description	Base line: Legacy training	Preparatory year	Preparatory year	First year of EBT implementation — discontinue legacy training. No economic benefits. Still high failure rate of pilots (2.6 % as in legacy training)	Second year of EBT implementation, discontinue legacy training. No economic benefits. Still high failure rate of pilots (2.6% as in legacy training)	Start of all benefits with less failures in OPC/LPC (2.08 % of pilots fail)	Continued benefits with less failures in OPC/LPC (1.56 % of pilots fail)	Continued benefits with less failures in OPC/LPC (1.3 % of pilots fail)	all benefits as in the previous year	all benefits as in the previous year	all benefits as in the previous year
17	***TOTAL benefits***		0	0	0	0	1 143 921	1 198 953	1 226 469	1 226 469	1 226 469	1 226 469
18	Saving due to decrease in % of pilots failing in OPC/LPC: Saving in daily wage of flight crew for the time that they do not fly.		0	0	0	0	55 032	110 064	137 580	137 580	137 580	137 580
19	Line check: pilot's line check requirement is reduced from 1 per year to 1 per 2 years		0	0	0	0	333 333	333 333	333 333	333 333	333 333	333 333
20	Ground training: Safety equipment procedure (SEP) training: A pilot's SEP training requirement is reduced from 1 per year to 1 per 2 years.		0	0	0	0	555 556	555 556	555 556	555 556	555 556	555 556
21	Indirect saving (flexibility): A reduction in pilot workload due to flexibility to run SIM outside the peak flying months.		0	0	0	0	200 000	200 000	200 000	200 000	200 000	200 000

STEP 6 — Comparison of the economic benefits and costs for EBT. Calculation of cost-benefit ratio and year of return of investments in EBT.

Table 13: Cost-benefit analysis of EBT implementation in a 10-year period39

	years	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***
No	short description	Preparatory year	Preparatory year	First year of EBT implementation — discontinue legacy training. No economic benefits. Still high failure rate of pilots (2.6 % as in legacy training)	Second year of EBT implementation, discontinue legacy training. No economic benefits. Still high failure rate of pilots (2.6 % as in legacy training)	All EBT costs. Start of all benefits with less failures in OPC/LPC (2.08 % of pilots fail)	All EBT costs. Continued benefits with less failures in OPC/LPC (1.56 % of pilots fail)	All EBT costs. Continued benefits with less failures in OPC/LPC (1.3 % of pilots fail)	All EBT costs and all benefits as in the previous year	All EBT costs and all benefits as in the previous year	All EBT costs and all benefits as in the previous year
16	**EBT costs**	**122 222**	**1 045 556**	**10 000**	**10 000**	**10 000**	**10 000**	**10 000**	**10 000**	**10 000**	**10 000**
17	**EBT benefits**	0	0	0	0	1 143 921	1 198 953	1 226 469	1 226 469	1 226 469	1 226 469
	NPV delta EBT costs	**122 222**	**966 675**	**8 890**	**8 548**	**8 219**	**7 903**	**7 599**	**7 307**	**7 026**	**6 756**
	NPV EBT benefits	0	0	0	0	**940 220**	**947 550**	**932 016**	**896 169**	**861 701**	**828 559**
	Cumulative NPV EBT costs	122 222	1 088 897	1 097 787	1 106 335	1 114 554	1 122 458	1 130 057	1 137 364	1 144 389	1 151 145
	Cumulative NPV EBT benefits	0	0	0	0	940 220	1 887 770	2 819 786	3 715 955	4 577 656	5 406 215
	Profitability indicators										
	NPV EBT benefits - NPV EBT costs	-122 222	-966 675	-8 890	-8 548	932 000	939 647	924 417	888 862	854 675	821 803
	Saving per pilot per year					0	0	0	0	0	0
	Portion of the net benefits as % of the annual turnover	0	0	0	0	1	2	2	3	4	5
	Benefit/cost ratio (cumulative NPV EBT					932	940	924	889	855	822

39 The discount rate for costs and benefits is 4 % (http://ec.europa.eu/regional_policy/sources/docgener/studies/pdf/cba_guide.pdf)

years	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***
benefits/cumulative NPV EBT costs)										
Years for return of investment (break-even point, year when cumulative costs = cumulative benefits)					**3-4 years for return of investment after the implementation of EBT**					

The CBA for a medium/large operator concludes that the implementation of EBT in recurrent training and checking of flight crew is a cost-effective solution. It is expected that the cost will be 0.03 % of the operator's annual turnover, with one-off costs representing 9 % of the current expenditure of the operator for recurrent training and checking. In addition, the implementation of EBT has the potential to generate significant economic benefits and to introduce an estimated saving of EUR 900 per pilot (EUR 900 000 saving per year for the operator). The profitability indicators show that the return of investment is generated 3 years after EBT implementation, considering that competent authorities grant full economic alleviations to the operator.

