European Union Aviation Safety Agency

Notice of Proposed Amendment 2024-02

in accordance with
Article 6 of MB Decision No 01-2022

Regular update of the air operations rules

Enhanced implementation of FDM programmes and miscellaneous amendments

RMT.0392 (Subtask #1e)

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This Notice of Proposed Amendment (NPA) proposes amendments to the EU air operations regulatory framework on flight data monitoring (FDM) programmes and other miscellaneous topics.
The objective is to enhance the implementation of FDM programmes and to make miscellaneous improvements to the regulatory framework to consider the principles of better regulation and lessons learnt from the implementation of rules by national authorities and industry, and to implement safety recommendations.
The proposed regulatory material is expected to maintain, and in some cases enhance, the level of safety and to provide benefits in terms of efficiency, with a low to very low economic impact.</td></tr>
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1. About this NPA

1.1. How this NPA was developed

The European Union Aviation Safety Agency (EASA) identified several issues (as described in Chapter 2) and, after having assessed the impacts of the possible intervention actions, identified rulemaking as the necessary intervention action.

This rulemaking activity is included in Volume II of the 2024 edition of the *European Plan for Aviation Safety* (EPAS)[1] under Rulemaking Task (RMT).0392, Subtask #1e.

EASA developed the regulatory material in question in line with Regulation (EU) 2018/1139[2] (the Basic Regulation) and the Rulemaking Procedure[3], and in accordance with the objectives and working methods described in the Terms of Reference (ToR) for this RMT[4].

When developing the regulatory material on FDM, EASA received the support of a group of experts from the industry (including aeroplane operators, aircraft manufacturers, a pilot association and three industry associations). For the regulatory material related to lessons learnt from the Boeing 737 MAX human factors issues, EASA also received support from external experts, and the material was discussed with the Advisory Bodies, namely the certification committee (C.COM), the Air OPS Technical Body and the Flight Standards Technical Committee (FS.TeC). For the development of the material related to evidence-based training, fuel/energy management and low-visibility operations, EASA received the support of experts nominated by the EASA Advisory Bodies to support the development of safety promotion tasks in these areas[5]. The remaining material was internally developed by EASA.

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/**[6].

The deadline for the submission of comments is **24 June 2024**.

1 https://www.easa.europa.eu/en/domains/safety-management/european-plan-aviation-safety

2 Regulation (EU) 2018/1139 of the European Parliament and of the Council of 4 July 2018 on common rules in the field of civil aviation and establishing a European Union Aviation Safety Agency, and amending Regulations (EC) No 2111/2005, (EC) No 1008/2008, (EU) No 996/2010, (EU) No 376/2014 and Directives 2014/30/EU and 2014/53/EU of the European Parliament and of the Council, and repealing Regulations (EC) No 552/2004 and (EC) No 216/2008 of the European Parliament and of the Council and Council Regulation (EEC) No 3922/91 (OJ L 212, 22.8.2018, p. 1) (https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1535612134845&uri=CELEX:32018R1139).

3 EASA is bound to follow a structured rulemaking process as required by Article 115(1) of Regulation (EU) 2018/1139. Such a process has been adopted by the EASA Management Board and is referred to as the ‘rulemaking procedure’. See Management Board Decision No 01-2022 of 2 May 2022 on the procedure to be applied by EASA for the issuing of opinions, certification specifications and other detailed specifications, acceptable means of compliance and guidance material (‘rulemaking procedure’), and repealing Management Board Decision No 18-2015 (https://www.easa.europa.eu/the-agency/management-board/decisions/easa-mb-decision-01-2022-rulemaking-procedure-repealing-mb).

4 ToR RMT.0392, *Regular Update of Air Operations Rules*, Issue 1 (https://www.easa.europa.eu/en/document-library/terms-of-reference-and-rulemaking-group-compositions/tor-rmt0392).

5 SPT.0012, SPT.0097 and SPT.0101, all included in the 2023–2025 edition of the EPAS.

6 In case of technical problems, please send an email to crt@easa.europa.eu with a short description.

1.3. The next steps

Following the consultation on the draft regulatory material, EASA will review all the comments received and will duly consider them in the subsequent phases of this rulemaking activity. For this purpose, EASA may involve external experts, depending on the topic.

Considering the above, EASA may issue an Opinion proposing amendments to Regulation (EU) No 965/2012. The Opinion will be submitted to the European Commission, which shall consider its content and decide whether to issue amendments to that Regulation.

Following the amendment of the Regulation, EASA may issue a Decision issuing the acceptable means of compliance (AMC) and guidance material (GM). When issuing the Opinion and Decision, EASA will also provide feedback to commentators and to the public on who provided comments during the consultation on the draft regulatory material, which comments were received, how such engagement and/or consultation was used in rulemaking and how the comments were considered.

2. In summary — why and what

2.1. Why we need to act

RMT.0392 is a standing rulemaking task. Its purpose is to address issues and topics of a miscellaneous nature identified in Regulation (EU) No 965/2012[7] (the Air OPS Regulation) and the related AMC and GM, which are not addressed by a dedicated rulemaking task.

The amendments proposed in this NPA stem from various sources ranging from candidate issues proposed by stakeholders, lessons learnt from the implementation of recent amendments to the Air OPS Regulation, safety issues resulting from EASA's safety risk portfolio and proposals coming from the EASA Advisory Bodies.

2.1.1. Description of the issue

This NPA intends to address several issues.

Flight data monitoring

FDM means the proactive and non-punitive use of digital flight data from routine operations to improve aviation safety.

Implementing an FDM programme usually consists of:

— continuously recording flight parameter values throughout the flight;

— routinely collecting this data from aircraft;

— processing the recordings with the help of specific software to extract safety-relevant information, such as deviations from the operating procedures or abnormal parameter values;

— using this information to help identify safety hazards, assess safety risks and monitor that measures to address safety risks are effective.

The implementation of an FDM programme is required by Air OPS Regulation for aeroplanes operated for commercial air transport (CAT) operations and with a maximum certificated take-off mass (MCTOM) of more than 27 000 kg (under ORO.AOC.130), and for helicopters operated for CAT offshore operations, when the helicopter is required to be equipped with a flight data recorder (under SPA.HOFO.145).

Lessons learnt from standardisation inspections, the report on the evaluation of the relevance and the effectiveness of the European Operators Flight Data Monitoring forum (EOFDM) best-practices documents (EVT.0009), which assessed the effectiveness of the documents produced by the forum[8], and several accident investigation reports show that some of the AMC and GM to the Air OPS Regulation need to be amended to ensure minimum performance of the FDM programme of an

[7] 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) (https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32012R0965).

[8] EASA, *Evaluation of the relevance and the effectiveness of the EOFDM best-practices documents*, January 2021 (https://www.easa.europa.eu/en/document-library/general-publications/evaluation-relevance-and-effectiveness-eofdm-best-practices).

operator and the effectiveness of the FDM programme in supporting the operator's management system.

More specifically, the following issues have been identified as needing to be addressed:

— setting minimum performance objectives for the main steps of an FDM programme (flight data recovery, flight data processing, flight data analysis);

— establishing the minimum set of risks that should be covered by an FDM programme;

— updating references and examples in the AMC and GM so as to reflect modern technologies and analysis techniques and current industry practice;

— clarifying how the FDM programme should be integrated with other processes of the operator's management system; and

— clarifying data protection principles when FDM data is used in conjunction with other types of safety data, and when FDM data is used for purposes other than safety.

For more details, please refer to Sections 5.1 and 6.1.

At least three safety issues included in EASA's CAT aeroplanes safety risk portfolio[9] are related to FDM:

— Approach path management (SI-0007);

— Entry of aircraft performance data (SI 0015); and

— Gap between certified take-off performance and take-off performance achieved in operations (SI-0017).

For more details on these three safety issues, please refer to Section 5.1.1.

In addition, the following safety recommendation addressed to EASA from aircraft accident and serious incident investigation reports published by the designated safety investigation authorities[10] has been considered:

— SR FRAN-2019-025, issued by the French Bureau d'Enquêtes et d'Analyses, after the serious incident involving an Airbus A340, registered F-GLZU, on 11 March 2017 at El Dorado International Airport (Colombia)[11]:

The BEA recommends that EASA in coordination with the national oversight authorities ensure that European operators introduce in their flight analysis programme, the indicators required to monitor take-off performance and at the very least, long take-offs.

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9 EASA safety risk portfolios are presented in Volume III of the EPAS (https://www.easa.europa.eu/en/document-library/general-publications/european-plan-aviation-safety-epas-2023-2025).

10 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).

11 In addition, note should be taken of the following safety recommendation: 'It is recommended that the UK Civil Aviation Authority encourage all UK Air Operator Certificate holders to implement into their flight data monitoring programme algorithms to detect the precursors relevant to the monitoring of takeoff performance detailed in the European Operators Flight Data Monitoring Document, *Guidance for the implementation of flight data monitoring precursors*.' (SR UNKG-2022-019, issued by the UK Air Accidents Investigation Branch after the serious incident involving a Boeing 737-800 registered G-JZHL, on 1 December 2021 at Kuusamo Airport, Finland).

The changes proposed in this NPA on the topic of FDM do not affect the harmonisation of EU requirements with International Civil Aviation Organization (ICAO) Standards and Recommended Practices (SARPs), since the AMC and GM have no equivalent in ICAO SARPs[12].

Similarly, it is assumed that these changes to the AMC and GM will not affect the aviation regulation of non-EU countries, except for those non-EU countries that align their national rules for air operations with EU rules.

Lessons learnt from the Boeing 737 MAX human factors issues

During the design phase of the human–machine interface in the flight deck, the type certificate applicant must demonstrate compliance with human factors requirements, anticipating potential in-service events related to human performance and implementing design-related mitigations. The type certificate applicant must therefore ensure that the design of the flight deck considers a comprehensive set of design principles well described in the literature under the concept of usability. The ultimate intent of designing a usable flight deck is to prevent, as far as is practicable, any kind of human performance issues in both normal and abnormal situations (including failure conditions), and to enable the management thereof should they occur.

Experience has shown that, despite the best efforts made during the initial airworthiness process of the type design, actual flight crew behaviour or performance in service may deviate from what was initially expected by the design approval holders and the certification authorities. Such deviations in both normal and abnormal situations (including failure conditions) may have safety consequences and result in serious incidents/accidents if they continue to go unnoticed.

Design approval holders and certification authorities normally rely on the continued airworthiness process of the type design to further capture and manage design weaknesses, assumptions invalid over time, etc. In such a context, it is therefore paramount that air operators systematically report to design approval holders occurrences involving human performance aspects detected by the flight crew during the operator's flight operations and/or by instructors during the operator's simulator training. It is equally paramount that design approval holders investigate these occurrences and can determine potential unsafe conditions originating from human performance issues.

The existing regulatory framework for occurrence reporting and continued airworthiness of the type design do not however fully address these key elements when it comes to human performance.

This topic is related to the safety issue 'Insufficient consideration of flight crew human factors in the continued airworthiness process of the type design' (SI-9003), which will be part of th[e] 1st edition of the airworthiness safety risk portfolio to be included in the next revision of EPAS Volume III.

Part-NCO — Pilot-in-command responsibilities and authority and use of checklists

With NPA 2022-11, EASA proposed several changes to the Air OPS Regulation to update the regulatory references to the EASA Basic Regulation. However, NCO.GEN.105 was omitted, together with several other points, which is why such changes are proposed in this NPA.

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12 ICAO State Letter AN 11/1.1.35-21/50 proposes to extend the scope of the standard requiring a flight data analysis programme in Section 3.3, Annex 6, Part I, to aeroplanes with an MCTOM between 15 000 kg and 27 000 kg. To date, this amendment has not been adopted by the ICAO Council and transposing this amendment into EU rules is not in the scope of this NPA.

In addition, regarding point (a)(3) of NCO.GEN.105, some additional amendments are proposed, particularly at the level of AMC and GM, regarding the use of checklists, following feedback received from approved training organisations, the operations of which are covered by Part-NCO under Article 6(9) of the Air OPS Regulation, and pilots in the GA (General Aviation) community.

NCO.GEN.105 defines the responsibilities and authority of the pilot-in-command. Point (a)(3) establishes that the pilot-in-command is responsible for ensuring that all operational procedures and checklists are complied with.

AMC1 to NCO.GEN.105(a)(3) establishes that pilots should use checklists provided by the manufacturer. These checklists are standard and should be customised by the pilot-in-command / operator; however, in the case of Part-NCO, this is not clearly stated. This has led some NCAs to require that pilots-in-command / operators use Section 3 (abnormal/emergency procedures) of the aircraft flight manual (AFM) as if it were a checklist, regardless of its suitability as one. The most direct implication is very low checklist adherence by pilots.

The use of inappropriate checklists in flight is a safety issue; it can lead to misunderstandings by the pilots during the operations, which can lead to serious occurrences.

Three accidents have occurred since 2019[13] where lack of checklist adherence was found by the relevant safety investigation authority as the causal factor. In all three cases, the Comisión de Investigación de Accidentes e Incidentes de Aviación Civil (CIAIAC) was responsible, as they happened in Spain.

The CIAIAC has addressed the following safety recommendation to Agencia Estatal de Seguridad Aérea (AESA):

> *REC 51/20: Se recomienda a AESA que garantice la inclusión de los procedimientos y listas de verificación específicos para instrucción en el Manual de operaciones de las escuelas de formación (ATO) y supervise su idoneidad.'*
>
> *(Courtesy translation: It is recommended that AESA ensures adding specific procedures and checklists for training in the Operations Manual of the ATOs and monitor their appropriateness.)*

Other aviation authorities have also identified this issue. The Australian Civil Aviation Safety Authority (CASA) issued Advisory Circular 91-22 to address it:

> *The requirements for aircraft checklists are derived from regulation 91.095. The regulation requires the pilot in command (PIC) to operate an aircraft in compliance with the aircraft flight manual instructions.*
>
> […]
>
> *On review, regulation 91.095 was found to incorrectly express the intended policy objectives.*
>
> […]
>
> *Most flight manual operating procedures are presented in a checklist form with interspersed explanatory information. For effective use by aircraft crew, checklists should be devoid of*

[13] References to the official reports: Informe técnico (technical report) A-064/2019 (gear up landing), Informe técnico (technical report) A-046/2020 (gear up landing), Informe técnico (technical report) IN-046/2021 (gear up landing).

> *distracting non-essential information, with any remaining content limited to actionable items and the corresponding required outcomes. While these checklists are sometimes referred to as 'abbreviated checklists', the term should be used with caution to avoid implications that the list of checks is abbreviated or reduced e.g., as with abbreviated circuit training checklists. More accurate terms are 'aircraft checklist' or 'cockpit checklist'. Full-text operating procedures including notes, cautions and warnings as published in a flight manual, are referred to as 'amplified checklists' or 'expanded checklists', and as such are unsuitable for use in aircraft.*

Shortly after, CASA published *CASA EX81/21 – Part 91 of CASR – Supplementary exemptions and directions instrument 2021* to include an exemption to the rule based on its previous advisory circular:

> *Compliance with flight manual — exemption*
>
> *(1) The pilot in command of an aircraft to which Part 91 applies is exempted from compliance with the following provisions of CASR:*
>
> *(a) paragraph 91.095 (2) (a);*
>
> *(b) subregulation 91.095 (3) (in relation to paragraph 91.095 (2) (a)).*

(2) The exemptions in subsection (1) are subject to the condition that the pilot in command complies with the requirements and limitations set out in the aircraft flight manual instructions for the aircraft.

Introductory flights carried out with balloons and sailplanes

EASA has been made aware by France's Directorate General for Civil Aviation of a potential gap in ARO.OPS.300 in relation to operations with sailplanes and balloons.

Regulation (EU) 2018/395[14] on the operation of balloons and Regulation (EU) 2018/1976 ([15]) on the operation of sailplanes both establish that the competent authorities shall comply with the requirements of Part-ARO in the Air OPS Regulation[16]. Both regulations also contain provisions on introductory flights[17]. Nevertheless, point ARO.OPS.300 only mentions introductory flights carried out in accordance with Part-NCO. This has led to a lack of clarity on the possibility for competent authorities to define additional conditions for introductory flights of sailplanes and balloons, which is currently creating economic issues for operators and differences of interpretation among EASA Member States, resulting in there not being a level playing field.

The intent when Regulation (EU) 2018/395 and Regulation (EU) 2018/1976 were adopted was to keep the possibility for competent authorities to develop additional conditions for introductory flights carried out with balloons and sailplanes.

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[14] Commission Regulation (EU) 2018/395 of 13 March 2018 laying down detailed rules for the operation of balloons pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council (OJ L 71, 14.3.2018, p. 10) (https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32018R0395).

[15] Commission Implementing Regulation (EU) 2018/1976 of 14 December 2018 laying down detailed rules for the operation of sailplanes pursuant to Regulation (EU) 2018/1139 of the European Parliament and of the Council (OJ L 326, 20.12.2018, p. 64) (https://eur-lex.europa.eu/eli/reg_impl/2018/1976/oj).

[16] See points BOP.BAS.005 and SAO.GEN.105.

[17] See points BOP.BAS.015 and SAO.GEN.115, for example.

Recurrent training and checking

Ground training

EASA has received feedback from several stakeholders requesting clarity on the provisions of AMC1 ORO.FC.230 regarding ground training, specifically on the frequency that should apply to ground training on aircraft systems and abnormal and emergency procedures.

Evidence-based training

Several stakeholders highlighted difficulties with understanding some aspects of the AMC and GM related to evidence-based training (EBT) and requested clarification on how to apply them, specifically on the link between an EBT programme and upset prevention and recovery training, on the one hand, and training on flight path management during unreliable airspeed indication and other failures at high altitude, on the other, and how to apply level 0 grading to EBT.

Fuel/energy schemes — aerodrome selection policy — aeroplanes

During the implementation of the recent provisions on fuel/energy schemes introduced with Regulation (EU) 2021/1296[18], there were some difficulties with the interpretation of some of the AMC related to the planning minima of the destination alternate aerodrome. More specifically, questions were raised regarding some elements of GM2 CAT.OP.MPA.181, AMC2 CAT.OP.MPA.182 and AMC2 CAT.OP.MPA.185(a).

Low-visibility operations

During the implementation of the recent provisions on all-weather operations introduced with Regulation (EU) 2021/2237[19], there were some difficulties with the interpretation of some of the AMC on low-visibility operations (LVOs).

Mainly, stakeholders reported inconsistencies between some provisions in the AMC to SPA.LVO.120 related to the flight crew competence for LVOs. The current text of the AMC is not fully aligned for cases where the operator wishes to add a new 'LVO capacity' and train its pilots accordingly. This creates misalignments in the implementation of the provisions among EASA Member States, resulting in there not being a level playing field and creating issues with standardisation.

Aerodrome operating minima — general (Part-NCC and Part-SPO)

Table 1 of AMC3 NCC.OP.110 and Table 1 of AMC3 SPO.OP.110 are currently not consistent with Table 1 of AMC1 CAT.OP.MPA.110. This inconsistency was due to a mistake made during the final stage of development of the Decision that adopted those AMC, when changes introduced in Table 1 of AMC1 CAT.OP.MPA.110 were not reproduced in the other AMC.

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[18] Commission Implementing Regulation (EU) 2021/1296 of 4 August 2021 amending and correcting Regulation (EU) No 965/2012 as regards the requirements for fuel/energy planning and management, and as regards requirements on support programmes and psychological assessment of flight crew, as well as testing of psychoactive substances (OJ L 282, 5.8.2021, p. 5) (https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32021R1296&qid=1708337941277).

[19] Commission Implementing Regulation (EU) 2021/2237 of 15 December 2021 amending Regulation (EU) No 965/2012 as regards the requirements for all-weather operations and for flight crew training and checking (OJ L 450, 16.12.2021, p. 21) (https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32021R2237).

Training on dangerous goods

With SL AN 11/1.1.34-20/75, ICAO adopted competence-based training for dangerous goods, which was to be implemented by all States in 2023, at the latest. The standards for this training can be found in ICAO Doc 9284 *Technical Instructions for the Safe Transport of Dangerous Goods by Air*. Further information is provided in ICAO Doc 10147, *Guidance on a Competency-based Approach to Dangerous Goods Training and Assessment*.

Within the new system, personnel are required to be trained to be competent with respect to their functions and assessed accordingly. The assessment is continuous, to allow training to be adapted to the needs. The current AMC1 SPA.DG.105(a) provides for a written examination as the only means to obtain the qualification, which does not reflect the new approach from ICAO.

Adequate aerodrome and rescue and firefighting services

ICAO Annex 6, Part I, Attachment I 'Rescue and firefighting services (RFFS) levels' (supplementary to Annex 6, Part I, Chapter 4, point 4.1.4), provides guidance for assessing the level of RFFS deemed acceptable by aeroplane operators using aerodromes. This is useful guidance for the industry, and currently is not reflected in the Air OPS Regulation.

Editorial amendments

EASA has identified several references to Regulation (EC) No 216/2008 in the Air OPS Regulation that need to be amended to refer to Regulation (EU) 2018/1139.

2.1.2. Who is affected by the issue

The following stakeholders are affected by the different issues addressed in the NPA.

Flight data monitoring

This issue affects aircraft operators, national competent authorities, aircraft manufacturers and flight crew.

Lessons learnt from the Boeing 737 MAX human factors issues

This issue affects aircraft operators, national competent authorities, aircraft manufacturers and flight crew.

Use of checklists in Part-NCO

This issue affects aircraft operators under Part-NCO, including aircrew training organisations, national competent authorities and flight crew.

Introductory flights carried out with balloons and sailplanes

This issue affects sailplane and balloon operators and pilots and national competent authorities.

Recurrent training and checking

This issue affects aircraft operators, national competent authorities and flight crew.

Fuel/energy schemes — aerodrome selection policy — aeroplanes

This issue affects aircraft operators, national competent authorities and flight crew.

Low-visibility operations

This issue affects aircraft operators, national competent authorities and flight crew.

Aerodrome operating minima — general (Part-NCC and Part-SPO)

This issue affects aircraft operators, national competent authorities and flight crew.

Training on dangerous goods

This issue affects aircraft operators, national competent authorities and flight crew.

Adequate aerodrome and rescue and firefighting services

This issue affects aircraft operators, national competent authorities and flight crew.

Editorial amendments

The editorial amendments affect aircraft operators and national competent authorities.

2.1.3. Conclusion on the need for rulemaking

EASA concluded, as explained further in Chapter 3 below, that an intervention was necessary and that non-regulatory actions cannot effectively address the issue identified. Therefore, amendments to the Air OPS Regulation, and its AMC and GM are required.

2.2. What we want to achieve — objectives

The overall objectives of the EASA system are defined in Article 1 of the Basic Regulation. This NPA will contribute to achieving the overall objectives by addressing the issues described in Section 2.1.

More specifically, with the regulatory material presented here, EASA intends to achieve the following objectives.

Flight data monitoring

Regarding FDM, the specific objective of this NPA is to enhance the safety of operations with large aeroplanes used for CAT, and of operations with large helicopters used for offshore CAT, by:

— making FDM programmes more effective; and

— better integrating the FDM programme in the operator’s management system.

For more details on these objectives, please refer to Sections 5.2 and 6.2 of this NPA.

Lessons learnt from the Boeing 737 MAX human factors issues

The specific objective regarding this topic is to ensure that, during in-service flight operations or operator training and checking events, CAT operators better detect, collect, investigate and report to the design approval holder potential flight crew human intervention issues linked to flight deck design, operating procedures or training, or a combination thereof, that may lead to an unsafe condition.

Use of checklists in Part-NCO

The specific objective regarding this topic is to ensure that pilots engaged in NCO operations comply with applicable operational procedures and to clarify which checklists should be used to ensure that compliance.

Introductory flights carried out with balloons and sailplanes

Regarding this topic, the specific objective is to clarify that competent authorities may establish additional conditions for introductory flights carried out with balloons and sailplanes.

Recurrent training and checking

Regarding this topic, the specific objective of this NPA is to increase the clarity of several provisions at AMC level to facilitate understanding and uniform implementation of them.

Fuel/energy schemes — aerodrome selection policy — aeroplanes

The specific objective regarding this topic is to increase the clarity of the provisions on aerodrome selection policy at AMC level.

Low-visibility operations

The specific objective regarding this topic is to improve the understanding of the provisions at AMC and GM level related to flight crew competence for LVOs and operations with operational credits.

Aerodrome operating minima — general (Part-NCC, Part-SPO and Part-SPA)

The specific objective on this topic is to ensure consistency and harmonise the take-off minima in different AMC in Part-NCO, Part-SPO and Part-CAT. An additional objective is to align, when possible, the values and equipment for take-off and landing minima for CAT II in Part-SPA.

Training on dangerous goods

The specific objective regarding this topic is to ensure full consistency between the EU's and ICAO's approaches to training for dangerous goods.

Adequate aerodrome and rescue and firefighting services

Regarding this topic, the purpose is to include a reference to the relevant ICAO guidance in the GM to Part-CAT.

Editorial amendments

Regarding the editorial amendments, the purpose of this NPA is to ensure that the Air OPS Regulation includes the correct regulatory references to the EASA Basic Regulation.

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

This NPA proposes the following amendments to the Air OPS Regulation and its AMC and GM.

Flight data monitoring

To achieve the objectives indicated in Section 2.2, this NPA proposes changes to the AMC and GM to the following points of Part-ORO and Part-SPA, containing the requirements related to the management system, to FDM programmes of aeroplane operators, to FDM programmes of helicopter offshore operators and to the implementation of an alternative training and qualification programme (ATQP): ORO.GEN.200, ORO.AOC.130, ORO.FC.A.245 and SPA.HOFO.145.

To make FDM programmes more effective, this NPA proposes to do the following.

— Introduce, in the AMC to ORO.AOC.130 and SPA.HOFO.245, conditions that specify minimum performance objectives for the main steps of an FDM programme, which are as follows.

(a) **Flight data recovery.** The conditions address the functioning of the airborne system, the set of flight parameters to be collected, the flight collection rate and the time to identify a failure to collect data from an individual aircraft.

(b) **Flight data processing.** The conditions address the time for routine processing of the data by the FDM software, and the capabilities of the FDM software.

(c) **Flight data analysis.** The conditions address the identification and validation of significant FDM events and documentation of the source of flight parameters and the algorithms used to produce FDM events and measurements.

— Introduce, in the AMC to ORO.AOC.130 and SPA.HOFO.245, a minimum set of risks that should be monitored by an FDM programme. This set includes:

(a) risk areas that are relevant for all aeroplane operators, such as those pointed out by the EASA Annual Safety Review;

(b) risk areas that are relevant for all offshore operators, such as those pointed out by the EASA Annual Safety Review or HeliOffshore safety performance reports;

(c) some occurrences subject to mandatory occurrence reporting in accordance with Annex I to Regulation (EU) 2015/1018[20]; and

(d) indications that the airworthiness of the aircraft may be affected.

— Introduce changes in GM1 ORO.AOC.130, GM2 ORO.AOC.130, AMC1 ORO.FC.A.245, GM1 SPA.HOFO.245 and GM2 SPA.HOFO.245 to reflect technological evolutions and current industry best practices. Examples include the use of modern IT solutions (e.g. software-as-a-service), new capabilities of modern FDM software or the advent of large data exchange programmes.

For more details on these proposed amendments, please refer to Chapter 4 and to the description of Option 1 in Section 5.3. In addition, Section 5.5 contains a detailed assessment of the safety, environmental, social and economic impacts of these proposed amendments, and their impact on General Aviation and proportionality.

To better integrate the FDM programme in the operator's management system, this NPA proposes the following actions.

— Add the FDM programme to the safety information sources that should be used to support the safety risk management (SRM) steps, in AMC1 ORO.GEN.200(a)(3).

— Introduce conditions in AMC1 ORO.GEN.200(a)(1) specifying that the FDM programme is part of the responsibilities of the safety manager and of the safety review board.

— Reinforce internal controls on the implementation of the FDM procedure to protect flight crew identity, by referring to FDM procedures in AMC1 ORO.GEN.200(a)(6). This AMC specifies the scope of the operator's compliance monitoring function.

[20] Commission Implementing Regulation (EU) 2015/1018 of 29 June 2015 laying down a list classifying occurrences in civil aviation to be mandatorily reported according to Regulation (EU) No 376/2014 of the European Parliament and of the Council (OJ L 163, 30.6.2015, p. 1) (https://eur-lex.europa.eu/eli/reg_impl/2015/1018).

— Clarify in AMC1 ORO.AOC.130, GM1 ORO.AOC.130, AMC1 SPA.HOFO.145 and GM1 SPA.HOFO.145 how the FDM programme should support the SRM process.

— Reconcile, in AMC1 ORO.AOC.130 and AMC1 SPA.HOFO.145, the conditions regarding the protection of flight crew identity, with the principles regarding the protection of reporters as set out in Regulation (EU) No 376/2014[21].

— Introduce a recommendation in GM1 ORO.GEN.200 that, if a data source that is needed to support SRM is required to be protected, then the safety policy of the operator provides consistent protection of this data source when it is used for all other purposes; and recommend, in GM1 ORO.AOC.130 and GM1 SPA.HOFO.145, that access to FDM data for purposes other than FDM is consistently framed by procedures to protect flight crew identity.

— Clarify, in AMC1 ORO.FC.A.245, what information may be provided by the FDM programme to the ATQP responsible person and how this information should be handled.

For more details on these proposed amendments, please refer to Chapter 4 and to the description of Option 1 in Section 6.3. In addition, Section 6.5 contains a detailed assessment of the safety, environmental, social and economic impacts of these proposed amendments, and their impact on non-commercial aviation and on smaller organisations (proportionality).

Lessons learnt from the Boeing 737 MAX human factors issues

Under the scope of the Basic Regulation, and more specifically with regard to Regulation (EU) No 376/2014 and point ORO.GEN.160(a) in the Air OPS Regulation, operators shall mandatorily report to their competent authority occurrences of which they become aware. Without prejudice to this mandatory reporting, CAT operators are further required by point ORO.GEN.160(b) to report occurrences to the design approval holder.

The in-depth analysis of in-service occurrences involving human interventions requires full knowledge of the assumptions about the expected flight crew behaviour made by the design approval holder when demonstrating compliance with the certification basis, to be able to identify any deviations from these assumptions in the context of flight operations. Since it is not expected that operators have this knowledge, the responsibility of such analysis is therefore assumed to be assigned to the design approval holder. However, the efficiency of the continuing airworthiness system requires that design approval holders are made aware by operators of events or trends that may reveal shortcomings related to flight deck design, operating procedures or training, or a combination thereof, in a systematic and comprehensive way.

To ensure that, during in-service flight operations or operator training and checking events, CAT operators better detect, collect, investigate and report to the design approval holder potential flight crew human intervention issues linked to flight deck design, operating procedures or training, or a combination thereof, that may lead to an unsafe condition, this NPA proposes to amend

[21] Regulation (EU) No 376/2014 of the European Parliament and of the Council of 3 April 2014 on the reporting, analysis and follow-up of occurrences in civil aviation, amending Regulation (EU) No 996/2010 of the European Parliament and of the Council and repealing Directive 2003/42/EC of the European Parliament and of the Council and Commission Regulations (EC) No 1321/2007 and (EC) No 1330/2007 (OJ L 122, 24.4.2014, p. 18) (https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32014R0376).

ORO.GEN.160[22] and add an AMC and GM (AMC1 ORO.GEN.160(c) and GM1 ORO.GEN.160(c)) to strengthen the systematic reporting of occurrences or occurrence trends involving human interventions by CAT operators to the design approval holder. Note that EASA already issued a safety information bulletin[23] recommending that CAT operators consider systematic reporting of occurrences involving human interventions.

Use of checklists in Part-NCO

This NPA proposes to add a reference to checklists developed by the operator to AMC1 NCO.GEN.105(a)(3). The new GM1 NCO.GEN.105(a)(3) is also proposed to be added to provide further guidance on checklists.

Introductory flights carried out with balloons and sailplanes

This NPA proposes to amend ARO.OPS.300 to clarify that competent authorities may establish additional conditions for introductory flights carried out with balloons and sailplanes.

Recurrent training and checking

<u>Ground training</u>

EASA is proposing to increase the clarity of the provisions of AMC1 ORO.FC.230 regarding ground training, specifically regarding the frequency that should apply to ground training on aircraft systems and abnormal and emergency procedures, by adding new text to GM1 ORO.FC.230, which already contains guidance on several aspects related to recurrent training and checking.

<u>Evidence-based training</u>

To increase the clarity of provisions on EBT at AMC level, specifically on the link between an EBT training programme and upset prevention and recovery training, on the one hand, and training on flight path management during unreliable airspeed indication and other failures at high altitude, on the other, and on how to apply level 0 grading to EBT, EASA is proposing to amend AMC2 ORO.FC.231, AMC1 ORO.FC.231(a)(5), GM1 ORO.FC.231(a)(5), AMC1 ORO.FC.231(c), AMC4 ORO.FC.231(d)(1), AMC2 ORO.FC.232 and AMC3 ORO.FC.232.

Fuel/energy schemes — aerodrome selection policy — aeroplanes

To increase the clarity of the provisions on aerodrome selection policy, by addressing the questions raised by stakeholders, EASA is proposing proposes some amendments to GM2 CAT.OP.MPA.181, AMC2 CAT.OP.MPA.182 and AMC2 CAT.OP.MPA.185(a).

Low-visibility operations

To improve understanding of the provisions related to flight crew competence for LVOs and operations with operational credits, and to ensure consistency on how this topic is covered by different AMC, EASA is proposing some amendments to the current text of AMC1 SPA.LVO.100(a), AMC1 SPA.LVO.100(b), AMC2 SPA.LVO.100(b), AMC1 SPA.LVO.120(a), AMC2 SPA.LVO.120(a),

[22] Proposals to amend point ORO.GEN.160 were included in NPA 2022-11 and previously in NPA 2016-19 (RMT.0681 'Occurrence reporting'); the related CRD 2016-19 was published on 24 May 2019. The proposals in this NPA consider those changes.

[23] EASA SIB 2023-08: Reporting of occurrences involving human interventions linked to flight deck design, operating procedures, training, or a combination thereof (https://ad.easa.europa.eu/ad/2023-08).

AMC3 SPA.LVO.120(a), AMC2 SPA.LVO.120(b), AMC3 SPA.LVO.120(b), AMC4 SPA.LVO.120(b), AMC6 SPA.LVO.120(b) and GM1 SPA.LVO.120(b).

Aerodrome operating minima — general (Part-NCC, Part-SPO and Part-SPA)

To ensure consistency and harmonise take-off minima across the AMC to Part-NCO, Part-SPO and Part-CAT, EASA is proposing changes to Table 1 of AMC3 NCC.OP.110, Table 1 of AMC3 SPO.OP.110 and Table 1 of AMC1 CAT.OP.MPA.110. In addition, EASA is proposing to align the values for take-off and landing minima for CAT II in Part-SPA.

Training on dangerous goods

EASA is proposing to remove from AMC1 SPA.DG.105(a) the provision for a written examination as the only means to obtain the qualification. The amendment proposed does not prevent written examinations; rather, it provides more flexibility and allows for a proper evaluation, in line with the ICAO standards and recommended practices.

Adequate aerodrome and rescue and firefighting services

EASA is proposing to add the new GM2 CAT.OP.MPA.107, referring to the relevant ICAO guidance.

Editorial amendments

To ensure that the Air OPS Regulation includes the correct regulatory references to the EASA Basic Regulation, changes are proposed to ARO.GEN.125, ARO.GEN.135, ORO.SPO.115, ORO.SPO.120, ORO.MLR.100, ORO.FTL.120, ORO.FTL.125, NCC.GEN.105, NCC.GEN.106, NCC.GEN.110, NCC.OP.190, NCO.GEN.101, NCO.GEN.105, NCO.GEN.110, NCO.OP.170, NCO.SPEC.115, SPO.GEN.101, SPO.GEN.105, SPO.GEN.107, SPO.GEN.176, GM1 ARO.GEN.200(a), GM1 ORO.DEC.100, GM1 NCC.GEN.105(e)(2), GM1 NCC.GEN.106 and GM1 SPO.GEN.105(e)(2).

2.4 What are the stakeholders' views

The views of the stakeholders involved were positive regarding the amendments proposed on issues that EASA received external support with: FDM, lessons learned from the Boeing 737 MAX human factors issues, evidence-based training, fuel/energy management and LVOs. The remaining issues were developed internally by EASA, so no feedback from stakeholders was received. Nevertheless, the amendments proposed try to address issues that were raised by stakeholders, so it is assumed that they will be received positively.

3. Expected benefits and drawbacks of the proposed regulatory material

EASA assessed that an intervention was required and that amendments to the Air OPS Regulation and its AMC and GM are necessary to effectively address the issues described in Section 2.1, because the objectives described in Section 2.2 cannot be achieved effectively by non-regulatory action.

EASA also assessed the impacts of the proposed regulatory material to ensure that the regulatory material delivers its full benefits with minimal drawbacks.

The expected benefits and drawbacks of the regulatory material proposed for the topic of FDM were assessed with the support of a group of experts from the industry (including aeroplane operators, aircraft manufacturers, a pilot association and three industry associations). They are summarised below. For the full impact assessments, please refer to Chapters 5 and 6.

Regarding safety benefits, the proposals increase the effectiveness of the SRM process and of the occurrence reporting process for many operators, they create conditions for more effective FDM programme oversight, they support EASA's safety risk portfolios and they make the FDM programme more useful in supporting an ATQP.

Regarding social benefits, the proposals make the assessment of operations fairer for flight crew members and they make the FDM programmes better at supporting flight crews' professional needs.

The proposals bring moderate economic benefits for operators and aircraft manufacturers, by:

— reducing the risk of an occurrence with a significant cost impact on the operator and/or on the aircraft manufacturer;

— supporting a more cost-efficient SRM process for the operator; and

— creating the conditions for enhanced support to continuing airworthiness and in-line assessment of new systems.

The identified drawbacks of the proposals are related to the slight increase in some costs. These costs are limited, as the proposals include a notice period of 2 years, and any AMC amendment that may impact the design of airborne systems or airborne equipment is proposed to be restricted to aircraft that will be manufactured 3 years or more following the date of adoption.

The identified drawbacks can be summarised as follows:

— very limited expenses for operators to get the FDM software updated for meeting some new conditions, such as expenses related to the time to process significant FDM events;

— very limited expenses for operators to adapt their internal procedures for meeting some new conditions, such as expenses related to documenting the source of flight parameters and the definitions of FDM algorithms, to preventing disclosure of flight crew identity and to linking FDM event algorithms with occurrences subject to mandatory occurrence reporting;

— a very limited increase in cost for aircraft manufacturers, associated with a slight increase in support to their operators;

— a cost impact on small CAT operators that is, in proportion, slightly higher than on larger CAT operators (no cost impact on non-commercial operations);

— a possible slight and temporary increase in the workload for FDM staff; and

— a very limited increase in cost for national competent authorities to take into account the modified AMC in their oversight activities.

For the remaining elements of this NPA, the expected benefits and drawbacks of the proposals are discussed in the rationale for the amendments proposed in Chapter 4 below.

The proposed regulatory material has been developed in view of the better regulation principles, and particularly the regulatory fitness principles. In particular, the proposed regulatory material will:

— alleviate existing regulatory burden by increasing clarity on what is needed to achieve an effective and safe implementation of the rules;

— limit the regulatory burden created by amended requirements to the minimum, since in each case EASA chose the least burdensome option to address the objectives identified in Chapter 2, namely by always choosing to amend only AMC and GM whenever possible.

4. Proposed regulatory material

The amendment is arranged to show deleted, new or amended, and unchanged text as follows:

— deleted text is ~~struck through~~;

— new or amended text is highlighted in blue;

— an ellipsis '[…]' indicates that the rest of the text is unchanged.

Where necessary, the rationale is provided in *blue italics*.

4.1. Draft regulation amending Regulation (EU) No 965/2012

4.1.1. Annex II (Part-ARO)

SUBPART OPS: AIR OPERATIONS

SECTION I – GENERAL

ARO.GEN.125 Information to the Agency

(a) The competent authority shall without undue delay notify the Agency in case of any significant problems with the implementation of Regulation (EU) 2018/1139 and its delegated and implementing acts~~(EC) No 216/2008 and its Implementing Rules~~.

[…]

Rationale

Editorial amendment. No impacts expected.

ARO.GEN.135 Immediate reaction to a safety problem

[…]

(b) The Agency shall implement a system to appropriately analyse any relevant safety information received and without undue delay provide to Member States and the Commission any information, including recommendations or corrective actions to be taken, necessary for them to react in a timely manner to a safety problem involving products, parts, appliances, persons or organisations subject to Regulation (EU) 2018/1139 and its delegated and implementing acts ~~(EC) No 216/2008 and its Implementing Rules~~.

[…]

(d) Measures taken under (c) shall immediately be notified to all persons or organisations which need to comply with them under Regulation (EU) 2018/1139 and its delegated and implementing acts ~~(EC) No 216/2008 and its Implementing Rules~~. The competent authority shall also notify those measures to the Agency and, when combined action is required, the other Member States concerned.

Rationale

Editorial amendment. No impacts expected.

SECTION III – OVERSIGHT OF OPERATIONS

ARO.OPS.300 Introductory flights

The competent authority may establish additional conditions for introductory flights carried out in accordance with Part-NCO, Part-BOP of Regulation (EU) 2018/395 or Part-SAO of Regulation (EU) 2018/1976, in the territory of the Member State. Such conditions shall ensure safe operations and be proportionate.

Rationale

When ARO.OPS.300 was initially adopted, it was applicable to aeroplanes, helicopters, balloons and sailplanes, as Part-NCO was also applicable to balloons and sailplanes. Further to Regulation (EU) 2018/395 and Regulation (EU) 2018/1976, Part-NCO is no longer applicable to balloons and sailplanes (replaced by Part-BOP for balloons and Part-SAO for sailplanes). Nevertheless, the authority requirements applicable to operations with balloons and sailplanes are still those in Part-ARO of the Air OPS Regulation. Therefore, ARO.OPS.300 should be modified to reference these new balloon and sailplane regulations. This will clarify that competent authorities may establish additional conditions for introductory flights with balloons and sailplanes.

The current proposal will have no safety impact but will increase clarity and possibly efficiency at competent authority level.

4.1.2. Annex III (Part-ORO)

SUBPART GEN: GENERAL REQUIREMENTS

SECTION 1 – GENERAL

ORO.GEN.160 Occurrence reporting

[…]

(b) Without prejudice to point (a), the operator shall report to the competent authority and the organisation responsible for the design of the aircraft:

(1) any incident, malfunction, technical defect, exceeding of technical limitations or occurrence that would highlight inaccurate, incomplete or ambiguous information contained in the operational suitability data established in accordance with Regulation (EU) No 748/2012 or other irregular circumstance that has or may have endangered the safe operation of the aircraft and that has not resulted in an accident or serious incident;~~.~~

(2) any occurrence, or occurrence trends, involving human intervention, that would highlight shortcomings related to design, procedures or training, or a combination thereof, detected during operator simulator training and checking sessions, that could have potentially endangered the safe operation of the aircraft in actual flight operations.

[…]

Rationale

Please note that NPA 2022-11 also proposed amendments to the text in ORO.GEN.160, which considered the amendments proposed by RMT.0681 'Occurrence reporting'. Please refer to NPA 2022-11[24] for more details. The proposals in this NPA consider those changes.

The proposed amendments seek to strengthen the systematic reporting by commercial air transport (CAT) operators to the DAH of occurrences involving human interventions. That intent is to ensure that, during in-service flight operations or operator simulator training and checking, CAT operators better detect, collect, investigate and report occurrences/events/trends to the DAH on potential flight crew human intervention issues linked to type design, procedures or training, or a combination thereof, that may lead to an unsafe condition.

The expected benefits of these proposals are an increase in safety as a result of enhancing the detection of, and strengthening the systematic reporting to the DAH of, human intervention occurrences/events/trends by CAT operators.

Possible drawbacks are an increased workload for CAT operators (to detect, collect and analyse such occurrences/events/trends), for DAHs (to analyse a greater number of reports received from CAT operators) and potentially for EASA (to validate the DAH conclusions and mitigating actions in the event of an unsafe condition being confirmed).

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24 https://www.easa.europa.eu/en/document-library/notices-of-proposed-amendment/npa-2022-11

SUBPART SPO: COMMERCIAL SPECIALISED OPERATIONS

ORO.SPO.110 Authorisation of high risk commercial specialised operations

[…]

(c) The application for an authorisation or its amendment shall be made in a form and manner established by the competent authority, taking into account the applicable requirements of Regulation (EU) 2018/1139 and its delegated and implementing acts ~~(EC) No 216/2008 and its Implementing Rules~~.

Rationale

Editorial amendment. No impacts expected.

ORO.SPO.115 Changes

[…]

(b) The application for approval of a change shall be submitted before any such change takes place, in order to enable the competent authority to determine continued compliance with Regulation (EU) 2018/1139 and its delegated and implementing acts ~~(EC) No 216/2008 and its Implementing Rules~~ and to amend, if necessary, the authorisation. The operator shall provide the competent authority with any relevant documentation.

[…]

Rationale

Editorial amendment. No impacts expected.

ORO.SPO.120 Continued validity

[…]

(b) The operator's authorisation shall remain valid subject to:

(1) the operator remaining in compliance with the relevant requirements of Regulation (EU) 2018/1139 and its delegated and implementing acts ~~(EC) No 216/2008 and its Implementing Rules~~, taking into account the provisions related to the handling of findings as specified under ORO.GEN.150;

(2) the competent authority being granted access to the operator as defined in ORO.GEN.140 to determine continued compliance with the relevant requirements of Regulation (EU) 2018/1139 and its delegated and implementing acts ~~(EC) No 216/2008 and its Implementing Rules~~; and

[…]

Rationale

Editorial amendment. No impacts expected.

SUBPART MLR: MANUALS, LOGS AND RECORDS

ORO.MLR.100 Operations manual – general

(a) The operator shall establish an operations manual (OM) as specified under 8.~~b~~2 of Annex ~~I~~V to Regulation (EU) 2018/1139 ~~(EC) No 216/2008~~.

[…]

Rationale

Editorial amendment. No impacts expected.

SUBPART FTL: FLIGHT AND DUTY TIME LIMITATIONS AND REST REQUIREMENTS

SECTION 1 – GENERAL

ORO.FTL.120 Fatigue risk management (FRM)

(a) When FRM is required by this Subpart or an applicable certification specification, the operator shall establish, implement and maintain a FRM as an integral part of its management system. The FRM shall ensure compliance with the essential requirements in points 7.~~f~~5, 7.~~g~~6 and 8.~~f~~7 of Annex ~~I~~V to Regulation (EU) 2018/1139 ~~(EC) No 216/2008~~. The FRM shall be described in the operations manual.

[…]

Rationale

Editorial amendment. No impacts expected.

ORO.FTL.125 Flight time specification schemes

(a) Operators shall establish, implement and maintain flight time specification schemes that are appropriate for the type(s) of operation performed and that comply with Regulation (EU) 2018/1139 ~~(EC) No 216/2008~~, this Subpart and other applicable legislation, including Directive 2000/79/EC.

[…]

(c) To demonstrate compliance with Regulation (EU) 2018/1139 ~~(EC) No 216/2008~~ and this Subpart, the operator shall apply the applicable certification specifications adopted by the Agency. Alternatively, if the operator wants to deviate from those certification specifications in accordance with Article 76(7) ~~22(2)~~ of Regulation (EU) 2018/1139 ~~(EC) No 216/2008~~, it shall provide the competent authority with a full description of the intended deviation prior to implementing it. The description shall include any revisions to manuals or procedures that may be relevant, as well as an assessment demonstrating that the requirements of Regulation (EU) 2018/1139 ~~(EC) No 216/2008~~ and of this Subpart are met.

[…]

Rationale

Editorial amendment. No impacts expected.

4.1.3. Annex VII (Part-NCC)

SUBPART A: GENERAL REQUIREMENTS

NCC.GEN.105 Crew responsibilities

[…]

(e) The crew member shall not undertake duties on an aircraft:

(1) if ~~he/she~~ he or she knows or suspects that ~~he/she~~ he or she is suffering from fatigue as referred to in 7.~~f~~5 of Annex ~~I~~V to Regulation (EU) 2018/1139 ~~(EC) No 216/2008~~ or feels otherwise unfit, to the extent that the flight may be endangered; or

(2) when under the influence of psychoactive substances or for other reasons as referred to in 7.~~g~~6 of Annex ~~I~~V to Regulation (EU) 2018/1139 ~~(EC) No 216/2008~~.

[…]

Rationale

Editorial amendment. No impacts expected.

NCC.GEN.106 Pilot-in-command responsibilities and authority

(a) The pilot-in-command shall be responsible for:

(1) the safety of the aircraft and of all crew members, passengers and cargo on board during aircraft operations as referred to in 1.~~c~~3 of Annex ~~I~~V to Regulation (EU) 2018/1139 ~~(EC) No 216/2008~~;

(2) […];

(3) ensuring that all instructions, operational procedures and checklists are complied with in accordance with the operations manual and as referred to in 1.~~b~~2 of Annex ~~I~~V to Regulation (EU) 2018/1139 ~~(EC) No 216/2008~~;

(4) only commencing a flight if ~~he/she~~ he or she is satisfied that all operational limitations referred to in 2.~~a.3~~ (c) of Annex ~~I~~V to Regulation (EU) 2018/1139 ~~(EC) No 216/2008~~ are complied with, as follows:

[…]

(e) The pilot-in-command shall, in an emergency situation that requires immediate decision and action, take any action ~~he/she~~ he or she considers necessary under the circumstances in accordance with 7.~~d~~3 of Annex ~~I~~V to Regulation (EU) 2018/1139 ~~(EC) No 216/2008~~. In such cases ~~he/she~~ he or she may deviate from rules, operational procedures and methods in the interest of safety.

[…]

Rationale

Editorial amendment. No impacts expected.

NCC.GEN.110 Compliance with laws, regulations and procedures

[…]

(b) The pilot-in-command shall be familiar with the laws, regulations and procedures, pertinent to the performance of ~~his/her~~ his or her duties, prescribed for the areas to be traversed, the aerodromes or operating sites to be used and the related air navigation facilities as referred to in 1.~~a~~1 of Annex ~~I~~V to Regulation (EU) 2018/1139 ~~(EC) No 216/2008~~.

Rationale

Editorial amendment. No impacts expected.

SUBPART B: OPERATIONAL PROCEDURES

NCC.OP.190 Ice and other contaminants – flight procedures

[…]

(b) The pilot-in-command shall only commence a flight or intentionally fly into expected or actual icing conditions if the aircraft is certified and equipped to cope with such conditions ~~as referred to in 2.a.5 of Annex IV to Regulation (EC) No 216/2008~~.

Rationale

Editorial amendment. No equivalent reference exists in Regulation (EU) 2018/1139. Nevertheless, all the elements of the text of Regulation (EC) No 216/2008 are already contained in point (b) of NCC.OP.190. Therefore, there is no need for further references. No impacts expected.

4.1.4. Annex VII (Part-NCO)

SUBPART A: GENERAL REQUIREMENTS

NCO.GEN.101 Means of compliance

Alternative means of compliance to those adopted by the Agency may be used by an operator to establish compliance with Regulation (EU) 2018/1139 and its delegated and implementing acts. ~~(EC) No 216/2008 and its Implementing Rules.~~

Rationale

Editorial amendment. No impacts expected.

NCO.GEN.105 Pilot-in-command responsibilities and authority

(a) The pilot-in-command shall be responsible for:

(1) the safety of the aircraft and of all crew members, passengers and cargo on board during aircraft operations as referred to in 1.~~c~~3 of Annex ~~I~~V to Regulation ~~(EC) No 216/2008~~ (EU) 2018/1139;

[…]

(3) ensuring that all operational procedures and checklists for the preparation and execution of the flight are complied with as referred to in 1.~~b~~2 of Annex ~~I~~V to Regulation ~~(EC) No 216/2008~~ (EU) 2018/1139;

(4) only commencing a flight if ~~he/she~~ he or she is satisfied that all operational limitations referred to in 2.~~a.3~~(c) of Annex ~~I~~V to Regulation ~~(EC) No 216/2008~~ (EU) 2018/1139 are complied with, as follows:

[…]

(e) The pilot-in-command shall, in an emergency situation that requires immediate decision and action, take any action ~~he/she~~ he or she considers necessary under the circumstances in accordance with 7.~~d~~3 of Annex ~~I~~V to Regulation ~~(EC) No 216/2008~~ (EU) 2018/1139. In such cases ~~he/she~~ he or she may deviate from rules, operational procedures and methods in the interest of safety.