Case study 2: Economic impacts for a small operator

That case study is prepared for an operator with the following assumptions:

General assumptions regarding the baseline scenario (legacy training operator):

— Volume of fleet: 10 aircraft

— Number of pilots (captains and FO): 100

— Number of instructors/examiners: 10; indicatively 10 % of pilot population

— Number of line checks per year for all pilots: 60 (performed in 60 working days)

— Number of simulator sessions: 280 OPC/LPC sessions per year for all pilots (50 crews, 4 sessions per crew — in total, 200 sessions per crew with a coefficient of 1.4 due to the inefficiency).

— Development and update of the training programme under the legacy training: 10 working days.

— For 3 years, it is considered that the baseline operator provides 48 hours of simulator per crew.

— All other assumptions, made under case study 1 are valid and apply in this case as well.

Assumptions regarding EBT implementation:

— The operator is using an external consultant to develop the EBT competency framework, training programme and to train the training manager and instructors for EBT

— The training manager receives EBT training for 5 days (one-off cost)

— Development of an EBT programme by the training manager: 10 days (one-off cost)

— The operator is using an external consultant to train instructors/examiners to deliver EBT: each trainee/instructor is trained for 3 working days. 1 day training costs EUR 500 instructor/day (one-off cost).

— The operator engages the instructors/examiners for 4 days in EBT training: 3 working days for training and 1 working day for competency assessment (one-off cost).

— Recurrent costs are the same as for the legacy training.

— Operator needs 1 year to prepare for EBT implementation.

— EBT benefits are reaped 2 years after the EBT implementation, but progressively: 30 % in the third year, 60 % in the fourth year, 100 % in the fifth year, and for the following years under the analysis, all benefits are reaped.

— The failure rate in OPC/LPC is decreased progressively. During the first 2 years of the EBT implementation, the failure rate remains the same as for the legacy training (2.6 % of the pilot population). As regards the following years, in year 3 after the EBT implementation, the failure rate is 2.08 %; in year 4 after the EBT implementation, the failure rate is 1.56 %; and in year 5 and after it, it reaches its maximum decrease (1.3 % of pilots).

The CBA for the small operator is performed following the same methodology as in case study 1[40].

The CBA for a small operator concludes that there are benefits for small operators in implementing EBT in recurrent training and checking of flight crew. Despite that, a small operator may encounter the following difficulties in EBT implementation:

— EBT requires collecting and analysing the operator's own and/or the general fleet data, as well as operation-specific data. The existence of high-quality robust operational data is a powerful tool by which training priorities are adjusted. In particular, said data provides the operator with the opportunity to tailor the training to its own identified issues and risks by reducing or increasing the frequency of delivering certain topics. Data collection and analysis therefore results in improvement of the training programme. Data collection is necessary for a detailed analysis of existing threats and the identification of potential weaknesses in the operator's operational safety — for instance, inadequate flight crew performance. The costs for such data collection and assessment might be an obstacle to a small operator implementing EBT. These costs are not quantified in the CBA model (due to lack of reliable data).

— A small operator needs to make initial costs (one-off) to deploy EBT (indicative amount: EUR 80 000) which represent 0.11 % of its annual turnover or 3.7 % more of its expenditure for running legacy recurrent training and checking for its pilots. There costs mainly refer to the necessary external expertise to train the operator's staff in EBT, to train instructors, to deploy an IT tool that will support EBT, etc.

— A small operator may need to make one-off costs to increase the number of simulators from 3 to 4 simulator sessions per year. This may cause additional increase in the total costs for EBT implementation.

— Depending on the cost increase, these operators will decide whether to implement EBT.