[…]

Rationale

The amendments proposed are intended to update the regulatory references to the EASA Basic Regulation.

Regarding point (a)(3), some additional text has been inserted considering that the current text of point 1.2 of Annex V to the Basic Regulation ('A flight must be performed in such a way that the operating procedures specified in the Flight Manual or, where required the Operations Manual, for the preparation and execution of the flight are followed') is not completely identical to point 1.b of Annex IV to Regulation (EC) No 216/2008. The latter regulation contained a second sentence ('To *facilitate this, a checklist system must be available for use, as applicable, by crew members in all phases of operation of the aircraft under normal, abnormal and emergency conditions and situations. Procedures must be established for any reasonably foreseeable emergency situation'), which has become point 8.11 of Annex V to the Basic Regulation, making it applicable only to commercial air transport and other operations subject to a certification or declaration requirement (i.e. operations covered by Parts-CAT, -NCC, -SPA and -SPO).*

See the rationale for the proposed changes to AMC1 NCO.GEN.105(a)(3).

These changes are merely editorial, and no impact is expected.

NCO.GEN.110 Compliance with laws, regulations and procedure

[…]

(b) The pilot-in-command shall be familiar with the laws, regulations and procedures, pertinent to the performance of his/her duties, prescribed for the areas to be traversed, the aerodromes or operating sites to be used and the related air navigation facilities as referred to in 1.~~a~~1 of Annex ~~I~~V to Regulation (EU) 2018/1139 ~~(EC) No 216/2008~~.

[…]

Rationale

Editorial amendment. No impacts expected.

SUBPART B: OPERATIONAL PROCEDURES

NCO.OP.170 Ice and other contaminants – flight procedures

[…]

(a) The pilot-in-command shall only commence a flight or intentionally fly into expected or actual icing conditions if the aircraft is certified and equipped to cope with such conditions ~~as referred to in 2.a.5 of Annex IV to Regulation (EC) No 216/2008~~.

Rationale

Editorial amendment. No impacts expected. See the rationale for proposed amendments to NCC.OP.190.

SUBPART E: SPECIFIC REQUIREMENTS

NCO.SPEC.115 Crew responsibilities

[…]

(e) The crew member shall not undertake duties on an aircraft:

(1) if ~~he/she~~ knows he or she or suspects that ~~he/she~~ he or she is suffering from fatigue as referred to in 7.~~f.~~5 of Annex ~~I~~V to Regulation (EU) 2018/1139 ~~(EC) No 216/2008~~or feels otherwise unfit to perform ~~his/her~~ his or her duties; or

(2) when under the influence of psychoactive substances or for other reasons as referred to in 7.~~g~~ 6 of Annex ~~I~~V to Regulation (EU) 2018/1139 ~~(EC) No 216/2008~~.

[…]

Rationale

Editorial amendment. No impacts expected.

4.1.5. Annex VIII (PART-SPO)

SUBPART A: GENERAL REQUIREMENTS

SPO.GEN.101 Means of compliance

Alternative means of compliance to those adopted by the Agency may be used by an operator to establish compliance with Regulation (EU) 2018/1139 and its delegated and implementing acts ~~(EC) No 216/2008 and its Implementing Rules~~.

Rationale

Editorial amendment. No impacts expected.

SPO.GEN.105 Crew responsibilities

[…]

(e) The crew member shall not undertake duties on an aircraft:

(1) if ~~he/she~~ he or she knows or suspects that ~~he/she~~ he or she is suffering from fatigue as referred to in 7.~~f.~~5 of Annex ~~I~~V to Regulation (EU) 2018/1139 ~~(EC) No 216/2008~~or feels otherwise unfit to perform ~~his/her~~ his or her duties; or

(2) when under the influence of psychoactive substances or for other reasons as referred to in 7.~~g~~ 6 of Annex ~~I~~V to Regulation (EU) 2018/1139 ~~(EC) No 216/2008~~.

[…]

Rationale

Editorial amendment. No impacts expected.

SPO.GEN.107 Pilot-in-command responsibilities and authority

(a) […]

(4) only commencing a flight if ~~he/she~~ he or she is satisfied that all operational limitations referred to in 2~~a.3~~ (c) of Annex ~~I~~V to Regulation (EU) 2018/1139 ~~(EC) No 216/2008~~ are complied with, as follows:

[…]

Rationale

Editorial amendment. No impacts expected.

SUBPART B: OPERATIONAL PROCEDURES

SPO.OP.176 Ice and other contaminants – flight procedures

(a) The pilot-in-command shall only commence a flight or intentionally fly into expected or actual icing conditions if the aircraft is certified and equipped to cope with such conditions~~ as referred to in 2.a.5 of Annex IV to Regulation (EC) No 216/2008~~.

[…]

Rationale

Editorial amendment. No impacts expected. See the rationale for proposed amendments to NCC.OP.190.

4.2. Draft acceptable means of compliance and guidance material

4.2.1. Annex II (Part-ARO)

SUBPART GEN: GENERAL REQUIREMENTS

SECTION 2 – MANAGEMENT

GM1 ARO.GEN.200(a) Management system

GENERAL

(a) The competent authority designated by each Member State should be organised in such a way that:

[…]

(2) the functions and processes described in the applicable requirements of Regulation (EU) 2018/1130 ~~(EC) No 216/2008 and its Implementing Rules~~ and its delegated and implementing acts, AMC~~s~~, Certification Specifications (CSs) and Guidance Material (GM) may be properly implemented;

(3) the competent authority's organisation and operating procedures for the implementation of the applicable requirements of Regulation (EU) 2018/1139 and its delegated and implementing acts ~~(EC) No 216/2008 and its Implementing Rules~~ are properly documented and applied;

[…]

(b) A general policy in respect of activities related to the applicable requirements of Regulation (EU) 2018/1139 and its delegated and implementing acts ~~(EC) No 216/2008 and its Implementing Rules~~ should be developed, promoted and implemented by the manager at the highest appropriate level; […]

[…]

(d) The general policy, whilst also satisfying additional national regulatory responsibilities, should in particular take into account:

(1) the provisions of Regulation (EU) 2018/1139 ~~(EC) No 216/2008~~;

[…]

Rationale

Editorial amendment. No impacts expected.

4.2.2. Annex III (Part-ORO)

SUBPART GEN: GENERAL REQUIREMENTS

SECTION 2 – MANAGEMENT

AMC1 ORO.GEN.160(c) Occurrence reporting

OCCURRENCES OR EVENTS INVOLVING HUMAN INTERVENTION

(a) According to ORO.GEN.160(c), the operator needs to process reported human intervention-related occurrences, events or adverse trends that may reveal shortcomings related to design, procedures or training, or a combination of those, detected during flight operations and/or operator simulator training and checking sessions.

(b) Where the operator cannot determine with certainty that the human intervention-related occurrence, event or adverse trend is linked to design or where it cannot be excluded that there is a link to design, the operator should report said occurrence/event to the organisation responsible for the design of the aircraft.

(c) The operator should ensure that any reports sent to the organisation responsible for the design of the aircraft have been thoroughly analysed, under their management system process, and contain sufficiently detailed information to allow the organisation responsible for the design of the aircraft to conduct its own analysis in an efficient manner.

(d) The operator should report at least the following supporting analysis and information to the organisation responsible for the design of the aircraft, if available.

(1) A description of:

(i) the operational context at the time of the occurrence, such as air traffic control clearance and meteorological and environmental conditions;

(ii) any relevant information concerning flight crew (e.g. experience on type, time on duty preceding event, fatigue);

(iii) the aircraft status, including details of any minimum equipment list items;

(iv) any relevant issue on crew resource management; and

(v) relevant pilot training details.

(2) Information on:

(i) how the occurrence was detected (whom, when and how); and

(ii) how the crew recovered from the occurrence (whom, when and how).

(3) Other relevant data, such as:

(i) pilot report data;

(ii) technical logbook data;

(iii) if permitted by flight data monitoring programme requirements and by the operator’s procedures regarding the protection of flight crew identity, data from the flight data monitoring programme that is relevant for the analysis of the occurrence;

(i) aircraft communication addressing and reporting system (ACARS) data; and

(ii) data on the existence of similar previous events, and whether they resulted (on those occasions) in unsafe conditions.

(4) If the event or trend concerns operator simulator training and/or checking, the information provided to the organisation responsible for the design of the aircraft should include information regarding the training scenario, configuration of the simulator, type representativeness of the simulator used, any simulator limitations and any other relevant information pertaining to the training and simulator used.

(e) The operator should actively cooperate with the organisation responsible for the design of the aircraft and support any investigation commenced by the organisation after reporting an occurrence/event pursuant to point (b), including timely responses to any additional requests made.

Rationale

Please refer to the rationale for ORO.GEN.160.

GM1 ORO.GEN.160(c) Occurrence reporting

OCCURRENCES OR EVENTS INVOLVING HUMAN INTERVENTIONS

The following table provides a non-exhaustive list of possible human interventions that could lead or contribute to a reduction in safety margins and could lead to reportable occurrences or adverse trends of occurrences.

Table 1 — Non-exhaustive list of events and/or conditions that could lead or contribute to a reduction in safety margins

Category	Outcome	Definition
Perception	No/wrong/late visual detection	The operator's flight crew does not detect (or detects too late or inaccurately) a visual signal necessary to formulate a proper action plan or make a correct decision.
	No/wrong/late aural detection	The operator's flight crew does not detect (or detects too late or inaccurately) an aural signal necessary to formulate a proper action plan or make a correct decision.
	No/wrong/late kinaesthetic detection	The operator's flight crew does not detect (or detects too late or inaccurately) a kinaesthetic signal (e.g. stick shaker or pusher) necessary to formulate a proper action plan or make a correct decision.

Planning and decision-making	Incorrect/late/ absence of decision or plan	The operator's flight crew is not able to develop an adequate action plan or decision to manage the situation.
Response execution	Timing error	The operator's flight crew takes action that is appropriate for the perceived situation but executes it either too early or too late.
	Sequence error	The operator's flight crew carries out a series of actions in the wrong sequence.
	Correct action on the wrong object	The operator's flight crew takes action that is appropriate for the perceived situation but executes it wrongly by selecting an object (e.g. lever, knob, button, any other HMI element) different from the intended one.
	Wrong action on the right object	The operator's flight crew selects the correct object (e.g. lever, knob, button, any other HMI element) but performs an action that is not the correct one.
	Lack of physical coordination	The operator's flight crew takes action that is appropriate for the perceived situation but executes it in a wrong manner.
	No action executed	The operator's flight crew intends to take action that is appropriate for the perceived situation but does not execute it.
Communication	Incorrect/unclear transmission of information	The operator's flight crew transmits information to other actors, but this information is incorrect or unclear (e.g. use of incorrect entry).
	No transmission of information	The operator's flight crew does not transmit information that is necessary for other actors to operate safely/effectively.

Rationale

Please refer to the rationale for ORO.GEN.160.

AMC1 ORO.GEN.200(a)(1) Management system

COMPLEX OPERATORS — ORGANISATION AND ACCOUNTABILITIES

[…]

(a) Safety manager

[…]

(2) The functions of the safety manager should be to:

[…]

(vi) provide advice on safety matters; ~~and~~

(vii) ensure initiation and follow-up of internal occurrence/accident investigations~~.~~;

(viii) ensure, if a flight data monitoring programme is required, its effective use for safety risk management.

[…]

(b) Safety review board

[…]

(3) The safety review board should monitor:

[…]

(iii) the effectiveness of the operator's safety management processes, including those related to the flight data monitoring programme, if such a programme is required.

[…]

Rationale

AMC1 ORO.AOC.130 specifies that the safety manager should be responsible for the FDM programme. In addition, the operator's safety review board should monitor the effectiveness of the FDM programme as part of its monitoring of the management system's effectiveness.

Therefore, AMC1 ORO.GEN.200(a)(1) (organisation and accountabilities at a complex operator) is proposed to be modified to include mentions of the FDM programme in the descriptions of the tasks of the safety manager and of the safety review board.

AMC1 ORO.GEN.200(a)(3) Management system

COMPLEX OPERATORS — SAFETY RISK MANAGEMENT

(a) Hazard identification processes

(1) Reactive and proactive schemes for hazard identification should be the formal means of collecting, recording, analysing, acting on and generating feedback about hazards and the associated risks that affect the safety of the operational activities of the operator. Such schemes should include the flight data monitoring programme when such a programme is required.

[…]

(d) Safety performance monitoring and measurement

[…]

(2) This process should include:

(i) safety reporting, addressing also the status of compliance with the applicable requirements;

(ii) the flight data monitoring programme, for those aircraft required to be included in such a programme;

(iii)~~(ii)~~ safety studies, that is, rather large analyses encompassing broad safety concerns;

(iv)~~(iii)~~ safety reviews including trends reviews, which would be conducted during introduction and deployment of new technologies, change or implementation of procedures, or in situations of structural change in operations;

(v)~~(iv)~~ safety audits focussing on the integrity of the operator's management system, and periodically assessing the status of safety risk controls; and

(vi)~~(v)~~ safety surveys, examining particular elements or procedures of a specific operation, such as problem areas or bottlenecks in daily operations, perceptions and opinions of operational personnel and areas of dissent or confusion.

Rationale

AMC1 ORO.GEN.200(a)(3) (implementation of safety risk management by complex operators) mentions several sources of safety data for hazard identification, and safety performance monitoring and measurement ('reporting systems', 'safety studies', 'safety audits', 'safety surveys', etc), but not the FDM programme, although ORO.AOC.130 and SPA.HOFO.145 state that the FDM programme shall be part of the operator's management system and point (b) of AMC1 ORO.AOC.130 covers the main steps of SRM.

It is expected that an explicit mention of the FDM programme in this AMC will drive operators to fully integrate their FDM programme in their management system and competent authorities to verify the use of the FDM programme to support SRM.

In order to provide operators with sufficient period to implement these changes to their SRM processes, EASA intends to specify a deferred applicability of 2 years for these changes in the EASA ED Decision that will adopt them.

Note: In Chapter 3 of EASA NPA 2022-11, it is proposed to introduce a new AMC2 ORO.GEN.200(b) with the following condition: 'if the operator holds a HEMS, HOFO or HHO specific approval, it should implement all the elements and processes of a management system applicable to complex operators.' If that proposal is adopted, AMC1 ORO.GEN.200(a)(1) and AMC1 ORO.GEN.200(a)(3) will then become applicable to all helicopter offshore operators in the scope of this NPA, whereas today they are only applicable to offshore operators with a workforce of more than 20 full-time-equivalent staff, in accordance with AMC1 ORO.GEN.200(b). However, since most offshore operators have a workforce that is significantly larger than 20 full-time-equivalent staff, it is considered that the adoption of AMC2 ORO.GEN.200(b) will not change the impact of the proposed amendments to AMC1 ORO.GEN.200(a)(1) and AMC1 ORO.GEN.200(a)(3). The public consultation on EASA NPA 2022-11 ended on 20 March 2023.

GM2 ORO.GEN.200(a)(2) Management system

SAFETY POLICY REGARDING THE USE OF DATA FOR PURPOSES OTHER THAN SAFETY RISK MANAGEMENT

If a data source that is needed to support safety risk management is required to be protected, then it is recommended that the safety policy required by ORO.GEN.200 provides for consistent protection of this data source when it is used for other purposes. An example is using flight data for a flight data monitoring programme (protection of the data source is required by ORO.AOC.130 and SPA.HOFO.145) and for other programmes, such as a fuel efficiency programme or a preventive maintenance programme. In this example, the safety policy consistently addresses the protection of flight crew identity across all the programmes in which flight data is used.

Rationale

This new proposed GM recommends that when a source of data that is needed to support the SRM process is required to be protected, and this data is also used for purposes other than safety, the operator's safety policy required by point (a)(2) of ORO.GEN.200 should address data source protection for all possible uses of the data. This is necessary to avoid that uses of SRM data for purposes other than safety are detrimental to SRM implementation (through inappropriate handling or disclosing of this data and thereby degrading the operator's safety culture or the quality of the data provided by this source, or otherwise adversely affecting the use of this data for SRM) and ultimately the operator's management system.

FDM data is an example of such data (the operator is required to protect the source of data in accordance with ORO.AOC.130).

AMC1 ORO.GEN.200(a)(6) Management system

COMPLIANCE MONITORING — GENERAL

[…]

(b) […]

(4) management system procedures and manuals, including procedures applicable to the flight data monitoring programme, when such a programme is required;

[…]

Rationale

The protection of the data source required by points ORO.AOC.130 and SPA.HOFO.145 is not always effective, especially because the FDM procedure specified in points (j) and (k) of AMC1 ORO.AOC.130 is not complied with. This in turn affects the trust of pilots and the safety culture at the operator, and ultimately it makes the management system less effective. As the FDM programme shall be integrated in the management system as per ORO.AOC.130 and SPA.HOFO.145, FDM programme procedures should be considered part of the management system procedures, and therefore be in the scope of the compliance monitoring function of every operator. This is clarified by the proposal to explicitly mention the FDM programme procedures in point (b)(4) of AMC1 ORO.GEN.200(a)(6).

SUBPART AOC: AIR OPERATOR CERTIFICATION

AMC1 ORO.AOC.130 Flight data monitoring – aeroplanes

ORGANISATION OF THE FLIGHT DATA MONITORING (FDM) PROGRAMME

(a) Safety manager responsibility: ~~The~~ the safety manager, as defined under AMC1~~-~~ ORO.GEN.200(a)(1), should be responsible for the identification and assessment of issues and their transmission to the manager(s) responsible for the process(es) concerned. The latter should be responsible for taking appropriate and practicable safety action within a reasonable period of time that reflects the severity of the issue.

(b) Contribution to the management system: ~~An~~ an FDM programme should support the identification of safety hazards, their evaluation and the management of associated risks, required by ORO.GEN.200, by allowing the ~~an~~ operator to:

[…]

(3) estimate ~~use the FDM information on~~ the frequency and severity of such occurrences, ~~combined with an estimation of the level of severity, to~~ assess the safety risks and ~~to~~ determine which risks are unacceptable or may become unacceptable if the discovered trend continues;

[…]

(c) FDM analysis techniques: FDM analysis techniques should comprise the following:

(1) Exceedance detection ('FDM event'): searching for deviations from aircraft flight manual limits and standard operating procedures. ~~A set of core events should be selected to cover the main areas of interest to the operator and as much as possible, the most significant risks identified by the operator. The event definitions should be continuously reviewed to reflect the operator's current operating procedures.~~

(2) All flights measurement ('FDM measurement'): a system defining what is normal practice. This may be accomplished by retaining various snapshots of information from each flight.

[…]

(d) FDM analysis, assessment and process control tools: the effective assessment of information obtained from digital flight data should be dependent on the provision of appropriate information technology tool sets. These should include specialised software ('FDM software') for processing the flight data. In addition, in order to easily link flight data with occurrence reports and other data such as traffic data and weather data, these toolsets should have the following capabilities:

(1) software capable of automatically and uniquely identifying individual flights in the data files collected for FDM; and

(2) providing to the extent the necessary data is collected, for each FDM event detection, the aircraft geographical position and altitude, the coordinated universal time (UTC) date and time, the flight identification and the aircraft registration.

(e) ~~Education and publication~~ Safety information and promotion: ~~should be a fundamental principle of aviation safety in helping to reduce accident rates. The operator should pass on the lessons learnt to all relevant personnel and, where appropriate, industry.~~ the output of the FDM programme should be used, in compliance with the procedure specified in (k), to support the sharing of safety information with flight crew members and all other relevant personnel.

(f) Accident and incident data requirements: ~~Accident~~ accident and incident data requirements specified in CAT.GEN.MPA.195 take precedence over the requirements of an FDM programme. In these cases the FDR data should be retained as part of the investigation data and may fall outside the de-identification agreements.

(g) Event reporting: ~~Every~~ every flight crew member should be responsible for reporting events. Significant risk-bearing incidents detected by FDM should therefore normally be the subject of mandatory occurrence reporting by the crew. If this is not the case, then they should submit a retrospective report that should be included under the normal process for reporting and analysing hazards, incidents and accidents.

(h) Data recovery and analysis: ~~The~~ the data recovery and analysis strategy should ensure a sufficiently representative capture of flight information to maintain an overview of operations. ~~Data analysis~~ In addition, FDM event validation should be performed sufficiently frequently to enable action to be taken on significant safety issues. This includes all of the following:

(1) At least 80 % of the recordings of the flights performed in the past 12 months of any individual aeroplane that is in the scope of ORO.AOC.130 should be available for analysis with the FDM software and have valid data, unless the operator demonstrates to its competent authority that meeting this objective would cause a disproportionate cost impact; in that case, the proportion of flight recordings of any individual aeroplane that are available for analysis with the FDM software and have valid data should not be less than 60 % when averaged over the past 12 months.

(2) The operator should have means to identify, within 15 calendar days, a failure of the means to collect data from any individual aeroplane in the scope of ORO.AOC.130, unless the operator demonstrates to its competent authority that meeting this objective would cause a disproportionate cost impact; in that case, the time to identify such a failure should not exceed 22 calendar days.

(3) The time between completion of a flight and routine processing of the data of that flight by the FDM software (including event detection) should not exceed 15 calendar days for at least 80 % of flights for which data was collected within the FDM programme in the past 12 months, unless the operator demonstrates to its competent authority that meeting this objective would cause a disproportionate cost impact; in that case, at least 80 % of the flights for which data was collected within the FDM programme in the past 12 months should be processed by the FDM software within 22 days of completion of the flight.

(4) For each aeroplane that is in the scope of ORO.AOC.130 and that is first issued with an individual certificate of airworthiness (CofA) on or after [date of publication + 3 years]:

(i) the operator should ensure that, within 90 calendar days after it starts operating the aeroplane, the data collected for analysis by the FDM software includes all the flight parameters required to be recorded by a flight data recorder in accordance with AMC1.2 CAT.IDE.A.190; and

(ii) the operator should ensure that, within 90 calendar days after it starts operating the aeroplane, the recorded flight parameters specified in (i) meet the performance specifications (range, sampling intervals, accuracy limits and resolution in read-out) as defined in EUROCAE Document 112A or any later equivalent standard produced by EUROCAE.

(5) The operator should document the principles it uses for validating significant FDM events i.e. FDM events that require dedicated and timely review of the related flight data. Validation of a significant FDM event should be performed as a matter of priority, and in any case within 15 calendar days after it has been detected by the FDM software, for at least 80 % of the significant FDM events.

(i) Data retention strategy: ~~The~~ the data retention strategy should aim at providing the greatest safety benefits practicable from the available data:

(1) ~~A full dataset~~ all raw or decoded flight data recording files should be retained at least until the action and review processes are complete. 80 % or more of raw or decoded flight data recording files of the aircraft required to be part of the FDM programme should be retained and readily retrievable for analysis for at least 2 years;

(2) ~~thereafter,~~ a ~~reduced~~ dataset relating to closed issues should be maintained for longer-term trend analysis. ~~Programme managers may wish to retain samples of de-identified full-flight data for various safety purposes (detailed analysis, training, benchmarking, etc.).~~

(j) Data access and security policy: ~~The~~ the data access and security policy should restrict information access to authorised persons. When data access is required for airworthiness and maintenance purposes, a procedure should be in place to prevent disclosure of crew identity.

(k) Procedure to prevent disclosure of crew identity: ~~The~~ the procedure to prevent disclosure of crew identity should be written in a document, which should be signed by all parties (airline management, flight crew member representatives nominated either by the union or the flight crew themselves). This procedure should, as a minimum, define:

[…]

(6) ~~the conditions under which the confidentiality may be withdrawn for reasons of gross negligence or significant continuing safety concern~~ the conditions under which the protection of the information source may be withdrawn. These conditions should be consistent with the provisions laid down in Regulation (EU) No 376/2014 and the operator's safety risk management procedures;

[…]

(l) Maintaining knowledge about data and algorithms: the operator should maintain knowledge of the source of data and the algorithms used to produce FDM events and measurements. For each individual aircraft required to be part of the FDM programme and first issued with an individual CofA on or after [date of publication + 3 years], the operator should produce, within

90 calendar days after it starts operating this aircraft, the following documentation, and thereafter keep it up to date:

(1) Documentation on the data source and the performance (at least recording resolution and recording rate) of all the flight parameters that are collected from that aircraft for the purpose of the FDM programme.

(2) Documentation on the algorithms used to produce FDM events or FDM measurements from the data collected from that aircraft. This should include the following:

(i) A description of the logic of each algorithm. This description should be sufficiently detailed to verify consistency with the applicable flight manual limitations or standard operating procedures (SOPs), as applicable. In the case of an FDM event algorithm, the event trigger thresholds should be specified.

(ii) For each algorithm, the flight parameters needed by the algorithm and their minimum performance for the algorithm to deliver reliable results (at least minimum accuracy and minimum recording rate).

~~(l)~~(m) Airborne systems and equipment: for all aircraft required to be part of the FDM programme and that are first issued with an individual CofA on or after [date of publication + 3 years], ~~Airborne~~ airborne systems and equipment used to obtain ~~FDM~~ flight data should ~~range from a quick access recorder (QAR) in an aircraft with digital systems, to a crash-protected flight recorder in an older or less sophisticated aircraft~~ continuously collect the data throughout the flight, including when the aircraft is moving on the ground under its own power. ~~The analysis potential of the reduced data set available in the latter case may reduce the safety benefits obtainable. The operator should ensure that FDM use~~ The use of such airborne systems and equipment, including retrieval of data from the aircraft, ~~does~~ should not ~~adversely~~ affect the availability or the serviceability of flight recorders ~~equipment~~ required for accident investigation.

Rationale

The subtitle of AMC1 ORO.AOC.130 is proposed to be changed to clarify that this AMC addresses the organisation of the FDM programme and not what risk areas should be monitored by the FDM programme (the latter is addressed in AMC2 ORO.AOC.130, and examples of FDM methods are provided in GM2 ORO.AOC.130).

Most of the proposed amendments to AMC1 ORO.AOC.130 introduce minimum performance objectives for the collection of flight data, their processing by software, their analysis and their retention. This is because the feedback from standardisation inspections (in non-public EASA Standardisation Annual Reports for 2019 and 2020) and the evaluation of European Operators Flight Data Monitoring forum (EOFDM) best-practices documents show a great disparity in the effectiveness of the FDM programmes and that many operators invest too little in technology and human resources, resulting in them not achieving the goal of an FDM programme.

AMC1 ORO.AOC.130 on flight data monitoring does not include performance objectives to ensure minimum effectiveness of the FDM programmes. In several visited operators, FDM was not adequately used by the operator, which hampered its identification of operational hazards and therefore its safety risk management process.

Excerpt from the 2019 EASA Standardisation Annual Report.

Other proposed amendments are intended to better show the contribution of the FDM programme to the operator's management system, especially to the safety risk management (SRM) process, and to achieve more consistent protection of the information source between the occurrence reporting system and the FDM programme.

In order to provide operators with sufficient notice period to implement the amendments, EASA intends to specify a deferred applicability of 2 years for the changes to AMC1 ORO.AOC.130 in the EASA ED Decision that will adopt them. In addition, it is proposed to restrict the applicability of points (h)(4), (l) and (m) of AMC1 ORO.AOC.130 to aeroplanes that are first issued with an individual CofA at least 3 years after the date of publication of the ED Decision, as otherwise they may cause a change to airborne systems or airborne equipment on already operated aeroplanes.

Detailed rationale

— *Regarding point (b): standardisation findings reveal that some operators do not make any use of the output of their FDM programme for the SRM process required by point (a)(3) of ORO.GEN.200. Point (b) of AMC1 ORO.AOC.130 contains a description of the purpose of an FDM programme that matches the main steps of the SRM process, but the link with ORO.GEN.200 is missing. Therefore, reference to ORO.GEN.200 is proposed to be added.*

— *Regarding point (b)(3): the proposed amendments remove the ambiguity about the contribution of the FDM programme regarding SRM: the FDM programme should provide data that supports safety risk assessment and the monitoring of whether corrective actions are effective, but the FDM programme is not the sole source of data for assessing safety risks.*

— *Regarding point (c)(1): it is proposed to move the deleted text to a new AMC2 ORO.AOC.130 that is dedicated to what should be monitored by the FDM programme.*

— *Regarding point (d):*

- *If occurrence reports and relevant contextual data (weather data, traffic data, NOTAMs, fatigue data, etc.) can easily be linked to FDM events and FDM measurements, this can greatly enhance the analysis of events and trends. For this, it is necessary to accurately know where (global navigation satellite system position) and when (UTC date and time) an FDM event was detected and on which flight it happened (this is also applicable to the data points required to make an FDM measurement). This means that the FDM software should be capable of automatically and uniquely identifying individual flights in the flight data files, enabling it to reliably and quickly relate the flight data of a given flight to other data sources. Not every piece of FDM software currently has this capability and this will be taken into account by deferring the applicability date of the amendments to AMC1 ORO.AOC.130 by 2 years after the date of publication of the ED Decision.*

- *This also implies that the definition of each FDM event algorithm includes the extraction of position, date and time information, so that this information can be easily linked with contextual data afterwards. In addition, the flight identification (call sign) is important to uniquely relate an event to a flight crew report. The aircraft registration may be useful to check that the FDM event algorithm was applied to an aircraft type it was designed for. However, since some of these flight parameters are not expected to be recorded on the* *flight data recorder (FDR) for all aeroplanes, it is not certain that they will always be available for recording on a quick access recorder. Therefore, the condition 'to the extent the necessary data is collected' is proposed to be added.*

- *The requirement in ORO.AOC.130 to have 'adequate safeguards to protect the source of the data' still needs to be complied with. The scope of this proposed objective is only the technical capability of the FDM software, not the use or protection of this data.*

— *Regarding point (e): this point is about informing flight crew members and promoting safety; therefore, it is proposed that the heading 'Education and publication' is replaced by 'Safety information and promotion'. In addition, the content of this point is proposed to be reworded to make it specific ('and, where appropriate, industry' is a rather vague condition). Point (a)(4) of ORO.GEN.200 requires that the management system includes 'maintaining personnel trained and competent to perform their tasks'. Further, point (b) of AMC1 ORO.GEN.200(a)(4) specifies that the operator should establish communication about safety matters with their staff. Hence, the communication of safety information based on FDM to flight crew members supports the objective set in ORO.GEN.200 to maintain the competence of the staff.*

— *Regarding points (h)(1) and (h)(2): the purpose of the proposed amendments is to limit the probability that events go undetected because the event flight is not recorded or not processed by the FDM software. A flight collection rate of 80 % for any individual aircraft should be an achievable target for many operators (flight collection rate = number of valid flight recordings with data collected / number of flown flights, computed over 1 year). Today, many operators that have installed wireless quick access recorders collect data on 95 % or more of their flights. Therefore, a target of 80 % is proposed for point (h)(1). For point (h)(2), the objective is to identify a failure of the means to collect data from an individual aircraft within 15 calendar days. In addition, because these objectives might cause a disproportionate cost impact for some operators, points (h)(1) and (h)(2) offer the possibility to agree on less demanding objectives with the competent authority, if justified (flight collection rate of 60 % and time to identify a failure of the means to collect data from an individual aircraft not exceeding 22 calendar days).*

— *Regarding point (h)(3):*

- *For the FDM programme to effectively contribute to the SRM, it should detect significant events and new adverse trends in a timely manner. For example, it may help detect unreported events that require an immediate inspection to ensure that an aircraft is still airworthy. This starts with timely collection of data after the flight and timely processing of this data by the FDM software.*

- *Furthermore, when a retrospective report from a flight crew is needed or required in accordance with Regulation (EU) 2015/1018, it is preferable to request it within a few days of the concerned flight, when the crew members' memory of the flight is still fresh. As a general principle, the shorter the time taken to recover and analyse the flight data, the better.*

- *However, for a small proportion of aeroplane operators, especially those performing on-demand long-range flights, it may be more challenging to recover the flight data within 1 week or less. Therefore, the objective is proposed to be set to a maximum of 15 calendar days for 80 % of the flights. In addition, because this objective might still cause a* *disproportionate cost impact for some operators, the proposed point (h)(3) offers the possibility to agree on a less demanding objective with their competent authority, if justified (22 calendar days for at least 80 % of the flights).*

— *Regarding point (h)(4):*

- *Without the necessary flight parameters, FDM event and measurement definitions cannot be programmed or they are more difficult to programme as they may require reconstructing some flight parameters in the first place, which can be challenging. An example is terrain avoidance and warning system (TAWS) / ground proximity warning system (GPWS) warnings: just recording that the TAWS displayed a warning to the flight crew without indication of the active TAWS mode is often not sufficient for an event analysis, but reliably reconstructing the active TAWS mode is far from straightforward.*
- *In addition, the performance of recorded flight parameters can be decisive for implementing an FDM algorithm. For example, if the main gear compression parameter is only recorded every 4 seconds, accurately locating the point of touchdown at landing is challenging. With a typical approach speed of 150 kts, an aeroplane covers a distance of about 310 m within 4 seconds.*
- *All aeroplanes with a MCTOM of over 5 700 kg that are first issued with an individual CofA on or after 1 January 2023 and that are operated for commercial air transport should record on an FDR the flight parameters specified in ED-112A Tables II-A.1 and II-A.2, and comply with the performance requirements specified in those tables (refer to AMC1.2 CAT.IDE.A.190). If these flight parameters are collected for recording by the FDR, they can also be collected for FDM. Therefore, the data collected for FDM should include these flight parameters. This set can be extended in terms of recorded parameters or their performance, according to the needs of the operator or the peculiarities of the aircraft model.*
- *Currently, many operators have no in-house abilities to modify data frame layouts on the aircraft they operate. Therefore, it is proposed that point (h)(4) is only applicable to aeroplanes manufactured on or after [date of publication + 3 years], to avoid a disproportionate impact on currently operated aircraft.*
- *For newly operated aircraft, it is proposed that the operator is granted 90 calendar days to check that the flight parameters specified in point (h)(4) are collected for that aircraft, and that these flight parameters meet the performance specifications specified in ED-112A. This time is considered sufficient to verify the content of the flight data collected from the newly operated aircraft and to obtain the necessary documentation from the installer of the airborne system that is used on that aircraft to collect flight data.*

— *Regarding point (h)(5):*

- *A time objective for the validation of significant FDM events is proposed, to ensure that such events are addressed within a reasonable time. Significant FDM events are those requiring a timely and dedicated analysis of the related flight data. Examples of significant FDM events were introduced in point (a)(1) of GM1 ORO.AOC.130.*

- *The validation of significant FDM events should be a priority task of the FDM programme. A maximum time for validation of significant FDM events is proposed to be set to 15 calendar days from the time of their detection by the FDM software. This is a maximum time and not the recommended time.*
- *This time objective needs to be met for at least 80 % of significant FDM events, and not 100 %, to give operators sufficient flexibility to cope with unplanned situations, especially those operators with small FDM teams (typically just one or two staff members).*
- *To achieve this objective, a function should allow the FDM analyst to document the time when a significant FDM event is validated, for showing compliance later. It is considered that introducing such a function into current FDM software would not be challenging for FDM software providers. In addition, the applicability date of the amendments to AMC1 ORO.AOC.130 is intended to be deferred by 2 years after the date of publication of the ED Decision, which should provide for sufficient notice period to update FDM software.*

— *Regarding point (i):*

- *Retaining more than a year of flight data is necessary to monitor long-term trends and to factor in seasonal variations. Point (c)(2) of GM1 ORO.AOC.130 explains that 'All events are usually archived … Over time, this archived data can provide a picture of emerging trends and hazards that would otherwise go unnoticed.'*
- *In addition, the recording duration should be sufficient to test and validate new FDM event and measurement definitions. Testing and fine-tuning FDM event and measurement definitions usually requires large numbers of flights.*
- *Retaining raw flight data for longer periods is also advantageous when an operator needs to change FDM software, or when it needs evidence for a dispute (e.g. a passenger injury claim).*
- *It is considered that 2 years of data retention is sufficient. A longer duration is not proposed because of the volume of data to be stored and because the operated aircraft and the nature of operations change over time, and older flights cannot always be related to more recent flights.*

  As an example, the memory capacity required to store an hour of raw flight data, assuming that 2 048 12-bit-long words are recorded per second, is 10.5 MB. Assuming that utilisation of the aircraft is 18 hours per day on average, the memory capacity required to store the raw flight data corresponding to 2 years of operation of the aircraft is slightly more than 160 GB. Given that the current data storage cost is a few tens of euro per terabyte of data, the total cost impact for an operator to store the raw flight data corresponding to 2 years of operation of its fleet is considered very limited.
- *The new objective might necessitate revisiting the agreement with flight crew representatives regarding flight data protection. It is proposed to take this into account by deferring the applicability date of the amendments to AMC1 ORO.AOC.130 by 2 years after the date of publication of the ED Decision.*
- *The sentence 'Programme managers may wish to retain samples of de-identified full-flight data for various safety purposes (detailed analysis, training, benchmarking, etc.).'*

is proposed to be moved to point (c)(2)(iii) of GM1 ORO.AOC.130, as it does not specify means of compliance and is rather guidance. In addition, it is slightly reworded ('programme managers' is replaced by 'the FDM team').

— *Regarding point (k)(6): the conditions for protection of information sources should be aligned across different regulations so that operators can use the same processes or procedures regardless of the source and to foster a positive safety culture. The framework for withdrawing the protection of the information source is defined in Regulation (EU) No 376/2014.*

— *Regarding point (l): this is a new point proposed to ensure that operators maintain knowledge of the collected flight data and of FDM algorithms implemented in their software, which is sufficient to understand and correctly interpret the output of their FDM programme. The operator is responsible for the FDM programme, and this includes responsibility for correct and timely analysis of the output of FDM algorithms to support the SRM process. This responsibility cannot be delegated or transferred and implies that the operator has sufficient knowledge of the collected flight data and of how it was processed.*

- *To maintain this knowledge over time, the operator should document the following.*
  - *Information on the data source (which aircraft sensor or system) and the performance of flight parameters (recording resolution and recording rate). This information should be documented as it is essential for ensuring that flight parameters used by the FDM algorithms (FDM event algorithms and FDM measurement algorithms) that are programmed in the FDM software are adequate. This documentation should be controlled. In addition, it should include the history of modifications, to retain knowledge of changes made despite the evolution of the fleet and FDM staff changes.*
  - *Information on the FDM algorithms that is sufficient to ensure that these algorithms are adequate for the aircraft model, type of operation, SOPs, etc., or, if necessary, to perform (or request) an adaptation of these FDM algorithms. Today, many operators still use predefined algorithms that are provided with the FDM software, and they unfortunately perform no or limited adaptation of these algorithms.*
- *For newly operated aircraft, it is proposed that the operator is granted 90 calendar days to produce this documentation. This time objective is aligned with point (h)(4), which also grants 90 days to check the flight parameters collected from that aircraft and the performance specifications of these flight parameters.*

— *Regarding point (m):*

- *Using the FDR for FDM should now be reserved for exceptional cases, as it brings significant drawbacks for the FDM programme (the recording duration is limited, the number of parameters is limited and collecting data is more resource intensive) and may have an impact on the serviceability of the FDR. The FDR is required equipment for ICAO Annex 13 purposes. Use of the FDR was probably more commonplace in the 1990s and early 2000s, when there were no readily available alternatives, but today most operated aircraft are fitted with dedicated FDM recorders (quick access recorders, wireless quick access recorders, etc.). FDM has been required by JAR-OPS and then EU-OPS since 2005,* *and large commercial air transport aeroplanes manufactured in the last two decades all have specific airborne equipment for FDM purposes, so they do not use the FDR.*

- *However, to not be overprescriptive and hinder the development of new technologies, the use of the FDR is not proposed to be forbidden. Rather, the retrieval of flight data from the aircraft for the purpose of the FDM programme should not affect the availability or the serviceability of required flight recorders (FDRs, cockpit voice recorders, data link recording systems, etc.).*
- *Rather than forbidding the use of the FDR, it is more relevant for this AMC to specify the minimum performance of the airborne system, such as the capability to continuously collect flight data throughout the flight, including in the ground phases.*

AMC2 ORO.AOC.130 Flight data monitoring – aeroplanes

SCOPE OF THE FLIGHT DATA MONITORING (FDM) PROGRAMME

(a) A set of core FDM events or FDM measurements should be selected to cover the main areas of interest to the operator and, as much as possible, the most significant risks identified by the operator. The event definitions and measurement definitions should be continuously reviewed to reflect the operator's current operating procedures.

(b) For all aeroplanes in the scope of ORO.AOC.130 and that are first issued with an individual CofA on or after 1 January 2016, the FDM programme should monitor, to the extent possible with the available flight data and without requiring overly complex algorithms, at least the following key risk areas:

(1) risk of runway excursion during take-off or landing;

(2) risk of airborne collision

(3) risk of aircraft upset; and

(4) risk of collision with terrain.

(c) If the necessary flight parameters are collected by the airborne system used to obtain flight data, the FDM programme should monitor:

(1) exceedances indicating that the airworthiness of the aircraft may be affected and that are related to:

(i) speed and configuration;

(ii) altitude;

(iii) accelerations;

(iv) attitude angles;

(v) engine limitations (such as related to thrust parameters, exhaust gas temperature, vibration levels and reverse thrust versus aircraft speed);

(vi) aircraft weight;

(2) caution and warning alerts to the flight crew indicating that the airworthiness of the aircraft may be affected.

(d) The operator should establish and maintain a document identifying which types of occurrences are monitored with the FDM programme. This document should cover at least the occurrences subject to mandatory reporting and listed in Regulation (EU) 2015/1018, Annex I, Section 1 (excluding paragraph 1.5, point (3)) and Section 5. This document should provide a short description of the applicable FDM event(s) or FDM measurement(s) for each type of occurrence that is monitored with the FDM programme.

Rationale

There is no specification in AMC1 ORO.AOC.130 regarding the risk areas that should be monitored by the FDM programme. As a result, compliance with AMC1 ORO.AOC.130 does not guarantee that the operator uses its FDM programme to monitor the risk areas that are relevant for all large aeroplane operators, such as those pointed out by the EASA Annual Safety Review or by the European Plan for Aviation Safety, or those corresponding to occurrences subject to mandatory occurrence reporting in accordance with Annex I to *Regulation (EU) 2015/1018. Several accident investigations have shown that this may lead to adverse trends not being detected at all by the operator because occurrences are not reported by flight crews and not monitored through FDM*[25]*. See also No 2016-02R1 (erroneous take-off parameters) and No 2017-20 (slow rotation at take-off) of the EASA safety information bulletins.*

In order to provide operators with sufficient notice period to implement the new proposed AMC2 ORO.AOC.130, it is proposed that the applicability of this new proposed AMC is deferred by 2 years.

Detailed rationale

— *Regarding the proposed point (a): it is proposed to move part of point (c)(1) of AMC1 ORO.AOC.130 to point (a) of this new AMC, as this part addresses what is to be monitored with the FDM programme. Point (a) contains the general conditions regarding the choice of the risk areas to be monitored with the FDM programme and adapts the definitions of FDM events and measurements to the SOPs.*

— *Regarding the proposed point (b):*

[25] See, for instance, the following investigation reports:

— *Serious incident to the Airbus A340-313E registered F-GLZU on 11 March 2017 at Bogotà (Colombia)*, Bureau d'Enquêtes et d'Analyses (BEA France). Link to the BEA website: https://bea.aero/;

— *Serious incident to the Boeing 737-800 registered PH-BXG, at Amsterdam Schiphol Airport on 10 June 2018*, Dutch Safety Board (DSB Netherlands). Link to the DSB website: https://onderzoeksraad.nl/en/ ;

— *Serious incident to a Boeing 737-800 registered G-JZHL at Kuusamo Airport, on 1 December 2021*, Air Accidents Investigation Branch (AAIB United Kingdom). Link to the AAIB website: https://www.gov.uk/government/organisations/air-accidents-investigation-branch.

- *When considering commercial air transport operations with large aeroplanes, the most relevant risk areas for monitoring are aircraft upset, airborne collision and runway excursion according to EASA's 2020*[26] *and 2021*[27] *annual safety reviews.*
- *In addition, these three key risk areas appear in Volume II of the 2024 EPAS*[28] *(Section 3.1.1), along with the risk of terrain collision* [(29)]*.*
- *These four key risk areas (airborne collision, runway excursion at take-off and landing, aircraft upset and terrain collision) can be monitored with the help of the flight parameters that are usually recorded for FDM programmes. The [European Operators Flight Data Monitoring forum](#) has published detailed industry good practices on how to monitor precursors related to these four key risk areas in its document titled* Guidance for the implementation of flight data monitoring precursors*.*
- *It is important to monitor the risk of runway excursion at take-off and not only at landing, as highlighted by No 2016-02 (erroneous take-off parameters) and No 2017-20 (slow rotation at take-off) of the EASA safety information bulletins.*
- *The proposed point (b) is applicable to aeroplanes manufactured since 1 January 2016, as these aeroplanes should record on the crash-protected FDR the parameters specified in AMC1.1 CAT.IDE.A.190. These parameters are considered sufficient to monitor the four key risk areas specified in point (b) using FDM algorithms. It is assumed that the airborne systems and equipment used to obtain flight data for the FDM programme collect, as a minimum, the parameters specified in AMC1.1 CAT.IDE.A.190. Usually, on aeroplanes manufactured since 1 January 2016, such airborne systems and equipment collect many more parameters.*

— *Regarding the proposed point (c):*

- *Any exceedance of a flight parameter value that indicates a potential effect on the airworthiness of the aircraft should be monitored by the FDM. This includes, for example, exceeding hard landing limits, load factor exceedance in flight, flap / slat / landing gear overspeed, excessive engine temperature and tail strike. Point (c) also includes the monitoring of caution and warning alerts to the flight crew, when they indicate that the airworthiness of the aircraft may be affected.*
- *Airborne systems that are used to collect flight data (such as quick access recorders / wireless quick access recorders) and installed on aeroplanes first issued with an individual CofA on or after 1 January 2016 are assumed to record the necessary flight parameters on the FDR to comply with AMC1.1 CAT.IDE.A.190. However, flight controls input, the aircraft weight or engine settings might not be recorded for older aeroplanes. Therefore,*

[26] EASA, *Annual Safety Review 2020*, 2020 (https://www.easa.europa.eu/en/document-library/general-publications/annual-safety-review-2020).

[27] EASA, *Annual Safety Review 2021*, 2021 (https://www.easa.europa.eu/en/document-library/general-publications/annual-safety-review-2021#group-easa-downloads).

[28] EASA, *European Plan for Aviation Safety (EPAS) 2024*, 2024 (https://www.easa.europa.eu/en/document-library/general-publications/european-plan-aviation-safety-epas-2024).

[29] This explanation is based on the definition of 'terrain collision' in the Annex to Regulation (EU) 2020/2034.

point (c) specifies 'If the necessary flight parameters are collected by the airborne system used to obtain flight data'.

- *Using FDM for predictive maintenance or for on-condition monitoring is not in the scope of point (c) because the purpose of an FDM programme is safety, not maintenance efficiency. In addition, predictive maintenance and on-condition monitoring often require data and analysis techniques that are different to those used for FDM.*

— *Regarding the proposed point (d):*

- *FDM algorithms should be used to help detect unreported occurrences that are in the scope of Annex I to Regulation (EU) 2015/1018, as it is important to track these occurrences. FDM algorithms can also help detect events that are precursors to occurrences subject to mandatory reporting, so that corrective actions are taken to prevent such occurrences.*

- *In addition, the FDM programme and occurrence reporting are both parts of the operator's management system and both under the control of the operator's safety manager. Some FDM events should already trigger a request for retrospective reporting in accordance with point (g) of AMC1 ORO.AOC.130. FDM can be used to support occurrence reporting and the management system while maintaining protection of the data sources and without requiring the operator's reorganisation.*

- *Annex I to Regulation (EU) 2015/1018 lists the occurrences related to the operation of the aircraft that must be reported to the operator's competent authority (in accordance with Regulation (EU) No 376/2014). The most relevant for FDM are contained in Sections 1 and 5 of that Annex. However, the scope of paragraph 1.5, point (3), is very unspecific and may raise questions about the protection of data sources, because this point is asking for individual flight crew performance to be monitored: 'Any occurrence where the human performance has directly contributed to or could have contributed to an accident or a serious incident.' Therefore, it is proposed that this point is excluded.*

- *Some types of occurrences cannot be reliably monitored with just flight parameters (e.g. incorrect fuel type or contaminated fuel, interference with the aircraft caused by laser illumination). For others, monitoring based on FDM may require very complex algorithms. For others, some flight parameters are missing for programming the FDM algorithms, or the performance of these flight parameters may be insufficient. Therefore, point (d) only specifies that the operator documents, for each occurrence in Section 1 (except paragraph 1.5, point (3)) and Section 5 of Annex I, whether this occurrence is covered by the FDM programme and, if so, with which FDM algorithm(s). The operator does not have to implement new FDM algorithms to comply with point (d).*

GM1 ORO.AOC.130 Flight data monitoring – aeroplanes

IMPLEMENTATION OF AN FDM PROGRAMME

[…]

(a) FDM analysis techniques

(1) Exceedance / FDM event detection

(i) FDM programmes are used for detecting exceedances, such as deviations from flight manual limits, standard operating procedures (SOPs), or good airmanship. ~~Typically, a set of core events establishes the main areas of interest that are based on a prior assessment of the most significant risks by the operator.~~ It is advisable to monitor significant deviations from the SOPs in all phases of the flight, including when the aircraft is on the ground. ~~In addition, it is advisable to consider the following risks: risk of runway excursion or abnormal runway contact at take-off or landing, risk of loss of control in flight, risk of airborne collision, and risk of collision with terrain.~~

Examples of FDM events for aeroplanes: low or high lift-off rotation rate, ~~stall warning, ground proximity warning system (GPWS) warning, flap limit speed exceedance,~~ fast approach, high or low on glideslope~~, heavy landing~~.

Examples of significant FDM events for aeroplanes: stall warning, terrain awareness warning system (TAWS) warning.

(ii) Trigger logic expressions may be simple exceedances such as redline values. The majority, however, are composites that define a certain flight mode, aircraft configuration or payload-related condition. ~~Analysis software can also assign different sets of rules dependent on airport or geography. For example, noise sensitive airports may use higher than normal glideslopes on approach paths over populated areas.~~ In addition, it might be valuable to define several levels of exceedance severity (such as low, medium and high). While such levels of exceedance severity can help identify the most relevant events and trends, they should not be considered safety risk levels: assessing the safety risk level associated with an exceedance or a trend usually requires a more thorough assessment and considering all relevant data available to the operator.

Example for aeroplanes: FDM software assigning different sets of rules dependent on airport or geography. For example, noise-sensitive airports may use higher-than-normal glideslopes on approach paths over populated areas.

(iii) Exceedance detection provides useful information, which can complement that provided in crew reports.

Examples for aeroplanes: reduced flap landing, emergency descent, engine failure, rejected take-off, go-around, airborne collision avoidance system (ACAS) or GPWS warning, and system malfunctions.

(iv) The operator may also modify the standard set of core events to account for unique situations they regularly experience, or the SOPs they use.

Example for aeroplanes: to avoid nuisance exceedance reports from a non-standard instrument departure.

(v) The operator may also define new events to address specific problem areas.

Example for aeroplanes: restrictions on the use of certain flap settings to increase component life.

(vi) Being able to easily adjust the variables of FDM event algorithms can be advantageous, by allowing for an FDM event definition to be adapted to new operational conditions.

(2) All-flights measurements / FDM measurements

[…]

Examples of parameters monitored for aeroplanes: take-off weight, flap setting, temperature, rotation and lift-off speeds versus scheduled speeds, maximum pitch rate and attitude during rotation, and gear retraction speeds, heights and times.

Examples of comparative analyses for aeroplanes: pitch rates from high versus low take-off weights, good versus bad weather approaches, and touchdowns on short versus long runways.

[…]

(4) Investigation of incidents flight data by the operator

[…]

Examples of incidents where recorded data could be useful, for aeroplanes:

— ~~high cockpit workload conditions as corroborated by such indicators as late descent, late localizer and/or glideslope interception, late landing configuration;~~

— unstabilised and rushed approaches, glide path excursions, etc.;

— exceedances of prescribed operating limitations (such as flap limit speeds, engine overtemperatures); and

— wake vortex encounters, turbulence encounters or other events causing significant vertical accelerations.

[…]

(5) […]

Examples of continuing airworthiness uses, for aeroplanes: engine thrust level and airframe drag measurements, avionics and other system performance monitoring, flying control performance, and brake and landing gear usage.

(b) FDM equipment and software

(1) General

FDM programmes generally involve systems that capture flight data, transform the data into an appropriate format for analysis, and generate reports and visualisation to assist in assessing the data. Typically, the following ~~equipment capabilities are~~ is needed for effective FDM programmes:

(i) […]

(ii) a means to transfer the data recorded on board the aircraft to the ground ~~a ground-based processing station~~; and

(iii) ~~a ground-based computer system~~ software or a service to process and analyse the data, identify deviations from expected performance, generate reports to assist in interpreting the read-outs, etc.~~; and~~

~~(iv) optional software for a flight animation capability to integrate all data, presenting them as a simulation of in-flight conditions, thereby facilitating visualisation of actual events.~~

(2) Airborne equipment

(i) ~~The flight parameters and recording capacity required for flight data recorders (FDR) to support accident investigations may be insufficient to support an effective FDM programme. Other~~ Several technical solutions are available, including the following:

(A) ~~Quick access recorders (QARs). QARs~~ Some systems are installed in the aircraft and record flight data onto a low-cost removable medium.

(B) Some systems automatically ~~download~~ transmit the recorded data ~~information~~ via secure wireless systems after completion of the flight ~~when the aircraft is in the vicinity of the gate~~.

(C) ~~There are also~~ Some systems ~~that enable~~ preprocess the recorded data to be analysed ~~on board~~ while the aircraft is airborne. Whatever the flight data processing performed by such systems, a complete set of raw flight data still needs to be recovered after the flight, as this is needed for in-depth analysis of flight data by the FDM team.

~~(ii) Fleet composition, route structure and cost considerations will determine the most cost-effective method of removing the data from the aircraft.~~

(3) ~~Ground replay and analysis equipment~~ FDM software or service

(i) Data ~~are~~ is downloaded from the aircraft recording device ~~into a ground-based processing station, where the data are~~ and held securely to protect this sensitive information.

(ii) ~~FDM programmes generate large amounts of~~ The processing and analysis of flight data ~~requiring~~ requires specialised ~~analysis~~ FDM software or an FDM service.

(iii) The ~~analysis~~ FDM software or service typically converts the raw flight data into flight parameters expressed in engineering units and textual interpretation ('flight parameter decoding') and applies FDM algorithms on the flight parameters (refer to points (a)(1) and (a)(2)) ~~checks the downloaded flight data for abnormalities~~.

(iv) The ~~analysis~~ FDM software or service ~~may include:~~ typically includes the following: capability to produce parameter plots and parameter tables, capability to drill down and visualise flight parameter values over the portion of the flight during which an event was detected ~~annotated data trace displays, engineering unit listings, visualisation for the most significant incidents~~, access to interpretative material, links to other safety information and statistical presentations.

(v) For the FDM software or service, the following additional capabilities are advantageous.

(A) Capability to interface with advanced processing tools or to access advanced functions libraries.

(B) Capability to link flight data with other data sources (such as occurrence reports or weather data) in order to facilitate the analysis of events and trends. This capability should be used in accordance with data protection policies and procedures and its output restricted to authorised users (refer to AMC1 ORO.AOC.130).

(C) Capability to export FDM outputs (e.g. FDM event and measurement data) in a standard electronic format that is compatible with business intelligence tools.

(D) Capability to export FDM outputs in formats compatible with geographical information systems.

(E) Capability to replay flight data of a given flight in a flight animation, thereby facilitating visualisation of actual events.

(F) Capability to design and provide individual FDM summary reports or dashboards that can be confidentially consulted by flight crew members.

(G) Capability to export the information related to flight parameter decoding into a file format:

(a) that is compliant with an electronic documentation standard that has a general public licence policy; and

(b) that includes means to retain the history of changes to the decoding information.

(c) FDM in practice

(1) FDM process

[…](i) […].

Examples for aeroplanes: rate of unstable approaches or hard landings.

(ii) Highlight unusual or potentially unsafe circumstances: the user determines when non-standard, unusual or ~~basically~~ potentially unsafe circumstances occur; by comparing them to the baseline margins of safety, the changes can be quantified.

Example for aeroplanes: increases in unstable approaches (or other unsafe events) at particular locations.

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(iii) Identify potentially unsafe trends: based on the frequency and severity of FDM events ~~occurrence~~, trends are identified. ~~Combined with an estimation of the level of severity, the risks are assessed to determine which may become unacceptable if the trend continues.~~ If a trend seems to point at an increase of risk to an unacceptable level, a safety risk assessment is necessary, as part of the operator safety risk management.

Example for aeroplanes: a new procedure has resulted in high rates of descent that are nearly triggering GPWS warnings.

~~(iv) Mitigate risks: once an unacceptable risk has been identified, appropriate risk mitigation actions are decided on and implemented.~~

~~Example: having found high rates of descent, the SOPs are changed to improve aircraft control for optimum/maximum rates of descent.~~

(iv) Monitor effectiveness of corrective actions, if the FDM programme is relevant for that purpose: once a remedial action has been put in place in the framework of the operator's safety risk management, its effectiveness is monitored, confirming that it has reduced the identified risk and that the risk has not been transferred elsewhere. At this stage, the operator typically evaluates whether the FDM programme can contribute to this monitoring.

Example for aeroplanes: confirm that other safety measures at the aerodrome with high rates of descent do not change for the worse after changes in approach procedures.

(2) Analysis and follow-up

(i) FDM data is ~~are~~ typically processed ~~compiled every month or~~ at shorter~~er~~ intervals. The data is ~~are~~ then reviewed to identify specific exceedances and emerging undesirable trends and to disseminate the information to flight crews.

(ii) If ~~deficiencies in pilot handling technique~~ deviations from the standard operating procedures are ~~evident~~ detected and require attention, the information ~~is usually de-identified in order to protect the identity of the flight crew. The information~~ on ~~specific~~ these deviations is passed (in accordance with point (k) of AMC1 ORO.AOC.130) to the person responsible ~~exceedances is passed to a person (safety manager, agreed flight crew representative, honest broker) assigned by the operator~~ for flight crew contact ~~confidential discussion with the pilot~~. The decision to initiate flight crew contact (e.g. notification, request for additional information or confidential discussion) should be made after an initial assessment that takes into account contextual information. If it is decided to have a confidential discussion with the flight crew, the responsible person ~~assigned by the operator~~ provides the necessary contact with the pilot in order to clarify the circumstances, obtain feedback and give advice and recommendations for appropriate action. Such ~~appropriate~~ action is determined after a thorough safety risk assessment that is performed in the framework of the operator safety risk management and that takes into account all available data. Appropriate action could include re-training

~~for the pilot~~ (carried out in a constructive and non-punitive way), revisions to manuals, or requesting changes to ATC ~~and~~ or airport operating procedures.

~~(iii) Follow-up monitoring enables the effectiveness of any corrective actions to be assessed. Flight crew feedback is essential for the identification and resolution of safety problems and could be collected through interviews, for example by asking the following:~~

~~(A) Are the desired results being achieved soon enough?~~

~~(B) Have the problems really been corrected, or just relocated to another part of the system?~~

~~(C) Have new problems been introduced?~~

(iii~~iv~~) All events are usually archived in a way that means they can be sorted, validated and presented ~~database. The database is used to sort, validate and display the data~~ in easy-to-understand management reports. Over time, this archived data can provide a picture of emerging trends and hazards that would otherwise go unnoticed. In addition, the FDM team may wish to retain samples of de-identified full-flight data for various safety purposes (detailed analysis, training, benchmarking, etc.).

(iv) Sharing of safety information is part of the necessary processes to maintain personnel competent to perform their tasks and to support an effective management system (refer to ORO.GEN.200). Therefore, lessons ~~Lessons~~ learnt from the FDM programme may warrant inclusion in the operator's safety promotion programmes. Safety promotion ~~media~~ may include newsletters, flight safety magazines, emails, video messages, the provision of information on the company's intranet, highlighting examples in training and simulator exercises~~, periodic reports to industry and the competent authority~~. Care is required, however, to ensure that any information acquired through FDM is de-identified before using it in any training or promotional initiative.

(v~~i~~) […]

(d) Preconditions for an effective FDM programme

(1) Protection of FDM data and of related flight crew reports

The integrity of FDM programmes rests upon protection of the FDM data. Any disclosure for purposes other than safety management can compromise the voluntary provision of safety data, thereby compromising flight safety. It is also advised to take into account Regulation (EU) 2016/679 (general data protection regulation), where applicable. In addition, the inherent protection of reporters under Regulation (EU) No 376/2014 applies to flight crew members, whether their reports are voluntarily provided or retrospectively requested by the operator.

[…]

(3) Requisite safety culture

Indicators of ~~an effective~~ a positive safety culture within an FDM programme typically include:

(i) top management's demonstrated commitment to promoting a ~~proactive~~ positive safety culture;

[…]

(iv) involvement of persons with appropriate expertise when assessing FDM events, FDM measurements and trends ~~when identifying and assessing the risks~~ (for example, pilots experienced on the aircraft type being analysed);

[…]

(vii) ~~an efficient communication system for disseminating hazard information (and subsequent risk assessments) internally and to other organisations to permit timely safety action.~~ inclusion of the general trends provided by and lessons learnt from the FDM programme in the communications on safety matters specified in AMC1 ORO.GEN.200(a)(4).

(4) Integration with the operator's management system

Point ORO.AOC.130 requires the integration of the FDM programme with the operator's management system. Because of that, FDM programme outputs are expected to be used together with other relevant data sources and for supporting safety risk management (SRM). The SRM process is not an internal process of the FDM programme, but a process of the operator's management system. AMC1 ORO.AOC.130 specifies that the safety manager should be responsible for the identification and the assessment of issues, which are the first steps of the SRM process. The European Operators Flight Data Monitoring forum document *Breaking the Silos* (June 2019) details industry good practice regarding integration of the FDM programme in the management system.

(5) Up-to-date flight parameter decoding documentation

(i) The flight parameter decoding documentation is the documentation containing information sufficient for extracting flight parameter values from the recording data files and decoding them into values expressed in engineering units or textual interpretation This information is essential for programming flight parameter decoding by the FDM software.

(ii) It is important that flight parameter decoding documentation is obtained at the time of aircraft delivery and that it is kept up to date. To facilitate the management of this documentation over time, it is recommended that this documentation is compliant with an electronic documentation standard that has a general public licence policy. In addition, it is advisable to have a versioning system that allows for quick identification of the applicable decoding information for any individual aircraft and any time period.

(iii) When the airborne equipment used for FDM purposes records a copy of the FDR data stream, the FDR decoding documentation that must be retained in accordance with CAT.GEN.MPA.195 could be used.

(e) Implementing an FDM programme

[…]

(2) Aims and objectives of an FDM programme

(i) As with any project there is a need to define the direction and objectives of the work. A phased approach is recommended so that the foundations are in place for possible subsequent expansion into other areas. Using a building block approach will allow expansion, diversification and evolution through experience.

Example: with a modular system, begin by looking at basic safety-related issues only. ~~Add engine health monitoring, etc. in the second phase. Ensure compatibility with other systems.~~

(ii) A staged set of objectives starting from the first week's replay and moving through early production reports into regular routine analysis will contribute to a sense of achievement as milestones are met.

Examples of short-term, medium-term and long-term goals:

(A) Short-term goals:

— establish data download procedures, test ~~replay~~ FDM software~~, and identify aircraft defects~~;

— verify, for all aircraft in the FDM programme, that the flight parameters used for FDM events and measurements are valid and correctly decoded;

— verify that the flight parameter decoding documentation (see point (d)) is complete and correct;

— design and/or adapt FDM algorithms and test them, validate and investigate exceedance detections ~~data~~; and

— establish a user-acceptable routine report format to highlight individual exceedances and facilitate the acquisition of relevant statistics.

(B) Medium-term goals:

— produce reports and dashboards ~~an annual report —~~ that include key performance indicators;

— add other modules to the analysis (e.g. continuing airworthiness); and

— plan for the next fleet to be added to the FDM programme.

(C) Long-term goals:

— network FDM information across all of the operator's safety information systems; and

— ensure FDM provision for any proposed alternative training and qualification programme (ATQP).~~; and~~

~~— use utilisation and condition monitoring to reduce spares holdings.~~

(iii) Initially, focusing on a few known areas of interest will help prove the system's effectiveness. In contrast to an undisciplined 'scatter-gun' approach, a focused approach is more likely to gain early success.

Examples for aeroplanes: rushed approaches, or rough runways at particular aerodromes. Analysis of such known problem areas may generate useful information for the analysis of other areas.

(3) The FDM team

(i) Experience has shown that the 'team' necessary to run an FDM programme could vary in size from one person for a small fleet, to a dedicated section for large fleets. The descriptions below identify various functions to be fulfilled, not all of which need a dedicated position. As the safety manager should be responsible for the FDM programme, and FDM outputs should, to the extent possible, be analysed in relation to other safety data sources, it is expected that the FDM team is part of the safety manager's team.

(A) Team leader: it is essential that the team leader earns the trust and full support of both management and flight crew. ~~The team leader acts independently of others in line management to make recommendations that will be seen by all to have a high level of integrity and impartiality.~~ The individual requires good analytical, presentation and management skills.

(B) Flight operations interpreter: this person is usually a ~~current~~ qualified pilot (or perhaps a recently retired senior captain or instructor), who knows the operator's route network and aircraft. This team member's in-depth knowledge of SOPs, aircraft handling characteristics, aerodromes and routes is used to place the FDM data in a credible context.

[…]

(E) Engineering technical support: this person is usually an avionics specialist~~, involved in the supervision of mandatory serviceability requirements for FDR systems~~. This team member is knowledgeable about FDM and the associated systems needed to run the programme.

(F) FDM analyst: this person is responsible for the design and validation of FDM algorithms and the analysis of FDM outputs. This usually requires at least basic knowledge of statistics and/or programming skills, and in-depth knowledge of the FDM software or service. If the processing of data or the validation of FDM events is subcontracted to a service provider, the FDM analyst should have the necessary skills to effectively control and direct the work performed by that service provider. ~~Replay operative and administrator: this person is responsible for the day-to-day running of the system, producing reports and analysis.~~

(ii) All FDM team members need appropriate training or experience for their respective area of data analysis. Each team member is allocated a realistic amount of time to regularly spend on FDM tasks.

(f) Other uses of flight data

Whenever access to data from the FDM programme is requested to meet operational needs, such as fuel efficiency, aircraft performance and preventive maintenance, it is recommended to have a written procedure in place to prevent disclosure of crew identity. Furthermore, it is advisable that such a procedure contains, as a minimum, the following:

(1) the aim of the programme in which flight data is to be used;

(2) a data access and security policy, restricting access to information to specifically authorised persons identified by their position;

(3) a data retention policy; and

(4) the method to obtain de-identified flight crew feedback on those occasions that require specific flight follow-up for contextual information.

(g) The FDM programme and large data exchange programmes

Some States and organisations have set up so-called large data exchange programmes, under which they gather very large amounts of data (including FDM data) provided by many operators and by other industry stakeholders, which are then centrally processed and analysed. Participation in a large data exchange programme may bring various benefits for an operator, such as being able to compare its safety performance with that of comparable operators or getting access to other types of data (weather, traffic, etc.) or to advanced data integration capabilities. In addition, in the case of an operator with a small fleet producing small amounts of flight data that do not allow for reliable identification of trends, joining a large data exchange programme might help to overcome this limitation. However, taking part in a large data exchange programme does not in itself satisfy ORO.AOC.130 and every operator remains responsible for the implementation of its FDM programme. The operator's FDM programme needs to be well integrated into the management system for it to take advantage of a large data exchange programme.

Rationale

GM1 ORO.AOC.130 is proposed to be updated, to reflect technological evolutions and current industry best practice. In addition, corrections were needed to clarify the following:

— *the FDM programme is expected to support SRM, but the SRM steps should not be implemented by the FDM programme in isolation;*

— *the use of flight data for purposes other than the FDM programme should be framed by procedures to ensure appropriate handling of this data;*

— *the expected benefits from taking part in a large data exchange programme, and differences between a large data exchange programme and the FDM programme of an operator.*

Detailed rationale

— *Regarding the changes proposed to point (a)(1):*

- *The second sentence of point (a)(1)(i) has been deleted, as its intent is covered by point (a) of AMC2 ORO.AOC.130. Similarly, the last sentence of point (a)(1)(i) has been deleted, as its intent is covered by point (b) of AMC2 ORO.AOC.130.*

- *A sentence has been inserted into point (a)(1)(i) to recommend monitoring significant deviations from the SOPs in all phases of flight. It is important that the FDM algorithms cover all phases of flight (including taxi) as safety issues have been identified for each flight phase. Refer to the CAT aeroplanes safety risk portfolio, as presented, for instance, in* Volume III of the 2021–2025 EPAS[30]*. The investigation of a serious incident regarding an Airbus A340[31] found that several operators did not have any FDM algorithm in place to monitor take-off performance, which shows the need to include all flight phases. The investigation reports of two serious incidents with a Boeing 737-800[32] illustrate the value of FDM for detecting take-offs with insufficient performance when they are not reported by the flight crew.*

- *The examples of FDM events are split into 'examples of FDM events for aeroplanes' and 'examples of significant FDM events for aeroplanes'. This is to illustrate the notion of 'significant FDM events' that is proposed to be introduced in point (h)(5) of AMC1 ORO.AOC.130.*

- *A sentence has been inserted in point (a)(1(ii) to remind operators that the FDM event severity level is not equal to the level of safety risk. As some operators tend to confuse these two notions, clarification was felt necessary.*

- *A point (a)(1)(vi) has been added, as being able to adjust the FDM event algorithms in the event of a change to the SOPs, new destinations, etc., can make a significant difference with regard to the relevance of results. For this purpose, it is not always necessary to define a new FDM event: adjusting some variables in the FDM event algorithm can be sufficient. Today, many operators use predefined algorithms that are provided in their FDM software or by their FDM service provider and they unfortunately perform no or limited adaptation of these algorithms.*

— *Regarding the changes proposed to point (a)(4):*

The example of an incident related to high cockpit workload was removed, as there is no scientific evidence that flight crew workload could be reliably assessed using only flight data.

— *Regarding the changes proposed to point (b)(1):*

- *The capabilities needed to support the processing of flight data are not equipment related only and should take into account modern IT solutions such as software-as-a-service. The*

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[30] EASA, *The European Plan for Aviation Safety (EPAS 2021–2025)*, Volume III 'Safety risk portfolios', 2021 (https://www.easa.europa.eu/sites/default/files/dfu/epas_2021_2025_vol_three_final.pdf).

[31] *Serious incident to the Airbus A340-313E registered F-GLZU on 11 March 2017 at Bogotà (Colombia)*, Bureau d'Enquêtes et d'Analyses (France).

[32] *Serious incident to the Boeing 737-800 registered PH-BXG, at Amsterdam Schiphol Airport on 10 June 2018*, Dutch Safety Board (Netherlands); and *Serious incident to a Boeing 737-800 registered G-JZHL at Kuusamo Airport, on 1 December 2021*, Air Accidents Investigation Branch (United Kingdom).

recommended capabilities of the FDM software or service are addressed in point (b)(3) (see below).

- *The content of point (b)(1)(iv) has been moved to a new point (b)(3)(v), which lists recommended optional capabilities of FDM software or an FDM service.*

— *Regarding the changes proposed to point (b)(2):*

- *The first sentence of point (b)(2)(i) has been removed because using the FDR for FDM should be reserved for older aircraft that have no other solutions or as a temporary solution. Using the FDR for FDM was probably more commonplace in the 1990s and early 2000s, but today most operated aircraft are fitted with dedicated airborne equipment.*

- *As technology evolves and there are many solutions, reference to quick access recorder technology in point (b)(2)(i)(A) was replaced by more generic wording.*

- *Point (b)(2)(i)(B) has been split into two points and the new point (b)(2)(i)(C) is focused on airborne systems that preprocess flight data during the flight.*

- *A sentence has been added into point (b)(2)(i)(C) reflecting that some of these systems only retain or transmit a fraction of the flight data collected. This may be acceptable for aircraft condition monitoring, but it is not appropriate for an FDM programme: the FDM staff should have access to all raw flight data collected by the airborne system, so that, if necessary, they can drill down into the data of a given flight (for instance, to analyse a severe FDM event) and apply a new FDM algorithm definition to historical flight data.*

- *Point (b)(2)(ii) does not seem safety related; therefore, it has been removed.*

— *Regarding the changes proposed to point (b)(3):*

- *This point has been renamed 'FDM software or service', as the capabilities needed to support the processing of flight data are not equipment related only and should take into account modern IT solutions. For the same reason, the mention of a 'ground-based processing station' has been removed from point (b)(3)(i).*

- *Today, the volume of flight data is not really a limiting factor for ground systems; therefore, the term 'large amounts of data' has been removed from point (b)(3)(ii). However, the processing of flight data still requires the use of specialised software and/or contracting a specialised service provider, due to the peculiarities of flight data.*

- *The high-level description of what FDM software performs in point (b)(3)(iii) has been amended, as it was too restrictive (it did not include the conversion into flight parameters) and a link to the explanations about exceedance detection and measurements in point (a) was missing.*

- *In point (b)(3)(iv), the old-fashioned terms 'data trace' and 'listings' have been replaced by 'plots' and 'tables'.*

- *The new point (b)(3)(v) recommends additional capabilities of the FDM software or service that were identified as helpful for the analysis of data or internal communication, as follows.*

  - *Capability to interface with advanced analysis packages (point (b)(3)(v)(A)), as this allows the FDM analyst to faster implement algorithms, and not be limited by the functions available in the FDM software for designing FDM algorithms.*
  - *Capability to link flight data with other data sources such as occurrence reports, weather data, etc. (point (b)(3)(v)(B)). Such capability should be used in accordance with data protection policies and procedures. Point (j) of AMC1 ORO.AOC.130 specifies that there should be a data access and security policy restricting information access to authorised persons.*
  - *Capability to export FDM outputs (data of FDM events and FDM measurements) in a standard electronic format that is compatible with business intelligence tools, so that advantage can be taken of such tools (point (b)(3)(v)(C)).*
  - *Capability to export FDM output in a data format that is compatible with a geographical information system (point (b)(3)(v)(D)). This may be useful for presenting and interpreting data related to aircraft trajectory or spatial distribution of FDM events or for the analysis of those FDM events related to proximity to other traffic, proximity to terrain or obstacles, airspace design or navigation procedures.*
  - *Capability to produce flight animations. The content of the former point (b)(1)(iv) was moved to point (b)(3)(v)(E). The words 'simulation of in-flight conditions' were removed, as flight animation is only about visually reconstructing some of the information displayed to the pilot, the aircraft trajectory or the field of view from the cockpit, but not an accurate aircraft simulation like that provided by flight simulation training devices.*
  - *Capability to provide individual FDM summary reports or dashboards that can be confidentially consulted by flight crews, for example through their personal electronic devices (point (b)(3)(v)(F)).*
  - *Capability to export the flight parameter decoding information into a format that complies with an electronic documentation standard, which has a general public licence policy and which allows for configuration control (point (b)(3)(v)(G)). This makes it easier for an operator to import this information into its FDM software and to maintain it, also considering that an aircraft typically has several operators throughout its economic life cycle. For example, ARINC 647A FRED (flight recorder electronic documentation) is a standard that has been developed for the decoding documentation of the flight data recorder, and this standard meets the conditions in point (b)(3)(v)(G).*

— *Regarding the changes proposed to point (c)(1):*

- *The introduction of 'potentially' in points (c)(1)(ii) and (c)(1)(iii) brings an important nuance: the FDM programme is used to detect circumstances and trends that may be unsafe, but the safety risk assessment does not stop there. In many cases, FDM data taken alone is not sufficient to confirm that given circumstances were unsafe or that a trend is unsafe.*

- *Point (c)(1)(iv) has been removed, as it described a step of the operator's SRM, not a specific FDM process. The risk mitigation actions mentioned in the former point (iv) should be decided after a thorough assessment of safety risks that considers all relevant data available to the operator.*
- *Additional corrections to points (c)(1)(iii) and (c)(1)(v) have been performed to clarify the following.*
  - *Safety risks should be assessed and remedial actions be put in place in the framework of the operator SRM, not by the FDM programme in isolation.*
  - *FDM is not always appropriate for the monitoring of a safety issue. It is up to the operator to determine the most appropriate data source to monitor the evolution of a given safety issue.*

— *Regarding the changes proposed to point (c)(2):*

- *In point (c)(2)(i), 'every month' has been removed, as taking up to 1 month for compiling FDM data is not consistent with the EU time frame to analyse an FDM event that corresponds to a reportable occurrence (72 hours in accordance with Regulation (EU) No 376/2014) and with how human memory works: it cannot be reasonably expected that flight crew members will still provide an accurate retrospective report of an incident more than 1 month after it occurred. In addition, modern equipment and software solutions enable data to be processed on a daily basis, or even continuous processing as data comes in. However, as the time objective regarding data processing has been set in point (h)(3) of AMC1 ORO.AOC.130, there is no need to be specific in this point.*
- *Point (c)(2)(ii) is proposed to be amended to clarify the following.*
  - *The focus should be on deviations from the SOPs that require attention rather than 'deficiencies in pilot handling techniques', as this is more consistent with the end of that point, which includes 'revisions to manual' and 'changes to ATC and airport procedures'.*
  - *The decision to initiate the flight crew contact should be made after an initial assessment, and not systematically.*
  - *The person responsible for flight crew contact (typically the gatekeeper) may use means to exchange information with the flight crew other than a confidential discussion. A confidential notification to the flight crew or a request that the flight crew provide additional information may be sufficient, depending on the case.*
  - *Safety risks should be assessed, and remedial actions decided in the framework of the operator SRM, not by the FDM programme in isolation.*
  - *Further to that, the part of the text regarding de-identification has been removed. Instead, reference to point (k) of AMC1 ORO.AOC.130 is made, as this point addresses the procedure to protect flight crew identity.*
- *Point (c)(2)(iii) has been removed as it described a data source (flight crew surveys and interviews) that may be important for the operator SRM but is not part of FDM.*

- *In the new point (c)(2)(iii), the term 'database' has been removed, as it is old-fashioned. Modern IT solutions often store data in 'data lakes', 'data clouds', etc. In addition, a sentence previously in point (i) of AMC1 ORO.AOC.130 (about retaining samples of de-identified full flight data) has been moved to this point, as the content of this sentence is guidance, and so better placed in GM than in AMC.*
- *Regarding the new point (c)(2)(iv): this point has been reworded to better link the sharing of safety information based on FDM with point (a)(4) of ORO.GEN.200, which requires that the management system includes 'maintaining personnel trained and competent to perform their tasks'. Point (b) of AMC1 ORO.GEN.200(a)(4) specifies that the operator should establish communication about safety matters that:*

  '(i) ensures that all personnel are aware of the safety management activities as appropriate for their safety responsibilities;

  (ii) conveys safety critical information, especially relating to assessed risks and analysed hazards;

  (iii) explains why particular actions are taken; and

  (iv) explains why safety procedures are introduced or changed.'

  Hence, the communication of safety information based on FDM to all personnel of the operator supports the implementation of ORO.GEN.200.

  Reference to more modern ways of disseminating information (such as emailing) have been inserted. 'Periodic reports to industry and the competent authority' is not considered safety promotion; therefore, it has been removed.

— *Regarding the changes proposed to point (d)(1):*

As flight data might be considered personal data under Regulation (EU) 2016/679 (refer to European Operators Flight Data Monitoring forum document Breaking the Silos[33]*), advice to take into account this regulation has been inserted. In addition, a reminder has been added that the inherent protection of reporters under Regulation (EU) No 376/2014 applies to flight crew members, whether their reports are spontaneously provided or retrospectively requested by the operator. Using the example of an exceedance that was not reported by the flight crew but is detected through an FDM event, the flight crew should be requested to provide a retrospective report and they should benefit the reporter's protection in accordance with Regulation (EU) No 376/2014. The reporting timeline (within 72 hours in accordance with Regulation (EU) No 376/2014) should start when the flight crew is made aware of the event.*

— *Regarding the changes proposed to point (d)(3):*

- *'Effective safety culture' and 'proactive safety culture' have both been replaced by 'positive safety culture', as this is a more commonly used term, and it is the term used in ICAO Annex 19.*

[33] EOFDM Working Group C, *Breaking the Silos – Fully integrating flight data monitoring into the safety management system*, initial issue, June 2019.

- *Point (d)(3)(iv) has been amended because risk assessment is not an internal FDM process. Point (d)(3) should only contain examples of indicators that are specifically applicable to an FDM programme.*
- *The content of point (d)(3)(vii) has been changed because a communication system for 'disseminating hazard information' should be part of the operator's management system, as specified in AMC1 ORO.GEN.200(a)(4).*

— *Regarding the new proposed point (d)(4):*

This point has been created to:

- *clarify that integration of the FDM programme in the operator management is one of the preconditions for an effective FDM programme;*
- *remind the reader that SRM is wider than just the FDM programme;*
- *remind the reader that identification and assessment of safety issues is under the responsibility of the safety manager;*
- *make reference to a European Operators Flight Data Monitoring forum document that details best practice on integrating the FDM programme in the operator's management system.*

— *Regarding the proposed new point (d)(5):*

- *The flight parameter decoding documentation is essential for an operator to be able to use the recorded flight parameters for FDM. This documentation is needed for each individual aircraft. Therefore, it is proposed to add it to the list of preconditions for an effective FDM programme.*
- *To ensure that there is no misunderstanding about what 'flight parameter decoding documentation' means, an explanation of this term is introduced.*
- *To maintain knowledge over time and ensure that the right decoding is applied to current or historical flight data, there should be a versioning system that enables quick identification of the applicable decoding information for any individual aircraft and any time period. This will help the operator retain knowledge of changes regarding flight parameter decoding despite evolutions of the fleet and FDM staff changes, which will in turn help to maintain the performance of the FDM programme in the long term.*
- *It is expected that the first version of the flight parameter decoding documentation will be provided by the installer of the airborne system (type certificate / supplemental type certificate holder), as this organisation should have the full knowledge of what parameters are recorded and where in the data frames, and what conversion equations should be applied to retrieve parameter values expressed in engineering units. However, this documentation should be kept up to date by the operator.*
- *If the documentation format complies with an electronic documentation standard that has a general public licence policy, it will be easier for an operator to maintain this documentation, or to import it into its FDM software, taking into account that an aircraft*

typically has several operators throughout its life cycle. For example, ARINC 647A format could be used for FDM flight parameter decoding documentation.

- *Aircraft in the scope of ORO.AOC.130 (and SPA.HOFO.145) must also retain the flight parameter decoding documentation of the flight data recorder, as required by point (d) of CAT.GEN.MPA.195 (Handling of flight recorder recordings: preservation, production, protection and use). Hence, where flight data collected for FDM is the same as the flight data recorded by the FDR, the decoding documentation of the latter can be used.*

— *Regarding the changes proposed to point (e)(2):*

- *The last sentence of the example in point (e)(2)(i) has been deleted, as engine condition monitoring is not in the scope of FDM.*
- *In point (e)(2)(ii)(A), 'Identify aircraft defects' has been removed as it does not seem to be a relevant short-term goal for an FDM programme. Instead, two points have been inserted: the first one is about verifying that flight parameters used by the FDM software are valid and correctly decoded and the second one is about verifying that the flight parameter decoding documentation that is addressed in point (d)is complete and correct.*
- *In point (e)(2)(ii)(B), the goal to produce an annual report has been replaced by 'produce reports and dashboards'. This is because new information technologies make it possible to design web-based reports and dashboards that can be updated much more frequently than once per year.*
- *The last point of point (e)(2)(ii)(C) has been deleted, as aircraft condition monitoring and predictive maintenance are not in the scope of FDM.*

— *Regarding the changes proposed to point (e)(3):*

- *A sentence has been inserted in point (e)(3)(i) to recommend that the 'FDM team' is part of the team under the authority of the safety manager. This is consistent with AMC1 ORO.AOC.130, which specifies that the safety manger should be responsible for the FDM programme.*
- *In point (e)(3)(i)(A), the statement that 'the team leader [of the FDM programme] acts independently of others in line management to make recommendations' does not seem in line with the integration of the FDM programme in the operator's management system (as required by ORO.AOC.130) and with the safety manager being responsible for the FDM programme (in accordance with AMC1 ORO.AOC.130). It is rather expected that the FDM team leader reports to the safety manager and that the safety manager makes recommendations based on the analyses of all available data, including FDM data. Therefore, the second sentence of point (e)(3)(i)(A) has been deleted.*
- *In point (e)(3)(i)(B), 'current pilot' has been replaced by 'qualified pilot', as it is considered more relevant that the flight operations interpreter has the appropriate qualification rather than having recently been flying.*
- *In point (e)(3)(i)(E), the part of the first sentence regarding serviceability requirements for FDR systems has been deleted, as the FDR should no longer be used for an FDM*

programme, and today most operators do not use the FDR to collect data for the FDM programme.

- *In point (e)(3)(i)(F):*
  - *The description of the 'replay operative and administrator' function has been deleted. This description seems to relate to a technician who monitors the operation of software and hardware and produces ready-made reports. However, today, with wireless flight data transmission and software-as-a-service solutions, there may be little need to monitor FDM software and hardware.*
  - *Instead, the function of FDM analyst, which seemed to be missing in (e)(3)(i), has been inserted. The FDM analyst is responsible for the design and validation of FDM algorithms and the analysis of FDM outputs. Therefore, they should have sufficient knowledge of how FDM event and measurement algorithms are designed and of their intrinsic limitations, so that they can support correct interpretation of FDM software outputs and present these outputs in a meaningful way. This in turn means that the FDM analyst should have a scientific education, especially knowledge of statistics and some programming skills.*
  - *If data processing and FDM event validation are subcontracted to a service provider, the FDM analyst should be capable of controlling and directing the work of that service provider, as effective implementation of the FDM programme remains the responsibility of the operator. Therefore, point (e)(3)(i)(F) also recommends that the FDM analyst has the necessary skills to effectively control and direct the work performed by the FDM service provider.*

— *Regarding the new proposed point (f):*

- *The use of flight data for purposes other than the FDM programme is allowed and common practice among operators. Flight data is used, for example, to support fuel efficiency programmes or monitor aircraft performance.*
- *Nevertheless, the flight data used for the FDM programme should not be used in an uncontrolled manner in other programmes, otherwise this would defeat the purpose of requiring 'safeguards to protect the source of data' (refer to ORO.AOC.130).*
- *Therefore, point (f) recommends addressing all uses of flight data through a written procedure that provides a framework for using the flight data, including the aim, data access principles, data retention principles and how to obtain flight crew feedback.*
- *The content of point (f) is consistent with the new proposed GM2 ORO.GEN.200(a)(2).*

— *Regarding the new proposed point (g):*

- *It provides a general overview of the possible benefits of joining a large data exchange programme, in particular for operators that have small fleets. Examples of large data exchange programmes are the FAA Aviation Safety Information Analysis and Sharing programme, the International Air Transport Association Flight Data Exchange programme and the EASA Data4Safety programme.*

- *The operator remains responsible for its FDM programme in all cases. Therefore, point (g) also clarifies that joining a large data exchange programme is not an alternative means of compliance to AMC1 ORO.AOC.130. It also emphasises that, for participation in a large data exchange programme to bring safety benefits, the FDM programme should be completely integrated in the management system of the operator.*

GM2 ORO.AOC.130 Flight data monitoring — aeroplanes

EXAMPLES OF FDM METHODS ~~EVENTS~~

Table 1 provides examples of precursors of incidents that could be monitored through an FDM programme, by means of FDM events or FDM measurements. Methods to monitor these precursors may be further developed using operator- and aeroplane-specific limits. The table is considered illustrative and not exhaustive.

Note 1: Key risk areas as described in the Annex to Regulation (EU) 2020/2034 correspond to the aviation occurrence categories defined by the CAST/ICAO Common Taxonomy Team as follows:

— 'excursion' corresponds to 'Runway excursion' (RE);

— 'aircraft upset' corresponds to 'Loss of control - inflight' (LOC-I);

— 'terrain collision' corresponds to 'Controlled flight into or toward terrain' (CFIT);

— 'airborne collision' corresponds to 'Airprox/TCAS alert/Loss of separation/Near midair collision/Midair collision' (MAC).

Note 2: Please refer to European Operators Flight Data Monitoring forum (EOFDM) Working Group B, *Guidance for the implementation of flight data monitoring precursors*, for further details on methods to monitor the example precursors of incidents provided in Table 1.

Note 3: The far-right column of Table 1 only indicates the occurrence types directly related to the precursors among those listed in Regulation (EU) 2015/1018, Annex I 'Occurrences related to the operation of the aircraft'. The precursors of incidents listed in Table 1 may also be used to detect occurrence types other than those indicated in the far-right column.

Note 4: In addition to the precursors of incidents in Table 1, operators may need to monitor caution and warning alerts displayed to the flight crew and other indications that the airworthiness of the aircraft may be affected (as specified in AMC2 ORO.AOC.130). FDM events or measurements that monitor significant deviations from the SOPs in all phases of flight, including when the aircraft is on the ground, are also advisable. For brevity, Table 1 does not include such events.

Table 1

No	Number and title of the precursor as per EOFDM documentation	Description of the precursor as per EOFDM documentation	Relevant key risk area as described in the Annex to Regulation (EU) 2020/2034	Occurrence types as defined in Annex I to Regulation (EU) 2015/1018 that are directly related to the precursor
1	RE01 – Engine power changes during take-off	Develop means to detect engine power changes during take-off that may lead to a runway excursion.	Excursion (at take-off and at landing)	No direct link to a specific type of occurrence.
2	RE02 – Inappropriate aircraft configuration	Develop means to detect inappropriate aircraft configuration (lifting devices, pitch trim) which could cause take-off and landing performance problems; not all aircraft are equipped with take-off configuration warning systems and some of these systems cannot detect all types of configuration errors.	Excursion (at take-off and at landing)	1.3(6) Actual or attempted take-off, approach or landing with incorrect configuration setting.
3	RE03 – Monitoring the centre-of-gravity (CG) position	Develop means to detect CG out of limits on take-off or not consistent with the pitch trim settings.	Excursion (at take-off and at landing)	No direct link to a specific type of occurrence.
4	RE04 – Reduced elevator authority	Develop means to detect abnormal rotation in response to elevator inputs, reduced elevator movement or excessive force required to move the elevator surfaces.	Excursion (at take-off and at landing)	2.1(7) Abnormal functioning of flight controls such as asymmetric or stuck/jammed flight controls (e.g. lift (flaps/slats), drag (spoilers), attitude control (ailerons, elevators, rudder) devices).
5	RE05 – Slow acceleration	Develop means to measure the acceleration during the take-off roll and to detect abnormal values, taking into account the various factors that affect the take-off performance.	Excursion (at take-off and at landing)	1.3(5) Inability to achieve required or expected performance during take-off, go-around or landing.
6	RE06 – Aircraft malfunction	Develop means to detect aircraft malfunctions which are likely to cause rejected take-offs (RTOs) (e.g. ‘master	Excursion (at take-off and at landing)	No direct link to a specific type of occurrence.

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		warning' and 'master caution' alerts and airspeed indication disagreements).		
7	RE07 – Late rotation	Develop means to detect rotations conducted after VR or beyond the expected distance (or time) after the start of the take-off roll.	Excursion (at take-off and at landing)	No direct link to a specific type of occurrence.
8	RE08 – Slow rotation	Develop means to detect slow rotation.	Excursion (at take-off and at landing)	No direct link to a specific type of occurrence.
9	RE09 – No lift-off	Develop means to detect late lift-off (in time and/or distance) after rotation or start of the take-off roll.	Excursion (at take-off and at landing)	1.3(5) Inability to achieve required or expected performance during take-off, go-around or landing.
10	RE10 – Rejected take-off (RTO)	Develop means to identify rejected take-off (RTO).	Excursion (at take-off and at landing)	1.3(4) Any rejected take-off.
11	RE11 – Runway remaining after rejected take-off	Develop means to estimate the runway remaining ahead of the aircraft after the start of the rejected take-off (RTO) and to estimate the ground distance spent during the RTO.	Excursion (at take-off and at landing)	No direct link to a specific type of occurrence.
12	RE12 – Inadequate use of stopping devices	Develop means to identify late or inadequate activation of thrust reverser, brakes, airbrakes or other stopping devices during rejected take-offs (RTOs) and landings.	Excursion (at take-off and at landing)	No direct link to a specific type of occurrence.
13	RE13 – Insufficient deceleration	Develop means to detect slow deceleration after landing or rejected take-off (RTO), taking into consideration the various factors that affect the landing and the RTO performance.	Excursion (at take-off and at landing)	No direct link to a specific type of occurrence.

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14	RE14 – Incorrect input performance data	Develop means to detect erroneous data entry or calculation errors which could lead to incorrect thrust settings, incorrect V speeds or incorrect target approach speeds.	Excursion (at take-off and at landing)	1.1(1) Use of incorrect data or erroneous entries into equipment used for navigation or performance calculations that has or could have endangered the aircraft, its occupants or any other person.
15	RE15 – Runway remaining at lift-off	Develop means to estimate the runway remaining ahead of the aircraft at the moment of lift-off and to detect abnormal values.	Excursion (at take-off and at landing)	No direct link to a specific type of occurrence.
16	RE16 – Aircraft handling	Develop means to monitor the use of aircraft controls (rudder and nose-wheel steering) and brakes during take-off, rejected take-off (RTO), and landing, and to detect non-standard cases. In addition, monitor simultaneous control inputs of both flight crew and analyse their potential negative influence on safety.	Excursion (at take-off and at landing)	No direct link to a specific type of occurrence.
17	RE17 – Crosswind	Develop means to estimate the crosswind during take-off, approach and landing, and to detect abnormal values.	Excursion (at take-off and at landing)	No direct link to a specific type of occurrence.
18	RE18 – Forward thrust asymmetry	Develop means to identify forward thrust asymmetry during the take-off roll.	Excursion (at take-off and at landing)	No direct link to a specific type of occurrence.
19	RE19 – Steering system malfunction	Develop means to identify problems with the steering system which could affect lateral controllability.	Excursion (at take-off and at landing)	No direct link to a specific type of occurrence.
20	RE20 – Lateral deviation	Develop means to identify excessive lateral deviations or oscillations during take-off, rejected take-off (RTO) and landing, taking into consideration the runway width.	Excursion (at take-off and at landing)	No direct link to a specific type of occurrence.

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21	RE21 – Reverse thrust asymmetry	Develop means to identify reverse thrust asymmetry during a rejected take-off (RTO) or landing.	Excursion (at take-off and at landing)	No direct link to a specific type of occurrence.
22	RE22 – Braking asymmetry	Develop means to identify braking asymmetry during a rejected take-off (RTO) or landing (possibly in combination with RE12 'Inadequate use of stopping devices').	Excursion (at take-off and at landing)	No direct link to a specific type of occurrence.
23	(Reserved)			
24	RE24 – Tailwind	Develop means to estimate the tailwind during take-off, approach and landing.	Excursion (at take-off and at landing)	No direct link to a specific type of occurrence.
25	RE25 – Excessive engine power	Develop means to monitor the engine power reduction before touchdown and to identify abnormal engine utilisation in this phase of the flight.	Excursion (at take-off and at landing)	No direct link to a specific type of occurrence.
26	RE26 – Unstable approach	Develop means to identify and quantify unstable approaches, regardless of whether they result in go-around manoeuvres.	Excursion (at take-off and at landing)	1.3(8) Approach continued against air operator stabilised approach criteria.
27	RE27 – High energy over the threshold	Develop means to estimate the height, airspeed and ground speed while crossing the runway threshold.	Excursion (at take-off and at landing)	No direct link to a specific type of occurrence.
28	RE28 – Long flare	Develop means to detect the start of the flare and to estimate the ground distance the aircraft has covered from the start of the flare until touchdown.	Excursion (at take-off and at landing)	No direct link to a specific type of occurrence.
29	RE29 – Deep landing	Develop means to estimate the distance from the runway threshold until the touchdown point, and also the runway length available after touchdown.	Excursion (at take-off and at landing)	No direct link to a specific type of occurrence.

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30	RE30 – Abnormal runway contact (ARC)	Develop means to identify and quantify bounced (main or nose wheels), off-centre, nose-first or asymmetrical landings, as well as tail and wingtip strikes.	Excursion (at take-off and at landing)	1.3(7) Tail, blade/wingtip or nacelle strike during take-off or landing. 1.3(12) Hard landing.
31	RE31 – Go-around	Develop means to identify go-arounds and balked landings.	Excursion (at take-off and at landing)	No direct link to a specific type of occurrence.
32	RE32 – Excessive energy at touchdown	Develop means to correctly identify the touchdown instant, to measure airspeed and ground speed, and to identify cases of excessive energy.	Excursion (at take-off and at landing)	No direct link to a specific type of occurrence).
33	RE33 – Wrong runway or wrong runway entry point used	The difference between actual and planned runway or runway entry point used should be monitored.	Excursion (at take-off and at landing)	No direct link to a specific type of occurrence.
34	RE34 – Erroneous guidance	Develop means to detect cases of erroneous guidance during approach and landing.	Excursion (at take-off and at landing)	No direct link to a specific type of occurrence.
35	LOC01 – Fire, smoke and fumes	Develop means to detect the presence of fire, smoke or fumes in the cabin, cargo compartment, engines, and landing gear bay.	Aircraft upset	4(2) Any burning, melting, smoke, fumes, arcing, overheating, fire or explosion.
36	LOC02 – Pressurization system malfunction	Develop means to identify malfunctions of the pressurisation system which could cause crew incapacitation or discomfort. System malfunctions could cause abnormal or unexpected rates of cabin pressure, inability to cope with transients in engine regime, abnormal cabin altitude (not necessarily high enough to trigger alerts for the crew) or reversion from automatic control to manual. There might be scope for integration	Aircraft upset	4(7) Uncontrollable cabin pressure.

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		with the aircraft health monitoring systems and support for continued airworthiness.		
37	LOC03 – Pressurization system misuse	Develop means to identify the situations where the pressurisation system is not used correctly. For example, failure to turn on the bleed pressure after take-off, failure to set the landing pressure altitude, or inadequate use of the manual control mode.	Aircraft upset	No direct link to a specific type of occurrence.
38	(Reserved)			
39	LOC05 – High cabin altitude	Develop means to identify situations of abnormal cabin altitude, including but not limited to values that would trigger cabin altitude alerts (possibly in combination with LOC02 'Pressurisation system malfunction').	Aircraft upset	No direct link to a specific type of occurrence.
40	LOC06 – Oxygen (O_2) masks not deployed and not used by the crew	Develop means to identify situations where the crew failed to deploy and use the oxygen (O_2) masks in response to real or nuisance situations.	Aircraft upset	4(9) Any use of crew oxygen system by the crew.
41	LOC07 – Supplementary oxygen (O_2) system failure	Develop means to identify the failure of or leaks in the flight crew supplementary oxygen (O_2) system.	Aircraft upset	4(9) Any use of crew oxygen system by the crew.
42	LOC08 – Centre of gravity (CG) out of limits	Develop means to estimate the CG position and to detect situations where it is beyond the limits or not consistent with the pitch trim settings, as a result of load shifts, incorrect loadings or fuel imbalance.	Aircraft upset	No direct link to a specific type of occurrence.
43	LOC09 – Abnormal operations	Develop means to identify operations at or beyond the edges of the operating envelope or not in compliance with the standard operating procedures (SOPs). This should cover all airframe and engine limitations (as	Aircraft upset	1.4(6) Exceedance of aircraft flight manual limitation.

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		specified in the aircraft flight manual (AFM), including but not limited to indicated airspeed/Mach versus altitude, vertical speed, G limits, flap speed limits, speed brake limits, tire speed limits, landing gear limits, temperature limits, manoeuvrability speeds, engine parameters, tailwind, crosswind, excessive rudder inputs).		2.2(4) Engine operating limitation exceedance, including overspeed or inability to control the speed of any high-speed rotating component (e.g. APU, air starter, air cycle machine, air turbine motor, propeller or rotor).
44	LOC10 – Incorrect performance calculation	Develop means to detect erroneous data entry or calculation errors which could lead to incorrect thrust settings, incorrect V speeds or incorrect target approach speeds (to be reconciled with recommendation RE01 for runway excursions).	Aircraft upset	1.1(1) Use of incorrect data or erroneous entries into equipment used for navigation or performance calculations that has or could have endangered the aircraft, its occupants or any other person.
45	LOC11 – Overweight take-off	Develop means to identify overweight take-off situations that could have an adverse effect on the climb performance and obstacle clearance for performance-limited departures (possibly in combination with LOC10 'Incorrect performance calculation').	Aircraft upset	No direct link to a specific type of occurrence.
46	LOC12 – Envelope protection systems	Develop means to detect in-flight activation of the envelope protection systems of the aircraft.	Aircraft upset	1.4(4) Activation of any flight envelope protection, including stall warning, stick shaker, stick pusher and automatic protections.
47	LOC13 – Inadequate aircraft energy	Develop means to identify situations of inadequate aircraft energy (speed and/or altitude and/or thrust) for each phase of the flight.	Aircraft upset	No direct link to a specific type of occurrence.

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48	LOC14 – Inadequate aircraft attitude	Develop means to identify cases of excessive angles of pitch and roll. The identification should take into consideration the range of values acceptable for each phase of flight.	Aircraft upset	No direct link to a specific type of occurrence.
49	LOC15 – Loss of lift	Develop means to identify situations of actual loss of lift and cases of operation close to the edges of the lift envelope.	Aircraft upset	1.4(4) Activation of any flight envelope protection, including stall warning, stick shaker, stick pusher and automatic protections.
50	(Reserved)			
51	LOC17 – Electromagnetic interference (EMI)	Develop means to identify cues that could suggest situations of electromagnetic interference (EMI) (possibly in combination with LOC24 'Instrument malfunction').	Aircraft upset	No direct link to a specific type of occurrence.
52	LOC18 – Adverse weather	Develop means to identify the presence of adverse weather in the vicinity of the aircraft.	Aircraft upset	5(9) to 5(13).
53	LOC19 – Wind shear	Develop means to identify situations of wind shear (reactive and predictive).	Aircraft upset	5(12) A significant wind shear or thunderstorm encounter that has or could have endangered the aircraft, its occupants or any other person.
54	LOC20 – Severe turbulence	Develop means to identify situations of severe turbulence caused by different sources (clear-air turbulence, wake vortex, mountain waves, etc.).	Aircraft upset	5(7) Wake-turbulence encounters. 5(11) Severe turbulence encounter or any encounter resulting in injury to occupants or deemed to require a 'turbulence check' of the aircraft.

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55	LOC21 – Icing conditions	Develop means to identify situations of extremely cold conditions or icing of the engines, nacelles, propellers, wings and airframe. Operation in cold or icing conditions is frequent for most aircraft operations; therefore, they should not be considered abnormal. The objective is to develop a set of measurements to enable a better understanding of such environmental conditions in order to assess the response of the aircraft ice detection systems and to support recommendation LOC22 'De-icing system failure'.	Aircraft upset	5(13) Icing encounter resulting in handling difficulties, damage to the aircraft or loss or malfunction of any aircraft system.
56	LOC22 – De-icing system failure	Develop means to identify failure, ineffectiveness or incorrect utilisation (e.g. late activation) of de-icing and anti-icing systems.	Aircraft upset	No direct link to a specific type of occurrence.
57	LOC23 – Engine failure	Develop means to identify situations of latent or active engine failure, including foreign object damage (FOD) and hardware degradation and failure. There might be scope for integration with the engine health monitoring (EHM) and continued airworthiness.	Aircraft upset	2.2(5) Failure or malfunction of any part of an engine, power plant, APU or transmission resulting in any one or more of the following: (a) thrust-reversing system failing to operate as commanded; (b) inability to control power, thrust or rpm (revolutions per minute); (c) non-containment of components/debris.

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58	LOC24 – Instrument malfunction	Develop means to identify situations of instrument malfunction (possibly in combination with LOC17 ‘Electromagnetic interference (EMI)’).	Aircraft upset	2.1(6) Malfunction or defect of any indication system when this results in misleading indications to the crew.
59	(Reserved)			
60	LOC26 – Loss of thrust	Develop means to identify situations of unintended loss of thrust, or reduced engine performance, taking into consideration (but not only) the range of values acceptable for each phase of flight and fuel flow.	Aircraft upset	2.2(1) Failure or significant malfunction of any part or controlling of a propeller, rotor or power plant. 2.2(3) Flameout, in-flight shutdown of any engine or APU when required (e.g. ETOPS (extended range twin engine aircraft operations), MEL (minimum equipment list)).
61	LOC27 – Hardware failure	Develop means to identify cues that could suggest the existence of latent failures in safety-critical components (including but not limited to landing gears, doors, brakes, wheels and hydraulic systems). There might be scope for integration with the aircraft health monitoring (AHM) systems and continued airworthiness.	Aircraft upset	No direct link to a specific type of occurrence.
62	LOC28 – Flight control failure	Develop means to identify cues that could suggest failure or ineffectiveness of the flight controls.	Aircraft upset	2.1(7) Abnormal functioning of flight controls such as asymmetric or stuck/jammed flight controls (e.g. lift (flaps/slats), drag (spoilers), attitude control (ailerons, elevators, rudder) devices).