Nevertheless, Option 1 would not have a negative impact, because this option will be implemented on a voluntary basis. Furthermore, similarly for a medium operator, EBT has the potential to generate significant economic benefits and to introduce an estimated saving of EUR 1 000 per pilot, which represents around EUR 80 000-100 000 saving per year for the operator. The profitability indicators show that the return of investment is generated 5 years after the EBT implementation, considering that competent authorities grant economic alleviations to the operator.

3.6.4.2.2 Economic impact for the competent authorities

The requirement for inspectors to be competent in the approval of and oversight over EBT programmes would result in increased costs for the competent authorities for staff training in the short term. According to the estimations of the competent authorities, the following would be the impact of EBT deployment for an operator:

[40] For further details, please contact impact.assessment@easa.europa.eu

— The first 2 years after the EBT implementation, there would be certain workload for the competent authority: an additional 150-160 hours for initial training of the flight inspectors on EBT; approval of the development of the competency framework and approval of the training programme, evaluation of safety cases; an additional 40 hours for oversight of the training of the TRIs/TREs when an operator trains them.

— Afterwards, the workload is expected to decrease to a level of 50-70 hours per operator for approval of the training programmes and regular oversight, because the scope of the work would be limited to regular approval of the training programmes and regular oversight. In addition, the workload and the relative costs for the competent authority is expected to decrease with the time, as there might be more AOC holders implementing EBT.

As regards the oversight, the workload of the competent authority is not expected to increase, because the EBT implementation supports performance- and risk based oversight. Therefore, the overall impact on the competent authority is considered very low negative in the first years and neutral in the consecutive years.

3.6.4.2.3 Overall economic impact with Option 1

Overall, the economic impact for Option 1 is assessed low positive and is scored with +2.

3.6.4.3 Option 2 — Mandatory EBT for recurrent training and checking

The assessment of the economic impacts for the stakeholders for this option is based on the analysis performed in Option 1. In fact, all costs and benefits are relevant for medium/large operators and competent authorities. Option 2, however, has some drawbacks in terms of proportionality issues and most predominantly on small operators.

In this option, all airlines would need to invest in the development of EBT programmes. Despite the potential benefits identified in terms of safety and economy, there would be a negative impact on airlines that did not have the resources (in short-term plan) or expertise to develop EBT after the adoption of the rules. This impact would be most significant on smaller operators. It is expected that this option could undermine the commercial viability of many small airlines and air taxi operators. Overall, this option may potentially limit the accessibility to the market to some AOC holders and as a result, it is considered that it may generate a low negative impact.

Therefore, Option 2 is considered to have a low negative economic impact (score -2).

3.6.4.4 Conclusion on the economic impacts per option

Table 14: Economic impacts per option

Criteria	*Option 0* *No policy change*	*Option 1* *Voluntary EBT*	*Option 2* *Mandatory EBT*
Economic impact	No impact	**Low positive impact** *Medium/large operator (1 000 pilots):* One-off costs: 0.03 % of its turnover or 9% more than the current operator expenditure for recurrent training Recurrent costs: 0.01 % increase in the current operator expenditure for recurrent training Net benefit: EUR 900 per pilot/year Return of investment >3 years after the EBT implementation *Small operators (100 pilots)* One-off costs: 0.11 % of its turnover or 3.7 % more than the current operator expenditure for recurrent training Recurrent costs: no Net benefit: EUR 1 000 per pilot/year Return of investment >4 years after EBT implementation	**Low negative impact** Although the CBA shows that the EBT is beneficial for small operators, it is expected that they may not be ready to implement it immediately after rules are adopted. In the short term, the proposal may affect negatively their business and undermine their commercial viability.
	0	+2	-2

3.6.5. General Aviation and proportionality issues

Not applicable.

3.7. Conclusion

3.7.1. Comparison of options

The table below summarises the impacts of all options.

Table 15: Assessment of all options

Criteria	*Option 0* *No policy change*	*Option 1* *Voluntary EBT*	*Option 2* *Mandatory EBT*
Safety	0	+2	+3
Social	0	+2	+3
Economic	0	+2	-2
TOTAL	**0**	**+6**	**+4**

The final results of the RIA demonstrate that Option 1 'Voluntary EBT' is the preferred option for regulating the EBT implementation in recurrent training and checking of flight crew. It contributes to

maintaining a high level of aviation safety while providing a cost-efficient and socially acceptable framework.

Question to stakeholders

Stakeholders are also invited to comment on the RIA and to provide any other quantitative information they may find necessary to bring to the attention of EASA. As a result, the relevant parts of the RIA might be adjusted on a case-by-case basis.

3.7.2. Sensitivity analysis

The current section analyses the effect of other assumptions (presented in the economic impacts section) on the results from the CBA. For instance, EASA assumes that there is a general practice of having 4 simulator sessions per year for the medium/large operator case study. For the medium/large operators that have 3 sessions per year before implementing EBT, the return of investment will be after 4 years due to the simulator cost increase (EBT requires 4 simulator sessions). Depending on the cost increase, these operators will decide whether to implement EBT.

3.8. Monitoring and evaluation

Note: this section will be completed at the Opinion stage after the review of the comments provided to this NPA.

4. Proposed actions to support implementation

— Implementation and standardisation efforts regarding the proposed changes in Part-ARO, Part-ORO, Part-FCL and Part-ARA

— A dedicated workshop with stakeholders at the EASA premises after the consultation of the NPA

— Support to the stakeholders with the development of an EASA EBT manual

— Support to the operators wishing to implement EBT and their competent authorities — one-day training (SPT.012)

5. References

5.1. Affected regulations

— Commission Regulation (EU) No 1178/2011 of 3 November 2011 laying down technical requirements and administrative procedures related to civil aviation aircrew pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council (OJ L 311, 25.11.2011, p. 1)

— 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)

5.2. Affected decisions

— Decision N° 2012/015/Directorate R of the Executive Director of the Agency of 24th October 2012 on Acceptable Means of Compliance and Guidance Material to 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 'Guidance Material to Annex I – Definitions'

— Decision 2014/025/R of the Executive Director of the Agency of 28 July 2014 adopting Acceptable Means of Compliance and Guidance Material to Part-ARO of Commission Regulation (EU) No 965/2012 and repealing Decision 2014/014/R of the Executive Director of the Agency of 24 April 2014 'AMC and GM to Part-ARO — Issue 3'

— Decision 2014/017/R of the Executive Director of the Agency of 24 April 2014 adopting Acceptable Means of Compliance and Guidance Material to Part-ORO of Commission Regulation (EU) No 965/2012 and repealing Decision 2012/017/R of the Executive Director of the Agency of 24 October 2012 'AMC and GM to Part-ORO — Issue 2'

— Decision N° 2012/006/Directorate R of the Executive Director of the Agency of 19th April 2012 on Acceptable Means of Compliance and Guidance Material to Commission Regulation (EU) No 1178/2011 of 3 November 2011 laying down technical requirements and administrative procedures related to civil aviation aircrew pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council 'Acceptable Means of Compliance and Guidance Material to Part-ARA'

— Decision N° 2011/016/R of the Executive Director of the European Aviation Safety Agency of 15 December 2011 on Acceptable Means of Compliance and Guidance Material to Commission Regulation (EU) No 1178/2011 of 3 November 2011 laying down technical requirements and administrative procedures related to civil aviation aircrew pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council 'Acceptable Means of Compliance and Guidance Material to Part-FCL'

5.3. Other reference documents

— Decision No 2015/027/R of the Executive Director of the European Aviation Safety Agency of 16 December 2015 on guidance material to Part-ORO of Regulation (EU) No 965/2012 on the

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

- ICAO Annex 1 to the Convention on International Civil Aviation 'Personnel Licensing', 11th Edition, July 2011
- ICAO Annex 6 to the Convention on International Civil Aviation 'Operation of Aircraft', 10th Edition, July 2016
- ICAO Doc 9868 'Procedures for air navigation services Training' Second Edition, 2016
- ICAO Doc 9995 AN/497 'Manual of Evidence-based Training' First edition - 2013
- ICAO Doc 10011 AN/506 'Manual on aeroplane upset prevention and recovery training' First edition – 2014
- ICAO Doc 9841 AN/456 'Manual on the Approval of Training Organizations' Second edition – 2012
- ICAO Doc 9379 AN/916 'Manual of Procedures for Establishment and Management of a State's Personnel Licensing System'