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63	LOC29 – Mismanagement of automation	Develop means to identify situations of inadequate or unexpected use of automation or unexpected disconnection of automation.	Aircraft upset	1.4(9) Misinterpretation of automation mode or of any flight deck information provided to the flight crew that has or could have endangered the aircraft, its occupants or any other person.
64	LOC30 – Abnormal flight control inputs	Develop means to identify situations of abnormal inputs into thrust controls, control surfaces and lifting devices, taking into consideration the range of values acceptable for each phase of flight.	Aircraft upset	No direct link to a specific type of occurrence.
65	LOC31 – Fuel exhaustion	Develop means to identify situations of low fuel quantity – by comparison to the planned fuel quantity – as the flight proceeds to its destination.	Aircraft upset	4(8) Critically low fuel quantity or fuel quantity at destination below required final reserve fuel.
66	LOC32 – Incorrect aircraft configuration	Develop means to identify situations of incorrect or unusual aircraft configuration for each phase of the flight.	Aircraft upset	1.3(6) Actual or attempted take-off, approach or landing with incorrect configuration setting.
67	CFIT01 – Poor visibility conditions	Develop means to identify present visibility conditions (e.g. instrument meteorological conditions (IMC) or visual meteorological conditions (VMC)).	Collision with terrain	No direct link to a specific type of occurrence.
68	CFIT02 – Wrong altimeter settings	Develop means to identify wrong altimeter settings.	Collision with terrain	1.4(7) Operation with incorrect altimeter setting.
69	CFIT03 – Flight below minimum sector altitude (MSA)	Develop means to identify situations of aircraft that fly below the minimum sector altitude (MSA).	Collision with terrain	1.3(9) Continuation of an instrument approach below published minimums with inadequate visual references.

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70	CFIT04 – Deviation below the glideslope	Develop means to identify (severe) deviations below the glideslope that increase the CFIT risk.	Collision with terrain	1.3(8) Approach continued against air operator stabilised approach criteria.
71	CFIT05 – Flight management system (FMS) incorrectly set	Develop means to identify errors in the flight management system (FMS) settings, especially those associated to close-to-terrain operations (e.g. approach in a mountainous area).	Collision with terrain	No direct link to a specific type of occurrence.
72	CFIT06 – Inadequate vertical mode selections of the aircraft flight control system (AFCS)	Develop means to identify inadequate vertical mode selections of the aircraft flight control systems (AFCS), especially those associated to close-to-terrain operations (e.g. approach in a mountainous area).	Collision with terrain	1.4(9) Misinterpretation of automation mode or of any flight deck information provided to the flight crew that has or could have endangered the aircraft, its occupants or any other person.
73	CFIT07 – Incorrect descent point	Develop means to identify incorrect descent points.	Collision with terrain	No direct link to a specific type of occurrence.
74	CFIT08 – Inadequate terrain awareness and warning system (TAWS) escape manoeuvre	Develop means to identify escape manoeuvres, after a triggered TAWS alert, which are non-compliant with the correct manoeuvre or airline standard operating procedures (SOPs). Apart from that, approaches with repeated TAWS soft warnings (or just one TAWS warning) should be monitored. Repeated TAWS soft warnings during an approach can evidence that either the aircraft was not safe with regard to the terrain potentially due to the approach procedure design, or that the TAWS needs to be adjusted for that particular approach.	Collision with terrain	5(3) Activation of genuine ground collision system such as ground proximity warning system (GPWS) / terrain awareness and warning system (TAWS) ‘warning’.

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75	CFIT09 – Inadequate missed approach and go-around flight path	Develop means to identify missed approach and go-around flight paths that are non-compliant with published information or airline standard operating procedures (SOPs).	Collision with terrain	No direct link to a specific type of occurrence.
76	CFIT10 – Loss of communication	Develop means to identify loss of communication.	Collision with terrain	3(2) Prolonged loss of communication with ATS (air traffic service) or ATM unit.
77	CFIT11 – Low-energy state during approach / unstable approach	Develop means to identify low-energy states during approach and unstable approach.	Collision with terrain	No direct link to a specific type of occurrence.
78	CFIT12 – Inadequate response to wind shear warnings	Develop means to detect inadequate response to wind shear warnings, especially in situations close to terrain (e.g. approach in a mountainous area).	Collision with terrain	5(12) A significant wind shear or thunderstorm encounter that has or could have endangered the aircraft, its occupants or any other person.
79	CFIT13 – Reduced horizontal distance to terrain	Develop means to identify scenarios of reduced horizontal distance to terrain.	Collision with terrain	No direct link to a specific type of occurrence.
80	CFIT14 – Reduced time to terrain impact	Develop means to identify scenarios of reduced time to terrain impact assuming the aircraft maintains current track and speed.	Collision with terrain	No direct link to a specific type of occurrence.
81	MAC01 – Incorrect altimeter setting or incorrect transition timing	Develop means to detect incorrect altimeter settings or incorrect transition timing, which could lead to situations of increased mid-air collision (MAC) risk.	Airborne collision	1.4(7) Operation with incorrect altimeter setting.

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82	MAC02 – Lateral deviation	Develop means to detect situations where the actual flight trajectory deviates from the published, cleared or intended trajectory.	Airborne collision	1.4(5) Unintentional deviation from intended or assigned track of the lowest of twice the required navigation performance or 10 nautical miles.
83	MAC03 – Flight-level bust	Develop means to identify flight-level busts, i.e. situations where the cleared and intended altitude or flight level is overshot during climb or undershot during descent.	Airborne collision	1.4(3) Level bust.
84	MAC04 – High rate of climb/descent	Develop means to identify climbs and descents with high rates. Due to the trigger logic of ACAS alerts, high rates can lead to the generation of nuisance alerts (see MAC08 'Airborne collision avoidance system (ACAS) alerts').	Airborne collision	No direct link to a specific type of occurrence.
85	MAC05 – Inadequate use of automation	Develop means to identify situations of inadequate use of automation related to the aircraft trajectory.	Airborne collision	1.4(9) Misinterpretation of automation mode or of any flight deck information provided to the flight crew that has or could have endangered the aircraft, its occupants or any other person.
86	MAC06 – Automatic altitude control system OFF in reduced vertical separation minima (RVSM) conditions	Develop means to identify situations of inappropriate settings of the automatic altitude control system in reduced vertical separation minima (RVSM) conditions.	Airborne collision	No direct link to a specific type of occurrence.
87	(Reserved)			
88	MAC08 – Airborne collision avoidance system (ACAS) alerts	Monitor every safety-relevant information with respect to the airborne collision avoidance system (ACAS) that is available within the FDM. In particular, resolution	Airborne collision	5(2) ACAS RA (Airborne Collision Avoidance System, Resolution Advisory).

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		advisories (RAs) shall be identified and further investigated in detail.		
89	MAC09 – Inappropriate airborne collision avoidance system (ACAS) settings	Develop means to monitor the settings of the airborne collision avoidance system (ACAS) and to verify their suitability.	Airborne collision	No direct link to a specific type of occurrence.

~~The following table provides examples of FDM events that may be further developed using operator and aeroplane specific limits. The table is considered illustrative and not exhaustive. Other examples may be found in the documents published by the European Operators Flight Data Monitoring (EOFDM) forum.~~

~~**Event Group**~~	~~**Description**~~
~~Rejected take-off~~	~~High speed rejected take-off~~
~~Take-off pitch~~	~~Pitch rate low or high on take-off~~
	~~Pitch attitude high during take-off~~
~~Unstick speeds~~	~~Unstick speed high~~
	~~Unstick speed low~~
~~Height loss in climb-out~~	~~Initial climb height loss 20 ft above ground level (AGL) to 400 ft above aerodrome level (AAL)~~
	~~Initial climb height loss 400 ft to 1 500 ft AAL~~
~~Slow climb-out~~	~~Excessive time to 1 000 ft AAL after take-off~~
~~Climb-out speeds~~	~~Climb-out speed high below 400 ft AAL~~
	~~Climb-out speed high 400 ft AAL to 1 000 ft AAL~~
	~~Climb-out speed low 35 ft AGL to 400 ft AAL~~
	~~Climb-out speed low 400 ft AAL to 1 500 ft AAL~~
~~High rate of descent~~	~~High rate of descent below 2 000 ft AGL~~
~~Missed approach~~	~~Missed approach below 1 000 ft AAL~~
	~~Missed approach above 1 000 ft AAL~~
~~Low approach~~	~~Low on approach~~
~~Glideslope~~	~~Deviation under glideslope~~
	~~Deviation above glideslope (below 600 ft AGL)~~
~~Approach power~~	~~Low power on approach~~
~~Approach speeds~~	~~Approach speed high within 90 seconds of touchdown~~
	~~Approach speed high below 500 ft AAL~~
	~~Approach speed high below 50 ft AGL~~
	~~Approach speed low within 2 minutes of touchdown~~
~~Landing flap~~	~~Late land flap (not in position below 500 ft AAL)~~
	~~Reduced flap landing~~
	~~Flap load relief system operation~~

~~Event Group~~	~~Description~~
~~Landing pitch~~	~~Pitch attitude high on landing~~
	~~Pitch attitude low on landing~~
~~Bank angles~~	~~Excessive bank below 100 ft AGL~~
	~~Excessive bank 100 ft AGL to 500 ft AAL~~
	~~Excessive bank above 500 ft AGL~~
	~~Excessive bank near ground (below 20 ft AGL)~~
~~Normal acceleration~~	~~High normal acceleration on ground~~
	~~High normal acceleration in flight flaps up (+/- increment)~~
	~~High normal acceleration in flight flaps down(+/- increment)~~
	~~High normal acceleration at landing~~
~~Abnormal configuration~~	~~Take-off configuration warning~~
	~~Early configuration change after take-off (flap)~~
	~~Speed brake with flap~~
	~~Speed brake on approach below 800 ft AAL~~
	~~Speed brake not armed below 800 ft AAL~~
~~Ground proximity warning~~	~~Ground proximity warning system (GPWS) operation - hard warning~~
	~~GPWS operation — soft warning~~
	~~GPWS operation — windshear warning~~
	~~GPWS operation — false warning~~
~~Airborne collision avoidance system (ACAS II) warning~~	~~ACAS operation — Resolution Advisory~~
~~Margin to stall/buffet~~	~~Stick shake~~
	~~False stick shake~~
	~~Reduced lift margin except near ground~~
	~~Reduced lift margin at take-off~~
	~~Low buffet margin (above 20 000 ft)~~
~~Aircraft flight manual limitations~~	~~Maximum operating speed limit (V_{MO}) exceedance~~
	~~Maximum operating speed limit (M_{MO}) exceedance~~
	~~Flap placard speed exceedance~~
	~~Gear down speed exceedance~~

~~Event Group~~	~~Description~~
	~~Gear selection up/down speed exceedance~~
	~~Flap/slat altitude exceedance~~
	~~Maximum operating altitude exceedance~~

Rationale

GM2 ORO.AOC.130 is proposed to be amended to provide industry best practices on monitoring precursors of incidents related to the key risk areas that are specified in AMC2 ORO.AOC.130 with FDM (refer to the EOFDM Working Group B document Guidance for the implementation of flight data monitoring precursors*). The new Table 1 of GM2 ORO.AOC.130 contains examples of such precursors that could be monitored by means of FDM events or FDM measurements.*

In addition, the new Table 1 of GM2 ORO.AOC.130:

- *identifies, for each precursor of an incident, the relevant key risk area; these key risk areas are defined in Regulation (EU) 2020/2034 for implementing the European risk classification scheme that supplements Regulation (EU) No 376/2014;*
- *links the precursors of incidents to occurrence types subject to mandatory reporting as per Regulation (EU) No 376/2014, as listed in Regulation (EU) 2015/1018, Annex I.*

Linking the example precursors of incidents to the framework applicable to occurrence reporting contributes to better integrating the FDM programme and occurrence reporting. The FDM programme and occurrence reporting are both parts of the operator's management system, are both used to support SRM and are both under the control of the operator's safety manager. Their integration is beneficial for both processes and ultimately for the management system.

SUBPART DEC: DECLARATION

GM1 ORO.DEC.100 Declaration

[…]

MANAGED OPERATIONS

When the non-commercial operation of a complex motor-powered aircraft is managed by a third party on behalf of the owner, that party may be the operator in the sense of Article 3~~(h)~~(13) of Regulation (EU) 2018/1139 ~~(EC) No 216/2008~~, and therefore has to declare its capability and means to discharge the responsibilities associated with the operation of the aircraft to the competent authority.

In such a case, it should also be assessed whether the third-party operator undertakes a commercial operation, defined as the operation of an aircraft, in return for remuneration or other valuable consideration, which is available to the public or, when not made available to the public, which is performed under a contract between an operator and a customer, where the latter has no control over the operator ~~in the sense of Article 3(i) of Regulation (EC) No 216/2008~~.

Rationale

Editorial amendment. The definition of commercial operation used is the same as in Article 3(i) of Regulation (EC) No 216/2008. No impacts expected.

SUBPART FC: FLIGHT CREW

SECTION 2 – ADDITIONAL REQUIREMENTS FOR COMMERCIAL AIR TRANSPORT OPERATIONS

GM1 ORO.FC.230 Recurrent training and checking

LINE CHECK AND PROFICIENCY TRAINING AND CHECKING

[…]

GROUND TRAINING PROGRAMME

(e) Training on aircraft systems. It is recommended that training on aircraft systems referred to in point (a)(1)(i)(A) of AMC1 ORO.FC.230 is carried out at least every 12 calendar months, so that all the systems are covered over a period not exceeding 3 years.

(f) Training on abnormal and emergency procedures. It is recommended that the training on abnormal and emergency procedures referred to in point (a)(1)(i)(C) of AMC1 ORO.FC.230 is carried out at least every 12 calendar months, so that all such procedures are covered over a period not exceeding 3 years. Since operators cover major failures of aircraft systems in the FSTD/aircraft training programme, the ground training may focus on those other abnormal and emergency procedures that are not classified as major failures but have an impact on the safety of the flight. The ground training programme may not cover all the abnormal and emergency procedures; therefore, trivial and minor abnormal procedures may not be included.

COMPUTER-BASED TRAINING

(g) Computer-based training (CBT) may be used for ground training. CBT is any interactive means of structured training using a computer to deliver the content. CBT provides a valuable source of theoretical instruction, enabling the students to progress at their own pace within specified time limits. Such systems may allow self-study or distance learning, if they incorporate adequate knowledge testing procedures. It is good practice for the operator to make available a suitably qualified ground instructor at an agreed time and day (e.g. at the next briefing of a simulator session) to assist with areas of difficulty for the student.

Rationale

The proposed new points (e) and (f) provide guidance on the frequency that should apply to ground training on aircraft systems and abnormal and emergency procedures. The wording of points (e) and (f) assumes that at least two elements of the training (aircraft systems in point (e), abnormal and emergency procedures in point (f)) are covered every 12 months.

The new point (g) clarifies that CBT is possible in the context of ground training and includes some guidance on CBT. The definition of CBT comes from the EASA publication Guidance for allowing virtual classroom instruction and distance learning*, and the remaining elements mirror AMC2 ORA.ATO.125, with the necessary adaptations to suit the needs in Subpart ORO.FC.*

These proposals are intended to add clarity to the current provisions. A low positive impact on safety is expected.

AMC2 ORO.FC.231(a) Evidence-based training

UPSET PREVENTION AND RECOVERY TRAINING (UPRT) FOR COMPLEX MOTOR-POWERED AEROPLANES WITH A MAXIMUM OPERATIONAL PASSENGER SEATING CONFIGURATION (MOPSC) OF MORE THAN 19 AND FLIGHT PATH MANAGEMENT DURING UNRELIABLE AIRSPEED INDICATION AND OTHER FAILURES AT HIGH ALTITUDE IN AEROPLANES WITH A MAXIMUM CRUISING ALTITUDE ABOVE FL300

Operators approved for EBT should follow the provisions for upset prevention and recovery training (UPRT) contained in AMC1 ORO.FC.220&230 ~~'Operator conversion training and checking & recurrent training and checking'~~ and for training on flight path management during unreliable airspeed indication and other failures at high altitude in aeroplanes with a maximum cruising altitude above FL300 contained in AMC1 ORO.FC.120&130. These provisions ~~should be~~ are included in the tables of assessment and training topics detailed in ORO.FC.232. Further guidance can be found in the EASA EBT manual.

Rationale

The amendments proposed aim to clarify that operators approved for EBT need to include in their training programmes elements related to training on flight path management during unreliable airspeed indication and other failures at high altitude, as detailed in AMC1 ORO.FC.120&130. Compliance with AMC1 ORO.FC.120&130 is already required by EBT operators (and non-EBT operators); therefore, the amendments to AMC2 ORO.FC.231(a) simply clarify:

— *that the provisions in AMC1 ORO.FC.120&130 can be integrated in the EBT programme;*

— *how to integrate them, which is provided in the amendments proposed in AMC2 ORO.FC.232 (see below).*

The proposed amendments add clarity to the text, and a low positive impact on safety is expected.

AMC1 ORO.FC.231(a)(5) Evidence-based training

CONTINGENCY PROCEDURES FOR UNFORESEEN CIRCUMSTANCES THAT MAY AFFECT THE DELIVERY OF THE MODULE

[…]

(c) In case the pilot misses modules and does not meet the requirements of recent experience (FCL.060):

[…]

(5) when the pilot misses two or more modules and the pilot's rating is expired by less than 1 year:

[…]

(ii) training topics B and C of the other module(s) missing should be rescheduled before the pilot can resume line operations.

[…]

Rationale

The purpose of the proposed amendments is to clarify that the provisions of point (c)(5) of the AMC also apply to cases in which the pilot has missed two modules or more.

The proposed amendments add clarity to the text, and no impact is expected.

GM1 ORO.FC.231(a)(5) Evidence-based training

CONTINGENCY PROCEDURES — RATINGS RENEWAL

(a) […]

[…]

(2) […]

[…]

(ii) Two or more modules are missing: the pilot must complete one module (two simulator sessions) and training topics B and C of the other missing module (an extra simulator session) with a total of three simulator sessions. Training data is gathered in a short time period; therefore, an EBT instructor with examiner privilege is involved to ensure the proficiency of the pilot.

[…]

Rationale

Please refer to the rationale for the amendments to AMC1 ORO.FC.231(a)(5).

AMC1 ORO.FC.231(c) Evidence-based training

TRAINING SYSTEM PERFORMANCE — FEEDBACK PROCESS

[…]

(c) The following defined metrics should be collected as a minimum:

(1) level 0 grading metrics (competent/binary metrics): data metrics providing the information whether the pilot(s) is (are) competent or not (for training: whether the pilot ‘completed’ the training or not);

[…]

Rationale

Level 0 grading is a binary grading. The purpose of the first proposed amendment is to clarify that level 0 can be used to grade training sessions (e.g. scenario-based training). The wording ‘competent/not competent’ was perceived as confusing as it is usually used in the context of evaluation *or checking. A few existing paragraphs of GM to ORO.FC.231 clearly cover the possibility of using level 0 grading in scenario-based training while taking level 1 de-identified, and proposed amendments are consistent with that.*

The wording used ('whether the pilot 'completed' the training or not') follows the philosophy described in point (a)(3)(i) of ORO.FC.231.

The proposed amendments add clarity to the text, and no impact is expected.

AMC4 ORO.FC.231(d)(1) Evidence-based training

RECOMMENDED GRADING SYSTEM METHODOLOGY — VENN MODEL

(a) [...]

~~Abbreviated word picture VENN model~~				
	~~TEM~~	~~Observable behaviours~~		
~~Grading~~	~~OUTCOME (1)~~	~~HOW WELL (2) =~~	~~HOW MANY (i)+~~	~~HOW OFTEN (ii)~~
~~1~~	~~unsafe situation~~	~~ineffectively~~	~~few, hardly any~~	~~rarely~~
~~2~~	~~not an unsafe situation~~	~~minimally acceptable~~	~~some~~	~~occasionally~~
~~3~~	~~safe situation~~	~~adequately~~	~~many~~	~~regularly~~
~~4~~	~~safe situation~~	~~effectively~~	~~most~~	~~regularly~~
~~5~~	~~enhanced safety, effectiveness and efficiency~~	~~in an exemplary manner~~	~~all, almost all~~	~~always~~

Abbreviated word picture VENN model								
Observable behaviours					**&**	**TEM outcome**		**Grading**
HOW MANY (2)(i)	*+*	*HOW OFTEN (2)(ii)*	*=*	*HOW WELL (2)*		*OUTCOME (1)*		*GRADE*
few, hardly any		rarely		ineffectively		unsafe situation		**1**
some		occasionally		minimally acceptable		not an unsafe situation		**2**
many		regularly		adequately		safe situation		**3**
most		regularly		effectively		safe situation		**4**
all, almost all		always		in an exemplary manner		enhanced safety, effectiveness and efficiency		**5**

(b) Grades should be determined during each EBT module as follows:

(1) EVAL — overall performance of the phase at level 1 grading metrics.

(2) MT — overall performance of the phase at level 0 grading metrics. When the phase is graded ‘not competent’ or ‘not completed’, it requires level 2 grading metrics.

[…]

Rationale

The replacement table improves the presentation of the existing table and moves the TEM column to the end of the table in accordance with the latest amendments from ICAO.

Additionally, it is proposed to introduce new wording to point (b), to reflect the practice used by many operators, which consider ‘not completed’ more appropriate for this training phase, as ‘not competent’ is wording traditionally used in a checking environment. See the rationale for the proposed amendments to AMC1 ORO.FC.231(c).

The proposed amendments add clarity to the text, and no impact is expected.

AMC2 ORO.FC.232 EBT programme assessment and training topics

GENERATION 4 (JET) — TABLE OF ASSESSMENT AND TRAINING TOPICS

[…]

Section 5 — UPRT training topic with frequency (B). Evaluation phase, manoeuvres training phase or scenario-based training phase (EVAL, MT or SBT)															
EVAL, MT or SBT	Upset prevention training	B	N/A	Compliance with AMC1 or AMC2 to ORO.FC.220&230 and AMC1 ORO.FC.120&130 Include 'upset prevention elements' in 'Table 1' and 'unreliable airspeed indication' and other failures for the recurrent training programme in at least every cycle, such that all the elements are covered over a period not exceeding 3 years. The elements are numbered with letters from A to I in Table 1 of AMC1 ORO.FC.220&230. Each element is made up of several numbered components. […]	[…]	See Table 1 of AMC1 ORO.FC.220&230: Elements and respective components of upset prevention training.	Intentionally blank								
			CRZ			[…]			X					x	x
			TO APP			[…]			x	x		x	x		
			CRZ			[…]				X			x		x
			CRZ			[…]	X		x	x			x		
			CRZ			[…]			X	x			x		X
			CRZ			High-altitude ACAS RA (where the RA is required to be flown in manual flight)	x			x			x	x	
			CRZ			Basic flight physics principles concerning flights at high altitude, with a particular emphasis on the relative proximity of the critical Mach number and the stall and pitch behaviour, and an understanding of the reduced stall angle of attack when compared with low-altitude flight. Note: By executing at high altitude any of components A.3, A.4, A.5, A.6 or A.7 of Table 1 (prevention) of AMC1 ORO.FC.220&230 or component A.3 of Table 2 (recovery), this element may be credited.	Intentionally blank								
			CRZ			Interaction of automation (autopilot, flight director, auto-throttle/autothrust) and the consequences of failures inducing disconnection of the automation. Note: By executing at high altitude any of the components F.3, F.6 or H.5 of Table 1 of AMC1 ORO.FC.220&230, this element may be credited.	Intentionally blank								
			CRZ			Consequences of an unreliable airspeed indication and other failures at high altitude and the need for the flight crew to promptly identify the failure and react with appropriate (minimal) control inputs to keep the aircraft in a safe envelope. Note: By executing at high altitude any of the components H.1, H.2, H.3, H4, H5, H6 or H7 of Table 1 of AMC1 ORO.FC.220&230, this element may be credited.	Intentionally blank								
			CRZ			Unreliable airspeed indication or other failures at high altitude and the need for the flight crew to promptly identify the failure and react with appropriate (minimal) control inputs to keep the aircraft in a safe envelope.	X	X		X	X		X	X	X
			CRZ			Degradation of fly-by-wire (FBW) flight control laws/modes and its impact on aircraft stability and flight envelope protections, including stall warnings. Note: By executing at	Intentionally blank								

						high altitude component H.6 of Table 1 AMC1 ORO.FC.220&230 this element may be credited.	
			CRZ			Practical training, using appropriate simulators, on manual handling at high altitude in normal and non-normal flight control laws/modes, with particular emphasis on pre-stall buffet, the reduced stall angle of attack when compared with low-altitude flight and the effect of pitch inputs on the aircraft trajectory and energy state. Note: By executing at high altitude any of the components A.3, A.4, A.5, A.6, A.7, F.3, G.5, H.7 or I.1 of Table 1 of AMC1 ORO.FC.220&230, this element may be credited.	Intentionally blank
			CRZ			The requirement to promptly and accurately apply the stall recovery procedure, as provided by the aircraft manufacturer, at the first indication of an impending stall. Differences between high-altitude and low-altitude stalls must be addressed. Note: By executing at high altitude component A.2 of Table 1 of AMC1 ORO.FC.220&230, this element may be credited.	Intentionally blank
			CRZ			Procedures for taking over and transferring manual control of the aircraft, especially for FBW aeroplanes with independent side-sticks. Note: By executing at high altitude any of the components F.1, F.6, H.3 or H.4 of Table 1 of AMC1 ORO.FC.220&230, this element may be credited.	Intentionally blank
			N/A			Task sharing and crew coordination in high workload/stress conditions with appropriate call-out and acknowledgement to confirm changes to the aircraft flight control law/mode. Note: By executing at high altitude the training topic ‘workload distraction, pressure, stress’, this element may be credited.	Intentionally blank

[…]

Rationale

The proposed additions to Section 5 of the table, on UPRT training, improve the link with AMC1 ORO.FC.120&130 and AMC1 ORO.FC.220&230. See the rationale for the amendments to AMC2 ORO.FC.231(a).

The proposed amendments add clarity to the text, and a low positive impact on safety is expected.

AMC3 ORO.FC.232 EBT programme assessment and training topics

GENERATION 3 (JET) — TABLE OF ASSESSMENT AND TRAINING TOPICS

[…]

Section 5 — UPRT training topic with frequency (B). Evaluation phase, manoeuvres training phase or scenario-based training phase (EVAL, MT or SBT)															
EVAL, MT or SBT	Upset prevention training	B	N/A	Compliance with AMC1 or AMC2 to ORO.FC.220&230 and AMC1 ORO.FC.120&130 Include 'upset prevention elements' in 'Table 1' and 'unreliable airspeed indication' and other failures for the recurrent training programme in at least every cycle, such that all the elements are covered over a period not exceeding 3 years. The elements are numbered with letters from A to I in Table 1 of AMC1 ORO.FC.220&230. Each element is made up of several numbered components. […]	[…]	[…]	Intentionally blank								
			CRZ			[…]			X					x	x
			TO APP			[…]			x	x		x	x		
			CRZ			[…]				X			x		x
			CRZ			[…]	X		x	x			x		
			CRZ			[…]			X	x			x		X
			CRZ			[…]	x			x			x	x	
			CRZ			Basic flight physics principles concerning flights at high altitude, with a particular emphasis on the relative proximity of the critical Mach number and the stall and pitch behaviour, and an understanding of the reduced stall angle of attack when compared with low-altitude flight. Note: By executing at high altitude any of the components A.3, A.4, A.5, A.6 or A.7 of Table 1 (prevention) of AMC1 ORO.FC.220&230 or component A.3 of Table 2 (recovery), this element may be credited.	Intentionally blank								
			CRZ			Interaction of automation (autopilot, flight director, auto-throttle/autothrust) and the consequences of failures inducing disconnection of the automation. Note: By executing at high altitude any of the components F.3, F.6 or H.5 of Table 1 of AMC1 ORO.FC.220&230, this element may be credited.	Intentionally blank								
			CRZ			Consequences of an unreliable airspeed indication and other failures at high altitude and the need for the flight crew to promptly identify the failure and react with appropriate (minimal) control inputs to keep the aircraft in a safe envelope. Note: By executing at high altitude any of the components H.1, H.2, H.3, H4, H5, H6 or H7 of Table 1 of AMC1 ORO.FC.220&230, this element may be credited.	Intentionally blank								
			CRZ			Unreliable airspeed indication or other failures at high altitude and the need for the flight crew to promptly identify the failure and react with appropriate (minimal) control inputs to keep the aircraft in a safe envelope.	x	x		x	x		x	x	x
			CRZ			Degradation of fly-by-wire (FBW) flight control laws/modes and its impact on aircraft stability and flight envelope protections, including stall warnings. Note: By executing at	Intentionally blank								

						high altitude component H.6 of Table 1 of AMC1 ORO.FC.220&230, this element may be credited.	
			CRZ			Practical training, using appropriate simulators, on manual handling at high altitude in normal and non-normal flight control laws/modes, with particular emphasis on pre-stall buffet, the reduced stall angle of attack when compared with low-altitude flight and the effect of pitch inputs on the aircraft trajectory and energy state. Note: By executing at high altitude any of the components A.3, A.4, A.5, A6, A7, F.3, G.5, H.7 or I.1 of Table 1 of AMC1 ORO.FC.220&230, this element may be credited.	Intentionally blank
			CRZ			The requirement to promptly and accurately apply the stall recovery procedure, as provided by the aircraft manufacturer, at the first indication of an impending stall. Differences between high-altitude and low-altitude stalls must be addressed. Note: By executing at high altitude component A.2 of Table 1 of AMC1 ORO.FC.220&230, this element may be credited.	Intentionally blank
			CRZ			Procedures for taking over and transferring manual control of the aircraft, especially for FBW aeroplanes with independent side-sticks. Note: By executing at high altitude any of the components F.1, F.6, H.3 or H.4 of Table 1 of AMC1 ORO.FC.220&230, this element may be credited.	Intentionally blank
			N/A			Task sharing and crew coordination in high workload/stress conditions with appropriate call-out and acknowledgement to confirm changes to the aircraft flight control law/mode. Note: By executing at high altitude the training topic 'workload distraction, pressure, stress', this element may be credited.	Intentionally blank

[…]

Rationale

The proposed additions to Section 5 of the table, on UPRT training, improve the link with AMC1 ORO.FC.120&130 and AMC1 ORO.FC.220&230. See the rationale for the amendments to AMC2 ORO.FC.231(a).

The proposed amendments add clarity to the text, and a low positive impact on safety is expected.

AMC1 ORO.FC.A.245 Alternative training and qualification programme

COMPONENTS AND IMPLEMENTATION

(a) Alternative training and qualification programme (ATQP) components

The ATQP should comprise the following:

[…]

(5) A feedback loop for the purpose of curriculum validation and refinement, and to ascertain that the programme meets its proficiency objectives.

(i) The feedback should be used as a tool to validate that the curricula are implemented as specified by the ATQP; this enables substantiation of the curriculum, and that proficiency and training objectives have been met. The feedback loop should include data from ~~operations flight data monitoring,~~ the ~~advanced~~ flight data monitoring (FDM) programme and LOE/LOQE programmes. In addition, the evaluation process should describe whether the overall targets/objectives of training are being achieved and should prescribe any corrective action that needs to be undertaken.

[…]

(7) A flight data monitoring~~/analysis~~ programme ~~consisting of the following:~~

~~(i) A flight data monitoring (FDM) programme~~, as specified ~~described~~ in AMC1 ORO.AOC.130. ~~Data collection should reach a minimum of 60 % of all relevant flights conducted by the operator before ATQP approval is granted. This proportion may be increased as determined by the competent authority.~~

~~(ii) An advanced FDM when an extension to the ATQP is requested: an advanced FDM programme is determined by the level of integration with other safety initiatives implemented by the operator, such as the operator's safety management system. The programme should include both systematic evaluations of data from an FDM programme and flight crew training events for the relevant crews. Data collection should reach a minimum of 80 % of all relevant flights and training conducted by the operator. This proportion may be varied as determined by the competent authority.~~

~~The purpose of an FDM or advanced FDM programme for ATQP is to enable the operator to:~~

(i) The FDM programme should be used to:

(A) provide data to support the ATQP ~~programme's~~ implementation and justify any changes to the ATQP;

[…]

(~~i~~ii) ~~Data gathering:~~ Transmission of information: the FDM programme should provide to the ATQP responsible person the information that is needed for ATQP purposes. Subject to the procedure to prevent disclosure of crew identity (refer to point (k) of AMC1 ORO.AOC.130), the level of detail of that information should allow targeted changes to the training programme to be defined. ~~the data analysis should be made available to the person responsible for ATQP within the organisation.~~ The data gathered by the FDM programme for this purpose should:

[…]

(iii~~iv~~) ~~Data handling~~ Handling of transmitted information: the operator should establish a procedure to ensure the confidentiality of ~~individual flight crew members, as described by AMC1 ORO.AOC.130.~~ FDM-based information transmitted to the ATQP responsible person, which should be consistent with the procedure to prevent disclosure of crew identity specified in AMC1 ORO.AOC.130.

[…]

Rationale

AMC1 ORO.FC.A.245 is proposed to be amended to align its FDM-related conditions with current industry good practice and the conditions in AMC1 ORO.AOC.130.

In order to provide operators with sufficient notice period to implement the amendments, it is expected that the implementation of the amendments introduced to AMC1 ORO.FC.A.245 will be deferred by 2 years.

Detailed rationale

— *Regarding the changes proposed to point (a)(5), the distinction between 'FDM programme' and 'advanced FDM programme' has been removed. The term 'advanced FDM programme' is not used elsewhere in the Air OPS Regulation, ICAO Annex 6 or ICAO Document 10 000; nor is it used in FDM guidance and good-practice documents, such as UK Civil Aviation Authority CAP739 or European Operators Flight Data Monitoring forum industry good-practice documents. FDM specialists in the industry and authorities also do not use this term. In addition, the conditions that determined an 'advanced FDM programme' in the former point (a)(7)(i) of AMC1 ORO.FC.A.245 should now be required to be met by any FDM programme:*

- *the proposed new point (h)(1) of AMC1 ORO.AOC.130 specifies that at least 80 % of the flights of any aeroplane in the scope of ORO.AOC.130 should be available for analysis with the FDM software;*
- *every FDM programme must be integrated in the operator's management system, as required by ORO.AOC.130.*

Further to that, data from flight crew training events (e.g. from training sessions with flight simulation training devices) fall outside the scope of an FDM programme. According to the definition of FDM in Annex I to the Air OPS Regulation (Part-DEF), it is based on the use of digital flight data from routine operations, not on other types of data.

— *Regarding the changes proposed to point (a)(7):*

- *The description of advanced FDM programmes has been removed.*
- *The system based on two-step FDM implementation ('normal' FDM programme at the time of ATQP approval, followed by 'advanced' FDM programme when the ATQP approval*

is renewed) has been replaced by a single condition to implement an FDM programme as specified in AMC1 ORO.AOC.130. However, this change depends on the adoption of the new point (h)(1) of AMC1 ORO.AOC.130; a condition to achieve a flight collection rate of 80 % for extensions to ATQP approval would need to be maintained in point (a)(7), should the condition in point (h)(1) of AMC1 ORO.AOC.130 not be retained after the consultation on this NPA.

- *The former point on data gathering (new point (a)(7)(ii)) has been rephrased to better link it to the confidentiality procedure specified in point (k) of AMC1 ORO.AOC.130 and to clarify that the FDM programme should provide the ATQP responsible person with the information needed for their job and not necessarily all analyses. Usually, designated staff members (e.g. the safety manager, or safety analysts under the safety manager's authority) are entitled to have access to the identifiable FDM data or FDM analyses that relate to individual flight crew members, while other functions in the operator (training, flight operations, finance, etc.) do not have access to such protected data.*
- *The former point on data handling (new point (a)(7)(iii)) has been reworded for clarity (the FDM-based information is confidential, not the flight crew members).*

4.2.3 Annex IV (Part-CAT)

SUBPART B: OPERATING PROCEDURES

SECTION 1 – MOTOR-POWERED AIRCRAFT

GM2 CAT.OP.MPA.107 Adequate aerodrome

RESCUE AND FIREFIGHTING SERVICES (RFFS)

Guidance on the assessment of the level of an aerodrome's RFFS can be found in ICAO Annex 6, Part I, attachment I.

Rationale

In its Annex 6, Part I, ICAO introduced guidance related to RFFS, which is guidance for industry to implement RFFS procedures.

The new proposed GM provides a new source of information for the industry. The alignment with ICAO SARPs provides consistency, which will have a positive impact in terms of standardisation. The expected overall impact is low positive.

AMC1 CAT.OP.MPA.110 Aerodrome operating minima — general

TAKE-OFF OPERATIONS

[…]

Table 1

Take-off — aeroplanes (without LVTO approval)

RVR or VIS

[…]*: The ~~reported~~ RVR or VIS value representative of the initial part of the take-off run can be replaced by pilot assessment.

[…]

Rationale

The deletion of the word 'reported' is proposed to ensure consistency with the proposed changes to AMC3 NCC.OP.110 and AMC3 SPO.OP.110. See the rationales for those changes.

The amendment proposed aims to ensure clarity and consistency, and no impact is expected.

GM2 CAT.OP.MPA.181 Fuel/energy scheme — fuel/energy planning and in-flight re-planning policy — aeroplanes

BASIC FUEL SCHEME WITH VARIATIONS — STATISTICAL CONTINGENCY FUEL METHOD

~~As an example of statistical contingency fuel, the following statistical values of the deviation from the planned to the actual trip fuel provide appropriate statistical coverage:~~

~~(a) 99 % coverage plus 3 % of the trip fuel if the calculated flight time:~~

~~(1) is less than 2 hours; or~~

~~(2) is more than 2 hours and no fuel ERA aerodrome is available;~~

~~(b) 99 % coverage if the calculated flight time is more than 2 hours and a fuel ERA aerodrome is available; and~~

~~(c) 90 % coverage if:~~

~~(1) the calculated flight time is more than 2 hours;~~

~~(2) a fuel ERA aerodrome is available; and~~

~~(3) at the destination aerodrome, two separate runways are available and usable, one of which is suitable for type B instrument approach operations, and the meteorological conditions are in accordance with point CAT.OP.MPA.182(e).~~

The statistical contingency fuel (SCF) method is a method to calculate contingency fuel based on the operator's experience, typically considering statistically representative data from the past. It is applicable for specific city pairs and aircraft type combinations. When considering appropriate percentiles, the following factors, among others, are to be considered: specific route segment issues, runway availabilities, seasonality, time of day and aircraft type combinations. A common practice is the use of a coverage value of 90 %, 95 % or 99 %, but other practices may be possible. The values used need to be monitored and regularly adapted to reflect realistic baselines. It is recommended that this is done weekly or, as a minimum, monthly. The competent authority needs to be satisfied with the safety risk assessment and the operator's capability of implementing and monitoring the SCF procedure proposed. For further explanations, refer to ICAO Doc 9976 and the EASA fuel implementation manual.

Rationale

The example used in the current GM2 CAT.OP.MPA.181 led to some confusion among stakeholders. It is therefore proposed to amend the GM to include a more general text. The EASA fuel implementation manual to which the proposed GM refers is still under development and will be published in 2024.

The proposed amendment intends to increase clarity and no impact is expected.

AMC2 CAT.OP.MPA.182 Fuel/energy scheme — aerodrome selection policy — aeroplanes

BASIC FUEL SCHEME – DESTINATION ALTERNATE AERODROME

[…]

(b) For each IFR flight, the operator should select and specify in the operational and ATS flight plans two destination alternate aerodromes when, for the selected destination aerodrome, the safety margins for meteorological conditions of point (a) of AMC5 CAT.OP.MPA.182, ~~and the planning minima of AMC6 CAT.OP.MPA.182~~ cannot be met, or when no meteorological information is available.

[…]

Rationale

The proposed amendments aim to address questions raised by the reference to AMC6 CAT.OP.MPA.182, which is unnecessary and duplicates other provisions in AMC5 CAT.OP.MPA.182.

The proposed amendment intends to increase clarity and no impact is expected.

AMC2 CAT.OP.MPA.185(a) Fuel/energy scheme — aerodrome selection policy — aeroplanes

BASIC FUEL SCHEME WITH VARIATIONS — PROCEDURES FOR IN-FLIGHT FUEL MANAGEMENT

(a) […]

[…]

(3) destination 1 aerodrome alternate fuel ~~if a destination 1 alternate aerodrome is required~~ according to point (c)(4) of CAT.OP.MPA.181;

(4) additional fuel, if required; ~~and~~

(5) ~~FRF~~ extra fuel, if required; and

(6) FRF.

[…]

Rationale

The reference to CAT.OP.MPA.181(c)(4) is proposed to be introduced for legal certainty.

It is also proposed to introduce a reference to 'extra' and final reserve fuel, which are both required to be considered for in-flight planning under CAT.OP.MPA.181 (points (5) and (7)) but were mistakenly not mentioned in this AMC.

The proposed amendment intends to increase clarity and no impact is expected.

4.2.4 Annex V (Part-SPA)

SUBPART E: LOW-VISIBILITY OPERATIONS (LVOS) AND OPERATIONS WITH OPERATIONAL CREDITS

AMC1 SPA.LVO.100(a) Low-visibility operations and operations with operational credits

LOW-VISIBILITY TAKE-OFF (LVTO) OPERATIONS — AEROPLANES IN AN RVR OF LESS THAN 400 M

[…]

(b) The ~~reported~~ RVR value representative of the initial part of the take-off run can be replaced by pilot assessment.

(c) The minimum RVR value specified in Table 1 or 2 should be achieved for all reporting points representative of the parts of the runway from the point at which the aircraft commences the take-off run until the end of the calculated accelerate-stop distance ~~from that point~~.

[…]

Rationale

It is proposed to remove the word 'reported' from point (b) to clarify that the pilot assessment can replace: :

— *RVR that has been reported in the airport; and/or*

— *touchdown zone RVR, when it is not available (e.g. the tower provides MID and STOP-END RVR but touchdown RVR is out of service).*

The wording of point (c) is proposed to be amended to avoid misunderstanding between take-off run and take-off distance.

The proposed amendments aim to improve clarity, and no impact is expected.

AMC1 SPA.LVO.100(b) Low-visibility operations and operations with operational credits

INSTRUMENT APPROACH OPERATIONS IN LOW-VISIBILITY CONDITIONS — CAT II OPERATIONS

[…]

Table 4

CAT II operation minima: RVR (m) versus DH (ft)

Aircraft categories		Auto-coupled or HUD to below DH*	
		A, B, C	D
DH (ft)	100–120	300	300*/350~~*~~
	121–140	400	400

Aircraft categories		Auto-coupled or HUD to below DH*	
		A, B, C	D
	141–199	400**/450	400**/450

*: An RVR of 300 m may be used for a Category D aeroplane conducting an autoland or using HUDLS to ~~touchdown~~ touch down.

**: An RVR of 400 m may be used for an aeroplane conducting an autoland or using HUDLS to touch down.

Rationale

The proposed amendment aims to align the LVO take-off minima that require specific approval (i.e. RVR of 400 m) with the CAT II instrument approach operation (which also requires specific approval) at AMC level. In addition, it is proposed to add a reference to the use of HUDLS, which is currently missing.

AMC2 SPA.LVO.100(b) Low-visibility operations and operations with operational credits

INSTRUMENT APPROACH OPERATIONS IN LOW-VISIBILITY CONDITIONS — CAT III OPERATIONS

[…]

Table 5

CAT III operation minima: RVR (m) versus DH (ft)

DH(ft)	Ground ~~R~~roll-out control/Ground-roll guidance system	RVR (m)*
50-99	Not required	175
0-49 or no DH	Fail-passive	125
	Fail-operational	75

Rationale

The amendment clarifies that the equipment that the AMC refers to is the ground-roll control or ground-roll guidance and not the 'approach' landing system. Some operators have been using fail-passive automatic landing systems (i.e. CAT III single) with a 125 m RVR, when this should not be the case. According to point (c) of CS AWO.B.CATIII.113, a fail-operational automatic landing system is required, or a fail-operational hybrid landing system and a fail-operational or fail-passive automatic ground-roll control or head-up ground-roll guidance. Thus, a fail-passive automatic landing system (i.e. CAT III single) can only be certified at 50 feet or above and therefore 175 m RVR is required. The amendment is proposed to avoid misunderstandings between landing systems and ground systems.

AMC1 SPA.LVO.120(a) Flight crew competence

COMPETENCE OF THE FLIGHT CREW FOR THE INTENDED OPERATIONS — EXPERIENCE IN TYPE OR CLASS, OR AS PILOT-IN-COMMAND/COMMANDER

To ensure that the flight crew is competent to conduct the intended operations, the operator should assess the risks associated with the conduct of low-visibility approach operations by pilots new to the aircraft type or class, including pilots new to the role of pilot-in-command, and take the necessary mitigations. Where such mitigations include an increment to the visibility or RVR for LVOs, this should be stated in the operations manual.

Rationale

The proposed amendment intends to clarify that this AMC is also applicable when a pilot-in-command has not previously been pilot-in-command on any aircraft type. Although this was indicated in the subtitle of the AMC, it was not explicitly mentioned in the text of the AMC, and this was creating confusion among stakeholders.

The purpose of the proposed amendments is to introduce clarity to the provisions, and a low positive impact on safety is expected. It may also lead to a low economic impact for operators that are not already applying the AMC to new pilots-in-command.

AMC2 SPA.LVO.120(a) Flight crew competence

COMPETENCE OF THE FLIGHT CREW FOR THE INTENDED OPERATIONS — RECENT EXPERIENCE FOR EFVS OPERATIONS

[…]

(b) If a flight crew member is authorised to operate as pilot flying and pilot monitoring during EFVS operations, the flight crew member should complete ~~the required number of approaches~~ at least one approach in the other ~~each~~ operating capacity.

Rationale

Please refer to the rationale for the proposed changes to AMC3 SPA.LVO.120(a).

AMC3 SPA.LVO.120(a) Flight crew competence

COMPETENCE OF THE FLIGHT CREW FOR THE INTENDED OPERATIONS — RECENT EXPERIENCE FOR SA CAT I, CAT II, SA CAT II AND CAT III APPROACH OPERATIONS

[…]

(d) If a flight crew member is authorised to operate as pilot flying and pilot monitoring, the flight crew member should complete ~~the required number of approaches~~ at least one approach in the other ~~each~~ operating capacity.

Rationale

The proposed changes aim to eliminate inconsistencies between the current points (b) and (d) of AMC3 SPA.LVO.120(a), which were not fully aligned for cases where the operator wishes to add a new

'LVO capacity' and train its pilots accordingly. Point (b) refers to 'at least one approach' to add the additional capacity, and point (d) required the same number of approaches as the first capacity, which for some cases could be up to four approaches, which is excessive and not the original intention.

Related changes have been made to AMC2 SPA.LVO.120(a), AMC2 SPA.LVO.120(b), AMC3 SPA.LVO.120(b), AMC4 SPA.LVO.120(b) and AMC6 SPA.LVO.120(b), to ensure consistency.

The proposed amendments aim to improve clarity, and an overall low positive impact is expected.

AMC2 SPA.LVO.120(b) Flight crew competence

INITIAL TRAINING AND CHECKING FOR SA CAT I, CAT II, SA CAT II AND CAT III APPROACH OPERATIONS

[…]

(d) If a flight crew member is authorised to operate as pilot flying and pilot monitoring, the flight crew member should complete at least one approach in the other operating capacity.

Rationale

The new point (d) is proposed to ensure consistency across the AMC to SPA.LVO.120. Although GM1 SPA.LVO.120, describing the general philosophy of LVO training, already mentions the possibility of adding new capacities, this was not explicitly mentioned in all AMC and this was creating confusion for operators and authorities.

Please refer also to the rationale for the proposed changes to AMC3 SPA.LVO.120(a).

The proposed amendments aim to improve clarity, and an overall low positive impact is expected.

AMC3 SPA.LVO.120(b) Flight crew competence

INITIAL TRAINING AND CHECKING FOR EFVS OPERATIONS

[…]

(d) If a flight crew member is authorised to operate as pilot flying and pilot monitoring, the flight crew member should complete at least one approach in the other operating capacity.

Rationale

Please refer to the rationale for the proposed changes to AMC2 SPA.LVO.120(b).

AMC4 SPA.LVO.120(b) Flight crew competence

RECURRENT CHECKING FOR LVTO, SA CAT I, CAT II, SA CAT II AND CAT III APPROACH OPERATIONS

[…]

(d) If a flight crew member is authorised to operate as pilot flying and pilot monitoring, the flight crew member should complete at least one approach in the other operating capacity.

Rationale

Please refer to the rationale for the proposed changes to AMC2 SPA.LVO.120(b).

AMC6 SPA.LVO.120(b) Flight crew competence

RECURRENT CHECKING FOR EFVS OPERATIONS

[…]

(b) If a flight crew member is authorised to operate as pilot flying and pilot monitoring during EFVS operations, ~~then~~ the flight crew member should complete ~~the required number of approaches~~ at least one approach in the other ~~each~~ operating capacity.

Rationale

Please refer to the rationale for the proposed changes to AMC3 SPA.LVO.120(a).

GM1 SPA.LVO.120(b) Flight crew competence

FLIGHT CREW TRAINING

[…]

Table 1

Summary of initial training requirements for LVOs and operations with operational credits

Approval	Airborne equipment	Previous experience	Reference	Practical (FSTD) training[4]	LIFUS (if required)[4]
CAT II	Auto coupled to below DH with manual landing	[…]	[…]	[…]	[…]
		Previously qualified with the same operator, similar operations[3]	AMC2 SPA.LVO.120(b) point (b)(3~~2~~)(ii)	[…]	[…]
		[…]	[…]	[…]	[…]
		[…]	[…]	[…]	[…]

[…]

Rationale

Editorial amendment to correctly reflect the regulatory reference; no impact is expected.

SUBPART G: TRANSPORT OF DANGEROUS GOODS

AMC1 SPA.DG.105(a) Approval to transport dangerous goods

TRAINING PROGRAMME

(a) The operator should indicate for the approval of the training programme how the training will be carried out. For formal training courses, the course objectives, the training programme syllabus/curricula and examples of the assessments to be carried out ~~written examination to be undertaken~~ should be included.

(b) […]

(c) Training intended to give general information and guidance may be by any means including handouts, leaflets, circulars, slide presentations, videos, computer-based training, etc., and may take place on-the-job or off-the-job. The person being trained should receive an overall awareness of the subject. This training programme should also include ~~a written, oral or computer-based~~ an assessment plan ~~examination~~ covering all areas of the training syllabi ~~programme,~~ and showing that a required minimum level of ~~knowledge~~ competence has been acquired.

(d) Training intended to give an in-depth and detailed appreciation of the whole subject or particular aspects of it should be by formal training courses, which should include a written examination.~~, the successful passing of which will result in the~~ Personnel should be assessed to ensure that they are competent to perform any function for which they are responsible. Successful demonstration of their competence will result in the issue of the proof of qualification. The course may be by means of tuition, as a self-study programme, or a mixture of both. The person being trained should gain sufficient knowledge so as to be able to apply the detailed rules of the Technical Instructions.

[…]

Rationale

The proposed amendments aim to provide for more flexibility regarding the assessment of personnel, to facilitate the implementation of the new competence-based approach to the training on dangerous goods adopted by ICAO.

There is not expected to be an impact on safety. An assessment plan needs to be elaborated in accordance with the competence-based training provisions. Continuous assessment provides the possibility to improve and adapt training. The fact that all knowledge components are addressed or appear to be included in a course and that all trainees have passed the required test does not necessarily mean that they can competently perform their assigned functions. The amendment provides sufficient flexibility to the operator to tailor both the assessment and the training to the functions and ensure that the competence needed for the performance of the duties is achieved by the personnel.

As operators are already implementing competence-based training in accordance with ICAO, the change can only have a positive impact for those operators who no longer need to have a written *examination as proof of competency and, thus, can remove the examination from their training programmes. Thus, the economic impact, if any, would be positive.*

SUBPART K: HELICOPTER OFFSHORE OPERATIONS

AMC1 SPA.HOFO.145 Flight data monitoring (FDM) programme

ORGANISATION OF THE FDM PROGRAMME

(a) Safety manager responsibility: ~~R~~refer to point (a) of AMC1 ORO.AOC.130.

(b) Contribution to the management system: refer to point (b) of AMC1 ORO.AOC.130.

(c) FDM analysis techniques: refer to point (c) of AMC1 ORO.AOC.130.

(d) FDM analysis, assessment and process control tools: refer to point (d) of AMC1 ORO.AOC.130.

(e) Safety information and promotion: refer to point (e) of AMC1 ORO.AOC.130.

(f) Accident and incident data requirements: refer to point (f) of AMC1 ORO.AOC.130.

(g) Event reporting: refer to point (g) of AMC1 ORO.AOC.130.

(h) Data recovery and analysis: the data recovery and analysis strategy should ensure a sufficiently representative capture of flight information to maintain an overview of operations. In addition, FDM event validation should be performed sufficiently frequently to enable action to be taken on significant safety issues. This includes all of the following.

    (1) At least 80 % of the flights of any individual helicopter in the scope of SPA.HOFO.145 and that were performed in the past 12 months should be available for analysis with the FDM software and have valid data, unless the operator demonstrates to its competent authority that meeting this objective would cause a disproportionate cost impact; in that case, the proportion of flights of any individual helicopter, that are available for analysis with the FDM software and have valid data, should not be less than 60 % when averaged over the past 12 months.

    (2) The operator should have means to identify within 15 calendar days a failure to collect data from any individual helicopter in the scope of SPA.HOFO.145, unless the operator demonstrates to its competent authority that meeting this objective would cause a disproportionate cost impact; in that case, the time to identify such a failure should not exceed 22 calendar days.

    (3) The time between completion of a flight and routine processing of the data of that flight by the FDM software (including event detection) should not exceed 7 calendar days for at least 80 % of flights collected with the FDM programme in the past 12 months, unless the operator demonstrates to its competent authority that meeting this objective would cause a disproportionate cost impact; in that case, at least 80 % of the flights collected with the FDM programme in the past 12 months should be processed by the FDM software within 15 days of completion of the flight.

(4) For each helicopter that is in the scope of SPA.HOFO.145 and that is first issued with an individual CofA on or after [date of publication + 3 years]:

(i) the operator should ensure that, within 90 calendar days after it starts operating the helicopter, the data collected for analysis by the FDM software includes all the flight parameters required to be recorded by a flight data recorder in accordance with AMC1.2 CAT.IDE.H.190; and

(ii) the operator should ensure that, within 90 calendar days after it starts operating the helicopter, the recorded flight parameters specified in (i) meet the performance specifications (range, sampling intervals, accuracy limits and resolution in read-out) as defined in EUROCAE Document 112A or any later equivalent standard produced by EUROCAE.

(5) The operator should document the principles it uses for validating significant FDM events (i.e. FDM events that require dedicated and timely review of the related flight data). Validation of a significant FDM event should be performed as a matter of priority, and in any case within 15 calendar days after it has been detected by the FDM software, for at least 80 % of the significant FDM events.

(i) Data retention strategy: refer to point (i) of AMC1 ORO.AOC.130.

(j) Data access and security policy: refer to point (j) of AMC1 ORO.AOC.130.

(k) Procedure to prevent disclosure of crew identity: refer to point (k) of AMC1 ORO.AOC.130.

(l) Maintaining knowledge about data and algorithms: refer to point (l) of AMC1 ORO.AOC.130.

(m) Airborne systems and equipment: refer to point (m) of AMC1 ORO.AOC.130.

Rationale

Similar to AMC1 ORO.AOC.130, the subtitle of AMC1 SPA.HOFO.145 is proposed to be changed to clarify that this AMC addresses the minimum performance of the FDM programme and not what risk areas should be monitored by the FDM programme (the latter is addressed in the proposed AMC2 SPA.HOFO.145, and examples of FDM methods are provided in the proposed amendments to GM2 SPA.HOFO.145).

The reference to AMC1 ORO.AOC.130 is proposed to be replaced by points that refer to the conditions specified in the points of AMC1 ORO.AOC.130.

However, the proposed point (h) of AMC1 SPA.HOFO.145 does not refer to a point of the proposed AMC1 ORO.AOC.130, as the conditions in subpoints (h)(3) and (h)(4) are slightly different. More specifically:

— *Point (h)(3) specifies that the time between completion of a flight and routine processing of the data of that flight with the FDM software should not exceed 7 calendar days for 80 % of the flights, while point (h)(3) of AMC1 ORO.AOC.130 sets an objective of a maximum of 15 calendar days for 80 % of the flights. The reason is that helicopter offshore operators are already required* *to download flight data on a daily basis by the International Association of Oil & Gas Producers[34]. Nevertheless, similar to what is proposed for point (h)(3) of AMC1 ORO.AOC.130, the proposed point (h)(3) of AMC1 SPA.HOFO.145 includes the possibility to agree on a less demanding objective with the competent authority to avoid a disproportionate cost impact.*

— *Point (h)(4)(i) specifies that the data collected for analysis by the FDM software should include the flight parameters recorded by an FDR in accordance with AMC1.2 CAT.IDE.H.190, while the proposed point (h)(4)(i) of AMC1 ORO.AOC.130 specifies that the data collected for analysis by the FDM software should include the flight parameters recorded by an FDR in accordance with AMC1.2 CAT.IDE.A.190. The flight parameters to be recorded on an FDR are different for an aeroplane and a helicopter.*

In order to provide operators with sufficient notice period to implement the amendments, it is expected that the applicability date of these amendments to AMC1 SPA.HOFO.145 will be deferred by 2 years. In addition, the applicability of points (h)(4), (l) and (m) of AMC1 SPA.HOFO.145 is proposed to be restricted to helicopters that are first issued eith an individual CofA at least 3 years after the date of publication of the ED Decision, as otherwise the applicability of these points may cause a change to airborne systems or airborne equipment on already operated helicopters.

AMC2 SPA.HOFO.145 Flight data monitoring (FDM) programme

SCOPE OF THE FLIGHT DATA MONITORING (FDM) PROGRAMME

(a) A set of core FDM events or FDM measurements should be selected to cover the main areas of interest to the operator and, as far as possible, the most significant risks identified by the operator. The event definitions and measurement definitions should be continuously reviewed to reflect the operator's current operating procedures.

(b) For all helicopters in the scope of SPA.HOFO.145 and that are first issued with an individual CofA on or after 1 January 2016, the FDM programme should monitor, to the extent possible with the available flight data and without requiring overly complex algorithms, at least the following key risk areas:

(1) risk of aircraft upset;

(2) risk of collision with terrain;

(3) risk of obstacle collision in flight, during take-off or landing;

(4) risk of excursion from the touchdown and lift-off area, during take-off or landing.

(c) If the necessary flight parameters are collected by the airborne system used to obtain flight data, the FDM programme should monitor:

(1) exceedances indicating that the airworthiness of the aircraft may be affected and that are related to any of the following parameters:

[34] Refer to International Association of Oil & Gas Producers, *Offshore Helicopter Recommended Practices*, 2020 (https://www.iogp.org/bookstore/product/offshore-helicopter-recommended-practices/) (see the module 'Aircraft operations').

(i) speed;

(ii) altitude;

(iii) accelerations;

(iv) attitude angles;

(v) aircraft weight;

(vi) engine torque;

(2) caution and warning alerts to the flight crew indicating that the airworthiness of the aircraft may be affected.

(d) The operator should establish and maintain a document identifying which types of occurrences are monitored with the FDM programme. This document should cover at least occurrences subject to mandatory reporting and listed in Regulation (EU) 2015/1018, Annex I, Section 1 (excluding paragraph 1.5, point (3)) and Section 5. This document should provide a short description of the applicable FDM event(s) or FDM measurement(s) for each type of occurrence that is monitored with the FDM programme.

Rationale

There is no specification in the proposed AMC1 SPA.HOFO.145 regarding the risk areas that should be monitored by the FDM programme. As a result, compliance with the proposed AMC1 SPA.HOFO.145 would not allow it to be ensured that the operator uses its FDM programme to monitor the risk areas that are obviously relevant for all offshore operators, such as those corresponding to occurrences subject to mandatory occurrence reporting in accordance with Annex I to Regulation (EU) 2015/1018.

In order to provide operators with sufficient notice period to implement the proposed AMC2 SPA.HOFO.145, it is expected that its applicability will be deferred by 2 years.

Detailed rationale

— *Regarding point (a): similarly to point (a) of the proposed AMC2 ORO.AOC.130, this point contains the general conditions regarding the choice of the risk areas to be monitored with the FDM programme and adapting the definitions of FDM events and measurements to the standard operating procedures.*

— *Regarding point (b):*

- *When considering commercial air transport (CAT) operations with helicopters, the most relevant risk areas for monitoring according to EASA's 2022 Annual Safety Review (ASR), Figure 67, are aircraft upset, terrain collision, airborne collision and obstacle collision in flight.*

- *The 2022 EASA ASR contains specific safety statistics for helicopter operators based in EASA Member States. However, Figure 64 of the 2021 EASA ASR shows that more than half of accidents and serious incidents occurred during CAT operations performed by such operators over 2011–2020 actually occurred during helicopter emergency medical services or air taxi operations. In addition, an internal review of EASA accident data for CAT helicopter operations shows that almost no airborne collision occurred involving helicopter operators based in EASA Member States during offshore operations and that,* *for such operators, the key risk area 'airborne collision' is instead relevant for other subtypes of CAT operations (e.g. helicopter emergency medical services, air taxi, sightseeing).*

- *In addition, the* HeliOffshore Safety Performance Report *shows that the main CAST/ICAO Common Taxonomy Team occurrence categories for all accidents over 2013–2021 (73 accidents in total) are as follows.*
  - *System component failure – non-power plant (SCF-NP) and system component failure – power plant (SCF-PP), with 21 % and 7 % of accidents, respectively. An SCF-NP or SCF-PP event with a helicopter is likely to result in aircraft upset and/or terrain collision, if not recovered by the flight crew.*
  - *Controlled flight into terrain (CFIT), with 13 % of accidents. CFIT is a subset of the risk area 'terrain collision'.*
  - *Loss of control – in flight (LOC-I), with 13 % of accidents. LOC-I is a subset of the risk area 'aircraft upset'.*
  - *Abnormal runway contact (ARC), with 9 % of accidents. ARC is a subset of the risk area 'excursion'.*
  - *Collision with obstacle(s) during take-off and landing (CTOL), with 7 % of accidents. CTOL is a subset of the risk area 'obstacle collision in flight'.*
  - *Other, with 29 % of accidents. This category contains '15 different causes, each with a proportion of 5 % or less'.*
- *While* HeliOffshore Safety Performance Report *data is specific to offshore operators, a large proportion of operators that are HeliOffshore members are not based in an EASA Member State.*
- *Therefore, based on the data from the 2021 EASA ASR and the* HeliOffshore Safety Performance Report*, and taking into account the respective scopes of these documents, the most important risk areas for helicopter offshore operations performed by operators based in EASA Member States seem to be:*
  - *aircraft upset;*
  - *terrain collision;*
  - *obstacle collision in flight; and*
  - *excursion.*

— *With regard to monitoring the risk of terrain collision, examples are provided in the updated GM2 SPA.HOFO.145 proposed in this section. In addition, a helicopter terrain awareness and warning system (HTAWS) is required for helicopters in the scope of SPA.HOFO.145 and manufactured since 1 January 2019, in accordance with SPA.HOFO.160 ('Equipment requirements'). Hence, when a HTAWS is installed, the related HTAWS warnings could be captured by the FDM programme to help monitor the risk of collision with terrain. In addition, a flight parameter corresponding to the HTAWS should be recorded on the FDR of helicopters first issued with an individual CofA on or after 1 January 2023, in accordance with*

AMC1.2 CAT.IDE.H.190. It is assumed that, for those helicopters, the same flight parameters can be collected by the airborne system used to collect flight data for the FDM programme.

— *With regard to monitoring the risk of obstacle collision in flight during take-off or landing: flight parameters that should be recorded on the FDR of helicopters first issued with an individual CofA on or after 1 August 1999 in accordance with AMC2 CAT.IDE.H.190 (such as pitch and roll attitude, airspeed, altitude) are sufficient to monitor some of the precursors of this risk area. It is assumed that, for those helicopters, the same flight parameters are collected by the airborne system used to collect flight data for the FDM programme (e.g. the quick access recorder or wireless quick access recorder). Examples of such precursors that could be monitored by the FDM programme are provided in the updated GM2 SPA.HOFO.145 presented in this section.*

— *With regard to monitoring the risks of aircraft upset and the risk of excursion from the touchdown and lift-off area: flight parameters that should be recorded on the FDR of helicopters first issued with an individual CofA on or after 1 August 1999 in accordance with AMC2 CAT.IDE.H.190 (such as pitch and roll attitude, airspeed, altitude, normal acceleration) are sufficient to monitor some precursors of aircraft upset and of excursion. It is assumed that, for those helicopters, the same flight parameters are collected by the airborne system used to collect flight data for the FDM programme. Examples of such precursors that could be monitored by the FDM programme are provided in the updated GM2 SPA.HOFO.145 presented in this section.*

However, it should be noted that, for some of the helicopters operated today, the necessary flight parameters to monitor some of the risk areas listed in point (b) may be difficult to collect without expensive changes to the airborne equipment. In addition, the information that these flight parameters contain may be insufficient (for instance, the flight parameter may only be a Boolean parameter or its sampling rate may be insufficient), which may significantly limit the possibilities to programme effective FDM algorithms. The condition 'to the extent possible with the available flight data and without requiring overly complex algorithms' is meant to take into account this possible limitation.

— *Regarding point (c):*

- *Any exceedance of a flight parameter value that indicates a potential immediate effect on the airworthiness of the aircraft should be monitored by the FDM programme. This includes, for example, exceedances related to:*
  - *speed;*
  - *altitude;*
  - *accelerations;*
  - *attitude angles;*
  - *aircraft weight; and*
  - *engine torque.*
- *Point (c) also includes the monitoring of caution and warning alerts to the flight crew, when they indicate that the airworthiness of the aircraft may be affected.*

- *However, for older helicopters, some of the necessary flight parameters might not be recorded. Therefore, point (c) specifies 'If the necessary flight parameters are collected by the airborne system used to obtain flight data'.*
- *Using FDM for predictive maintenance or for usage monitoring is not in the scope of point (c) because the purpose of an FDM programme is safety, not maintenance efficiency. In addition, predictive maintenance and health and usage monitoring systems often require dedicated airborne equipment and data and analysis techniques that are different to those used for FDM.*

— *Regarding point (d): see the rationale for point (d) of AMC2 ORO.AOC.130.*

GM1 SPA.HOFO.145 Flight data monitoring (FDM) programme

IMPLEMENTATION ~~DEFINITION~~ OF AN FDM PROGRAMME

~~Refer to GM1 ORO.AOC.130, except for the examples that are specific to aeroplane operation.~~

Flight data monitoring is defined in Annex I to this Regulation. It should be noted that the requirement to establish an FDM programme is applicable to all individual aircraft in the scope of SPA.HOFO.145, not to a subset selected by the operator.

(a) FDM analysis techniques

(1) Exceedance / FDM event detection

(i) FDM programmes are used for detecting exceedances, such as deviations from rotorcraft flight manual limits, standard operating procedures (SOPs) or good airmanship . It is advisable to monitor significant deviations from the SOPs in all phases of flight, including when the aircraft is on the ground.

Examples of FDM events for helicopters: low or high pitch rotation rate on take-off, high pitch attitude on landing, excessive roll attitude, low ground speed on approach.

Examples of significant FDM events for helicopters: high rate of descent below 500 ft, high torque on take-off, terrain awareness warning system (TAWS) warning, low airspeed on departure.

(ii) Trigger logic expressions may be simple exceedances such as redline values. The majority, however, are composites that define a certain flight phase or configuration. In addition, it might be valuable to define several levels of exceedance severity (such as low, medium and high). While such levels of exceedance can help identify the most relevant events and trends, they should not be considered safety risk levels: assessing the safety risk level associated with an exceedance or trend requires a more thorough assessment and considering all relevant data available to the operator.

Example for helicopters: FDM software assigning different sets of rules dependent on location or time of day. For example, being able to differentiate between day and night operations, whether take-off/approach was conducted to an airfield or an offshore installation.

(iii) Exceedance detection provides useful information, which can complement that provided in crew reports.

Examples for helicopters: engine failure(s), engine/gearbox overtorque, high/low rotor speed, airborne collision avoidance system (ACAS), stabilisation augmentation system (SAS) status and system malfunctions.

(iv) The operator may also modify the standard set of core events to account for unique situations it regularly experiences, or the SOPs it uses.

Example for helicopters: arrival profiles for helicopter-specific landing areas.

(v) The operator may also define new events to address specific problem areas.

Example for helicopters: to monitor compliance with temporary operating restrictions mandated by an airworthiness directive.

(vi) Being able to easily adjust the variables of FDM event algorithms can be advantageous as it allows for an FDM event definition to be adapted to new operational conditions.

(2) All-flight measurement / FDM measurements

FDM data is retained from all flights, not just the ones producing significant events. A selection of parameters is retained that is sufficient to characterise each flight and enable a comparative analysis of a wide range of operational variability. Emerging trends and tendencies may be identified and monitored before the trigger levels associated with exceedances are reached.

Examples of parameters monitored for helicopters: maximum torque during take-off, pitch attitude and rotation rates during take-off, gear retraction and extension heights and maximum speed with gear extended.

Examples of comparative analyses for helicopters: pitch attitude and rotation rates achieved during night departures versus day departures.

(3) Statistics

Series of data are collected to support the analysis process: these usually include the number of flights flown per aircraft and details sufficient to generate rate and trend information.

(4) Investigation of incident flight data by the operator

Recorded flight data provides valuable information for follow-up to incident reports and other technical reports. It is useful in adding to the impressions and information recalled by the flight crew. It also provides an accurate indication of system status and performance, which may help in determining cause and effect relationships.

Examples of incidents for which recorded data could be useful for helicopters:

— unstable approaches (excessive ground speed, excessive rate of descent, downwind approach, etc.),

— loss of control in flight (incorrect autopilot mode engaged, vortex ring state, etc.),

— exceedances of prescribed operating limitations (such as related to engine / main gearbox torque, engine temperature, main rotor rpm, etc.),

— turbulence encounters or other events causing significant vertical accelerations.

It should be noted that recorded flight data have limitations. For example, not all the information displayed to the flight crew is recorded, the source of recorded data may be different from the source used by a flight instrument and the sampling rate or the recording resolution of a parameter may be insufficient to capture accurate information.

(5) Continuing airworthiness

Data of all-flight measurements and exceedance detections can be utilised to assist the continuing airworthiness function. For example, engine monitoring programmes look at measures of engine performance to determine operating efficiency and predict impending failures.

Examples of continuing airworthiness use for helicopters: avionics and other system performance monitoring, gearbox overtorque, engine temperature exceedance.

(b) FDM equipment and software

(1) General

FDM programmes generally involve systems that capture flight data, transform the data into an appropriate format for analysis, and generate reports and visualisation to assist in assessing the data. Typically, the following is needed for effective FDM programmes:

(i) an on-board device to capture and record data on a wide range of in-flight parameters;

(ii) a means to transfer the data recorded on board the aircraft to the ground;

(iii) software or a service to process and analyse the data, identify deviations from expected performance, generate reports to assist in interpreting the read-outs, etc.

(2) Airborne equipment

(i) Several technical solutions are available, including the following.

(A) Some systems are installed in the aircraft and record flight data onto a low-cost removable medium.

(B) Some systems automatically transmit the recorded data via secure wireless systems after completion of the flight.

(C) Some systems preprocess the recorded data to be analysed while the aircraft is airborne. Whatever the flight data processing performed by such systems, a complete set of raw flight data still needs to be recovered after the flight, as this is needed for in-depth analysis of flight data by the FDM team.

(3) FDM software or service

(i) Data is downloaded from the aircraft recording device and held securely to protect this sensitive information.

(ii) The processing and analysis of flight data require specialised FDM software or a specialised FDM service.

(iii) The FDM software or service typically converts the raw flight data into flight parameters expressed in engineering units and textual interpretation ('flight parameter decoding') and applies FDM algorithms on the flight parameters (refer to points (a)(1) and (a)(2)).

(iv) The FDM software or service typically includes the following: capability to produce parameter plots and parameter tables, capability to drill down and visualise flight parameter values over the portion of the flight during which an event was detected, access to interpretative material, links to other safety information and statistical presentations.

(v) For the FDM software or service, the following additional capabilities are advantageous.

(A) Capability to interface with advanced processing tools or to access advanced functions libraries.

(B) Capability to link flight data with other data sources (such as occurrence reports or weather data) in order to facilitate the analysis of events and trends. This capability should be used in accordance with data protection policies and procedures and its output restricted to authorised users (refer to AMC1 ORO.AOC.130).

(C) Capability to export FDM outputs (e.g. FDM event and measurement data) in a standard electronic format that is compatible with business intelligence tools.

(D) Capability to export FDM outputs in formats compatible with geographical information systems.

(E) Capability to replay flight data of a given flight in a flight animation, thereby facilitating visualisation of actual events.

(F) Capability to design and provide individual FDM summary reports or dashboards that can be confidentially consulted by flight crew members.

(G) Capability to export the information related to flight parameter decoding into a flight format:

— that is compliant with an electronic documentation standard that has a general public licence policy; and

— that includes means to retain the history of changes to the decoding information.

(c) FDM in practice

(1) FDM process

Typically, operators follow a closed-loop process in applying an FDM programme, for example the following.

(i) Establish a baseline: initially, operators establish a baseline of operational parameters against which changes can be detected and measured.

Examples for helicopters: rate of unstable approaches, rate of incorrect pitch rate / pitch attitude at take-off.

(ii) Highlight unusual or potentially unsafe circumstances: the user determines when non-standard, unusual or potentially unsafe circumstances occur; by comparing them to the baseline margins of safety, the changes can be quantified.

Example for helicopters: increases in unstable approaches (or other unsafe events) at particular locations.

(iii) Identify potentially unsafe trends: based on the frequency and severity of FDM events, trends are identified. If a trend seems to point to an increase of risk to an unacceptable level, a safety risk assessment is necessary, as part of the operator safety risk management.

Example for helicopters: increases in unstable approaches at particular locations.

(iv) Monitor effectiveness of corrective actions, if the FDM programme is relevant for that purpose: once a remedial action has been put in place in the framework of the operator's safety risk management, its effectiveness is monitored, confirming that it has reduced the identified risk and that the risk has not been transferred elsewhere. At this stage, the operator typically evaluates whether the FDM programme can contribute to this monitoring.

Example for helicopters: confirm that the change has resulted in a reduction in events and that no new additional events have been generated.

(2) Analysis and follow-up

(i) FDM data is typically processed at short intervals. The data is then reviewed to identify specific exceedances and emerging undesirable trends and to disseminate the information to flight crews.

(ii) If deviations from the standard operating procedures are detected and require attention, the information on these deviations is passed (in accordance with point (k) of AMC1 SPA.HOFO.145) to the person responsible for flight crew contact. The decision to initiate flight crew contact (e.g. notification, request for additional information or confidential discussion) should be made after an initial assessment that takes into account contextual information. If it is decided to have a confidential discussion with the flight crew, the responsible person provides the necessary contact with the pilot in order to clarify the circumstances, obtain feedback and give advice and recommendations for appropriate action. Such action is determined after a thorough safety risk assessment that is performed in the framework of the operator safety risk management and that takes into account all available data. Appropriate action could include retraining (carried out in a constructive and non-punitive way), revisions to manuals, or requesting changes to ATC or airport operating procedures.

(iii) All events are usually archived in a way that means they can be sorted, validated and presented in easy-to-understand management reports. Over time, this archived data can provide a picture of emerging trends and hazards that would otherwise go unnoticed. In addition, the FDM team may wish to retain samples of de-identified full-flight data for various safety purposes (detailed analysis, training, benchmarking, etc.).

(iv) Sharing of safety information is part of the necessary processes to maintain personnel competent to perform their tasks and to support an effective management system (refer to ORO.GEN.200). Therefore, lessons learnt from the FDM programme may warrant inclusion in the operator's safety promotion programmes. Safety promotion may include newsletters, flight safety magazines, emails, video messages, the provision of information on the company's intranet, highlighting examples in training and simulator exercises. Care is required, however, to ensure that any information acquired through FDM is de-identified before using it in any training or promotional initiative.

(v) All successes and failures are recorded, comparing planned programme objectives with expected results. This provides a basis for review of the FDM programme and the foundation for future programme development.

(d) Preconditions for an effective FDM programme

(1) Protection of FDM data and of related flight crew reports

The integrity of FDM programmes rests upon protection of the FDM data. Any disclosure for purposes other than safety management can compromise the voluntary provision of safety data, thereby compromising flight safety. It is also advised to take into account Regulation (EU) 2016/679 (general data protection regulation), where applicable. In addition, the inherent protection of reporters under Regulation (EU) No 376/2014 applies to flight crew members, whether their reports are spontaneously provided or retrospectively requested by the operator.

(2) Essential trust

The trust established between management and flight crew is the foundation for a successful FDM programme. This trust can be facilitated by:

(i) early participation of the flight crew representatives in the design, implementation and operation of the FDM programme;

(ii) a formal agreement between management and flight crew, identifying the procedures for the use and protection of data; and

(iii) data security, optimised by:

(A) adhering to the agreement;

(B) the operator strictly limiting data access to selected individuals;

(C) maintaining tight control to ensure that identifying data is kept securely; and

(D) ensuring that operational problems are promptly addressed by management.

(3) Requisite safety culture

Indicators of a positive safety culture within an FDM programme typically include:

(i) top management's demonstrated commitment to promoting a positive safety culture;

(ii) a non-punitive operator policy that covers the FDM programme;

(iii) FDM programme management by dedicated staff under the authority of the safety manager, with a high degree of specialisation and logistical support;

(iv) involvement of persons with appropriate expertise when assessing FDM events, FDM measurements and trends (for example, pilots experienced on the aircraft type being analysed);

(v) monitoring fleet trends aggregated from numerous operations, not focusing only on specific events;

(vi) a well-structured system to protect the confidentiality of the data; and

(vii) inclusion of the general trends provided by and lessons learnt from the FDM programme in the communications on safety matters specified in AMC1 ORO.GEN.200(a)(4).

(4) Integration with the operator's management system

SPA.HOFO.145 requires the integration of the FDM programme with the operator's management system. Because of that, FDM programme outputs are expected to be used together with other relevant data sources and for supporting safety risk management (SRM). The SRM process is not an internal process of the FDM programme, but a process of the operator's management system. AMC1 SPA.HOFO.145 specifies that the safety manager should be responsible for the identification and the assessment of issues, which are the first steps of the SRM process. The European Operators Flight Data Monitoring forum document *Breaking the Silos* (June 2019) details industry good practice regarding integration of the FDM programme with in the management system.

(5) Up-to-date flight parameter decoding documentation

(i) The flight parameter decoding documentation is the documentation containing information sufficient for extracting flight parameter values from the recording data files and decoding them into values expressed in engineering units or textually interpreting them. This information is essential for programming flight parameter decoding by FDM software.

(ii) It is important that flight parameter decoding documentation is obtained at the time of aircraft delivery and that it is kept up to date. To facilitate the management of this documentation over time, it is recommended that this documentation is compliant with an electronic documentation standard that has a general public licence policy. In addition, it is advisable to have a versioning system that allows for quick identification of the applicable decoding information for any individual aircraft and any time period.

(iii) When the airborne equipment used for FDM purposes records a copy of the FDR data stream, the FDR decoding documentation that must be retained in accordance with CAT.GEN.MPA.195 could be used.

(e) Implementing an FDM programme

(1) General considerations

(i) Typically, the following steps are necessary to implement an FDM programme:

(A) implementation of a formal agreement between management and flight crew;

(B) establishment and verification of operational and security procedures;

(C) installation of equipment;

(D) selection and training of dedicated and experienced staff to operate the programme; and

(E) commencement of data analysis and validation.

(ii) An operator with no FDM experience may need a year to achieve an operational FDM programme. Another year may be necessary before any safety and cost benefits appear. Improvements in the analysis software, or the use of outside specialist service providers, may shorten these time frames.

(2) Aims and objectives of an FDM programme

(i) As with any project there is a need to define the direction and objectives of the work. A phased approach is recommended so that the foundations are in place for possible subsequent expansion into other areas. Using a building block approach will allow expansion, diversification and evolution through experience.

Example: with a modular system, begin by looking at basic safety-related issues only.

(ii) A staged set of objectives starting from the first week's replay and moving through early production reports into regular routine analysis will contribute to a sense of achievement as milestones are met.

Examples of short-term, medium-term and long-term goals:

(A) Short-term goals:

— establish data download procedures, test FDM software;

— verify, for all aircraft in the FDM programme, that the flight parameters used for FDM events and measurements are valid and correctly decoded;

— verify that the flight parameter decoding documentation (see point (d)) is complete and correct;

— design and/or adapt FDM algorithms and test them, validate and investigate exceedance detections; and

— establish a user-acceptable routine report format to highlight individual exceedances and facilitate the acquisition of relevant statistics.

(B) Medium-term goals:

— produce reports and dashboards that include key performance indicators;

— add other modules to the analysis (e.g. continuing airworthiness); and

— plan for the next fleet to be added to the FDM programme.

(C) Long-term goals:

— network FDM information across all of the operator's safety information systems; and

— ensure FDM provision for any proposed alternative training and qualification programme (ATQP).

(ii) Initially, focusing on a few known areas of interest will help prove the system's effectiveness. In contrast to an undisciplined 'scatter-gun' approach, a focused approach is more likely to gain early success.

Examples for helicopters: monitoring of onshore and offshore approaches, and onshore and offshore take-off profiles. Analysis of such known problem areas may generate useful information for the analysis of other areas.

(3) The FDM team

(i) Experience has shown that the 'team' necessary to run an FDM programme could vary in size from one person for a small fleet, to a dedicated section for large fleets. The descriptions below identify various functions to be fulfilled, not all of which need a dedicated position. As the safety manager should be responsible for the FDM programme, and FDM outputs should, to the extent possible, be analysed in relation to other safety data sources, it is expected that the FDM team is part of the safety manager's team.

(A) Team leader: it is essential that the team leader earns the trust and full support of both management and flight crew. The individual requires good analytical, presentation and management skills.

(B) Flight operations interpreter: this person is usually a qualified pilot (or perhaps a recently retired senior captain or instructor), who knows the operator's route network and aircraft. This team member's in-depth knowledge of SOPs, aircraft handling characteristics, aerodromes and routes is used to place the FDM data in a credible context.

(C) Technical interpreter: this person interprets FDM data with respect to the technical aspects of the aircraft operation and is familiar with the power plant, structures and systems departments' requirements for information and any other engineering monitoring programmes in use by the operator.

(D) Gatekeeper: this person provides the link between the fleet or training managers and flight crew involved in events highlighted by FDM. The position requires good people skills and a positive attitude towards safety education. The person is typically a representative of the flight crew association or an 'honest broker' and is the only person permitted to connect the identifying data with the event. It is essential that this person earns the trust of both management and flight crew.

(E) Engineering technical support: this person is usually an avionics specialist. This team member is knowledgeable about FDM and the associated systems needed to run the programme.

(F) FDM analyst: this person is responsible for the design and validation of FDM algorithms and the analysis of FDM outputs. This usually requires at least basic knowledge of statistics and/or programming skills, and in-depth knowledge of the FDM software or service. If the processing of data or the validation of FDM events is subcontracted to a service provider, the FDM analyst should have the necessary skills to effectively control and direct the work performed by that service provider.

(ii) All FDM team members need appropriate training or experience for their respective area of data analysis. Each team member is allocated a realistic amount of time to regularly spend on FDM tasks.

(f) Other uses of flight data

Whenever access to data from the FDM programme is requested to meet operational needs, such as fuel efficiency, aircraft performance and preventive maintenance, it is recommended to have a written procedure in place to prevent disclosure of crew identity. Furthermore, it is advisable that such a procedure contains, as a minimum, the following:

(1) the aim of the programme in which flight data is to be used;

(2) a data access and security policy, restricting access to information to specifically authorised persons identified by their position;

(3) a data retention policy; and

(4) the method to obtain de-identified flight crew feedback on those occasions that require specific flight follow-up for contextual information.

(g) The FDM programme and large data exchange programmes

Some States and organisations have set up so-called large data exchange programmes, under which they gather very large amounts of data (including FDM data) provided by many operators and by other industry stakeholders, which are then centrally processed and analysed. Participation in a large data exchange programme may bring various benefits for an operator, such as being able to compare its safety performance with that of comparable operators or getting access to other types of data (weather, traffic, etc.) or to advanced data integration capabilities. In addition, in the case of an operator with a small fleet producing small amounts of flight data that do not allow for reliable identification of trends, joining a large data exchange programme might help to overcome this limitation. However, taking part in a large data exchange programme does not in itself satisfy ORO.AOC.130 and every operator remains responsible for the implementation of its FDM programme. The operator's FDM programme needs to be well integrated into the management system for it to take advantage of a large data exchange programme.

Rationale

It is proposed to align the text of GM1 SPA.HOFO.145 with that of the updated GM1 ORO.AOC.130 as proposed above. However, in GM1 SPA.HOFO.145, the aeroplane-specific examples have been replaced by examples that are relevant for helicopter offshore operations.

GM2 SPA.HOFO.145 Flight data monitoring (FDM) programme

ADDITIONAL GUIDANCE AND INDUSTRY GOOD PRACTICE

(a) Additional guidance material for the establishment of an FDM programme can be found in:

(1) International Civil Aviation Organization (ICAO) Doc 10000 — Manual on Flight Data Analysis Programmes (FDAP), 2nd edition, 2021; and

(2) United Kingdom Civil Aviation Authority (UK CAA) CAP 739 — Flight Data Monitoring.

(b) Examples of industry good practice for the establishment of FDM can be found in:

(1) HeliOffshore — Helicopter flight data monitoring (HFDM) recommended practice for offshore operations (HO-HFDM-RP)~~Recommended Practice for Oil and Gas Passenger Transport Operations, Version 1.0, September 2020 (HO-HFDM-RP-v1.0)~~;

(2) the documents published by the European Operators Flight Data Monitoring forum (EOFDM).~~European Operators Flight Data Monitoring forum (EOFDM) — Preparing a memorandum of understanding for an FDM programme;~~

~~(3) EOFDM — Best practice document: Key performance indicators for a Flight Data Monitoring programme; and~~

~~(4) EOFDM — 'Breaking the silos', Fully integrating Flight Data Monitoring into the Safety Management System.~~

(c) Table 1 provides examples of potential precursors of incidents that could be monitored through an FDM programme, by the means of FDM events or FDM measurements~~ examples of FDM event definitions that~~. These examples may be further developed using operator- and helicopter-specific limits. This table is considered illustrative and non-exhaustive. ~~Appendix 5 to HO-HFDM-RP-v1.0 contains other examples of FDM event definitions.~~ More important than the number of FDM event definitions that are programmed in the FDM software is that those definitions cover, as much as practicable, the operational risks that have been identified by the operator.

Note 1: Key risk areas as described in the Annex to Regulation (EU) 2020/2034 correspond to the following aviation occurrence categories defined by the CAST/ICAO Common Taxonomy Team, as follows:

— 'aircraft upset' corresponds to 'Loss of Control in flight' (LOC-I);

— 'terrain collision' corresponds to 'Controlled Flight into Terrain' (CFIT);

— 'obstacle collision in flight' corresponds to elements of 'Controlled Flight into Terrain' (CFIT) and 'Collision with Obstacle(s) During Take-off and Landing' (CTOL);

— 'excursion' corresponds to elements of 'Runway Excursion' (RE) and 'Abnormal Runway Contact' (ARC).

Note 2: The far-right column of Table 1 only indicates the occurrence types directly related to the precursors among those listed in Regulation (EU) 2015/1018, Annex I 'Occurrences related to the operation of the aircraft'. The precursors listed in Table 1 may be used to detect occurrence types other than those indicated in the far-right column.

Note 3: Table 1 does not include additional information that can provide useful context, such as day/night, accrued hours and latitude/longitude.

Note 4: In addition to the examples of incident precursors in Table 1, operators may need to monitor caution and warning alerts displayed to the flight crew and other indications that the airworthiness of the aircraft may be affected (as specified in AMC2 SPA.HOFO.145). FDM events or FDM measurements that monitor significant deviations from the SOPs in all phases of flight, including when the aircraft is on the ground, are also advisable.

Note 5: The examples of incident precursors described in Table 1 were developed with a primary focus on passenger transport. For other types of offshore operations, other incident precursors may need to be monitored.

~~Table 1 — Examples of FDM event definitions~~

[The current table is deleted and replaced by the following.]

Table 1 — Examples of potential precursors of incidents that could be monitored with FDM algorithms

Ref	Title	Description	Relevant key risk area as described in the Annex to Regulation (EU) 2020/2034	Occurrence types as defined in Annex I to Regulation (EU) 2015/1018 that are directly related to the precursor
Before take-off and after landing (onshore and offshore)				
GND-01	Ground taxi, power high	To detect when excessive power is used during ground taxiing.	Excursion	1.3(1)
GND-02	Ground taxi, speed high	To detect when the helicopter is ground taxied at high speed.	Excursion	1.3(1)
GND-03	Ground taxi, pedal excessive	To detect when the pedals are used to excess on the ground. (Exclude control check prior to rotor start.)	Excursion	1.3(1)
GND-04	Ground taxi, lateral acceleration high	To detect high levels of lateral acceleration, when ground taxiing, indicating high cornering speed.	Excursion	1.3(1)
GND-05	Ground taxi, longitudinal acceleration high	To detect high levels of longitudinal acceleration, when ground taxiing, indicating excessive braking.	Excursion	1.3(1)
GND-06	Ground taxi, excessive cyclic position	To detect excessive movement of the rotor disc when running on ground. (Exclude control check prior to rotor start.)	Excursion	1.4(6)
GND-07	Ground taxi, excessive rate of cyclic	To detect an excessive rate of movement of cyclic control when running on ground. (Exclude control check prior to rotor start.)	Excursion	1.4(6)
GND-08	Ground taxi, excessive roll	To detect the risk of a helicopter rollover when ground taxiing.	Excursion	1.4(6)
GND-09	Ground taxi, yaw rate high	To detect when the helicopter yaws at a high rate during ground taxi. (Could also catch ‘tight’ turns causing tyre scrubbing.)	Excursion	1.4(6)
GND-10	Hover, yaw rate high	To detect when the helicopter yaws at a high rate when in a hover.	Aircraft upset	1.4(2)

Ref	**Title**	**Description**	**Relevant key risk area as described in the Annex to Regulation (EU) 2020/2034**	**Occurrence types as defined in Annex I to Regulation (EU) 2015/1018 that are directly related to the precursor**
GND-11	Air taxi, speed high	To detect when the helicopter is air taxied at high speed.	Excursion	1.4(2)
GND-12	Pitch attitude limits	To detect when the helicopter is operated at the sloping ground limits, or the moving helideck limits.	Aircraft upset	1.4(6)
GND-13	Roll attitude limits	To detect when the helicopter is operated at the sloping ground limits, or the moving helideck limits.	Aircraft upset	1.4(6)
GND-14	Rotor brake applied early	To detect when the rotor brake is applied at too high main rotor rotation speed (NR).	Ground damage	1.4(6)
Flight – take-off and landing				
TOL-01	Gear extension and retraction – airspeed	To detect when gear is extended at too high speed, or retracted early (based on speed).	Other injuries	1.3(6)
TOL-02	Gear extension – distance	To detect when gear is extended late (based on distance).	Other injuries	1.3(6)
TOL-03	Gear extension & retraction – height	To detect when gear is extended late, or retracted early (based on height).	0ther injuries	1.3(6)
TOL-04	Cabin heater on (take-off and landing)	To detect use of engine bleed air during periods of high power demand.	Aircraft upset, terrain collision	1.3(6), 5(1)
TOL-05	Heavy landing	To detect when hard/heavy landings take place.	Excursion	1.3(12)
TOL-06	Offshore landing with tailwind landing	To detect an offshore landing with a tailwind out of limits.	Aircraft upset	1.3(8)

Ref	Title	Description	Relevant key risk area as described in the Annex to Regulation (EU) 2020/2034	Occurrence types as defined in Annex I to Regulation (EU) 2015/1018 that are directly related to the precursor
TOL-07	High ground speed prior to touchdown	To detect 'quick stop' approaches.	Aircraft upset	1.4(2)
TOL-08	Rig take-off, rotation height outside take-off decision point limits	To detect a rotation height too low (risk of deck strike in case of an engine failure) or too high (risk of heavy landing in case of an engine failure) – based on rotorcraft flight manual (RFM) requirement for radio altimeter and SOPs.	Collision on runway Excursion Obstacle collision in flight	1.4(6), 1.4(2), 5(1)
TOL-09	Rig take-off, pitch attitude outside limits	To detect a pitch attitude too low (risk of deck strike in engine failure) or too high in offshore take-off.	Collision on runway Obstacle collision in flight	1.4(6), 1.4(2), 5(1)
TOL-10	Rig take-off, pitch rate outside limits	To detect a pitch rate too low (risk of deck strike in engine failure) or too high in offshore take-off.	Collision on runway Obstacle collision in flight	1.4(6), 1.4(2), 5(1)
Flight – speed				
SPD-01	High airspeed with power	To detect limitation exceedance (maximum normal operating speed (VNO) / never exceed speed (VNE)).	Aircraft upset	1.4(6)
SPD-02	High airspeed without power	To identify limitation exceedance of power-off airspeed.	Aircraft upset	1.4(6)
SPD-03	High airspeed at low altitude	To detect excessive airspeed in low-level flight, also for bird-strike prevention.	Aircraft upset Terrain collision	1.4(2), 5(1)
SPD-04	Low airspeed at altitude	To identify low airspeed in flight outside of take-off and landing.	Aircraft upset	1.4(2)
SPD-05	Low airspeed on departure	To detect low airspeed during departure climb.	Aircraft upset	1.4(2)

Ref	Title	Description	Relevant key risk area as described in the Annex to Regulation (EU) 2020/2034	Occurrence types as defined in Annex I to Regulation (EU) 2015/1018 that are directly related to the precursor
Flight – height				
HGT-01	Altitude high	To detect flight outside of the published flight envelope.	Aircraft upset	1.4(6)
HGT-02	Rate of climb high	To detect excessive rate of climb.	Aircraft upset	1.4(2)
HGT-03	Rate of descent high	To detect excessive rates of descent.	Aircraft upset Terrain collision	1.4(2)
HGT-04	Rate of descent high at low speed	To detect high rate of descent at low speed.	Aircraft upset Terrain collision	1.4(2)
HGT-05	Minimum altitude in autorotation	To detect a minimum altitude exceedance when practising autorotations at height.	Terrain collision	5(1)
Flight – attitude and controls				
AAC-01	Excessive pitch attitude	To detect excessive pitch attitude during flight (can be height and/or speed limited).	Aircraft upset	1.4(2)
AAC-02	Excessive pitch rate	To detect excessive pitch rate in flight (can be height or speed limited).	Aircraft upset	1.4(2)
AAC-03	Excessive roll attitude	To detect excessive use of roll attitude in flight (can be speed or height limited).	Aircraft upset	1.4(2)
AAC-04	Excessive roll rate	To detect excessive roll rate in flight (can be height or speed limited).	Aircraft upset	1.4(2)

Ref	**Title**	**Description**	**Relevant key risk area as described in the Annex to Regulation (EU) 2020/2034**	**Occurrence types as defined in Annex I to Regulation (EU) 2015/1018 that are directly related to the precursor**
AAC-05	Excessive yaw rate	To detect excessive yaw rates in flight (can be height, speed or torque limited).	Aircraft upset	1.4(2)
AAC-06	Excessive cyclic input	To detect excessive cyclic control input in flight (lateral and longitudinal).	Aircraft upset	1.4(2)
AAC-07	Excessive pedal input	To detect movement of the tail rotor pedals to extreme left and right positions in flight.	Aircraft upset	1.4(2)
AAC-08	Excessive vertical acceleration	To detect excessive G loading of the rotor disc, both positive and negative, due to manoeuvring or turbulence or helideck heave.	Aircraft upset	1.4(2), 1.4(6)
		Flight – general		
GEN-01	Outside air temperature high	To detect when the helicopter is operated at the limits of outside air temperature (OAT) including in hot gas.	Aircraft upset	1.4(6)
GEN-02	One engine inoperative (OEI)	To detect OEI conditions in flight.	Aircraft upset	2.1(3)
GEN-03	Torque limits exceeded	To detect RFM torque exceedances including 5-minute take-off, maximum take-off, maximum continuous, etc., as appropriate.	Aircraft upset	1.4(6)
GEN-04	Torque split	To detect a torque differential and hence possible engine-related issues.	Aircraft upset	2.2
GEN-05	Rotor speed outside limits – power	To detect main rotor speed (NR) above or below limits, in flight.	Aircraft upset	1.4(6)
GEN-06	Rotor speed high – power off	To detect high rotor speed with power off.	Aircraft upset	1.4(6)

Ref	**Title**	**Description**	**Relevant key risk area as described in the Annex to Regulation (EU) 2020/2034**	**Occurrence types as defined in Annex I to Regulation (EU) 2015/1018 that are directly related to the precursor**
GEN-07	Fuel content low	To detect low-fuel alerts.	Aircraft upset	4(8)
GEN-08	HTAWS/EGPWS alert triggered	To detect when HTAWS/EGPWS alerts (including AVAD) have been activated and which mode.	Terrain collision	5(3)
GEN-09	TCAS TA or RA	To detect traffic collision avoidance system (TCAS) traffic or resolution advisory (TA/RA).	Airborne collision	5(2)
Flight – approach				
APP-01	Airspeed low	To detect low airspeed on approach (part of unstable approach).	Aircraft upset	1.3(8)
APP-02	Ground speed change high	To detect excessive ground speed fluctuation on approach (part of unstable approach).	Aircraft upset	1.3(8)
APP-03	Ground speed high	To detect high ground speed on approach (part of unstable approach).	Aircraft upset	1.3(8)
APP-04	Pitch attitude excessive	To detect high or low pitch on approach – exclude final manoeuvring (part of unstable approach).	Aircraft upset	1.3(8)
APP-05	Pitch rate high	To detect high pitch rate on approach – exclude final manoeuvring (part of unstable approach).	Aircraft upset	1.3(8)
APP-06	Roll attitude high	To detect excessive angle of bank on approach – exclude final manoeuvring (part of unstable approach).	Aircraft upset	1.3(8)
APP-07	Roll rate	To detect high roll rate on approach – exclude final manoeuvring (part of unstable approach).	Aircraft upset	1.3(8)

Ref	Title	Description	Relevant key risk area as described in the Annex to Regulation (EU) 2020/2034	Occurrence types as defined in Annex I to Regulation (EU) 2015/1018 that are directly related to the precursor
APP-08	Altitude excessive	To detect high or low altitude on approach relative to deck/runway (part of unstable approach).	Aircraft upset	1.3(8)
APP-09	Rate of descent on approach high	To detect high rates of descent on approach (part of unstable approach).	Aircraft upset Obstacle collision in flight	1.3(8), 5(1)
APP-10	Heading difference high	To detect excessive difference between current heading and final approach heading (part of unstable approach).	Aircraft upset Obstacle collision in flight	1.3(8), 5(1)
APP-11	Glideslope deviation	To detect excessive glideslope deviation on instrument landing system (ILS) approaches (part of unstable approach).	Aircraft upset Terrain collision	1.3(8), 5(1)
APP-12	Localiser deviation	To detect excessive localiser deviation on ILS approaches (part of unstable approach).	Aircraft upset	1.3(8)
APP-13	Go-around	To detect missed approaches.	Excursion, terrain collision, aircraft upset	1.3(1), 1.3(8), 5(1)
Flight – automation				
AUT-01	Stability augmentation system (SAS) / autopilot (AP) disengaged	To detect flight without SAS/AP engaged, per channel for multichannel SAS/AP.	Aircraft upset	1.4(2)
AUT-02	SAS/AP disengaged on take-off	To detect inadvertent lift-off without SAS/AP engaged.	Aircraft upset	1.3(6)
AUT-03	Higher modes engaged out of limits	To detect engagement of upper modes outside of prescribed flight manual limits.	Aircraft upset	1.4(6)

Rationale

The original list of FDM events in GM2 SPA.HOFO.145 was derived from work carried out by the Global Helicopter Flight Data Monitoring Steering Group, an association that is no longer operational. The list was first published in 2012, and so it was considered appropriate to review the list to reflect current practices.

The concept of 'FDM event' was replaced by 'precursor' so as to include FDM measurements.

A number of examples of FDM precursors were removed for a variety of reasons. These FDM precursors included:

— *those that were not appropriate for certain types of flight (e.g. shuttle flights between two offshore platforms) and so the risks were better captured in other FDM precursors;*

— *those that were specific to aircraft types no longer used for offshore operations (e.g. Super Puma); and*

— *those that were duplicated (e.g. detection of 'quick stop').*

Some FDM precursors were modified or combined with others, including:

— *through improving the language of the precursor description to remove disparities; and*

— *where they captured two extremes of the same parameter (e.g. high and low pitch values combined in a single precursor description).*

A number of new precursors were added to cover conditions such as:

— *take-off from an offshore platform;*

— *excessive pitch rate and roll rate on approach; and*

— *torque limit exceedances.*

The 'Parameters Required' column has been removed. Part of the original motivation for this column was to inform operators of the typical flight parameters required to monitor these precursors. However, although SPA.HOFO.145 only mandates FDM from 2019 for offshore commercial air transport, the offshore helicopter industry has been using FDM for much longer, often as a requirement of offshore customers. Therefore, most operators are already familiar with event definition and the necessary parameters are already available.

Also, since detailed algorithm definitions are beyond the scope of the GM, the parameter list taken alone was not helpful for operators.

A stabilised approach is widely acknowledged as an important part of flight safety. However, in helicopter operations, this has not been well defined in a consistent way. Therefore, those precursors that could be used to detect non-stabilised approaches have been noted as 'Part of unstable approach'.

In line with the proposed GM2 to ORO.AOC.130:

— *a column has been included to link the events to the relevant risk areas in Regulation (EU) 2020/2034;*

— *a column has been included indicating which occurrence type (as defined in Annex I to Regulation (EU) 2015/1018) each FDM precursor may relate to, in order to assist operators in* *forming a closer connection between precursors in the FDM programme and mandatory occurrence report; and*

— *a unique reference number has been added to each precursor for ease of reference.*

4.2.5 Annex VI (Part-NCC)

SUBPART B: OPERATIONAL PROCEDURES

GM1 NCC.GEN.105(e)(2) Crew responsibilities

GENERAL

In accordance with 7.~~g~~6 of Annex ~~I~~V to Regulation (EU) 2018/1139 ~~(EC) No 216/2008~~ (E~~e~~ssential R~~r~~equirements for air operations), a crew member must not perform duties on board an aircraft when under the influence of psychoactive substances or alcohol or when unfit due to injury, fatigue, medication, sickness or other similar causes. This should be understood as including the following:

[…]

Rationale

Editorial amendment. No impacts expected.

GM1 NCC.GEN.106 Pilot-in-command responsibilities and authority

GENERAL

In accordance with 1.~~c.~~3 of Annex ~~I~~V to Regulation (EU) 2018/1139 ~~(EC) No 216/2008~~ (Essential Requirements for air operations), the pilot-in-command is responsible for the operation and safety of the aircraft and for the safety of all crew members, passengers and cargo on board. […]

[…]

Rationale

Editorial amendment. No impacts expected.

AMC3 NCC.OP.110 Aerodrome operating minima — general

TAKE-OFF OPERATIONS

[…]

Table 1

Take-off — aeroplanes (without LVTO approval)

RVR or VIS

~~**Facilities**~~	~~**RVR or VIS (m)***~~
~~Day only: Nil**~~	~~500~~
~~Day: at least runway edge lights or runway centre line markings~~	~~400~~

~~Night: at least runway edge lights or runway centre line lights and runway end lights~~	

~~*: The reported RVR or VIS value representative of the initial part of the take-off run can be replaced by pilot assessment.~~

~~**: The pilot is able to continuously identify the take-off surface and maintain directional control.~~

Minimum RVR* or VIS*	Facilities
500 m (day)	Nil**
400 m (day)	Centre line markings or Runway edge lights or Runway centre line lights
400 m (night)	Runway end lights*** and Runway edge lights or runway centre line lights

* The RVR or VIS value representative of the initial part of the take-off run can be replaced by pilot assessment.

** The pilot is able to continuously identify the take-off surface and maintain directional control.

*** Runway end lights may be substituted by colour-coded runway edge lights or colour-coded runway centre line lights.

[...]

Rationale

Table 1 of AMC3 NCC.OP.110 and Table 1 of AMC3 SPO.OP.110 are currently not consistent with Table 1 of AMC1 CAT.OP.MPA.110. This inconsistency was due to a mistake made during the final stage of development of the Decision that adopted those AMC, when changes introduced in Table 1 of AMC1 CAT.OP.MPA.110 were not reproduced in the other AMC. These proposed amendments aim to correct this situation and ensure consistency.

The proposed changes have no safety impacts. Regarding economic impact:

— *the proposed changes will not impact chart providers (Lido, Jeppesen, Navblue, etc.) since their commercial rule manual only considers CAT.OP.MPA.110; therefore, the changes to the AMC to Part-NCC and Part-SPO will not affect their products;*

— *Part-NCC and Part-SPO operators should not be negatively affected either; in fact, there may even be a positive impact of the consistency with AMC1 CAT.OP.MPA.110, since many of these operators are already using the commercial rule manual from the chart providers mentioned above.*

4.2.6 Annex VII (Part-NCO)

SUBPART A: GENERAL REQUIREMENTS

AMC1 NCO.GEN.105(a)(3) Pilot-in-command responsibilities and authority

CHECKLISTS

(a) The pilot-in-command should have and use the latest checklists provided by the manufacturer~~.~~ or the operator, covering all phases of operation of the aircraft under normal, abnormal and emergency conditions and situations.

[…]

Rationale

CS 23.2620 requires manufacturers to include operating procedures in the AFM. They do so in Section 3 (abnormal/emergency procedures) and Section 4 (normal procedures) of the AFM. Section 3, as it is now in all AFMs, is appropriate both for the safe operation of the aircraft and for instructing pilots to deal with such conditions. This is so because abnormal/emergency procedures are accomplished in a 'read-and-do' process – except memory items – and by sole reference to this section, meaning they do not require any extra supporting documents to be used. However, normal procedures are performed in a 'do–verify' way. This means that normal procedures are incomplete when lacking a separate document – 'normal checklists' – to support them during the 'verify' phase of the process. This supporting document is not published by manufacturers, but it is needed by operators to guarantee the safe operation of the flight and, in the case of approved training organisations, to avoid negative training. This is consistent with the final study report of research project EASA/2012/1, Principles and guidelines relative to the design of checklists and working methods in the cockpit[35]*.*

In the case of operations covered by Part-CAT and Part-NCC, ORO.GEN.110 requires operators to establish these checklists, considering not only the aircraft documentation but also observing human factors principles.

In the case of operations covered by Part-SPO, AMC1 SPO.GEN.130(c) refers the pilot to checklists provided by the type certificate holder or the operator.

It is therefore proposed to amend AMC1 NCO.GEN.105(a)(3) in a consistent way, to refer also to checklists provided by the operator. This amendment will be particularly relevant in the case of approved training organisations, where the current text of the AMC has led some authorities to reject alternatives to Section 3 of the AFM, leading to a very low checklist adherence by both students and instructors.

See the rationale for the proposed changes to NCO.GEN.105.

The changes proposed are expected to have a positive impact on safety and no negative economic impact.

[35] https://www.easa.europa.eu/en/downloads/1220/en

GM1 NCO.GEN.105(a)(3) Pilot-in-command responsibilities and authority

NORMAL CHECKLISTS

(a) A normal checklist is a written list to confirm that safety-critical actions included in the associated normal procedure have been performed.

(b) When normal checklists are not provided by the manufacturer, the operator may be required to develop normal checklists. The design and the usage of checklists need to observe human factors principles and take into account the latest relevant documentation and information from the manufacturer.

Rationale

This new GM is proposed to be added to complement the implementation of the related AMC1 NCO.GEN.105(a)(3). The new text is based on Airbus' 2004 'Flight Operations Briefing Notes on Normal Checklists' *and on the final study report of research project EASA/2012/1,* Principles and guidelines relative to the design of checklists and working methods in the cockpit.

Moreover, elements of point (h) of ORO.GEN.110 were also considered.

Approved training organisations in particular, as NCO operators, should aim not only to achieve safe operations but also to guarantee the avoidance of negative training. It is paramount that they teach the correct way of operating any aircraft, but especially for those students who will later progress into operators that expect checklist discipline and adherence to already be a habit.

Please refer also to the rationale for the proposed changes to AMC1 NCO.GEN.105(a)(3). The changes proposed are expected to have a positive impact on safety and no negative economic impact.

4.2.7 Annex VIII (Part-SPO)

SUBPART A: GENERAL

GM1 SPO.GEN.005 Scope

LIST OF SPECIALISED OPERATIONS

(a) Specialised operations include the following activities:

[…]

(19) scientific research flights (other than those under Annex ~~I~~I to Regulation (EU) 2018/1139 ~~(EC) No 216/2008~~;

[…]

Rationale

Editorial amendment. No impacts expected.

GM1 SPO.GEN.105(e)(2) Crew member responsibilities

GENERAL

In accordance with 7.~~g.~~6 of Annex ~~I~~V to Regulation (EU) 2018/1139 ~~(EC) No 216/2008~~ (Essential Requirements for air operations), a crew member must not perform duties on board an aircraft when under the influence of psychoactive substances or alcohol or when unfit due to injury, fatigue, medication, sickness or other similar causes. This should be understood as including the following:

[…]

Rationale

Editorial amendment. No impacts expected.

SUBPART B: OPERATIONAL PROCEDURES

AMC3 SPO.OP.110 Aerodrome operating minima — general

TAKE-OFF OPERATIONS

[…]

Table 1

Take-off — aeroplanes (without LVTO approval)

RVR or VIS

~~Facilities~~	~~RVR or VIS (m)*~~
~~Day only: Nil**~~	~~500~~

~~Day: at least runway edge lights or runway centre line markings~~ ~~Night: at least runway edge lights or runway centre line lights and runway end lights~~	~~400~~

~~*: The reported RVR or VIS value representative of the initial part of the take-off run can be replaced by pilot assessment.~~

~~**: The pilot is able to continuously identify the take-off surface and maintain directional control.~~

Minimum RVR* or VIS*	Facilities
500 m (day)	Nil**
400 m (day)	Centre line markings or Runway edge lights or Runway centre line lights
400 m (night)	Runway end lights*** and Runway edge lights or runway centre line lights

* The RVR or VIS value representative of the initial part of the take-off run can be replaced by pilot assessment.

** The pilot is able to continuously identify the take-off surface and maintain directional control.

*** Runway end lights may be substituted by colour-coded runway edge lights or colour-coded runway centre line lights.

[…]

Rationale

Please refer to the rationale for the proposed changes to AMC3 NCC.OP.110.

5. Impact assessment A — conditions and guidance for effective flight data monitoring

5.1. What is the issue?

The current implementation of FDM programmes by many operators that are in the scope of FDM requirements is not effective enough.

As a result, the management systems of these operators are lacking effectiveness, as the FDM programme shall 'be integrated in [the] management system' of the operator, according to ORO.AOC.130 ('Flight data monitoring – aeroplanes') and SPA.HOFO.145 ('Flight data monitoring (FDM) programme'). The partially ineffective implementation of FDM programmes also has negative effects on continuing airworthiness and training (see Section 5.1.1).

More specifically, the feedback from standardisation inspections (contained in non-public EASA Standardisation Annual Reports for 2019 and 2020) and the report of EPAS action EVT.0009, *Evaluation of the relevance and the effectiveness of the EOFDM best-practices documents* (published in 2021), show great disparity in the effectiveness of the FDM programmes. At several operators visited during standardisation inspections, 'FDM was not adequately used by the operator, which hampered its identification of operational hazards and therefore its safety risk management process' (2019 EASA Standardisation Annual Report). A few examples of the findings are provided below, for illustration.

— An operator was not monitoring the flight collection rate of the FDM programme (and so it was unable to provide the percentage of flights monitored through the FDM programme).

— At another operator, only standard FDM algorithms not adapted to the oparator's SOPs were implemented in the FDM software, so that FDM software results were not relevant.

— At another operator, some flight phases were not covered by any FDM algorithm. Events happening during these flight phases would not be detected.

— At another operator, the FDM programme did not include any follow-up of event rates or event trends. This is because the operator had set the FDM event thresholds such that FDM events were triggered only when there was a very significant deviation from the SOPs. As a result, FDM events were very seldom and so computing rates or trends was not possible. As a result of this bad practice, one of the main benefits of FDM programmes – detecting smaller but growing deviations from the SOPs before they potentially result in a reportable occurrence – was lost.

In addition, several accident investigation reports show that ineffective implementation of the FDM programme may lead to adverse trends not being detected at all by the operator because they are not reported by flight crews and not monitored by the FDM programme[36]. See also EASA safety

[36] See for instance: the following investigation reports:

— *Serious incident to the Airbus A340-313E registered F-GLZU on 11 March 2017 at Bogotà (Colombia), Bureau d'Enquêtes et d'Analyses* (France). This report includes the following safety recommendation: 'The BEA recommends that EASA in coordination with the national oversight authorities ensure that European operators introduce in their flight analysis programme, the indicators required to monitor take-off performance and at the very least, long take-information bulletins No 2016-02R1 (erroneous take-off parameters) and No 2017-20 (slow rotation at take-off).

In most cases, the lack of effectiveness of FDM programmes cannot be explained by a lack of experience in the FDM domain. FDM programmes have been mandated for operators of aeroplanes with an MCTOM of over 27 000 kg since the publication of Commission Regulation (EC) No 859/2008 (known as the EU-OPS regulation) in 2008. In addition, FDM programmes were required of offshore operators by the International Association of Oil & Gas Producers several years before FDM implementation became mandatory on 1 January 2019, in accordance with SPA.HOFO.145.

In addition, EASA has actively promoted FDM industry best practice through the EOFDM[37]. Since its establishment in 2011, the EOFDM has produced several industry best-practices documents (totalling several hundreds of pages of publicly available technical guidance) and contributed to the agenda of several safety conferences. Hence, it is considered that the possibilities offered by safety promotion are exploited as much as possible by EASA in the FDM domain, and that safety promotion alone is not sufficient to improve the implementation of FDM programmes.

The main reasons for ineffective implementation of FDM programmes by some of the operators are as follows.

— **The absence of minimum performance objectives for the main steps of an FDM programme (flight data recovery, flight data processing, flight data analysis).** In this regard, the EVT.0009 report concludes, among other things, that the resources allocated by many small and medium-sized European operators to their FDM programmes 'do not allow them to achieve something more than mere compliance with the rules (small staff numbers, limited technical know-how, use of predefined FDM event definitions, flight data processing outsourced)'. According to the 2019 EASA Standardisation Annual Report, 'AMC1 ORO.AOC.130 on flight data monitoring does not include performance objectives to ensure minimum effectiveness of the FDM programmes.' FDM implementation problems discovered during standardisation inspections could often not be raised as findings against the operators concerned due to the lack of performance objectives in AMC1 ORO.AOC.130.

— **The lack of conditions setting the minimum set of risks to be covered by an FDM programme.** Compliance with AMC1 ORO.AOC.130 or AMC1 SPA.HOFO.145 is not sufficient to ensure that the FDM programme monitors the risk areas that are obviously relevant for all operators, such as those pointed out by the EASA Annual Safety Review or by the EPAS[38], or those corresponding

offs.' *Serious incident to the Boeing 737-800 registered PH-BXG, at Amsterdam Schiphol Airport on 10 June 2018*, Dutch Safety Board (Netherlands).

— *Serious incident to a Boeing 737-800 registered G-JZHL at Kuusamo Airport, on 1 December 2021*, Air Accidents Investigation Branch (United Kingdom). This report includes the following safety recommendation: 'It is recommended that the UK Civil Aviation Authority encourage all UK Air Operator Certificate holders to implement into their flight data monitoring programme algorithms to detect the precursors relevant to the monitoring of takeoff performance detailed in the European Operators Flight Data Monitoring Document, Guidance for the implementation of flight data monitoring precursors.'

[37] The EOFDM is a voluntary partnership between European operators and EASA. Through the publication of industry best-practices documents, the EOFDM aims to facilitate the implementation of flight data monitoring by European operators and to help them gain the maximum benefits from their FDM programmes. The activities of the EOFDM have been tracked in the EPAS since 2016.

[38] EASA, *European Plan for Aviation Safety 2021–2025*, 2021 (https://www.easa.europa.eu/en/document-library/general-publications/european-plan-aviation-safety-2021-2025).

to occurrences subject to mandatory occurrence reporting in accordance with Annex I to Regulation (EU) 2015/1018.

— **The AMC/GM to ORO.AOC.130, ORO.FC.A.245 and SPA.HOFO.145 refer to technologies, technological limitations, analysis techniques and industry practice that are partially obsolete**, as the content of these AMC/GM is based on older documents[39]. This is also applicable to some conditions related to FDM for implementing an ATQP (as specified in AMC1 ORO.FC.A.245). In addition, the tables of example FDM events provided in GM2 ORO.AOC.130 and GM2 SPA.HOFO.145 are based on documents that no longer reflect industry best practice. As a result, the technologies or technological choices made by European operators 'hinder the full implementation of the EOFDM precursors (flight parameters missing or their performance is not sufficient to implement the EOFDM precursors)', as indicated in the conclusions of the EVT.0009 report.

The report of EVT.0009 identifies two strategic objectives that are related to enhancing the effectiveness of FDM programmes.

— **Objective B.** 'Achieve that European operators allocate sufficient resources to their FDM programmes and use them in a more safety-effective manner.'

— **Objective D.** 'Improve the performance of the technologies used to run the FDM programmes.'

It should be noted that ICAO SARPs do not set minimum performance objectives for an FDM programme or a minimum set of risks to be covered by all FDM programmes. In addition, the air operations regulations of states outside the EU do not require an FDM programme, or, when they do, they do not address minimum performance objectives for an FDM programme or the minimum set of risks to be covered with FDM. Hence, the issue considered in this IA is **not** caused by insufficient harmonisation with ICAO SARPs or with aviation regulations of non-EU states.

It should also be emphasised that **an ineffective FDM programme cannot be satisfactorily compensated for by other sources of safety data**, such as occurrence reports, or Automatic Dependent Surveillance – Broadcast (ADS-B). Below are a few reasons for this.

— As explained in the EOFDM document *Breaking the Silos*, flight data 'are generated and recorded based on a clearly defined target, threshold or criteria. Hence, if the defined condition is satisfied the information is generated and recorded. The condition for their existence is clearly defined.' FDM algorithms' outputs are not subject to human interpretation or individual perception of risk, unlike occurrence reports.

— FDM algorithms can detect deviations that are not easy to identify for a flight crew. They can also produce measurements based on data collected from every flight, while it would be a disproportionate effort for flight crews to report after every single flight.

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[39] The content of these AMC/GM is mainly based on:

— Joint Aviation Authorities, Temporary Guidance Leaflet No 44, JAR-OPS 1, Amendment 13, Section 2, updated to incorporate Section 2 text proposals from suspended Joint Aviation Authorities NPAs, June 2008, for AMC1 ORO.AOC.130, AMC1 ORO.FC.A.245 and the table of example FDM events in GM2 ORO.AOC.130;

— ICAO Doc 9859, *Safety Management Manual*, 1st edition, 2006, for GM1 ORO.AOC.130; and

— Global Helicopter Flight Data Monitoring, *Helicopter Flight Data Monitoring – Industry best practice*, April 2012, for the table of example FDM events in GM2 SPA.HOFO.145.

— As indicated in the EOFDM document *Breaking the Silos*, 'When facing a recurrent issue during the operation (such as a technical failure or an issue with the SOP), the natural human tendency is to not report it any more after a couple of occurrences. This is because one gets used to the issue or reporting is perceived as a waste of time when this issue is perceived as known. In that case, FDM may facilitate a quantitative assessment of the issue and of any related trend.'

— ADS-B messages are automatically transmitted throughout the flight by the aircraft transponder. Several providers detect and decode ADS-B messages and offer batches of data based on ADS-B message content. However, ADS-B messages contain only a small subset of the flight parameters typically collected for FDM. This flight parameter subset is not sufficient for implementing most of the algorithms of a typical FDM programme.

5.1.1. Safety risk assessment

The safety risk is 'the predicted probability and severity of the consequences or outcomes of a hazard' (ICAO Doc 9859, *Safety Management Manual*), where 'consequences or outcomes of a hazard' relate to an aircraft accident or incident.

Therefore, one common approach to assessing the effectiveness of airborne equipment or flight crew procedures is to rely on conventional methods of risk assessment, such as the one reflected in CS 25.1309 'Equipment, systems and installations' of the Certification Specifications for Large Aeroplanes (CS-25). In simple terms, this approach is based on a two-dimensional risk assessment, where one dimension is related to the frequency of an undesirable outcome and the other dimension reflects the potential severity of that undesirable outcome[40]. Airborne equipment and flight crew procedures reduce the frequency and/or the severity of undesirable outcomes, by:

— allowing the safe continuation of the flight under normal or abnormal conditions; or

— providing the highest survivability rate possible after an accident.

Whether the flight parameters of a given flight are collected and analysed for an FDM programme has no effect on the safe continuation of that flight[41]. A conventional method of risk assessment is simply not appropriate for assessing the safety benefits of an FDM programme because such a method is focused on the safe completion of the flight following an event (e.g. a combination of system failures).

An FDM programme may contribute to reducing safety risks at individual operator level through three types of impact, as follows.

— **Its impact on the operator's management system.** The FDM programme helps make the operator's management system more effective, in particular by doing the following.

  (a) Providing accurate and frequent data to support the SRM process (refer to point (b) of AMC1 ORO.AOC.130).

  (b) Providing an independent means to detect occurrences and the possibility of requesting a retrospective report from the flight crew (refer to point (g) of AMC1 ORO.AOC.130).

[40] There are other methods to assess events risk. These include Aviation Risk Management Solutions or the European risk classification scheme, but also using the notions of outcome severity and probability.

[41] It is not required to analyse the flight data during the flight for safety purposes and this is not common practice today. Therefore, the potential safety benefits of 'real-time' FDM are not discussed in this document.

Flight crew reports are an important source of data for the operator's management system.

— **Its impact on continuing airworthiness.** The FDM programme may improve the detection by the operator of events that may affect aircraft airworthiness. Examples are hard landings; load factor exceedances in flight (e.g. due to abrupt manoeuvres); brake temperature exceedances; engine temperature exceedances; overspeed with or without flaps/slats extended, or with landing gear extended; and tail strike. The collected flight data may also be used for predictive maintenance, which decreases the likelihood of an aircraft being in an abnormal or emergency situation due to failure of an essential system (although predictive maintenance is outside the scope of FDM).

— **Its impact on flight crew training.** The FDM programme may help the operator to:

(a) make training programmes and scenarios more representative of actual operation and more focused on the main operational risks; or

(b) identify remedial training needs in a timely manner;

(c) support specific training with concrete examples (for instance on Category B and Category C aerodromes, on visual approaches and on unexpected aircraft or systems behaviour) with data from actual flights.

Hence, the FDM programme is a source of information **supporting several safety-critical processes** for which the operator is responsible, such as the SRM and flight crew occurrence reporting processes of the operator's management system, training and continuing airworthiness, but the FDM programme is not a safety-critical process per se.

In addition, the operator's FDM programmes have been identified as **important for addressing several safety issues with high or medium Safety Issue Priority Index score in EASA's safety risk portfolios** (refer to Volume III of the 2023–2025 EPAS). These include:

— approach path management (SI-0007);

— entry of aircraft performance data (SI-0015);

— gap between certified take-off performance and take-off performance achieved in operations (SI-0017).

EASA and International Air Transport Association publications recommend that operators use their FDM programmes to monitor these safety issues. Table 5.1 provides information on these issues.

Table 5.1. Safety issues of the EASA CAT aeroplanes safety risk portfolio that this NPA is expected to help address

Safety issue title and description	Safety Issue Priority Index score	Documents recommending the use of FDM for monitoring this issue	Documents providing methods to help monitor this safety issue with the FDM programme
Approach path management (SI-0007) This safety issue addresses the inappropriate execution of an approach at any point from FL100 until reaching safe taxiing speed. This can lead to runway excursions, aircraft upset, terrain collision or airborne collision. It covers all types of instrumental and visual approaches. The following areas are reviewed in this safety issue: • management of the energy of the aircraft and the influence of external factors affecting the approach, such as tailwind or crosswind, windshear, downdraughts/updraughts and other weather-related factors; • decision-making process of the flight crew to go around or continue with the approach; and • SOPs and the relevance of those procedures for the approach flown, flight crew training and the existing regulatory framework. In addition to addressing this safety issue from a flight crew perspective, this safety issue also explores air traffic management (ATM)-related factors that may lead to non-stabilised approaches. These include air traffic controller instructions (e.g. vectoring, intermediate level-off) that result in a high descent profile for the flight crew or bring the aircraft too close to the runway. This safety issue is linked to the 'ATM influence on non-stabilised approaches (SI-2010)' in the ATM/ANS safety risk portfolio.	High	International Air Transport Association, *Risk Mitigation Policies, Procedures and Best Practices*, 2nd edition (2016)	Data4Safety, *Guidance for Identifying Unstable Approach with Flight Data* (2022) EOFDM, *Guidance for the implementation of flight data monitoring precursors*, Revision 04 (December 2022)
Entry of aircraft performance data (SI-0015) The incorrect entry of data into the flight management system that is used to set the take-off or landing performance parameters of the aircraft can have catastrophic consequences. This can potentially occur due to miscommunication errors, errors in electronic flight bags, incorrect entry of data into the flight management system, last-minute changes by air traffic control and load masters and the incorrect calculation of the performance parameters. To mitigate this safety issue, technical solutions are being considered for the	Medium	EASA SIB 2016-02R1: Use of erroneous parameters at take-off	EOFDM, *Guidance for the implementation of flight data monitoring precursors*, Revision 04 (December 2022)

Safety issue title and description	Safety Issue Priority Index score	Documents recommending the use of FDM for monitoring this issue	Documents providing methods to help monitor this safety issue with the FDM programme
long term; in the short to medium term, the focus will be on improvements to SOPs.			
Gap between certified take-off performance and take-off performance achieved in operations (SI-0017) One type of incorrect rotation is slow rotation rate performed by the flight crew at take-off, with the aim of avoiding tail strikes. This is especially critical in short- and high-altitude runways as too-slow rotations there can lead to runway excursions, aircraft upset or terrain collision. The most critical scenario is a heavy aircraft, typically a long-haul flight by a large four-engine aircraft with high payload, in short high-altitude runways. Relevant SOPs and training for flight crew have to be reviewed and implemented to ensure that flight crew rotate the aircraft at the correct rate during take-off.	Medium	EASA SIB 2017-20: Slow rotation take-off	EOFDM, *Guidance for the implementation of flight data monitoring precursors*, Revision 04 (December 2022)

Therefore, **an ineffective FDM programme is considered to have a negative effect on safety**, by:

— affecting risk detection and/or risk assessment made under several safety-critical processes of an operator – SRM, flight crew occurrence reporting, training, continuing airworthiness;

— rendering the decision-making of an operator's safety-critical processes more difficult and uncertain, and the corrective actions less relevant;

— affecting the effectiveness of FDM-based corrective actions for several safety issues included in EASA's safety risk portfolios;

— affecting the evaluation of corrective actions at the level of an operator and at the level of the EASA SRM process.

5.1.2. Who is affected

The stakeholders primarily affected by ineffective implementation of FDM programmes are **operators in the scope of ORO.AOC.130** (CAT operators of aeroplanes with an MCTOM of more than 27 000 kg)**, ORO.FC.A.245** (CAT operators of aeroplanes that implement an ATQP) **and SPA.HOFO.145** (CAT offshore operators of helicopters with an MCTOM of more than 3 175 kg). Ineffective implementation of the FDM programme is detrimental to the safety of air operations. As most of the operations with such aircraft are in commercial passenger transport, this means a decreased level of safety for these passengers.

Stakeholders affected to a lesser extent by this issue are the following.

— **Manufacturers of aircraft models in the scope of ORO.AOC.130 or SPA.HOFO.145**, as the issue increases the risk of an accident with their products.

— **National competent authorities** (responsible for the oversight of the management system of their national operators).

— **Flight crew members.** Ineffective implementation of the FDM programme at an operator means a missed opportunity for its flight crew members to get useful and non-blaming feedback on events on flights, on flights to challenging destinations or on the execution of new flight techniques (the FDM programme must be non-punitive). Ineffective implementation of FDM programmes might also be problematic if a flight crew member is facing passengers complaints (e.g. after a firm landing), as FDM data may in that case be essential to establish factual information.

The scope of this IA is limited to the AMC/GM to ORO.AOC.130, ORO.FC.A.245 and SPA.HOFO.145. It does not impact other rulemaking tasks or other EASA non-rulemaking actions.

This issue has no impact on the theoretical knowledge of pilots.

5.1.3. How could the issue evolve

Without any corrective action, the FDM programmes of many operators will remain ineffective, and as a consequence:

— several safety-critical processes managed by these operators (SRM, flight crew occurrence reporting, continuing airworthiness, training) will remain insufficiently effective;

— several corrective actions on safety issues included in EASA's safety risk portfolios will remain partially ineffective; these are the corrective actions relying on FDM programmes of operators to monitor the safety issues (refer to Table 5.1).

As a result, safety risks that should be addressed by an operator's safety-critical processes or at the level of EASA will continue to exist.

5.2. What we want to achieve — objectives

The specific objective of this proposal is to enhance the safety of operations with large aeroplanes used for CAT, and of operations with large helicopters used for offshore CAT, **by making FDM programmes more effective**.

To achieve this, it is necessary to:

— establish minimum performance objectives for an FDM programme;

— ensure that a core set of risks is monitored by all FDM programmes; and

— take into account technological evolutions and new industry best practice, while ensuring that any new condition is sustainable and not technology prescriptive.

5.3. How we want to achieve it — options

Three policy options, corresponding to three possible ways to address the issue, have been identified: do nothing, amend the regulatory framework or promote voluntary implementation by the industry. They are presented in Table 5.2.

Table 5.2. Selected policy options

Option No	Short title	Description
0	No policy change	No policy change (risks remain as outlined in the issue analysis).
1	Amend AMC/GM	Amend the AMC/GM to ensure sufficient performance and appropriate scope of FDM programmes, and to take into account modern technologies and practice.
2	Safety promotion	Promote a minimum level of performance of the FDM programme, a minimum set of risks to be monitored and modern technologies and practice.

5.3.1. Option 0

Option 0 consists in maintaining the status quo without introducing any change to the AMC/GM and without initiating any other type of action.

5.3.2. Option 1

Option 1 consists in the following.

(a) Introducing, in AMC to ORO.AOC.130 and SPA.HOFO.245, conditions that specify minimum performance objectives for the main steps of an FDM programme:

(1) conditions regarding flight data recovery, which includes conditions on the functioning of the airborne system, the set of flight parameters to be collected, the flight collection rate and the time to identify a failure to collect data from an individual aircraft;

(2) conditions regarding flight data processing, which includes conditions on the time for routine processing of the data by the FDM software and on the capabilities of the FDM software;

(3) conditions regarding flight data analysis, which includes conditions on the identification and validation of significant FDM events and on documenting the source of flight parameters and the algorithms used to produce FDM events and measurements.

(b) Specifying, in AMC to ORO.AOC.130 and SPA.HOFO.245, a minimum set of risks that should be monitored by an FDM programme. This set includes:

(1) risk areas that are relevant for all aeroplane operators, such as those pointed out by the EASA Annual Safety Review or the EPAS[42];

[42] EASA, *European Plan for Aviation Safety 2021–2025*, 2021 (https://www.easa.europa.eu/en/document-library/general-publications/european-plan-aviation-safety-2021-2025).

(2) risk areas that are relevant for all offshore operators, such as those pointed out by the EASA Annual Safety Review or HeliOffshore safety performance reports;

(3) some occurrences subject to mandatory occurrence reporting in accordance with Annex I to Regulation (EU) 2015/1018;

(4) indications that the airworthiness of the aircraft may be affected.

(c) Introducing changes in GM1 ORO.AOC.130, GM2 ORO.AOC.130, AMC1 ORO.FC.A.245, GM1 SPA.HOFO.245 and GM2 SPA.HOFO.245 to reflect technological evolutions and current industry best practice. Examples include the use of modern IT solutions (e.g. software-as-a-service), new capabilities of modern FDM software or the advent of large data exchange programmes.

Table 5.3 provides an overview of the changes introduced by Option 1 to AMC1 ORO.AOC.130, AMC2 ORO.AOC.130 and AMC1 ORO.FC.A.245 (aeroplane operators) and to AMC1 SPA.HOFO.145 and AMC2 SPA.HOFO.145 (helicopter offshore operators).

Note 1: The changes to the AMC are presented in a simplified form in Table 5.3, which may not contain all the applicability conditions. The exact text of the proposed amendments can be found in Chapter 4.

Note 2: The changes to GM introduced by Option 1 are not presented in Table 5.3, but they can be found in Chapter 4. The GM paragraphs amended by Option 1 are GM1 ORO.AOC.130, GM2 ORO.AOC.130, GM1 SPA.HOFO.245 and GM2 SPA.HOFO.245.

In addition, the applicability of the AMC amendments introduced by Option 1 depends on whether they could cause a change to airborne systems and equipment. This enables the avoidance of retrofit costs for a large number of aircraft in the scope of ORO.AOC.130, ORO.FC.A.245 or SPA.HOFO.145.

The following principles have been followed.

— AMC amendments that may cause a change to airborne systems or airborne equipment on already operated aircraft are solely applicable to aircraft that are manufactured at least 3 years after the date of publication of the ED Decision adopting these amendments.

- In Chapter 4 of this NPA, 'first issued with an individual CofA on or after [date of publication + 3 years]' appears in the text of such amendments.
- Exception: amendments in point (b) of AMC2 ORO.AOC.130 and point (b) of AMC2 SPA.HOFO.145 are applicable to aircraft manufactured since 1 January 2016, as it is considered that these amendments would not cause a change to airborne systems or airborne equipment for such aircraft.

— AMC amendments that are not likely to cause a change to airborne systems or airborne equipment on already operated aircraft are applicable to all aircraft in the scope of the requirements considered, and a notice period of 2 years will be provided, depending on the assumed amount of work considered necessary to implement the amendment. For this purpose, a deferred applicability date will be specified in the EASA ED Decision adopting these AMC amendments.

Table 5.3. Overview of the AMC amendments introduced by Option 1 (unless specified, the amendments are equally applicable to aeroplanes and helicopters)

Description of amendment introduced by Option 1	**Amended or new AMC**	**Applicable to**
Amend the condition regarding airborne systems and equipment as follows: • airborne systems and equipment used to obtain FDM data should continuously collect the flight data used for FDM throughout the flight; • the retrieval of flight data from the aircraft for the purpose of the FDM programme should not affect the availability or serviceability of a flight recorder required for accident investigation.	AMC1 ORO.AOC.130 AMC1 SPA.HOFO.145	Aeroplanes and helicopters first issued with an individual CofA on or after [date of publication + 3 years]
Introduce the following condition. At least 80 % of the flights of any individual aeroplane that were performed in the past 12 months should be available for analysis with the FDM software and have valid data, or, if needed to avoid a disproportionate cost impact, an objective of 60 % of the flights of any individual aeroplane can be agreed with the competent authority.	AMC1 ORO.AOC.130 AMC1 SPA.HOFO.145	Operators in the scope of ORO.AOC.130 or SPA.HOFO.145, as of [date of publication + 2 years]
Introduce the following condition. The operator should have means to identify a failure to collect flight data from any individual aircraft within 15 days, or, if needed to avoid a disproportionate cost impact, a time objective of 22 days can be agreed with the competent authority.	AMC1 ORO.AOC.130 AMC1 SPA.HOFO.145	Operators in the scope of ORO.AOC.130 or SPA.HOFO.145, as of [date of publication + 2 years]
Introduce the following condition. The time between completion of a flight and routine processing of the data of that flight by the FDM software should not exceed 15 calendar days (aeroplanes) / 7 calendar days (helicopters) for at least 80 % of flights collected with the FDM programme. If needed to avoid a disproportionate cost impact, a time objective for routine processing of data after a flight of 22 calendar days (aeroplanes) / 15 calendar days (helicopters) can be agreed with the competent authority.	AMC1 ORO.AOC.130 AMC1 SPA.HOFO.145	Operators in the scope of ORO.AOC.130 or SPA.HOFO.145, as of [date of publication + 2 years]
Introduce the following conditions: • the data collected for analysis by the FDM software should include all the flight parameters recorded by a flight data recorder in accordance with AMC1.2 CAT.IDE.A.190 (aeroplanes) / AMC1.2 CAT.IDE.H.190 (helicopters); • these flight parameters should meet the performance specifications as defined in EUROCAE Document 112A or any later equivalent standard.	AMC1 ORO.AOC.130 AMC1 SPA.HOFO.145	Aeroplanes and helicopters first issued with an individual CofA on or after [date of publication + 3 years]

Description of amendment introduced by Option 1	**Amended or new AMC**	**Applicable to**
Introduce the following conditions: • the operator should document the principles it uses for identifying significant FDM events; • validation of a significant FDM event should be performed as a matter of priority and within 15 calendar days after detection by the FDM software, for at least 80 % of such significant FDM events.	AMC1 ORO.AOC.130 AMC1 SPA.HOFO.145	Operators in the scope of ORO.AOC.130 or SPA.HOFO.145, as of [date of publication + 2 years]
Introduce the following condition. The operator should maintain documentation on: (1) the data source and the performance of all the flight parameters that are collected for the purpose of the FDM programme; and (2) the algorithms used to produce FDM events or FDM measurements on the data collected from that aircraft, including: (i) a description of the logic of each algorithm; and (ii) for each algorithm, the flight parameters needed by the algorithm and their minimum performance for the algorithm to deliver reliable results.	AMC1 ORO.AOC.130 AMC1 SPA.HOFO.145	Aeroplanes and helicopters first issued with an individual CofA on or after [date of publication + 3 years]
Introduce the following condition. The FDM analysis and assessment tools should include: (1) specialised software ('FDM software') for processing the flight data; and (2) in order to easily link FDM data with occurrence reports and other data: (i) software capable of automatically and uniquely identifying individual flights in the data files collected for FDM; and (ii) to the extent the necessary data is collected, providing, for each FDM event detection, the aircraft geographical position and altitude, the coordinated universal time (UTC) date and time, the flight identification and the aircraft registration.	AMC1 ORO.AOC.130 AMC1 SPA.HOFO.145	Operators in the scope of ORO.AOC.130 or SPA.HOFO.145, as of [date of publication + 2 years]
Introduce the following condition. 80 % or more of raw or decoded flight data recording files of the aircraft required to be part of the FDM programme should be retained and readily retrievable for analysis for at least 2 years.	AMC1 ORO.AOC.130 AMC1 SPA.HOFO.145	Operators in the scope of ORO.AOC.130 or SPA.HOFO.145, as of [date of publication + 2 years]

<table>
<tr><th>Description of amendment introduced by Option 1</th><th>Amended or new AMC</th><th>Applicable to</th></tr>
<tr><td>Introduce the following condition.

Aeroplanes. The FDM programme should monitor at least the following key risk areas:
• risk of runway excursion during take-off or landing,
• risk of airborne collision,
• risk of aircraft upset,
• risk of collision with terrain.

Helicopters. The FDM programme should monitor at least the following key risk areas:
• risk of aircraft upset,
• risk of collision with terrain,
• risk of obstacle collision in flight during take-off or landing,
• risk of excursion from the touchdown and lift-off surface.</td><td>AMC2 ORO.AOC.130

AMC2 SPA.HOFO.145</td><td>Aeroplanes and helicopters with an individual CofA first issued on or after 1 January 2016

Applicable as of [date of publication + 2 years]</td></tr>
<tr><td>Introduce the following condition.

If the necessary flight parameters are collected, the FDM programme should monitor:
• (for aeroplanes) exceedances indicating that the airworthiness of the aircraft may be affected and that are related to speed and configuration, altitude, accelerations, attitude angles, engine limitations or aircraft weight;
• (for helicopters) exceedances indicating that the airworthiness of the aircraft may be affected and that are related to speed, altitude, accelerations, attitude angles or aircraft weight;
• caution and warning alerts to the flight crew and indicating that the airworthiness of the aircraft may be affected.</td><td>AMC2 ORO.AOC.130

AMC2 SPA.HOFO.145</td><td>Operators in the scope of ORO.AOC.130 or SPA.HOFO.145, as of [date of publication + 2 years]</td></tr>
<tr><td>Introduce the following condition.

The operator should establish and maintain a document identifying which classes of occurrence are monitored with the FDM programme. This document should cover at least occurrences subject to mandatory reporting and listed in Regulation (EU) 2015/1018, Annex I, Sections 1 and 5. This document should provide a short description of the applicable FDM event(s) or FDM measurement(s) for each class of occurrence that is monitored with the FDM programme.</td><td>AMC2 ORO.AOC.130

AMC2 SPA.HOFO.145</td><td>Operators in the scope of ORO.AOC.130 or SPA.HOFO.145, as of [date of publication + 2 years]</td></tr>
</table>

Description of amendment introduced by Option 1	Amended or new AMC	Applicable to
Remove the two-phases condition regarding the proportion of flights to be collected by the FDM programme to support an ATQP (60 % before granting ATQP approval, 80 % before a request to extend the ATQP), and replace it with a reference to AMC1 ORO.AOC.130.	AMC1 ORO.FC.A.245	Operators in the scope of ORO.FC.A.245, as of [date of publication + 2 years]

5.3.3 Option 2

Option 2 consists in producing safety promotion material that:

- recommends certain targets regarding flight data recovery, flight data processing and flight data analysis, so as to ensure a minimum level of performance of the FDM programme;
- recommends a minimum set of risks to be monitored by all operators; and
- recommends the use of modern technologies to enhance the effectiveness of the FDM programme.

The recommendations in this safety promotion material would have the same content as the changes proposed under Option 1. The content of any other safety promotion material would be non-binding in any manner.

This safety promotion material could be produced as an EASA document. It could also be produced as part of the EOFDM best-practices documents, subject to agreement with EOFDM members. In this regard, it should be noted that some of the recommendations under Option 2 are already included in EOFDM documents:

- Annex 2 to EOFDM's *Guidance for the implementation of flight data monitoring precursors* contains tables of recommended flight parameters together with their minimum rate and resolution;
- EOFDM's *Key performance indicators for a flight data monitoring programme* proposes, among other things, indicators related to the flight collection rate and the time to retrieve and process the data.

5.4. Methodology and data used for conducting the impact assessments

Please refer to Appendix A to this document.

5.5. What are the impacts

5.5.1. Safety impact

Note: As the amendments introduced by Options 1 and 2 are similar for aeroplane operators and for offshore operators, the following is considered equally valid for these two categories of stakeholders.

The main possible safety consequences, as described in Table A.2 of Appendix A, were reviewed to determine which are applicable to Options 1 and 2, and assess their safety effects. A summary of this assessment is presented in this section. Moreover, this section provides the overall safety scoring for each policy option.

Possible safety consequences of Options 1 and 2

No negative safety consequences were found if Option 1 or Option 2 were to be implemented, only positive safety consequences.

Table 5.4 shows the possible safety consequences that are applicable to Options 1 and 2 and the estimated safety effect.

Table 5.4. Applicability of possible safety consequences to Options 1 and 2 and type of safety effect

Possible safety consequences	Applicable to Options 1 and 2?	Safety effect if applicable, or justification if not applicable
Negative safety consequences		
Misuse of flight data, for instance to blame/sanction flight crews, or (mis)perception by flight crews (fear of being blamed), that may result in a poor safety culture with a negative effect on safety.	No	Option 1 and Option 2 do not address the use of FDM data or their protection. They will not improve or degrade the protection of data sources.
Flight crew members becoming more focused on their 'FDM performance' and less on good airmanship and compliance with the SOPs.	No	Option 1 and Option 2 do not include any monitoring of the FDM statistics of individual flight crew. In addition, significant deviations from the SOPs should be monitored, not the perfect implementation of the SOPs.
Positive safety consequences		
More effective SRM (more complete and timely assessment of safety risks and better monitoring of mitigation measures) and better level of occurrence reporting.	Yes	Option 1 and Option 2 specify that the FDM programme should cover at least: • excursion, collision with terrain, airborne collision and aircraft upset for aeroplanes; and • collision with terrain, aircraft upset, obstacle collision in flight and excursion from the touchdown and lift-off area for offshore helicopters. In addition, these conditions specify that the operator should know which of the occurrence classes requiring reporting are also monitored with FDM and by which FDM algorithms. This results in the FDM programme significantly increasing the effectiveness of the SRM and flight crew occurrence reporting processes: • for all operators in the case of Option 1; or • for some operators in the case of Option 2.

Possible safety consequences	**Applicable to Options 1 and 2?**	**Safety effect if applicable, or justification if not applicable**
		Medium positive safety impact.
Ensuring the continued airworthiness of the aircraft (lower risk of losing a critical system or part).	Yes	Option 1 and Option 2 specify that the FDM programme should monitor all exceedances that indicate that the airworthiness of the aircraft may be immediately affected. This will help more reliable detection of events relevant for airworthiness, and so moderately increase the effectiveness of the continuing airworthiness process: • for all operators in the case of Option 1; or • for some operators in the case of Option 2. Low-level positive safety impact.
Enabling predictive maintenance.	No	Option 1 and Option 2 do not address predictive maintenance.
Better-trained flight crew (lower risk of errors, better preparation for abnormal situations and difficult operating conditions).	No	Option 1 and Option 2 do not address the use of FDM data for training.
More effective oversight of FDM programmes by national competent authorities.	Yes (for Option 1 only)	Option 1 introduces more specific and clear criteria for a flight inspector to assess whether an operator complies with the applicable FDM requirements. National competent authorities can raise a finding if any one of these criteria is not fulfilled. Low-level positive safety impact.

Possible safety consequences	**Applicable to Options 1 and 2?**	**Safety effect if applicable, or justification if not applicable**
Enhancing the effectiveness and the evaluation of corrective actions for one or several safety issues included in EASA's safety risk portfolios.	Yes	Option 1 and Option 2 introduce a minimum set of key risk areas to be monitored. This enhances the effectiveness of FDM-based actions for at least the following safety issues included in EASA's safety risk portfolios: • approach path management (SI-0007) is covered by the risk area 'runway excursion at landing'; • entry of aircraft performance data (SI-0015) and gap between certified take-off performance and take-off performance achieved in operations (SI-0017) are covered by the risk area 'runway excursion at take-off'. This results in better risk control for several safety issues: • for all operators in the case of Option 1 (low-level positive safety impact); or • for some operators in the case of Option 2 (very low-level positive safety impact).

Safety impact of Option 1

The level of safety impact of Option 1 is considered to be medium positive (score of + 5), as the introduction of regulatory changes at the level of AMC/GM is expected to significantly increase the effectiveness of the SRM process and of the flight crew occurrence reporting process for all operators that are required to have an FDM programme. It also supports more efficient continued airworthiness activities of the operator and it contributes to enhancing the implementation and evaluation of corrective actions for some safety issues included in EASA's safety risk portfolios.

Safety impact of Option 2

The recommendations in the safety promotion material proposed under Option 2 would have the same content as the changes proposed under Option 1.

However, the safety effect of Option 2 is significantly less than that of Option 1, as such recommendations would be implemented **on a voluntary basis**. It is also not possible to assess the proportion of operators that would implement such recommendations, but the EVT.0009 report concludes, among other things, that 'the resources allocated by many small and medium-sized European operators to their FDM programmes do not allow them to achieve something more than mere compliance with the rules'.

Therefore, **the level of safety impact of Option 2 is considered to be very low-level positive (score of + 1)**, as it slightly increases the effectiveness of at least one safety-critical process, namely the SRM process.

5.5.2. Environmental impact

Data collected by the FDM programme may help the operator to monitor compliance with procedures to limit aircraft noise and aircraft emissions, for instance procedures related to aircraft trajectory, to the management of engines and to fuel efficiency. However, the amendments introduced by Option 1 and the safety promotion material introduced by Option 2 do not address such procedures. Therefore, the level of environmental impact of Options 1 and 2 is considered neutral (score of 0).

Please refer to Appendix A for the types of environmental impact applicable to aircraft operations.

5.5.3. Social impact

Note: As the amendments introduced by Options 1 and 2 are similar for aeroplane operators and for offshore operators, the following is considered equally valid for these two categories of stakeholders.

The main possible social consequences that are described in Appendix A were reviewed to determine which are applicable to Options 1 and 2 and assess their effects. A summary of this assessment is presented in this section. Moreover, this section provides the overall social scoring for each policy option.

Possible social consequences of Option 1 and Option 2

Table 5.5 shows the possible social consequences that are applicable to Option 1 and Option 2 and the estimated safety effect.

Table 5.5. Applicability of possible social consequences to Option 1 and Option 2 and associated effect

Possible social consequences	Applicable to Options 1 and 2?	Social effect if applicable, or justification if not applicable
Negative social consequences		
Use of flight data to blame/sanction flight crews, or (mis)perception by flight crews (fear of being blamed or constantly tracked).	No	None of the proposals under Option 1 or Option 2 affects the protection of the flight data source.
Excessive workload or overdemanding objectives, fatigue and risk of burnout for flight crews and/or management system / FDM staff.	Yes	None of the proposals under Option 1 or Option 2 affects the workload of flight crew members. The proposals under Option 1 may slightly and temporarily increase the workload of FDM staff. Very low-level negative social impact.
Inappropriate use or dissemination of flight data, which creates a risk of misuse by third parties (e.g. journalists, social media, law firms) or affects the dignity and/or career aspirations of flight crew members.	No	None of the proposals under Option 1 or Option 2 affects the protection of the flight data source.
Permanent internal tensions between staff members or departments making the place of work a source of stress for staff members.	No	None of the proposals under Option 1 or Option 2 affects the organisation of units inside an operator.
Positive social consequences		
Objective data supporting a fairer assessment of operations. Rates and trends help in finding deficiencies in SOPs and training, rather than focusing on individual flight crew members.	No	None of the proposals under Option 1 and Option 2 address how the output of the FDM programme are used to assess the operations.

Possible social consequences	Applicable to Options 1 and 2?	Social effect if applicable, or justification if not applicable
Support to flight crews' professional needs. Flight crew members feel that the FDM programme helps them to do a better job.	Yes	Option 1 and Option 2 introduce conditions that are necessary for the FDM programme to provide useful feedback to flight crew members: minimum flight collection rate, maximum time to process data after a flight, minimum set of risks to be monitored, etc. Hence, Option 1 and Option 2 make the FDM programme a better tool to support flight crew needs to understand and learn from in-flight events, or to ensure that a new flight technique or a new SOP is correctly implemented. An effective FDM programme may help solve such issues before they cause a reportable occurrence. Low-level positive social impact.
Smoothed working relationships between staff members and/or departments at the operator. Increased well-being at the place of work.	No	None of the proposals under Option 1 or Option 2 affects the working relationship between departments.

Social impact of Option 1

The level of social impact of Option 1 is considered to be **low positive (score of + 3)**, as the introduction of regulatory changes at the level of AMC/GM is expected to create a limited and temporary increase in workload for FDM staff, and better support to flight crews' professional needs (see Table 5.5).

Social impact of Option 2

The recommendations in the safety promotion material proposed under Option 2 would have the same content as the amendments proposed under Option 1. The social effect of Option 2 is significantly less than that of Option 1, as such recommendations would be implemented **on a voluntary basis**.

For this reason, the level of social impact of Option 2 is considered neutral (score of 0).

5.5.4. Economic impact

Economic impact on operators

Note: Operators in the scope of this IA are already required to implement an FDM programme, in accordance with ORO.AOC.130 or SPA.HOFO.145. Hence, these operators already bear costs related to the necessary hardware, software and services for collecting and processing data. They also already have staff designated to run the FDM programme. Hence, the impact discussed in this section is not the economic impact of implementing an FDM programme, but only the economic impact of the policy options defined in Section 5.3.

Option 1

For determining the economic impact of Option 1 on aeroplane operators in the scope of ORO.AOC.130 or ORO.FC.A.245 and helicopter offshore operators in the scope of SPA.HOFO.145, both impact on cost (negative economic impact) and impact on savings (positive economic impact) have been assessed.

For assessing the impact of Option 1 on cost, each individual AMC amendment introduced by this option (see Section 5.3.2) was reviewed to determine whether it could result in costs for aircraft operators (aeroplane operators in the scope of ORO.AOC.130 and helicopter offshore operators in the scope of SPA.HOFO.145) and the associated level of cost impact. For this purpose, it was checked whether each individual AMC amendment may have consequences with a negative economic impact, and the level of cost associated was determined (refer to Table A.4 of Appendix A). The detailed results are shown in Table B.1 of Appendix B to this document. It was found that only one AMC amendment may have a low-level impact on operators, with the other AMC amendments having no or a very low-level cost impact. In addition, Table 5.6 shows a summary of the possible negative economic consequences for an aircraft operator, their applicability to Option 1 and the assessed effect on cost. This table shows that, from four possible negative economic consequences, one has a low level of impact and three have a very low level of impact.

Therefore, the cost impact of Option 1 on aircraft operators is estimated to be low level.

Note: The GM amendments are considered to have a neutral impact on costs and savings, as GM is non-binding. It is considered that each aircraft operator would make its own assessment and only implement a given GM paragraph if it is economical for the operator.

For assessing the impact on savings, the AMC amendments introduced by Option 1 were not reviewed individually. Instead, the possible effects on savings of the AMC amendments taken altogether were assessed. Each possible consequence with a positive economic impact for aircraft operators (refer to Table A.4 of Appendix A) was assessed; if a possible consequence was found to be applicable to Option 1, an assessment of the level of savings was performed, using the economic impact scale presented in Table A.4 of Appendix A.

The potential savings brought by the AMC amendments for aircraft operators are summarised in Table 5.7. This table shows that reduced numbers of occurrences with a significant cost impact and more cost-efficient SRM are expected to generate low levels of savings, while other possible economic consequences are either not applicable to Option 1 or would create very low levels of savings.

Therefore, the impact of Option 1 on savings made by aircraft operators is estimated to be low level.

The overall economic impact of Option 1 on operators (taking into account the impact on cost and the impact on savings) is estimated to be neutral (score of 0).

Table 5.6. Review of possible costs for operators brought by Option 1

Possible negative economic consequences (costs)	Applicable to Option 1?	Effect on cost if applicable, or justification if not applicable, and level of saving
Change of airborne equipment (including certification, installation, purchasing download equipment and updating procedures to collect flight data).	Yes	If airborne equipment with extended capability may be needed to implement an AMC amendment, then this AMC amendment was made only applicable to aeroplanes and helicopters first issued with an individual CofA on or after [date of publication + 3 years]. Very low-level cost impact.
Change of FDM analysis software (including reprogramming of FDM algorithms, staff retraining and updating related procedures).	Yes	Some FDM software suites might need to be updated to allow the user to document FDM event validation. Some FDM software suites might need to be updated to allow automatic flight identification in the flight data. Very low-level cost impact.
Increased need for data analysis capabilities (e.g. because of more data to analyse and/or more advanced analysis skills needed), requiring recruitment or increasing the volume of analysis services contracted.	Yes	Some operators may need to document the principles they use for identifying significant FDM events. Some operators may need to implement a few more FDM algorithms to cover the minimum set of risk areas and airworthiness-related events. Many operators will need to establish or maintain documentation on flight parameters and FDM algorithms. Once such documentation is created, keeping it up to date will require a small amount of work. Low-level cost impact.
Changes to procedures regarding coordination with other departments, or changes to agreements with flight crew representatives.	Yes	Some operators may need to change their procedures to meet the time objective to process the data and analyse significant FDM events. Some operators may need to change their flight data retention policy and procedures. Many operators will need to establish a cross-reference table between occurrence classes as defined in occurrence reporting regulations and their FDM algorithms. This is an easy task. Very low-level cost impact.

Table 5.7. Review of possible savings for operators brought by Option 1

Possible positive economic consequences (savings)	**Applicable to Option 1?**	**Effect on savings if applicable, or justification if not applicable, and level of saving**
Reduced risk of occurrences with a significant cost impact (e.g. aircraft repair, grounded aircraft, passenger rights complaints, damaged company image).	Yes	Through better coverage of operations (at least 80 %) and better monitoring of common risk areas applicable to large aeroplanes, more adverse trends should be detected by operators before they result in expensive occurrences. Low-level impact on savings.
More cost-efficient SRM (e.g. more targeted risk assessments and risk mitigation measures).	Yes	More flight parameters available and better understanding of their FDM events by operators will support better safety risk assessment, one of the main steps of SRM. Low-level impact on savings.
Reduced maintenance cost (e.g. by using flight data for engine condition monitoring, by monitoring the use of brakes, by supporting maintenance troubleshooting, by saving on flight data recorder maintenance costs).	No	Option 1 does not address the use of flight data for maintenance.
Better fuel efficiency through monitoring of the usage of fuel.	No	Option 1 does not address the use of flight data for fuel efficiency.
Reduced flight crew training cost (e.g. if the operator has an ATQP or EBT).	No	Option 1 does not address the use of flight data for reducing flight crew training cost.
Increased confidence of the oversight authority, resulting in reduced oversight activities.	Yes	It is not certain that an operator will get credit from the improvements to its FDM programme brought by Option 1, as the FDM programme is just a component of the management system and an oversight authority rather assesses whether the overall implementation of the operator's management system is satisfactory. Very low-level impact on savings.
More efficient management of change (better-informed allocation of resources).	Yes	A more performant FDM programme might support management of change in some cases where FDM is a relevant data source. Very low-level impact on savings.
Decrease in insurance premiums.	Yes	There might be some leverage to reduce insurance premiums if the operator can demonstrate that it has a strong management system and very few events that are insurance cases. Being able

Possible positive economic consequences (savings)	Applicable to Option 1?	Effect on savings if applicable, or justification if not applicable, and level of saving
		to evidence an enhanced FDM programme and demonstrate improved safety may help for creating the conditions for decreasing insurance premiums. Very low-level impact on savings.

Option 2

The recommendations in the safety promotion material proposed under Option 2 would have the same content as the changes proposed under Option 1.

As this safety promotion material would be implemented on an ad hoc basis, it is considered that each aircraft operator would make its own assessment and only implement it if it is economical for the operator. **As a result, the economic impact of Option 2 on operators is estimated to be neutral or slightly positive (score of 0).**

Economic impact on manufacturers

Option 1

For determining the economic impact of Option 1 on aircraft manufacturers (large aeroplane manufacturers and helicopter manufacturers), both impact on cost (negative economic impact) and impact on savings (positive economic impact) have been assessed.

For assessing the impact on cost, each individual AMC amendment introduced by Option 1 (see Section 5.3.2) was reviewed to determine whether it could result in costs for aircraft manufacturers, and the associated level of cost impact. For this purpose, it was checked whether each individual AMC amendment may have consequences with a negative economic impact on aircraft manufacturers (refer to Table A.5 of Appendix A), and the level of cost associated was determined. The detailed results are shown in Table B.2 of Appendix B to this document. It was found that none of the AMC amendments have more than very low-level cost impact. In addition, Table 5.8 shows a summary of the possible negative economic consequences for an aircraft manufacturer, their applicability to Option 1 and the assessed effect on cost. This table shows that, from two possible negative economic consequences, one has no impact and the other one has a very low level of cost impact.

Therefore, the cost impact of Option 1 on aircraft manufacturers is estimated to be very low level.

For assessing the impact on savings, AMC amendments introduced by Option 1 were not reviewed individually. Instead, the possible effects on savings of the AMC amendments taken altogether were assessed. Each possible consequence with a positive economic impact for aircraft manufacturers (refer to Table A.5 of Appendix A) was assessed; if such a consequence was found to be applicable to Option 1, the level of savings for aircraft manufacturers was assessed. For assessing the level of savings, the economic impact scale presented in Table A.5 was used.

The potential savings brought by the AMC amendments for aircraft manufacturers are summarised in Table 5.9. This table shows that the following are expected to generate low levels of savings:

— reduced number of occurrences with a significant cost impact,

— better evidence to reduce the responsibility of the aircraft manufacturer after occurrences,

— enhanced support to continuing airworthiness and in-line assessment of new systems.

Other possible economic consequences are not applicable to Option 1. In addition, the GM amendments are considered to have a neutral impact on cost. **Therefore, the impact of Option 1 on savings made by aircraft manufacturers is estimated to be low level.**

In summary, the overall economic impact of Option 1 on aircraft manufacturers (taking into account the impact on cost and the impact on savings) is estimated to be low-level positive (score of + 3).

Table 5.8. Review of possible costs for aircraft manufacturers brought by Option 1

Negative positive economic consequences	**Applicable to Option 1?**	**Effect on cost if applicable, or justification if not applicable**
Change to aircraft design if the recording equipment needs to be updated (e.g. to meet new required capabilities).	No	AMC amendments that require airborne equipment with extended capability are only applicable to aeroplanes and helicopters first issued with an individual CofA on or after [date of publication + 3 years]. AMC amendments that require the use of specific flight parameters and that encompass already operated aircraft are applicable only when these specific flight parameters are collected.
Increased level of support to operators (e.g. questions on data frame, interpretation of parameters, event thresholds, shadow processing of data).	Yes	Aircraft manufacturers have the information on the data sources of flight parameters and information on the resolution and sampling rate of the flight parameters collected by the data acquisition unit of the flight data recorder. Some work to update flight parameter documentation might be needed. Very low-level cost impact.

Table 5.9. Review of possible savings for aircraft manufacturers brought by Option 1

Possible positive economic consequences	**Applicable to Option 1?**	**Effect on savings if applicable, or justification if not applicable**
Reduced risk of occurrences with a significant cost impact (e.g. grounded fleet, reduced number of orders due to damaged company or product image).	Yes	Specifying minimum performance of the FDM programmes (e.g. in terms of time to analyse the flight data, or of flight collection rate) and a minimum set of risks to be monitored with the FDM programme is expected to result in an overall increase of the capability of FDM programmes to detect trends and events that are precursors of accidents and serious incidents.

Possible positive economic consequences	Applicable to Option 1?	Effect on savings if applicable, or justification if not applicable
		This will contribute to a long-term overall reduction of the risk of occurrences with a significant cost impact on the aircraft manufacturer. Low-level impact on savings.
Better evidence to reduce the responsibility of the manufacturer (e.g. in case of an accident or incident investigation).	Yes	More information will be available to determine whether the aircraft design could have contributed to a reportable occurrence or to an accident or serious incident: • a minimum set of flight parameters to be collected (based on EUROCAE Document 112A) is specified; • the FDM programme should detect exceedances that indicate that the airworthiness of the aircraft may be immediately affected; • raw flight data should be retained for at least 2 years, so that the use of the aircraft in accordance with its limitations and the recommendations of the aircraft manufacturer can be verified. Low-level impact on savings.
Enhanced support to continuing airworthiness and in-line assessment of new systems, provided aircraft operators share their flight data.	Yes	The changes are expected to somewhat facilitate the support to continuing airworthiness or in-line assessment of new systems by the aircraft manufacturer, as follows. • The proposed minimum performance criteria (flight collection rate, time to analyse flight data, minimum set of flight parameters) are already met by many modern aircraft and therefore they are not considered a game changer for continuing airworthiness or in-line assessment of new systems. However, setting minimum performance criteria would in some cases significantly facilitate the technical support provided by aircraft manufacturers. In particular, if the aircraft manufacturer can always rely on a minimum set of recorded flight parameters to perform a technical analysis, they will not have to reconstruct these flight parameters or request a flight data recorder download. This will reduce costs associated with technical support to their operators for analysing significant occurrences. • The enhanced performance of FDM programmes will enable an earlier and more reliable identification of any potential safety issue with a new system or the way it is operated when

Possible positive economic consequences	Applicable to Option 1?	Effect on savings if applicable, or justification if not applicable
		entering into service, which can reduce costs (earlier identification allows for earlier corrective actions, so that fewer aircraft and operators are impacted). Low-level impact on savings.
New services based on flight data (provided aircraft operators share their flight data), such as: • customised training syllabi for flight crew; • predictive maintenance; • automatic troubleshooting; • solutions to optimise the aircraft maintenance programme, such as extending time intervals between maintenance tasks, based on information on the actual operations from flight data.	No	The changes are not expected to create more favourable conditions with regard to the development of new services based on flight data.

Option 2

The recommendations in the safety promotion material proposed under Option 2 would have the same content as the changes proposed under Option 1.

However, the economic effects of Option 2 are less than those of Option 1, as such recommendations would be implemented only by some EU-based operators. **Therefore, the overall economic impact of Option 2 on aircraft manufacturers is estimated to be very low-level positive (score of + 1).**

Economic impact on national competent authorities

Option 1 does not introduce any new requirement; it solely amends some of the AMC/GM to three points of the EU air operations rules (ORO.AOC.130, ORO.FC.A.245 and SPA.HOFO.145). The changes are very limited compared with the whole scope of management system oversight, so that they would only marginally affect the national competent authorities' oversight activities.

Therefore, the overall economic impact of Option 1 on national competent authorities is estimated to be very low-level negative (score of – 1).

Option 2 has no effect on the oversight activities of national competent authorities, as it only consists in producing non-binding safety promotion material. **Therefore, the overall economic impact of Option 2 on national competent authorities is estimated to be neutral (score of 0).**

Assessment of the overall economic impact on aviation stakeholders

Overall, Option 1 and Option 2 have a neutral economic impact on stakeholders (refer to Table 5.10).

In addition, Option 1 does not positively or negatively affect harmonisation of EU requirements with ICAO SARPs or with the aviation regulations of non-EU states, since minimum performance objectives of FDM programmes and minimum sets of risk to be monitored by an FDM programme are not addressed by ICAO SARPs or aviation regulations of non-EU states. Option 2 does not positively or negatively affect harmonisation of EU requirements with ICAO SARPs or with the aviation regulations of non-EU states, as it introduces only non-binding safety promotion material.

Question to stakeholders on the economic impacts. *Stakeholders are invited to provide quantified elements to justify the possible economic impacts of the options proposed, or alternatively propose other justified solutions to the issue.*

Table 5.10. Economic impact of the amendments introduced by Options 1 and 2 on stakeholders

	Option 0	**Option 1**	**Option 2**
Aircraft operators (aeroplanes and off-shore helicopters)	Neutral (0)	Low-level impact on cost Low-level impact on savings Overall economic impact: neutral (0)	Neutral (0)
Aircraft manufacturers	Neutral (0)	Very low-level impact on cost Low-level impact on savings Overall economic impact: low-level positive (+ 3)	Very low-level positive (+ 1)
National competent authorities	Neutral (0)	Very low-level negative (– 1)	Neutral (0)
All stakeholders	**Neutral (0)**	**Neutral (0)**	**Neutral (0)**

5.5.5. General Aviation and proportionality issues

Note: Refer to Appendix A to this document for an explanation of the impact of a policy option on General Aviation and proportionality.

Impact of Option 1

The policy options under this IA have no impact on non-commercial operations (refer to Appendix A). To assess the impact of Option 1 on small and medium-sized enterprises (SMEs), the two fictitious small commercial operators, A and H, described in Appendix A were considered.

Both impact on cost (negative economic impact) and impact on savings (positive economic impact) were assessed for operators A and H.

For assessing the impact of Option 1 on cost for operators A and H, each individual AMC amendment introduced by Option 1 was reviewed, using Table A.8 of Appendix A. In particular, it was assessed whether any individual AMC amendment might introduce a level of cost that would be proportionally higher for operator A or operator H than for larger operators.

It was found that the AMC amendments would probably generate a temporary low-level cost for operators A and H (please refer to Table B.3 of Appendix B to this document). In addition, the GM amendments are considered to have a neutral impact on cost.

Therefore, the cost impact of Option 1 on operators A and H is estimated to be low level, slightly higher than the cost impact of Option 1 on larger operators.

For assessing the impact on savings, AMC amendments introduced by Option 1 were not reviewed individually. Instead, the possible effects on savings of the AMC amendments taken altogether were assessed.

The potential savings brought by the AMC amendments for operators A and H would be of the same level as those identified for larger operators (see Section 5.5.4). In addition, the GM amendments are considered to have a neutral impact on cost. **Therefore, the impact of Option 1 on savings made by operators A and H is estimated to be low level, as is the impact of Option 1 on savings made by larger operators.**

The overall economic impact of Option 1 on operators A and H is estimated to be very low-level negative, while it is considered neutral when considering larger operators. **Therefore, it is assumed that Option 1 has a very low-level negative impact on proportionality (score of – 1).**

Impact of Option 2

The recommendations in the safety promotion material proposed under Option 2 would have the same content as the changes proposed under Option 1.

As this safety promotion material would be implemented on an ad hoc basis, it is considered that each small operator would make its own assessment and only implement it if it is economical for the operator. **As a result, the overall economic impact of Option 2 on small operators is estimated to be neutral, which means a neutral impact on proportionality (score of 0).**

5.6. Conclusion

Table 5.11 shows the results of the IA. Based on these results, **Option 1 is the preferred option**, as it has positive safety and social impacts, and no or very little economic impact or impact on the environment or proportionality.

This choice does not affect EASA activities to promote FDM industry best practice through the EOFDM (refer to Section 5.1), which are expected to continue. Rather, as Option 1 introduces new performance objectives and a minimum set of risk areas to be monitored, it is possible that this option increases the need of operators for sharing FDM industry good practice.

Question to stakeholders. *Stakeholders are invited to provide any other quantitative information they find necessary to bring to the attention of EASA.*

As a result, the relevant parts of the IA may be adjusted on a case-by-case basis.

Table 5.11. Results of Impact Assessment A[43]

Impact criteria	**Option 0 – 'No policy change'**	**Option 1 – 'Amend AMC/GM'**	**Option 2 – 'Safety promotion'**
Safety impact	Neutral (0)	Medium-level positive (+ 5) Option 1 increases the effectiveness of the SRM process and of the occurrence reporting process for many operators, and it is helpful for some safety issues included in EASA's safety risk portfolios.	Very low-level positive (+ 1) Option 2 increases the effectiveness of the SRM process and of the occurrence reporting process for some operators.
Environmental impact	Neutral (0)	Neutral (0)	Neutral (0)
Social impact	Neutral (0)	Low-level positive (+ 3) Option 1 better supports flight crews' professional needs. Option 1 does not affect the health or job security of staff, their job conditions or the protection of flight data against misuse.	Neutral (0) Option 2 does not affect the health or job security of staff, their job conditions or the protection of flight data against misuse.
Economic impact	Neutral (0)	Neutral (0) Option 1 has: • a neutral economic impact on operators (low level of savings generated by a reduced number of costly occurrences and more cost-efficient SRM, low level of cost); • a low-level positive economic impact on manufacturers (reduced number of costly occurrences, better evidence for establishing responsibilities after occurrences, enhanced support to continuous airworthiness and in-line assessment of new systems);	Neutral (0) Option 2 only introduces non-binding safety promotion material; therefore, it has a neutral economic impact on operators and national competent authorities. Option 2 has a very low-level positive economic impact on manufacturers.

43 A multicriteria analysis scale of – 10 to + 10, as described in Appendix A to this document, is used.

Impact criteria	**Option 0 – 'No policy change'**	**Option 1 – 'Amend AMC/GM'**	**Option 2 – 'Safety promotion'**
		• a very low-level negative impact on national competent authorities (minor changes to the oversight of operators' management systems).	
Impact on non-commercial aviation and on smaller organisations (proportionality)	Neutral (0)	Very low-level negative (– 1) Option 1 has no impact on non-commercial operations as it only applies to CAT operations with large aeroplanes and helicopters. Option 1 has a neutral or very low-level impact on operators that are SMEs (low level of cost compensated for by low level of savings).	Neutral (0) Option 2 only introduces non-binding safety promotion material.
Total (sum of score points)	0	+ 7	+ 1

6. Impact assessment B — better integration of the flight data monitoring programme in the operator's management system

6.1. What is the issue

The integration of FDM programmes in the management systems of operators is incomplete, which affects the effectiveness of these management systems.

The reasons for this effect are detailed below.

— **FDM programmes are often not well integrated with other processes of the management system.** While ORO.AOC.130 and SPA.HOFO.145 require the FDM programme to be integrated in the operator's management system, the feedback from standardisation findings (as summarised in EASA's 2019 and 2020 non-public Standardisation Annual Reports) revealed that, at some operators, the FDM programme and other processes of the management system are still disconnected. For instance, the following problems were found in the context standardisation inspections:

- at an operator, the FDM programme was not part of the data source used for steps 1 (identify the safety risks) and 2 (assess the safety risks) of the operator's SRM process;
- at another operator, there was no evidence of follow-up actions to address the potential safety risks detected with the FDM programme.

In addition, competent authorities tend to overlook this issue[44]. This situation seems to be exacerbated by the following.

- The absence of a clear link between the AMC/GM to ORO.GEN.200 ('Management system') on the one hand and the AMC/GM to ORO.AOC.130 and SPA.HOFO.145 ('Flight data monitoring') on the other hand.
- Ambiguous wording in the AMC/GM to ORO.AOC.130 and SPA.HOFO.145, which may be interpreted as recommending that safety risks are assessed and that remedial actions are put in place by the FDM programme in isolation. In fact, the FDM programme is only expected to support the SRM process that is run by the operator as part of its management system.
- Inconsistencies between the FDM-related conditions in AMC1 ORO.FC.A.245 and the AMC/GM to ORO.AOC.130.

— **The principles to be followed when handling FDM data in conjunction with other types of safety data to support the SRM process** (such as flight crew reports for which conditions regarding the protection of reporters are set in Regulation (EU) No 376/2014) **are unclear for many operators**. This situation seems to be exacerbated by the lack of clear conditions in the air operations rules and their AMC and GM. This creates a risk that FDM data is handled by an

[44] Task MST.0032 ('Oversight capabilities / focus areas') of Volume II of the 2023–2025 EPAS includes the following action:
(c) Organisations' management system in all sectors
Member States shall foster the ability of [national competent authorities] to assess and oversee the organisations' management system in all sectors. This shall […] consider inspection findings and safety information such as occurrences, incidents, and accidents and, where applicable, flight data monitoring (FDM).

operator in a way that is detrimental to a positive safety culture, and in turn degrades the quantity and quality of occurrence reports produced by flight crews. Ultimately, this can seriously degrade the effectiveness of the operator's management system.

— **Guidance is missing regarding the handling of FDM data, when it is used for purposes other than safety** (e.g. for supporting a fuel efficiency programme or a preventive maintenance programme). This creates a risk that FDM data is handled by an operator in a way that is detrimental to a positive safety culture, and in turn degrades the quantity and quality of occurrence reports produced by flight crews. Ultimately, this can seriously degrade the effectiveness of the operator's management system.

FDM programmes have been required to be integrated in the management systems of operators since ORO.AOC.130 and SPA.HOFO.145 were adopted (in 2012[45] and 2016[46], respectively); therefore, the issue considered in this assessment cannot be explained by recent changes to these requirements.

6.1.1. Safety risk assessment

As explained in Section 5.1.1 in relation to Impact Assessment A, a conventional method of risk assessment is simply not appropriate for assessing the safety benefits of an FDM programme.

Insufficient integration of the FDM programme in the operator's management system has detrimental effects on safety, through at least two types of impact:

— negative impact on risk detection and risk assessment made under the SRM process of the operator's management system, by not making adequate use of FDM data or by degrading the quality of flight crew reports;

— negative impact on the decision-making of the operator's SRM process, rendering decisions more difficult and uncertain, and the decided actions less relevant.

It should also be noted that EASA's safety risk portfolios include the safety issue 'Effectiveness of safety management'. This safety issue has a medium Safety Issue Priority Index score, and incomplete integration of an FDM programme with the operator's management system affects this safety issue[47].

Below is the full description of this safety issue, as provided in Volume III of the 2021–2025 EPAS:

Effectiveness of safety management (SI-0041)

Aviation organisations are required to implement safety management systems as part of their safety programmes. This issue reviews an ineffective implementation of safety management system by the aviation organisations. The complex nature of aviation safety and the significance of addressing HF aspects show the need for an effective management of safety by the aviation organisations. This issue covers the regulatory requirements and promotion of SMS principles, for both aviation authorities and organisations, and the capability to detect, anticipate and act upon new emerging threats and associated challenges. It also includes the settling of the adequate safety culture in organisations and authorities. This

[45] ORO.AOC.130 was adopted by the Air OPS Regulation.

[46] SPA.HOFO.145 was adopted by Commission Regulation (EU) 2016/1199 of 22 July 2016 amending the Air OPS Regulation.

[47] Note: The description of safety issue SI-0041 uses the term 'safety management system' to designate the operator's management system. Hence, SI-0041 is about the effectiveness of the operator's management system.

issue had deteriorated in the context of COVID-19 pandemic; refer to Reduced focus on, or prioritisation of safety (SI-5009).'

6.1.2. Who is affected

The stakeholders primarily affected by the issue described in Sections 6.1 and 6.1.1 are as follows.

— **Operators in the scope of ORO.AOC.130** (CAT operators of aeroplanes with an MCTOM of more than 27 000 kg)**, ORO.FC.A.245** (CAT operators of aeroplanes that implement an ATQP) **and SPA.HOFO.145** (CAT offshore operators of helicopters with an MCTOM of more than 3 175 kg). Incomplete integration of their FDM programme in their management systems is detrimental to the safety of air operations. As most of the operations with such aircraft are in commercial passenger transport, this means a decreased level of safety for these passengers.

— **Flight crew members.** This issue affects the implementation of adequate safeguards to protect the source of the FDM data, as required by ORO.AOC.130 and SPA.HOFO.145, and therefore creates a risk of this data being used in a manner that is detrimental to the career or the reputation of a flight crew member.

Stakeholders affected to a lesser extent by this issue are:

— **manufacturers of aircraft models in the scope of ORO.AOC.130, ORO.FC.A.245 or SPA.HOFO.145**, as the issue increases the risk of an accident with their products;

— **national competent authorities** (responsible for the oversight of the management system of their national operators).

The scope of this IA is limited to the AMC/GM to ORO.GEN.200, ORO.AOC.130, ORO.FC.A.245 and SPA.HOFO.145. EASA NPA 2022-11, issued on 20 December 2022, also contains proposed amendments to some AMC/GM to ORO.GEN.200, which have no impact on the proposed amendments in this NPA (refer to the detailed rationales of AMC1 ORO.GEN.200(a)(3) and AMC1 ORO.GEN.200(a)(6) in Section 4.2). EASA NPA 2022-11 was subject to public consultation until 20 March 2023.

This NPA has no impact on the theoretical knowledge of pilots.

6.1.3. How could the issue evolve

Without any corrective action, the implementation of the management systems of many operators will continue to be partially ineffective due to incomplete integration with FDM programmes. As a result, the capability of operators' management systems to detect and act upon new threats in a timely manner will remain insufficient.

6.2. What we want to achieve — objectives

The specific objective of this proposal is to enhance the safety of operations with large aeroplanes used for CAT, and of operations with large helicopters used for offshore CAT, by **introducing a clear framework for integrating FDM programmes in operators' management systems**.

To achieve this, it is necessary to:

— clarify how the FDM programme should interact with other processes of the operator's management system;

— clarify how FDM data should be handled when it is used in conjunction with other types of safety data (especially flight crew reports) to support the SRM; and

— clarify how FDM data should be handled when it is used for purposes other than safety.

6.3. How we want to achieve it — options

Two policy options, corresponding to two possible ways to address the issue, have been identified: do nothing or amend the regulatory framework. They are presented in Table 6.1.

Note: A policy option to promote better integration of the FDM programme in the operator's management system has not been retained for this IA, because the intent of such a policy option is already covered by the following EOFDM best-practices documents, which are either published or being developed.

— **EOFDM document *Breaking the Silos* (June 2019).** This document is the deliverable of safety promotion task SPT.077, Good practices for the integration of operator's FDM data with other safety data sources (refer to the 2017–2021 EPAS).

— **Deliverable of the safety promotion task SPT.0126, *Integrating the flight data monitoring programme with safety risk management*.** The delivery target is 2024 (refer to Volume II of the 2023–2025 EPAS).

Table 6.1. Selected policy options

Option No	Short title	Description
0	No policy change	No policy change (risks remain as outlined in the issue analysis).
1	Amend AMC/GM	Amend the AMC/GM to ensure complete integration of FDM programmes in the operators' management systems.

6.3.1. Option 0

Option 0 consists in maintaining the status quo without introducing any regulatory change or undertaking any kind of action.

6.3.2. Option 1

Option 1 consists in amending AMC/GM in Part-ORO and Part-SPA to establish a clear framework for complete integration of FDM programmes in operators' management systems. More specifically, it consists in the following.

— Adding the FDM programme to the safety information sources that should be used to support the SRM steps, in AMC1 ORO.GEN.200(a)(3).

— Specifying, in AMC1 ORO.GEN.200(a)(1), that the FDM programme is part of the responsibilities of the safety manager and of the safety review board.

— Reinforcing internal controls on the implementation of the FDM procedure to protect flight crew identity, by referring to FDM procedures in AMC1 ORO.GEN.200(a)(6). This AMC specifies the scope of the operator's compliance monitoring function.

— Clarifying, in AMC1 ORO.AOC.130, GM1 ORO.AOC.130, AMC1 SPA.HOFO.145 and GM1 SPA.HOFO.145, how the FDM programme should support the SRM process.

— Reconciling, in AMC1 ORO.AOC.130 and AMC1 SPA.HOFO.145, the conditions regarding the protection of flight crew identity in an FDM programme, with the principles regarding the protection of reporters in accordance with Regulation (EU) No 376/2014.

— Recommending, in GM1 ORO.GEN.200, that, if a data source that is needed to support SRM is required to be protected, then the safety policy of the operator provides consistent protection of this data source when it is used for all other purposes; and recommending, in GM1 ORO.AOC.130 and GM1 SPA.HOFO.145, that access to FDM data for purposes other than FDM is consistently framed by procedures to protect flight crew identity.

— Clarifying, in AMC1 ORO.FC.A.245, what information may be provided by the FDM programme to the ATQP responsible person and how this information should be handled.

None of the amendments introduced by Option 1 is expected to cause a change to airborne systems or airborne equipment on already operated aircraft; therefore, these amendments are applicable to all aircraft in the scope of the requirements considered (ORO.AOC.130 or SPA.HOFO.145) and not only newly manufactured aircraft.

Among the AMC amendments introduced by Option 1, some are expected to cause changes to the operator's procedures and/or to require agreement with flight crew representatives; therefore, a notice period of 2 years will be provided for their implementation. For this purpose, a deferred applicability date will be specified in the EASA ED Decision adopting these AMC amendments. The remaining amendments are not expected to affect the operator's procedure or agreements with flight crew representatives or to have any other potential consequence that would justify delaying their implementation (such as necessitating a change to FDM analysis software or the need to increase internal resources). Therefore, for the remaining amendments, no notice period is provided, meaning that they would become applicable within a few weeks after the date of publication of the EASA Decision.

Table 6.2 provides an overview of the amendments introduced by Option 1 to AMC1 ORO.GEN.200, AMC1 ORO.AOC.130 and AMC1 ORO.FC.A.245 (aeroplane operators).

Note 1: In Table 6.2, the changes to AMC are presented in a simplified form that may not show all the applicability conditions. The exact text of the proposed amendments can be found in Chapter 4.

Note 2: The changes to GM introduced by Option 1 are not presented in Table 6.2, but they can be found in Chapter 4. The GM paragraphs amended by Option 1 are GM1 ORO.AOC.130 and GM1 SPA.HOFO.245. In addition, Option 1 introduces a new GM paragraph, GM2 ORO.GEN.200(a)(2).

Table 6.2. Overview of the amendments introduced by Option 1 (unless specified, the amendments are equally applicable to aeroplanes and helicopters)

Description of amendment introduced by Option 1	**Amended or new AMC**	**Applicable to**
Introduce the following conditions: • the safety manager should ensure effective use of the FDM programme for SRM; • the safety review board should include the FDM programme in its monitoring of the effectiveness of the operator's safety management processes.	AMC1 ORO.GEN.200(a)(1)	Complex operators in the scope of ORO.AOC.130 or SPA.HOFO.145, as of [date of publication]
Introduce the following conditions: • hazard identification schemes should include the FDM programme when the latter is required; • safety performance monitoring and measurement should include the FDM programme, for those aircraft required to be included in such a programme.	AMC1 ORO.GEN.200(a)(3)	Complex operators in the scope of ORO.AOC.130 or SPA.HOFO.145, as of [date of publication + 2 years]
Introduce the following condition. Compliance monitoring should include procedures applicable to the FDM programme as part of management system procedures.	AMC1 ORO.GEN.200(a)(6)	Operators in the scope of ORO.AOC.130 or SPA.HOFO.145, as of [date of publication]
Link the condition regarding identification and assessment of safety risks and the monitoring of remedial actions with FDM to the identification of safety hazards, their evaluation and the management of associated risks that are required by ORO.GEN.200 ('Operator's management system').	AMC1 ORO.GEN.130 AMC1 SPA.HOFO.145	Operators in the scope of ORO.AOC.130 or SPA.HOFO.145, as of [date of publication]
Change the condition regarding education and publication as follows. The output of the FDM programme should be used, in compliance with the procedure specified in (k), to support the sharing of safety information with flight crew members and all other relevant personnel.	AMC1 ORO.GEN.130 AMC1 SPA.HOFO.145	Operators in the scope of ORO.AOC.130 or SPA.HOFO.145, as of [date of publication + 2 years]

Description of amendment introduced by Option 1	Amended or new AMC	Applicable to
Change the condition regarding withdrawal of confidentiality as follows. The procedure to prevent disclosure of flight crew identity should define the conditions under which the protection of the information source may be withdrawn. These conditions should be consistent with provisions laid out in Regulation (EU) No 376/2014 and the operator’s SRM procedures.	AMC1 ORO.GEN.130 AMC1 SPA.HOFO.145	Operators in the scope of ORO.AOC.130 or SPA.HOFO.145, as of [date of publication + 2 years]
Change the condition regarding FDM data gathering for an ATQP as follows. The FDM programme should provide to the ATQP responsible person information that is needed for ATQP purposes. Subject to the procedure to prevent disclosure of crew identity in AMC1 ORO.AOC.130, the level of detail of that information should enable targeted changes to the training programme to be set out.	AMC1 ORO.FC.A.245	Operators in the scope of ORO.FC.A.245, as of [date of publication + 2 years]
Rephrase the condition regarding FDM data handling in the framework of an ATQP as follows. The operator should establish a procedure to ensure confidentiality of FDM-based information transmitted to the ATQP responsible person, which should be consistent with the procedure to prevent disclosure of crew identity specified in AMC1 ORO.AOC.130.	AMC1 ORO.FC.A.245	Operators in the scope of ORO.FC.A.245, as of [date of publication + 2 years]

6.4. Methodology and data

Please refer to Section 10 (Appendix A).

6.5. What are the impacts

6.5.1. Safety impact

Note: As the amendments introduced by Option 1 are similar for aeroplane operators and offshore operators, the following is considered equally valid for these two categories of stakeholders.

The main possible safety consequences that are described in Table A.2 of Appendix A were reviewed to determine which are applicable to Option 1, and assess their safety effects. A summary of this assessment is presented in this section.

Moreover, this section provides the overall safety impact scoring for Option 1.

Possible safety consequences of Option 1

No negative safety consequences were found if Option 1 were to be implemented, only positive safety consequences.

An assessment of which of the possible safety consequences presented in Section 6.4.3 are applicable to Option 1 and of their safety effect was performed. The results of that assessment are presented in Table 6.3.

Table 6.3. Applicability of possible safety consequences to Option 1 and type of safety effect

Possible safety consequences	Applicable to Option 1?	Safety effect if applicable, or justification if not applicable
Negative safety consequences		
Misuse of flight data, for instance to blame/sanction flight crews, or (mis)perception by flight crews (fear of being blamed), that may result in a poor safety culture with a negative effect on safety.	No	Option 1 clarifies the protection of data sources and of reporters, through alignment with the occurrence reporting regulation, and by making clear that compliance monitoring should also look at correct implementation of FDM procedures. In the case of an ATQP, it clarifies that the FDM programme procedure to protect flight crew identity is applicable to data passed to the ATQP manager.
Flight crew members becoming more focused on their 'FDM performance' and less on good airmanship and compliance with the SOPs.	No	Option 1 does not include any monitoring of the FDM statistics of individual flight crew. Option 1 clarifies that the FDM programme should provide to the ATQP responsible person information that is needed for ATQP purposes, and not just FDM statistics.
Positive safety consequences		
More effective SRM (more complete and timely assessment of safety risks and better monitoring of mitigation measures) and better level of occurrence reporting.	Yes	Option 1 improves the integration of the operator's SRM with the FDM programme and the protection of flight crew members, which should contribute to more trust and ultimately better levels of reporting. Low-level positive safety impact.
Ensuring the continued airworthiness of the aircraft (lower risk of losing a critical system or part).	No	Option 1 does not address the continued airworthiness of aircraft in the scope of the FDM requirements.
Enabling predictive maintenance.	No	Option 1 does not address predictive maintenance.

Possible safety consequences	**Applicable to Option 1?**	**Safety effect if applicable, or justification if not applicable**
Better-trained flight crew (lower risk of errors, better preparation for abnormal situations and difficult operating conditions).	Yes	Option 1 clarifies the relevant information to be transmitted to the ATQP responsible person, for the few operators implementing an ATQP. Very low-level positive safety impact.
More effective oversight of FDM programmes by national competent authorities.	Yes	Option 1 introduces explicit references to the FDM programme in the AMC to ORO.GEN.200, which should drive more national competent authorities to check the implementation of the FDM programmes more systematically during their oversight of the management systems of operators. Low-level positive safety impact.
Enhancing the effectiveness and the evaluation of corrective actions for one or several safety issues included in EASA's safety risk portfolios.	Yes	Option 1 leads operators to use more systematically the FDM programme at each step of the SRM process, in particular for safety performance monitoring. By doing so, Option 1 improves the monitoring of those corrective actions of those EU-wide safety issues for which the use of FDM is relevant. Low-level positive safety impact.

Safety impact of Option 1

The level of safety impact of Option 1 is considered to be low positive (score of + 3), as it moderately increases the effectiveness of the SRM process and of the flight crew occurrence reporting process for all operators that are required to have an FDM programme, it moderately improves the oversight of FDM programmes, it supports better ATQP implementation and it contributes to enhancing the evaluation of corrective actions for some safety issues included in EASA's safety risk portfolios.

6.5.2. Environmental impact

Option 1 has no or very little effect on any of the types of environmental impact applicable to aircraft operation (refer to Appendix A). Therefore, the level of environmental impact of Option 1 is considered neutral (score of 0).

6.5.3. Social impact

Note: As the amendments introduced by Option 1 are similar for aeroplane operators and for offshore operators, the following is considered equally valid for these two categories of stakeholders.

The main possible social consequences that are described in Appendix A were reviewed to determine which are applicable to Option 1 and assess their effects. A summary of this assessment is presented in this section.

Moreover, this section provides the overall social scoring for Option 1.

Possible social consequences of Option 1

Table 6.4 shows the possible safety consequences that are applicable to Option 1 and the estimated safety effect.

Table 6.4. Applicability of possible social consequences to Option 1 and type of social effect

Possible social consequences	**Applicable to Option 1?**	**Social effect if applicable, or justification if not applicable**
Negative social consequences		
Use of flight data to blame/sanction flight crews, or (mis)perception by flight crews (fear of being blamed or constantly tracked).	No	Option 1 clarifies the protection of data sources and of reporters, through alignment with the occurrence reporting regulation, and by making clear that compliance monitoring should also look at correct implementation of FDM procedures. In the case of an ATQP, it clarifies that the FDM programme procedure to protect flight crew identity is applicable to data passed to the ATQP manager.
Excessive workload or overdemanding objectives, fatigue and risk of burnout for flight crews and/or management system / FDM staff.	Yes	Option 1 does not affect the workload of flight crew members. Option 1 may moderately and temporarily increase the workload of the staff running the management system and/or the FDM programme at some operators, through minor changes to procedures and ways of working at some operators. Very low-level negative social impact.

Possible social consequences	Applicable to Option 1?	Social effect if applicable, or justification if not applicable
Inappropriate use or dissemination of flight data, which creates a risk of misuse by third parties (e.g. journalists, social media, law firms) or affects the dignity and/or career aspirations of flight crew members.	No	Option 1 clarifies the protection of data sources and of reporters, through alignment with the principles in Regulation (EU) No 376/2014, by making clear that the compliance monitoring function should also look at the correct implementation of FDM procedures, and by addressing the case of use of flight data for purposes other than FDM.
Permanent internal tensions between staff members or departments making the place of work a source of stress for staff members.	No	Option 1 is considered to have no or a negligible effect on the quality of relationships between departments and staff members.
Positive social consequences		
Objective data supporting a fairer assessment of operations. Rates and trends help in finding deficiencies in SOPs and training, rather than focusing on individual flight crew members.	Yes	By clarifying that the safety risk assessments should be done in accordance with the SRM process, using FDM and other relevant safety sources together, and under the responsibility of the safety manager, Option 1 reduces the risk that assessments are unfair and unnecessarily focused on individual flight crew members. Low-level positive social impact.
Support to flight crews' professional needs. Flight crew members feel that the FDM programme helps them to do a better job.	No	Option 1 does not specifically address support to the professional needs of flight crew members.
Smoothed working relationships between staff members and/or departments at the operator. Increased well-being at the place of work.	No	Option 1 is considered to have no or a negligible effect on the quality of relationships between departments and staff members.

Social impact of Option 1

The social impact of Option 1 is considered to be overall **low-level positive (score of + 3)**, as Option 1 is expected to have the following social effects:

— a moderate and temporary increase in workload for staff in charge of the FDM programme and for staff in charge of the management system at some operators;

— a fairer assessment of operations that helps in finding deficiencies in SOPs and training, rather than focusing on individual flight crew members.

6.5.4. Economic impact

Economic impact of Option 1 on operators

Note: Operators in the scope of this IA are already required to implement an FDM programme, in accordance with ORO.AOC.130 or SPA.HOFO.145, or ORO.FC.A.245. Hence, these operators already bear costs related to the necessary hardware, software and services for collecting and processing data. They also already have staff designated to run the FDM programme. Hence, the impact discussed in this section is not the economic impact of implementing an FDM programme, but only the economic impact of the policy options defined in Section 6.3.

For determining the economic impact of Option 1 on aeroplane operators in the scope of ORO.AOC.130 or ORO.FC.A.245 and helicopter offshore operators in the scope of SPA.HOFO.145, both impact on cost (negative economic impact) and impact on savings (positive economic impact) have been assessed.

For assessing the impact of Option 1 on cost, each individual AMC amendment introduced by this option (see Section 6.3.2) was reviewed to determine whether it could result in costs for aircraft operators (aeroplane operators in the scope of ORO.AOC.130 or ORO.FC.A.245 and helicopter offshore operators in the scope of SPA.HOFO.145) and the associated level of cost impact. For this purpose, it was checked whether each individual AMC amendment may have consequences with a negative economic impact, and the level of cost associated was determined (refer to Table A.4 of Appendix A).

The detailed results are shown in Table C.1 of Appendix C to this document.

It was found that none of the AMC amendments have more than very low-level cost impact. Table 6.5 shows a summary of the possible negative economic consequences for an operator.

The GM amendments are considered to have a neutral impact on cost, as GM is non-binding: it is considered that each aircraft operator would make its own assessment and only implement a given GM paragraph if it is economical for the operator.

Therefore, the cost impact of Option 1 for operators is estimated to be very low level.

For assessing the impact on savings, AMC amendments introduced by Option 1 were not reviewed individually. Instead, the possible effects on savings of the AMC amendments taken altogether were assessed. Each possible consequence with a positive economic impact for aircraft operators was assessed (refer to Table A.4 of Appendix A); if a possible consequence was found to be applicable to Option 1, an assessment of the level of savings was performed, using the economic impact scale presented in Table A.4 of Appendix A.

The potential savings brought by the AMC amendments for aircraft operators are summarised in Table 6.6. This table shows that Option 1 generates very low levels of savings by slightly reducing the risk of expensive occurrences, making the SRM at some operators more cost-efficient, and creating conditions for reduced oversight and decreased insurance premiums for some operators. The GM amendments are considered to have a neutral impact on savings, as GM is non-binding.

Therefore, the impact of Option 1 on savings made by operators is estimated to be very low level.

Therefore, the overall economic impact of Option 1 on operators (taking into account the impact on cost and the impact on savings) is estimated to be neutral (score of 0).

Table 6.5. Review of possible costs for operators brought by Option 1

Possible negative economic consequences (costs)	**Applicable to Option 1?**	**Effect on cost if applicable, or justification if not applicable, and level of saving**
Change of airborne equipment (including certification, installation, purchasing download equipment and updating procedures to collect flight data).	No	Implementing Option 1 does not require any change to airborne equipment or associated download equipment.
Change of FDM analysis software (including reprogramming of FDM algorithms, staff retraining and updating related procedures).	No	Implementing Option 1 does not require any change to FDM analysis software.
Increased need for data analysis capabilities (e.g. because of more data to analyse and/or more advanced analysis skills needed), requiring recruitment or increasing the volume of analysis services contracted.	No	Implementing Option 1 does not require increasing data analysis capabilities.
Changes to procedures regarding coordination with other departments, or changes to agreements with flight crew representatives.	Yes	Option 1 may require: • minor changes to agreements with flight crew representatives regarding the FDM programme (as Option 1 provides for more consistent protection of flight crew identity, finding a new agreement with flight crew representatives is not considered challenging); • minor changes to SRM procedures; • minor changes to procedures regarding the communication of safety information stemming from the FDM programme; • minor changes to the compliance monitoring documentation. Very low-level cost impact.

Table 6.6. Review of possible savings for operators brought by Option 1

Possible positive economic consequences (savings)	**Applicable to Option 1?**	**Effect on savings if applicable, or justification if not applicable, and level of saving**
Reduced risk of occurrences with a significant cost impact (e.g. aircraft repair, grounded aircraft, passenger rights complaints, damaged company image).	Yes	Option 1 slightly contributes to enhancing the safety culture, harmonising with occurrence reporting processes and overall better SMS implementation, with a positive effect on the prevention of expensive occurrences. The proposed changes only affect a few procedures and clarify existing expectations. Very low-level impact on savings.
More cost-efficient SRM (e.g. more targeted risk assessments and risk mitigation measures).	Yes	Option 1 links more clearly the SRM steps specified in the AMC to ORO.GEN.200 ('Management system') with the FDM provisions in ORO.AOC.130 and SPA.HOFO.145. This will drive more operators to make extensive use of their FDM programme to support their SRM process. However, larger operators, which make most of the total earnings before interest and taxes for the EU-based operators, already implement the proposed changes. Therefore, the savings associated with more cost-efficient SRM would probably be limited when considering all EU-based operators together. Very low-level impact on savings.
Reduced maintenance cost (e.g. by using flight data for engine condition monitoring, by monitoring the use of brakes, by supporting maintenance troubleshooting, by saving on flight data recorder maintenance costs).	No	Option 1 does not address maintenance.
Better fuel efficiency through monitoring of the usage of fuel.	No	Option 1 does not address fuel efficiency.
Reduced flight crew training cost (e.g. if the operator has an ATQP or EBT).	No	Option 1 clarifies some FDM provisions in the AMC to ATQP requirements, but with no or little effect on training cost.
Increased confidence of the oversight authority, resulting in reduced oversight activities.	Yes	The compliance monitoring of operators would better cover the FDM programme and its consistent use to support the operator's management system. This and other factors might lead a national competent authority to decide to reduce oversight activities for some operators. Very low-level impact on savings.

Possible positive economic consequences (savings)	Applicable to Option 1?	Effect on savings if applicable, or justification if not applicable, and level of saving
More efficient management of change (better-informed allocation of resources).	Yes	The management of change is part of an operator's management system. Option 1 would make the FDM programme more useful for supporting the management of change. For example, FDM can be used to support changes to SOPs. Very low-level impact on savings.
Decrease in insurance premiums.	Yes	There might be some leverage to reduce insurance premiums if the operator can demonstrate that it has a strong SMS and very few events that are insurance cases. Being able to evidence an enhanced management system and demonstrate improved safety may help in creating the conditions for decreasing insurance premiums. Very low-level impact on savings.

Economic impact on manufacturers

For determining the economic impact of Option 1 on aircraft manufacturers (large aeroplane manufacturers and helicopter manufacturers), both impact on cost (negative economic impact) and impact on savings (positive economic impact) have been assessed.

For assessing the impact of Option 1 on cost, each individual AMC amendment introduced by this option (see Section 6.3.2) was reviewed to determine whether it could result in costs for aircraft manufacturers and the associated level of cost impact. For this purpose, it was checked whether each individual AMC amendment may have consequences with a negative economic impact on aircraft manufacturers, and the level of cost associated was determined (refer to Table A.5 of Appendix A).

The detailed results are shown in Table C.2 of Appendix C to this document.

It was found that none of the proposed changes causes any cost for aeroplane manufacturers or helicopter manufacturers.

The GM amendments are considered to have a neutral impact on cost.

Therefore, Option 1 is considered to have no cost impact on aircraft manufacturers.

For assessing the impact on savings, the AMC amendments introduced by Option 1 were not reviewed individually. Instead, the possible effects on savings of the AMC amendments taken altogether were assessed. Each possible consequence with a positive economic impact for aircraft manufacturers (refer to Table A.5 of Appendix A) was assessed; if a possible consequence was found to be applicable to Option 1, an assessment of the level of savings was performed, using the economic impact scale presented in Table A.5 of Appendix A.

The potential savings brought by the AMC amendments for aircraft manufacturers are summarised in Table 6.7. This table shows that Option 1 generates very low levels of savings by slightly reducing the risk of occurrences with significant cost impact for aircraft manufacturers. The GM amendments are considered to have a neutral impact on savings, as GM is non-binding.

Therefore, the impact of Option 1 on savings made by aircraft manufacturers is estimated to be very low level.

The overall economic impact of Option 1 on aircraft manufacturers (taking into account the impact on cost and the impact on savings) is estimated to be very low-level positive (score of + 1).

Table 6.7. Review of possible savings for aircraft manufacturers brought by Option 1

Possible safety consequences	**Applicable to Option 1?**	**Effect on savings if applicable, or justification if not applicable**
Reduced risk of occurrences with a significant cost impact (e.g. grounded fleet, reduced number of orders due to damaged company or product image).	Yes	Option 1 slightly contributes to enhancing the safety culture, harmonising with occurrence reporting processes and overall better SMS implementation, with a positive effect on the prevention of occurrences with a significant cost impact for the aircraft manufacturer. The proposed changes only affect a few procedures and clarify existing expectations. Very low-level impact on savings.
Better evidence to reduce the responsibility of the manufacturer (e.g. in case of an accident or incident investigation).	No	The changes do not provide for better evidence to reduce the responsibility of the manufacturer.
Enhanced support to continuing airworthiness and in-line assessment of new systems, provided aircraft operators share their flight data.	No	The changes do not facilitate the support to continuing airworthiness or in-line assessment of new systems by the aircraft manufacturer.
New services based on flight data (provided aircraft operators share their flight data), such as: • customised training syllabi for flight crew; • predictive maintenance; • automatic troubleshooting; • solutions to optimise the aircraft maintenance programme, such as extending time intervals between maintenance tasks, based on information on the actual operations from flight data.	No	The changes do not facilitate the development of new services based on flight data.

Economic impact on national competent authorities

Option 1 does not introduce any new requirement; it solely amends some of the AMC/GM to four points of the EU air operations rules (ORO.GEN.200, ORO.AOC.130, ORO.FC.A.245 and SPA.HOFO.145).

Option 1 should drive more national competent authorities to check the implementation of the FDM programmes more systematically during their oversight of the management systems of operators. On the other hand, with Option 1, the compliance monitoring of operators would better cover the FDM programme and its consistent use to support operators' management systems. This and other factors might lead a national competent authority to decide to reduce oversight activities for some operators.

Therefore, the economic impact of Option 1 on national competent authorities is estimated to be neutral (score of 0).

Assessment of the overall economic impact for aviation stakeholders

Overall, Option 1 has a neutral economic impact on stakeholders (refer to Table 6.8). In addition, Option 1 does not positively or negatively affect harmonisation of EU requirements with ICAO SARPs or with the aviation regulations of non-EU states, since the changes introduced by Option 1 are not addressed by ICAO SARPs or aviation regulations of non-EU states.

Question to stakeholders on the economic impacts. *Stakeholders are invited to provide quantified elements to justify the possible economic impacts of the options proposed, or alternatively propose other justified solutions to the issue.*

Table 6.8. Economic impact of the amendments introduced by Option 1 on stakeholders

	Option 0	**Option 1**
Aircraft operators	Neutral (0)	Neutral (0)
Aircraft manufacturers	Neutral (0)	Very low-level positive (+ 1).
National competent authorities	Neutral (0)	Neutral (0)
All stakeholders	**Neutral (0)**	**Neutral (0)**

6.5.5. General Aviation and proportionality issues

Note: Refer to Appendix A to this document for an explanation of the impact of the policy options on General Aviation and proportionality.

Non-commercial operations are outside the scope of ORO.AOC.130, ORO.FC.A.245 and SPA.HOFO.145, as these requirements only address CAT operations. The policy options under this IA therefore have no impact on non-commercial operations. To assess the impact of Option 1 on SMEs, the two fictitious small operators, A and H, described in Appendix A were considered.

Both impact on cost (negative economic impact) and impact on savings (positive economic impact) were assessed for operators A and H.

Each individual AMC amendment introduced by Option 1 was reviewed to determine whether this amendment could result in costs for operators A and H that are proportionally higher than for larger operators. For this review, Table C.1 of Appendix C to this document was used, as this table shows the cost impact of each individual AMC amendment on operators.

It was found that the cost impact of the AMC amendments introduced by Option 1 on operators A and H is very low level, as is the cost impact of these amendments on larger operators (refer to Section 6.5.4).

Therefore, the cost impact of Option 1 on operators A and H is estimated to be very low level, as is the cost impact of Option 1 on larger operators.

For assessing the impact of Option 1 on savings made by operators A and H, the AMC amendments introduced by Option 1 were not reviewed individually. Instead, Table 6.6 was used, as this table shows the impact of Option 1 on savings made by operators.

The potential savings brought by the AMC amendments for operators A and H would be very low level, as they are for larger operators. **Therefore, the impact of Option 1 on savings made by operators A and H is estimated to be very low level, as is the impact of Option 1 on savings made by larger operators.**

The overall economic impact of Option 1 on operators A and H is estimated to be similar to the economic impact on larger operators (refer to 5.5.4.1). Therefore, it is assumed that Option 1 has **a neutral impact on proportionality (score of 0)**.

6.6. Conclusion

Table 6.9 shows the results of this IA. Based on these results, **Option 1 is the preferred option**, as it has positive safety and social impacts, and no or very little environmental impact, economic impact and impact on proportionality.

This option does not affect current EASA activities to promote FDM industry best practice through the EOFDM, which are planned to continue (refer to Section 6.3).

Question to stakeholders. *Stakeholders are invited to provide any other quantitative information they find necessary to bring to the attention of EASA.*

As a result, the relevant parts of the IA may be adjusted on a case-by-case basis.

Table 6.9. Results of Impact Asssessment B[48]

Impact criteria	***Option 0 – 'No policy change'***	***Option 1 – 'Amend AMC/GM'***
Safety impact	Neutral (0)	Low-level positive (+ 3) Option 1: • moderately increases the effectiveness of the SRM process and of the flight crew occurrence reporting process for all operators that are required to have an FDM programme; • moderately improves the effectiveness of the oversight of FDM programmes; • supports better use of FDM for ATQP implementation; • contributes to enhancing the evaluation of corrective actions for some safety issues included in EASA's safety risk portfolios.
Environmental impact	Neutral (0)	Neutral (0) Option 1 does not affect aircraft noise levels, it does not affect aircraft engine emissions that contain pollutants and it has no effect on the climate.
Social impact	Neutral (0)	Low-level positive (+ 3) Option 1: • introduces a fairer assessment of operations for flight crew members; • may moderately and temporarily increase the workload of the staff running the management system and/or the FDM programme.
Economic impact	Neutral (0)	Neutral (0) Option 1: • has a neutral economic impact on aircraft operators (very low-level cost impact and very low-level impact on savings); • has a very low-level positive economic impact on aircraft manufacturers;

48 A multicriteria analysis scale of – 10 to + 10, as described in Appendix A to this document, is used.

Impact criteria	***Option 0 – 'No policy change'***	***Option 1 – 'Amend AMC/GM'***
		• has a neutral economic impact on national competent authorities.
Impact on non-commercial aviation and on smaller organisations (proportionality)	Neutral (0)	Neutral (0) Option 1 has no impact on non-commercial operations as it only applies to CAT operations with large aeroplanes and helicopters. Option 1 does not have more impact on operators that are SMEs than on other operators.
Total (sum of score points)	0	+ 6

7. Monitoring and evaluation

No specific monitoring or evaluation of the proposed amendments is foreseen, except the existing standardisation activities and exchange between EASA and the relevant stakeholders, which should identify any emerging issues.

8. Proposed actions to support implementation

No specific actions to support the implementation of the proposed amendments is foreseen, except the existing standardisation activities and exchange between EASA and the relevant stakeholders.

9. References

9.1. Related EU regulations

- Regulation (EU) 2018/1139 of the European Parliament and of the Council of 4 July 2018 on common rules in the field of civil aviation and establishing a European Union Aviation Safety Agency, and amending Regulations (EC) No 2111/2005, (EC) No 1008/2008, (EU) No 996/2010, (EU) No 376/2014 and Directives 2014/30/EU and 2014/53/EU of the European Parliament and of the Council, and repealing Regulations (EC) No 552/2004 and (EC) No 216/2008 of the European Parliament and of the Council and Council Regulation (EEC) No 3922/91.
- Regulation (EU) No 376/2014 of the European Parliament and of the Council of 3 April 2014 on the reporting, analysis and follow-up of occurrences in civil aviation, amending Regulation (EU) No 996/2010 of the European Parliament and of the Council and repealing Directive 2003/42/EC of the European Parliament and of the Council and Commission Regulations (EC) No 1321/2007 and (EC) No 1330/2007.
- Commission Implementing Regulation (EU) 2015/1018 of 29 June 2015 laying down a list classifying occurrences in civil aviation to be mandatorily reported according to Regulation (EU) No 376/2014 of the European Parliament and of the Council.
- Commission Delegated Regulation (EU) 2020/2034 of 6 October 2020 supplementing Regulation (EU) No 376/2014 of the European Parliament and of the Council as regards the common European risk classification scheme.
- Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC.
- 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.
- Commission Regulation (EC) No 859/2008 of 20 August 2008 amending Council Regulation (EEC) No 3922/91 as regards common technical requirements and administrative procedures applicable to commercial transportation by aeroplane.
- Commission Regulation (EU) 2018/395 of 13 March 2018 laying down detailed rules for the operation of balloons pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council.
- Commission Regulation (EU) 2018/1976 of 14 December 2018 laying down detailed rules for the operation of sailplanes pursuant to Regulation (EU) 2018/1139 of the European Parliament and of the Council.

9.2. Related EASA decisions

Not applicable.

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[49] This document is not public.

[50] This document is not public.

[51] This document is not public.

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[52] This document is not public.
[53] This document is not freely available.
[54] This document is not public.
[55] This document is not public.
[56] This document is not public.
[57] This document is not public.
[58] This document is not public.
[59] This document is not public.

10. Appendices

Appendix A — Methodology and data used for conducting IAs A and B

Methodology applied: multicriteria analysis

The methodology applied for IAs A and B is multicriteria analysis (MCA), which enables all the options to be compared by scoring them against a set of criteria (in the case of EASA: safety, environmental, social, economic and proportionality criteria).

The MCA covers a wide range of techniques that aim to combine a variety of positive and negative impacts into a single framework to allow for an easier comparison of scenarios.

The MCA key steps in this IA include the following:

— establishing the criteria to be used for comparing the options (these criteria must be measurable, at least in qualitative terms);

— scoring how well each option meets the criteria; the scoring needs to be relative to the baseline scenario (Option 0);

— ranking the options by combining their scores.

The criteria used to compare the options were derived from the Basic Regulation, and the guidelines for the IA were developed by the European Commission. The principal objective of the Basic Regulation, in accordance with its Article 1(1), is to 'establish and maintain a high uniform level of civil aviation safety in the Union'. As additional objectives, the Basic Regulation identifies environmental, economic, proportionality and harmonisation aspects, which are reflected below.

For the scoring of the impacts, a scale of – 10 to + 10 is used to indicate the negative and positive impacts of each option (i.e. from 'very high' to 'very low' negative impacts and 'very low' to 'very high' positive impacts). The general scale and related scores presented in Table A.1 were used as a basis to develop specific scales for each criterion.

Table A.1. Scale used for the scoring of impacts

Level of impact	**Score**
Very high negative	– 10
High negative	– 7
Medium negative	– 5
Low negative	– 3
Very low negative	– 1
Neutral	0
Very low positive	+ 1
Low positive	+ 3
Medium positive	+ 5
High positive	+ 7
Very high positive	+ 10

Data collection

Information about EU-based fleets was collected from Cirium's Fleets Analyzer in order to support the assessment of impact of policy options on operators. Fleets Analyzer is an online tool for accessing Cirium's fleets database[60]. Cirium's fleets database is updated every 24 hours and includes detailed information of close to half a million aircraft worldwide.

The extracted fleets include aeroplanes with an MCTOM exceeding 27 000 kg and helicopters with an MCTOM exceeding 3 175 kg that:

— were operated by operators based in EASA Member States for CAT (military and state operators and aircraft excluded); and

— were in service or in temporary storage.

Information about instrument flight rules (IFR) traffic was collected from Eurocontrol's STATFOR dashboard in order to support the assessment of the economic impact of the COVID-19 pandemic and Russia's war of aggression against Ukraine on aeroplane operators. The extracted data includes the number of IFR flights (including departures, arrivals, internal flights and overflights) in the airspace of all EASA Member States except Iceland, for the period 2019–2022. The data extraction was performed on 12 January 2023.

Information about flight hours was collected from published HeliOffshore dashboards in order to support the assessment of the economic impact of the COVID-19 pandemic and Russia's war of aggression against Ukraine on helicopter offshore operators. The data considered was thate published on the HeliOffshore website.

Method to assess the safety impact of policy options

As explained in Section 5.1.1, the FDM programme is a source of information supporting several safety-critical processes for which the operator is responsible and several safety issues in EASA's safety risk portfolios, but the FDM programme is not a safety-critical process per se.

Hence, the safety impact of a policy option under IA A or B is mainly driven by the following.

— How much this option may contribute to enhancing (or degrading) operators' safety-critical processes, by better (or not) informing these processes. However, other essential components of an operator's safety-critical process, such as decision-making, defining actions and implementing actions, do not depend on the FDM programme.

— How much this option may affect the safety issues managed through EASA's safety risk portfolios.

The effect of such a policy option on an operator's safety-critical process will probably remain limited in most cases. The same applies to safety issues managed through EASA's safety risk portfolios. Subsequently, it is assumed that the impact of such a policy option on safety remains in the range of medium negative to medium positive.

[60] Cirium has not seen or reviewed any conclusions, recommendations, or other views that may appear in this document. Cirium makes no warranties, express or implied, as to the accuracy, adequacy, timeliness, or completeness of its data or its fitness for any particular purpose. Cirium disclaims any and all liability relating to or arising out of use of its data and other content or to the fullest extent permissible by law.

Table A.2 contains the scale used for assessing the safety impact of policy options under IAs A and B. This table also includes an inventory of the main possible safety consequences of policy options identified in the framework of these IAs.

Table A.2. Specific scale used to assess the safety impact of policy options

Level of safety impact	**Description of the level of safety impact**	**Main possible safety consequences**
Negative safety impacts		
Medium negative (score: – 5)	The policy option **significantly** decreases the effectiveness of at least one safety-critical process of the operator, or the effectiveness of FDM-based corrective actions for safety issues included in EASA's safety risk portfolios. Examples • The policy option results in a safety-critical process of the operator not being able to monitor some important risk areas. • The policy option makes decision-making for a safety-critical process of the operator significantly more difficult and uncertain.	• Misuse of flight data, for instance to blame/sanction flight crews, or (mis)perception by flight crews (fear of being blamed), that may result in a poor safety culture with a negative effect on safety. • Flight crew members becoming more focused on their 'FDM performance' and less on good airmanship and compliance with the SOP.
Low negative (score: – 3)	The policy option **moderately** decreases the effectiveness of at least one safety-critical process of the operator, or the effectiveness of FDM-based corrective actions for safety issues included in EASA's safety risk portfolios. Examples • The policy option decreases the quality of some data needed by a safety-critical process of the operator. • The policy option increases the probability that events or a failure relevant for a safety-critical process of the operator remain undetected or are detected too late.	
Very low negative (score: – 1)	The policy option **marginally** affects the effectiveness of any safety-critical process of the operator and of FDM-based corrective actions for safety issues included in EASA's safety risk portfolios.	
Positive safety impacts		
Very low positive (score: + 1)	The policy option **marginally** increases the effectiveness of at least one safety-critical process of the operator, or the effectiveness of FDM-based corrective actions for safety issues included in EASA's safety risk portfolios.	• Enhanced management system implementation: more effective SRM (more complete and timely

Low positive (score: + 3)	The policy option **moderately** increases the effectiveness of at least one safety-critical process of the operator, or the effectiveness of FDM-based corrective actions for safety issues included in EASA's safety risk portfolios. Examples • The policy option enhances the quality of some data needed by a safety-critical process of the operator. • The policy option makes decision-making for a safety-critical process of the operator easier. • The policy option helps reduce the probability that events or a failure relevant for a safety-critical process of the operator remain undetected or are detected too late.	assessment of safety risks and better monitoring of mitigation measures) and better level of occurrence reporting by flight crew members. • Ensuring the continued airworthiness of the aircraft (lower risk of losing a critical system or part). • Enabling predictive maintenance. • Better-trained flight crew (lower risk of errors, better preparation for abnormal situations and difficult operating conditions). • More effective oversight of FDM programmes by national competent authorities. • Enhancing the effectiveness and the evaluation of FDM-based corrective actions for one or several safety issues included in EASA's safety risk portfolios.
Medium positive (score: + 5)	The policy option **significantly** increases the effectiveness of at least one safety-critical process of the operator, or the effectiveness of FDM-based corrective actions for safety issues included in EASA's safety risk portfolios. Examples • The policy option results in a safety-critical process of the operator discovering or monitoring important risk areas that were not monitored until now. • The policy option makes decision-making for a safety-critical process of the operator significantly better (more proportionate, more targeted) or allows issues to be addressed that could not be correctly addressed otherwise.	

Method to assess the economic impact of policy options

In 2018, EASA developed — with a task force of its Stakeholder Advisory Body (hereafter designated 'SAB TF eco') — a scale to define the different levels of sustainability for cost impacts of regulatory changes. This resulted in the definition of a cost impact scale based on total earnings before interest and taxes (EBIT) (commonly called 'profit margin').

Note: This cost impact scale is meant for assessing total cost impacts on stakeholders, not cost impacts on an individual organisation. In addition, this cost impact scale was developed before the COVID-19 pandemic. Therefore, it is to be used as guidance and to be put into context. An approximative timing for the implementation of the proposed amendments to AMC/GM is, at the earliest, second half of 2024, with a transitional period of 2 years for some requirements. It is assumed that, by that time, the operators in the scope of points ORO.AOC.130 and SPA.HOFO.145 have recovered from the economic losses caused by the COVID-19 pandemic in terms of flights and financial situation. Table A.3 illustrates the recovery of European air traffic after the COVID-19 pandemic.

Based on the cost impact scale of the SAB TF eco, specific scales have been defined to help assess the economic impact of the policy options of IAs A and B on operators and on manufacturers: see Tables A.4 (for both aeroplane operators and offshore operators) and A.5 (for aircraft manufacturers). Tables A.4 and A.5 also include an inventory of the main possible economic consequences that policy options identified in the framework of these IAs might have.

Note: Guidance on the costs and savings brought by an operator's management system is considered relevant for assessing the economic impact of policy options under IA A or B (since FDM is part of the management system as per points ORO.AOC.130 and SPA.HOFO.145). A reference document is *Determining the Value of SMS* (2016)[61]. This document includes an example of cost–benefit analysis related to introducing FDM. In addition, changes to FDM programme implementation may have an economic impact on other departments and other activities run by the operator. For instance, Chapter III of the EOFDM document *Breaking the Silos*[62] identifies several possible additional benefits of an FDM programme.

Table A.3. Number of IFR flights (departures, arrivals, internal flights, overflights) in the airspace of all EASA Member States except Iceland, for 2019–2022

Year	Number of IFR flights	Variation compared with 2019 (%)
2019	9 984 834	Not applicable
2020	4 455 611	– 55.4
2021	5 499 117	– 44.9
2022	8 344 918	– 16.4

Source: Eurocontrol's STATFOR dashboard.

[61] Safety Management International Collaboration Group, *Determining the Value of SMS*, 2016 (https://skybrary.aero/sites/default/files/bookshelf/3427.pdf).

[62] EOFDM, *Breaking the Silos*, 2019 (https://www.easa.europa.eu/downloads/96903/en).

Table A.4. Specific scale used to assess the economic impact of a policy option on operators

<table>
<tr><th>Level of economic impact</th><th>Score</th><th>Percentage of total EBIT</th><th>Main possible economic consequences</th></tr>
<tr><td colspan="4">Negative economic impacts</td></tr>
<tr><td>Very high</td><td>– 10</td><td>More than 16.7 %</td><td rowspan="5">Change of airborne equipment (including certification, installation, purchasing download equipment and updating procedures to collect flight data).
Change of FDM analysis software (including reprogramming of FDM algorithms, staff retraining and updating related procedures).
Increased need for data analysis capabilities (e.g. because of more data to analyse and/or more advanced analysis skills needed), requiring recruitment or increasing the volume of analysis services contracted.
Changes to procedures regarding coordination with other departments, or changes to agreements with flight crew representatives.</td></tr>
<tr><td>High</td><td>– 7</td><td>More than 10 %</td></tr>
<tr><td>Medium</td><td>– 5</td><td>More than 3.3 %</td></tr>
<tr><td>Low</td><td>– 3</td><td>More than 0.8 %</td></tr>
<tr><td>Very low</td><td>– 1</td><td>More than 0.3 %</td></tr>
<tr><td colspan="4">Positive economic impacts</td></tr>
<tr><td>Very low</td><td>+ 1</td><td>More than 0.3 %</td><td rowspan="5">Reduced risk of occurrences with a significant cost impact (e.g. aircraft repair, grounded aircraft, passenger rights complaints, damaged company image).
More cost-efficient SRM (e.g. more targeted risk assessments and risk mitigation measures).
Reduced maintenance cost (e.g. by using flight data for engine condition monitoring, by monitoring the use of brakes, by supporting maintenance troubleshooting, by saving on flight data recorder maintenance costs).
Better fuel efficiency through monitoring of the usage of fuel.
Reduced flight crew training cost (e.g. if the operator has an ATQP or EBT).
Increased confidence of the oversight authority, resulting in reduced oversight activities.
More efficient management of change (better-informed allocation of resources).
Decrease in insurance premiums.</td></tr>
<tr><td>Low</td><td>+ 3</td><td>More than 0.8 %</td></tr>
<tr><td>Medium</td><td>+ 5</td><td>More than 3.3 %</td></tr>
<tr><td>High</td><td>+ 7</td><td>More than 10 %</td></tr>
<tr><td>Very high</td><td>+ 10</td><td>More than 16.7 %</td></tr>
</table>

Table A.5. Specific scale used to assess the economic impact of a policy option on aircraft manufacturers

<table>
<tr><th>Level of economic impact</th><th>Score</th><th>Percentage of total EBIT</th><th>Main possible economic consequences</th></tr>
<tr><td colspan="4">Negative economic impacts</td></tr>
<tr><td>Very high</td><td>– 10</td><td>More than 16.7 %</td><td rowspan="5">Change to aircraft design if the recording equipment needs to be updated (e.g. to meet new required capabilities).
Increased level of support to operators (e.g. questions on data frame, interpretation of parameters, event thresholds, shadow processing of data).</td></tr>
<tr><td>High</td><td>– 7</td><td>More than 10 %</td></tr>
<tr><td>Medium</td><td>– 5</td><td>More than 3.3 %</td></tr>
<tr><td>Low</td><td>– 3</td><td>More than 0.8 %</td></tr>
<tr><td>Very low</td><td>– 1</td><td>More than 0.3 %</td></tr>
<tr><td colspan="4">Positive economic impacts</td></tr>
<tr><td>Very low</td><td>+ 1</td><td>More than 0.3 %</td><td rowspan="5">Reduced risk of occurrences with a significant cost impact (e.g. grounded fleet, reduced number of orders due to damaged company or product image).
Better evidence to reduce the responsibility of the manufacturer (e.g. in case of an accident or incident investigation).
Enhanced support to continuing airworthiness and in-line assessment of new systems provided aircraft operators share their flight data.
New services based on flight data (provided aircraft operators share their flight data), such as:
customised training syllabi for flight crew;
predictive maintenance;
automatic troubleshooting;
solutions to optimise the aircraft maintenance programme, such as extending time intervals between maintenance tasks, based on information on the actual operations from flight data.
Example: intervals between checks relative to corrosion may be linked to the actual number of flight hours operated</td></tr>
<tr><td>Low</td><td>+ 3</td><td>More than 0.8 %</td></tr>
<tr><td>Medium</td><td>+ 5</td><td>More than 3.3 %</td></tr>
<tr><td>High</td><td>+ 7</td><td>More than 10 %</td></tr>
<tr><td>Very high</td><td>+ 10</td><td>More than 16.7 %</td></tr>
</table>

Level of economic impact	Score	Percentage of total EBIT	Main possible economic consequences
			in an offshore environment, instead of the fixed numbers usually given in the maintenance planning documentation of the aircraft manufacturer.

Method to assess the impact of options on General Aviation and proportionality

When considering air operations, the impact of a policy option on General Aviation and proportionality can be described as the impact that this policy option has on operators that are small or medium-sized enterprises (SMEs) and on non-commercial operations.

Non-commercial operations are outside the scope of ORO.AOC.130, ORO.FC.A.245 and SPA.HOFO.145, as these requirements only address CAT operations. Therefore, only the impact of policy options on operators that are SMEs needs to be considered.

According to the European Commission's User Guide to the SME Definition[63], the main criteria to qualify an enterprise as medium-sized, small or micro are the staff headcount and either the turnover or the balance sheet total. See Table A.6.

Note: For partner enterprises (e.g. another enterprise holds more than 25 % of capital or of voting rights) or linked enterprises (forming a group, for example through franchise), additional criteria apply with regard to the computation of staff headcount and turnover.

Table A.6. European Commission criteria for determining whether an enterprise is an SME, and the applicable category

Company category	**Staff number**	**Turnover**	or **Balance sheet total**
Medium-sized	< 250	EUR ≤ 50 million	EUR ≤ 43 million
Small	< 50	EUR ≤ 10 million	EUR ≤ 10 million
Micro	< 10	EUR ≤ 2 million	EUR ≤ 2 million

Commercial air transport aeroplane operators

It is assumed that operators of aeroplanes with an MCTOM of over 27 000 kg have a turnover of significantly more than EUR 200 000 per staff member. Therefore, for simplification it is proposed to consider turnover as the main criterion and to assume that an operator whose turnover is below the

[63] European Commission, *User Guide to the SME Definition*, 2020 (https://ec.europa.eu/docsroom/documents/42921).

threshold value for a given company category will also have a staff headcount that is less than the corresponding staff headcount threshold for that company category.

In addition, it is assumed that operators of aeroplanes with an MCTOM of over 27 000 kg employ more than 20 full-time-equivalent staff. Therefore:

— the case of the category 'micro' can be excluded for operators in the scope of ORO.AOC.130; and

— such operators will fall into the category 'complex operator' in accordance with the AMC/GM to ORO.GEN.200 ('Management system').

A review of operators of the 248 aeroplane operators in the scope of ORO.AOC.130 shows that 54 of them operate only one aeroplane with an MCTOM of over 27 000 kg. While some of these 54 operators also operate other, lighter aircraft, others only operate one aeroplane (typically charter operators or cargo operators).

In addition, public information related to various operators shows that they employ on average 10–20 pilots per aeroplane. The number of employees per aeroplane is very variable as it also depends on the type of aircraft operated and the type of operation (passengers or cargo, scheduled or unscheduled), but it seems to be no less than 30 employees. Likewise, the turnover per aeroplane is very variable (depending on the aircraft payload / passenger capacity), but it usually exceeds EUR 20 million per aeroplane.

Based on this information, to assess proportionality for operators of aeroplanes in the scope of ORO.AOC.130, it is proposed to only consider the case of a fictitious very small operator designated 'operator A' and operating just one aeroplane with an MCTOM of over 27 000 kg. It is assumed that this operator employs 30 employees, of whom 10 are pilots, and that it has a turnover of EUR 20 million and an EBIT of 6 % of the turnover (same as provided by the economic scale of EASA and the SAB TF eco for full services and regional airlines). See Table A.7.

Table A.7. Fictitious very small operators considered for the proportionality assessment

	Fleet	**Number of pilots**	**Total staff number (including pilots)**	**Turnover**	**EBIT**
Operator A	1 aeroplane with MCTOM exceeding 27 000 kg	10	30	EUR 20 million	EUR 20 million × 6 % = EUR 1.2 million
Operator H	5 helicopters with MCTOM exceeding 3 175 kg, of which 1 is used for CAT	20	60	EUR 15 million	EUR 15 million × 3 % = EUR 450 000

	offshore operations				

Commercial air transport offshore helicopter operators

A review of the 27 helicopter operators in the scope of SPA.HOFO.145 shows that 12 of them only operate one helicopter with an MCTOM of over 3 175 kg for CAT offshore operations. However, all 12 of these helicopter operators operate several helicopters for onshore operations.

In addition, public information related to helicopter offshore operators shows that they typically employ 12–16 staff members per helicopter and that a typical number of pilots per helicopter is four or five, subject to roster patterns and operational needs. Typical turnover per helicopter is between EUR 3 million and EUR 7 million. This is a very approximate estimate, as some operators have additional non-aircraft revenue streams, which will affect this figure.

Based on this information, to assess proportionality for operators of helicopters in the scope of SPA.HOFO.145, it is proposed to only consider the case of a fictitious very small operator designated 'operator H', with EUR 15 million turnover; 60 staff members, of whom 20 are pilots; operating five helicopters with an MCTOM of over 3 175 kg, out of which one is for offshore operations and the other four are for onshore operations; and an EBIT of 3 % of the turnover (same as provided by the economic scale of EASA and the SAB TF eco for full services and regional airlines). See Table A.7.

Proportionality impact scale

The cost impact scales of policy options on the two fictitious small operators were determined by applying the EBIT percentage thresholds, as defined in the economic scale of EASA and the SAB TF eco, to these fictitious operators. See Table A.8. This table includes an inventory of the main possible economic consequences that policy options might have on a small operator.

Table A.8. Specific scale used to assess the economic impact of a policy option on aircraft operators that are SMEs

Level of (negative) cost impact on SMEs	**Score**	**Percentage of EBIT**	**Total estimated economic impact in EUR / year (rounded to the nearest thousand)**		**Main possible economic consequences**
			Fictitious operator A	**Fictitious operator H**	
Very low	– 1	More than 0.3 %	More than EUR 4 000/year	More than EUR 1 000/year	• **Change of airborne equipment** (including certification, installation, purchasing download equipment and updating procedures to collect flight data).
Low	– 3	More than 1.7 %	More than EUR 20 000/year	More than EUR 8 000/year	
Medium	– 5	More than 3.3 %	More than EUR 40 000/year	More than EUR 15 000/year	
High	– 7	More than 10 %	More than EUR 120 000/year	More than EUR 45 000/year	

Level of (negative) cost impact on SMEs	**Score**	**Percentage of EBIT**	**Total estimated economic impact in EUR / year (rounded to the nearest thousand)**		**Main possible economic consequences**
			Fictitious operator A	**Fictitious operator H**	
Very high	– 10	More than 16.7 %	More than EUR 200 000/year	More than EUR 75 000/year	• **Change of FDM analysis software** (including reprogramming of FDM algorithms, staff retraining and updating related procedures). • **Increased need for data analysis capabilities** (e.g. because of more data to analyse and/or more advanced analysis skills needed), requiring recruitment or increasing the volume of analysis services contracted. • **Changes to procedures** regarding coordination with other departments, **or changes to agreements** with flight crew representatives.

Method to assess the social impact of policy options

In general terms, social impacts may include impacts on:

— employment and the labour market;

— working hours and working conditions (e.g. training), and labour contracts;

— movement of personnel;

— health;

— social inclusion and protection of particular social groups;

— gender equality, equal treatment and equal opportunities, and non-discrimination; and/or

— access to social protection.

The staff members that are most likely to be affected are the flight crew members, the flight crew members' representatives and the staff in charge of running the management system (as the FDM programme is a component of the management system). It is proposed to focus on these three groups.

Table A.9 contains the scale used for assessing the social impact of policy options under IAs A and B. Table A.9 also includes an inventory of the main possible consequences with a social impact of policy options identified in the framework of these IAs.

Table A.9. Specific scale used to assess the social impact of policy options

<table>
<tr><th>Level of social impact</th><th>Description of the level of social impact</th><th>Main possible consequences with a social impact</th></tr>
<tr><td colspan="3">Negative social impacts</td></tr>
<tr><td>Medium negative (score of – 5)</td><td>The policy option has a moderate negative social impact.
Examples
• The policy option is likely to result in negative consequences for the health or job security of pilots or of FDM staff at a small proportion of operators.
• The policy option is likely to degrade the working conditions of pilots at a small proportion of operators.</td><td rowspan="3">• Use of flight data to blame/sanction flight crews, or (mis)perception by flight crews (fear of being blamed or constantly tracked).
• Excessive workload or overdemanding objectives, fatigue and risk of burnout for flight crews and/or management system / FDM staff.
• Inappropriate use or dissemination of flight data, which creates a risk of misuse by third parties (e.g. journalists, social media, law firms) or affects the dignity and/or career aspirations of flight crew members.
• Permanent internal tensions between staff members or departments making the place of work a source of stress for staff members.</td></tr>
<tr><td>Low negative (score of – 3)</td><td>The policy option has a limited negative social impact.
Examples
• The policy option is likely to decrease the well-being of pilots or FDM staff at some operators.
• The policy option is likely to degrade working relationships between staff members or between departments at some operators.</td></tr>
<tr><td>Very low negative (score of – 1)</td><td>The policy option has a marginal negative social impact.</td></tr>
<tr><td colspan="3">Positive social impacts</td></tr>
<tr><td>Very low positive (score of + 1)</td><td>The policy option has a marginal positive social impact.</td><td>• Objective data supporting a fairer assessment of operations. Rates and</td></tr>
</table>

Level of social impact	**Description of the level of social impact**	**Main possible consequences with a social impact**
Low positive (score of + 3)	The policy option **has a limited positive social impact**. Examples • The policy option is likely to increase the well-being of pilots or FDM staff at some operators. • The policy option is likely to enhance working relationships between staff members or between departments at some operators.	trends help in finding deficiencies in SOPs and training, rather than focusing on individual flight crew members. • Support to flight crews' professional needs. Flight crew members feel that the FDM programme helps them to do a better job. • Smoothed working relationships between staff members and/or departments at the operator. Increased well-being at the place of work.
Medium positive (score of + 5)	The policy option **has a moderate positive social impact**. Examples • The policy option is likely to moderately strengthen the protection of flight data against misuse. • The policy option is likely to result in positive consequences for the health or job security of pilots at a small proportion of operators.	

Method to assess the environmental impact of policy options

In general terms, types of environmental impact applicable to aircraft operations include:

— aircraft noise level;

— aircraft engine emissions (smoke, gaseous emissions, non-volatile particulate matter emissions);

— emissions of carbon dioxide (CO_2);

— emissions of other greenhouse gases and other types of contribution to climate change (e.g. contrails).

Note: No environmental impact scale is used in the context of IAs A and B, as it is deemed that the policy options of these IAs have no or a very negligible impact on the environment.

Appendix B — Detailed review of the cost impact of Option 1 of IA A

Cost impact of Option 1 on aircraft operators

Table B.1 presents the individual AMC amendments introduced by Option 1 of IA A and their estimated impact on cost for aircraft operators. This table shows that one AMC amendment (related to documenting the data source of flight parameters and the FDM algorithms) could have a temporary low-level cost impact on aircraft operators (one-time cost), otherwise the amendments would have no or a very low-level cost impact on operators. In addition, the conditions introduced in the AMC amendments are performance based and not technology prescriptive, and operators remain free to choose the most economical solution to meet these conditions.

Table B.1. Review of the cost impact of AMC amendments introduced by Option 1 for aircraft operators

Description of amendment introduced by Option 1	**Applicable to**	**Estimated level of cost**	**Comment**
Amend the condition regarding airborne systems and equipment as follows: • airborne systems and equipment used to obtain FDM data should continuously collect the flight data used for FDM throughout the flight; and • the retrieval of flight data from the aircraft for the purpose of the FDM programme should not affect the availability or serviceability of a flight recorder required for accident investigation.	Aeroplanes and helicopters first issued with an individual CofA on or after [date of publication + 3 years]	Neutral or very low	The equipment will be forward-fitted on newly manufactured aircraft; no retrofit. Can be met with just installing a quick access recorder (QAR).
Introduce the following condition. At least 80 % of the flights of any individual aeroplane that were performed in the past 12 months should be available for analysis with the FDM software and have valid data, or, if needed to avoid a disproportionate cost impact, an objective of 60 % of the flights of any individual aeroplane can be agreed with the competent authority.	Operators in the scope of ORO.AOC.130 or SPA.HOFO.145, as of [date of publication + 2 years]	Neutral or very low	Most operators already recover FDM raw data at least once every 15 days, and memory media of current airborne systems used for FDM already have a large memory capacity. A portable readout unit is of the order of a few thousand euro. Therefore, 80 % of flights collected from every aircraft should be achievable without significant cost impact for most operators. However, as this objective might have a disproportionate cost impact for some operators (e.g. on some older aircraft, the recording capacity of the QAR makes it difficult to achieve 80 %), they also have the possibility to agree with their competent authority on a less demanding objective (60 % of flights collected from every aircraft).

Description of amendment introduced by Option 1	**Applicable to**	**Estimated level of cost**	**Comment**
Introduce the following condition. The operator should have means to identify a failure to collect flight data from any individual aircraft within 15 days, or, if needed to avoid a disproportionate cost impact, a time objective of 22 days can be agreed with the competent authority.	Operators in the scope of ORO.AOC.130 or SPA.HOFO.145, as of [date of publication + 2 years]	Neutral or very low	15 days takes into account the penalising case of on-demand long-range flights. Even for such operators, it is expected that the aircraft will return to the base where the flight data can be recovered at least every 15 days. However, as this objective might have a disproportionate cost impact for some operators, they also have the possibility to agree on a less demanding time objective with their competent authority (22 days).
Introduce the following condition. The time between completion of a flight and routine processing of the data of that flight by the FDM software should not exceed 15 calendar days (aeroplanes) / 7 calendar days (helicopters) for at least 80 % of flights collected with the FDM programme. If needed to avoid a disproportionate cost impact, a time objective for routine processing of data after a flight of 22 calendar days (aeroplanes) / 15 calendar days (helicopters) can be agreed with the competent authority.	Operators in the scope of ORO.AOC.130 or SPA.HOFO.145, as of [date of publication + 2 years]	Neutral or very low	**Aeroplanes.** 15 days already takes into account the penalising case of on-demand long-range flights. Even for such operators, it is expected that the aircraft will return to the base where the flight data can be recovered at least every 15 days. In addition, it is permitted that data from 20 % of flights takes more than 15 days to be collected. However, as this objective might have a disproportionate cost impact for some operators, they also have the possibility to agree on a less demanding time objective with their competent authority (22 days). **Helicopters.** Offshore operators are required to download flight data on a daily basis by the International Association of Oil & Gas Producers (refer to International Association of Oil & Gas Producers, *Offshore Helicopter Recommended Practices*, 2020 (see the module 'Aircraft operations'). However, as this objective might have a disproportionate cost impact for some helicopter operators, they also have the possibility to agree on a less demanding time objective with their competent authority (15 days).

Description of amendment introduced by Option 1	Applicable to	Estimated level of cost	Comment
Introduce the following conditions: • the data collected for analysis by the FDM software should include all the flight parameters recorded by a flight data recorder in accordance with AMC1.2 CAT.IDE.A.190 (aeroplanes) / AMC1.2 CAT.IDE.H.190 (helicopters); and • these flight parameters should meet the performance specifications as defined in EUROCAE Document 112A or any later equivalent standard.	Aeroplanes and helicopters first issued with an individual CofA on or after [date of publication + 3 years]	Neutral or very low	**Aeroplanes.** The equipment will be forward-fitted on newly manufactured aircraft; no retrofit. If some aircraft manufacturers sell the aircraft with the capability, but not the necessary equipment, this will be part of the purchase decision of the operator.
Introduce the following conditions: • the operator should document the principles it uses for identifying significant FDM events; • validation of a significant FDM event should be performed as a matter of priority and within 15 calendar days after detection by the FDM software, for at least 80 % of significant FDM events.	Operators in the scope of ORO.AOC.130 or SPA.HOFO.145, as of [date of publication + 2 years]	Neutral or very low	FDM software solutions all allow FDM event severity levels to be defined. Most operators already have criteria for identifying significant FDM events, based on severity levels and contextual information. The objective only needs to be met for 80 % of significant FDM events, to give operators sufficient flexibility to cope with unplanned situations, especially those operators with small FDM teams. Regarding software, FDM software might need to be slightly updated to allow the FDM analyst to document FDM event validation, for showing compliance with this condition.

Description of amendment introduced by Option 1	**Applicable to**	**Estimated level of cost**	**Comment**
Introduce the following condition. The operator should maintain documentation on: (1) the data source and the performance of all the flight parameters that are collected for the purpose of the FDM programme; and (2) the algorithms used to produce FDM events or FDM measurements on the data collected from that aircraft, including: (i) a description of the logic of each algorithm; and (ii) for each algorithm, the flight parameters needed by the algorithm and their minimum performance for the algorithm to deliver reliable results.	Aeroplanes and helicopters first issued with an individual CofA on or after [date of publication + 3 years]	Low	This amendment will result in many operators establishing or maintaining documentation on flight parameters and FDM algorithms, with associated cost. Once such documentation is created, keeping it up to date will require a small amount of work; therefore, the level of cost impact is low until entry into application of the amendment and very low afterwards. Regarding documentation on the data source and performance of flight parameters, the QAR / wireless QAR parameter documentation will be required only for newly manufactured aircraft; no retrofit. The work provided by the QAR / wireless QAR installer to obtain the information from the aircraft manufacturer and produce this documentation might be billed to the operator. Regarding documentation on FDM algorithms, when considering a newly manufactured aircraft, either the operator has the knowledge necessary to produce this documentation (because they are designing their FDM algorithms) or they can get the required information from the FDM service provider as part of the service package (part of the contract conditions).

Description of amendment introduced by Option 1	Applicable to	Estimated level of cost	Comment
Introduce the following condition. The FDM analysis and assessment tools should include: (1) specialised software ('FDM software') for processing the flight data; and (2) in order to easily link FDM data with occurrence reports and other data: (i) software capable of automatically and uniquely identifying individual flights in the data files collected for FDM; and (ii) to the extent the necessary data is collected, providing, for each FDM event detection, the aircraft geographical position and altitude, the UTC date and time, the flight identification and the aircraft registration.	Operators in the scope of ORO.AOC.130 or SPA.HOFO.145, as of [date of publication + 2 years]	Neutral or very low	Many FDM software suites are already capable of uniquely identifying and dating individual flights, for instance using the date and time parameters. However, some FDM software suites might need updating. In addition, some algorithms may have to be adapted to capture the necessary data. Part of the associated cost may be carried by the FDM software vendor, as operators will expect that the software complies with the applicable regulations (this is often a basic clause in the contracts with suppliers); part could be billed to operators. Airborne systems used for FDM on newly manufactured aircraft already record latitude, longitude, UTC date and time, and flight number. In addition, information sufficient to uniquely identify the source QAR unit and thus the aircraft on which it is installed is also available. To avoid costly reconfiguration of the recording system for older aircraft models, the condition 'to the extent the necessary data is collected' was inserted.
Introduce the following condition. 80 % or more of raw or decoded flight data recording files of the aircraft required to be part of the FDM programme should be retained and readily retrievable for analysis for at least 2 years.	Operators in the scope of ORO.AOC.130 or SPA.HOFO.145, as of [date of publication + 2 years]	Neutral or very low	Most operators already retain data for more than 1 year, and many for several years, in order to remove seasonal variations and to check trends over longer periods of time. Memory cost is very low, so not a driving factor. Agreement with flight crew representatives should be easy to obtain, as this change would not affect their level of protection. Data retention procedures may need to be updated.

Description of amendment introduced by Option 1	Applicable to	Estimated level of cost	Comment
Introduce the following condition. **Aeroplanes.** The FDM programme should monitor at least the following key risk areas: • risk of runway excursion during take-off or landing, • risk of airborne collision, • risk of aircraft upset, and • risk of collision with terrain. **Helicopters.** The FDM programme should monitor at least the following key risk areas: • risk of aircraft upset, • risk of collision with terrain, • risk of obstacle collision in flight, during take-off or landing, • risk of excursion from the touchdown and lift-off area.	Aeroplanes and helicopters with an individual CofA first issued on or after 1 January 2016 Applicable as of [date of publication + 2 years]	Neutral or very low	**Aeroplanes.** Most operators already monitor FDM precursors to runway excursion, airborne collision, aircraft upset and risk of collision with terrain, and this is possible with rather simple algorithms, as illustrated in the EOFDM document *Guidance for the implementation of flight data monitoring precursors* (Revision 3). The proportion of operators that may have to implement more FDM algorithms because one of these key risk areas is not yet covered by their FDM programme will be small. With regard to the necessary flight parameters, AMC1.1 CAT.IDE.A.190 specifies the flight parameters to be recorded by the flight data recorder on board an aeroplane that is first issued with an individual CofA on or after 1 January 2016. These flight parameters are considered sufficient to monitor precursors of the four key risk areas specified in this amendment. **Helicopters.** Most operators already monitor FDM precursors to aircraft upset, risk of collision with terrain, risk of obstacle collision and risk of excursion from the touchdown and lift-off area, and this is possible with rather simple algorithms. The proportion of operators that may have to implement more FDM algorithms because one of these key risk areas is not yet covered by their FDM programme will be small. With regard to the necessary flight parameters, AMC1.1 CAT.IDE.H.190 specifies the flight parameters to be recorded by the flight data recorder on board a helicopter that is first issued with an individual CofA on or after 1 January 2016. These flight parameters are considered sufficient to monitor precursors of the four key risk areas specified in this amendment.

Description of amendment introduced by Option 1	Applicable to	Estimated level of cost	Comment
Introduce the following condition. If the necessary flight parameters are collected, the FDM programme should monitor: • (for aeroplanes) exceedances indicating that the airworthiness of the aircraft may be affected and that are related to speed and configuration, altitude, accelerations, attitude angles, engine limitations or aircraft weight; • (for helicopters) exceedances indicating that the airworthiness of the aircraft may be affected and that are related to speed, altitude, accelerations, attitude angles or aircraft weight; • caution and warning alerts to the flight crew and indicating that the airworthiness of the aircraft may be affected.	Operators in the scope of ORO.AOC.130 or SPA.HOFO.145, as of [date of publication + 2 years]	Neutral or very low	**Aeroplanes.** Most operators already monitor such exceedances. Aeroplanes first issued with an individual CofA on or after 1 January 2016 record the necessary flight parameters on the flight data recorder to be compliant (refer to AMC1.1 CAT.IDE.A.190). However, for older aeroplanes, the aircraft weight or some engine parameters might not be recorded. Hence the condition 'if the necessary flight parameters are collected'. **Helicopters.** Most operators already monitor such exceedances. Helicopters first issued with an individual CofA on or after 1 January 2016 record the necessary flight parameters on the flight data recorder to be compliant (refer to AMC1.1 CAT.IDE.H.190). However, for older helicopters, flight controls input, the aircraft weight or engine settings might not be recorded. Hence the condition 'if the necessary flight parameters are collected'. (Note: for some aspects, for example flight controls, there is no clear threshold established in the AFM or aircraft maintenance manual. For some other aspects, such as engine conditions, identifying an airworthiness issue can be very complex as many parameters and conditions need to be considered together. Therefore, these exceedances are not included for helicopters).

Description of amendment introduced by Option 1	**Applicable to**	**Estimated level of cost**	**Comment**
Introduce the following condition. The operator should establish and maintain a document identifying which classes of occurrence are monitored with the FDM programme. This document should cover at least occurrences subject to mandatory reporting and listed in Regulation (EU) 2015/1018, Annex I, Sections 1 and 5. This document should provide a short description of the applicable FDM event(s) or FDM measurement(s) for each class of occurrence that is monitored with the FDM programme.	Operators in the scope of ORO.AOC.130 or SPA.HOFO.145, as of [date of publication + 2 years]	Neutral or very low	This is only about creating a cross-reference table between occurrence classes as defined in two sections of Regulation (EU) 2015/1018 and the FDM algorithms implemented by the operator.
Remove the two-phases condition regarding the proportion of flights to be collected by the FDM programme to support an ATQP (60 % before granting ATQP approval, 80 % before a request to extend the ATQP), and replace it with a reference to AMC1 ORO.AOC.130 (where 80 % is the minimum).	Operators in the scope of ORO.FC.A.245, as of [date of publication + 2 years]	Neutral or very low	The change is raising the threshold for the flight collection rate from 60 % to 80 % of flights for new ATQP approvals. However, with a proposed notice period of 2 years, this should be easy to achieve for operators implementing an ATQP, as they are rather large operators, for which the flight collection rate is already more than 80 %.

Cost impact of Option 1 on aircraft manufacturers

Table B.2 presents the individual AMC amendments introduced by Option 1 of IA A and their estimated impact on cost for aircraft manufacturers. This table shows that all AMC amendments have no or a very low-level cost for aircraft manufacturers. In addition, the GM amendments are considered to have a neutral impact on cost.

Table B.2. Review of the cost impact of AMC amendments introduced by Option 1 for aircraft manufacturers

Description of amendment introduced by Option 1	Applicable to	Estimated level of cost impact on aircraft manufacturers	Comment
Amend the condition regarding airborne systems and equipment as follows: • airborne systems and equipment used to obtain FDM data should continuously collect the flight data used for FDM throughout the flight; and • the retrieval of flight data from the aircraft for the purpose of the FDM programme should not affect the availability or serviceability of a flight recorder required for accident investigation.	Aeroplanes and helicopters first issued with an individual CofA on or after [date of publication + 3 years]	Neutral or very low	Airborne systems such as QARs and wireless QARs are already installed on newly manufactured aircraft. This equipment continuously collects the flight data throughout the flight, and collects the flight data independently of the flight recorders.
Introduce the following condition. At least 80 % of the flights of any individual aeroplane that were performed in the past 12 months should be available for analysis with the FDM software and have valid data, or, if needed to avoid a disproportionate cost impact, an objective of 60 % of the flights of any individual aeroplane can be agreed with the competent authority.	Operators in the scope of ORO.AOC.130 or SPA.HOFO.145, as of [date of publication + 2 years]	Neutral or very low	Memory media of current airborne systems used for FDM, such as QARs and wireless QARs, have a large memory capacity. The cost of a portable readout unit allowing the data to be read without removing memory media from the aircraft is of the order of a few thousand euro. Therefore, it is considered that 80 % can be achieved easily by an operator. However, there could be some older aircraft for which the recording capacity of the QAR makes it difficult to achieve 80 %. In that case, the operator may agree with its

Description of amendment introduced by Option 1	**Applicable to**	**Estimated level of cost impact on aircraft manufacturers**	**Comment**
			competent authority on a less demanding objective (60 % of flights collected from every aircraft), to avoid a costly retrofit.
Introduce the following condition. The operator should have means to identify a failure to collect flight data from any individual aircraft within 15 days, or, if needed to avoid a disproportionate cost impact, a time objective of 22 days can be agreed with the competent authority.	Operators in the scope of ORO.AOC.130 or SPA.HOFO.145, as of [date of publication + 2 years]	Neutral or very low	If not already available, FDM software can be easily updated to include a routine to detect the absence of recent flight data from an individual aircraft. No impact on aircraft equipment.
Introduce the following condition. The time between completion of a flight and routine processing of the data of that flight by the FDM software should not exceed 15 calendar days (aeroplanes) / 7 calendar days (helicopters) for at least 80 % of flights collected with the FDM programme. If needed to avoid a disproportionate cost impact, a time objective for routine processing of data after a flight of 22 calendar days (aeroplanes) / 15 calendar days (helicopters) can be agreed with the competent authority.	Operators in the scope of ORO.AOC.130 or SPA.HOFO.145, as of [date of publication + 2 years]	Neutral or very low	If meeting the objective to process data within 15 calendar days (aeroplanes) / 7 calendar days (helicopters) would require expensive redesign or replacement of the airborne system and therefore a disproportionate cost impact for the operator, less demanding objectives may be agreed between the operator and its competent authority. Hence, this amendment has no impact on aircraft manufacturers.

Description of amendment introduced by Option 1	**Applicable to**	**Estimated level of cost impact on aircraft manufacturers**	**Comment**
Introduce the following conditions: • the data collected for analysis by the FDM software should include all the flight parameters recorded by a flight data recorder in accordance with AMC1.2 CAT.IDE.A.190 (aeroplanes) / AMC1.2 CAT.IDE.H.190 (helicopters); and • these flight parameters should meet the performance specifications as defined in EUROCAE Document 112A or any later equivalent standard.	Aeroplanes and helicopters first issued with an individual CofA on or after [date of publication + 3 years]	Neutral or very low	Airborne systems installed on newly manufactured aircraft for FDM (such as QARs and wireless QARs) already meet this condition. In addition, in accordance with AMC1.2 CAT.IDE.A.190 and AMC1.2 CAT.IDE.H.190, aeroplanes and helicopters that are first issued with an individual CofA on or after 1 January 2023 should record the flight parameters corresponding to Table II-A.1 (aeroplanes) or Table II-A.2 (helicopters) of ED-112A. As these flight parameters are usually collected by a data acquisition function or equivalent, this amendment just means that the airborne system used for FDM on newly manufactured aeroplanes should be connected to the data acquisition function of the flight data recorder.
Introduce the following conditions: • the operator should document the principles it uses for identifying significant FDM events; • validation of a significant FDM event should be performed as a matter of priority and within 15 calendar days after detection by the FDM software, for at least 80 % of significant FDM events.	Operators in the scope of ORO.AOC.130 or SPA.HOFO.145, as of [date of publication + 2 years]	Neutral or very low	This amendment has no impact on aircraft manufacturers.

Description of amendment introduced by Option 1	**Applicable to**	**Estimated level of cost impact on aircraft manufacturers**	**Comment**
Introduce the following condition. The operator should maintain documentation on: (1) the data source and the performance of all the flight parameters that are collected for the purpose of the FDM programme; and (2) the algorithms used to produce FDM events or FDM measurements on the data collected from that aircraft, including: (i) a description of the logic of each algorithm; and (ii) for each algorithm, the flight parameters needed by the algorithm and their minimum performance for the algorithm to deliver reliable results.	Aeroplanes and helicopters first issued with an individual CofA on or after [date of publication + 3 years]	Low	Regarding documentation on the data sources of flight parameters, aircraft manufacturers already have the information on the data sources of flight parameters and information on the resolution and sampling rate of the flight parameters collected by the data acquisition unit of the flight data recorder. Some work to update flight parameter documentation might still be needed. Regarding documentation on the FDM algorithms, this amendment has no impact on aircraft manufacturers.

Description of amendment introduced by Option 1	**Applicable to**	**Estimated level of cost impact on aircraft manufacturers**	**Comment**
Introduce the following condition. The FDM analysis and assessment tools should include: (1) specialised software (‘FDM software’) for processing the flight data; and (2) in order to easily link FDM data with occurrence reports and other data: (i) software capable of automatically and uniquely identifying individual flights in the data files collected for FDM; and (ii) to the extent the necessary data is collected, providing, for each FDM event detection, the aircraft geographical position and altitude, the UTC date and time, the flight identification and the aircraft registration.	Operators in the scope of ORO.AOC.130 or SPA.HOFO.145, as of [date of publication + 2 years]	Neutral or very low	Airborne systems installed on newly manufactured aircraft for FDM (such as QARs and wireless QARs) already record latitude, longitude, UTC date and time, and flight number. In addition, information sufficient to uniquely identify the source QAR unit and thus the aircraft on which it is installed is also available. However, there are older aircraft models for which the recording system would need to be reconfigured to collect these flight parameters: for example, latitude, longitude and date are not required to be recorded on the flight data recorder for aeroplanes first issued with an individual CofA before 1 January 2016. The recorded time on the flight data recorder can be a relative time count; it is not required to be a UTC time. Hence the condition ‘to the extent the necessary data is collected’.
Introduce the following condition. 80 % or more of raw or decoded flight data recording files of the aircraft required to be part of the FDM programme should be retained and readily retrievable for analysis for at least 2 years.	Operators in the scope of ORO.AOC.130 or SPA.HOFO.145, as of [date of publication + 2 years]	Neutral or very low	This amendment has no impact on aircraft manufacturers.

Description of amendment introduced by Option 1	Applicable to	Estimated level of cost impact on aircraft manufacturers	Comment
Introduce the following condition. **Aeroplanes.** The FDM programme should monitor at least the following key risk areas: • risk of runway excursion (at take-off and at landing), • risk of airborne collision, • risk of aircraft upset, • risk of collision with terrain. **Helicopters.** The FDM programme should monitor at least the following key risk areas: • risk of aircraft upset, • risk of collision with terrain, • risk of obstacle collision in flight during take-off or landing, • risk of excursion from the touchdown and lift-off area.	Aeroplanes and helicopters with an individual CofA first issued on or after 1 January 2016 Applicable as of [date of publication + 2 years]	Neutral or very low	**Aeroplanes.** AMC1.1 CAT.IDE.A.190 specifies the flight parameters to be recorded by the flight data recorder on board an aeroplane that is first issued with an individual CofA on or after 1 January 2016. These flight parameters are considered sufficient to monitor precursors of the four key risk areas specified in this amendment. **Helicopters.** AMC1.1 CAT.IDE.H.190 specifies the flight parameters to be recorded by the flight data recorder on board a helicopter that is first issued with an individual CofA on or after 1 January 2016. These flight parameters are considered sufficient to monitor precursors of the four key risk areas specified in this amendment.
Introduce the following condition. If the necessary flight parameters are collected, the FDM programme should monitor: • (for aeroplanes) exceedances indicating that the airworthiness of the aircraft may be affected and that are related to speed and configuration, altitude, accelerations, attitude angles, engine limitations or aircraft weight; • (for helicopters) exceedances indicating that the airworthiness of the aircraft may be affected and that are related to speed, altitude, accelerations, attitude angles or aircraft weight;	Operators in the scope of ORO.AOC.130 or SPA.HOFO.145, as of [date of publication + 2 years]	Neutral or very low	Airborne systems used for FDM (such as QARs / wireless QARs) and installed on aeroplanes first issued with an individual CofA on or after 1 January 2016 record the necessary flight parameters on the flight data recorder to comply with AMC1.1 CAT.IDE.A.190 (aeroplanes) or AMC1.1 CAT.IDE.H.190 (helicopters). However, for older aeroplanes, flight controls input, the aircraft weight or engine settings might not be recorded. Hence the condition 'if the necessary flight parameters are collected'.

Description of amendment introduced by Option 1	**Applicable to**	**Estimated level of cost impact on aircraft manufacturers**	**Comment**
• caution and warning alerts to the flight crew and indicating that the airworthiness of the aircraft may be affected.			
Introduce the following condition. The operator should establish and maintain a document identifying which classes of occurrence are monitored with the FDM programme. This document should cover at least occurrences subject to mandatory reporting and listed in Regulation (EU) 2015/1018, Annex I, Sections 1 and 5. This document should provide a short description of the applicable FDM event(s) or FDM measurement(s) for each class of occurrence that is monitored with the FDM programme.	Operators in the scope of ORO.AOC.130 or SPA.HOFO.145, as of [date of publication + 2 years]	Neutral or very low	This amendment has no impact on aircraft manufacturers.
Remove the two-phases condition regarding the proportion of flights to be collected by the FDM programme to support an ATQP (60 % before granting ATQP approval, 80 % before a request to extend the ATQP), and replace it with a reference to AMC1 ORO.AOC.130 (where 80 % is the minimum).	Operators in the scope of ORO.FC.A.245, as of [date of publication + 2 years]	Neutral or very low	This amendment has no impact on aircraft manufacturers.

Cost impact of Option 1 on small operators

Table B.3 presents the individual AMC amendments introduced by Option 1 of IA A and their estimated impact on cost for the small operators A and H described in Appendix A. This table shows that some AMC amendments may generate a temporary low-level cost for these operators. In addition, the GM amendments are considered to have a neutral impact on cost.

Table B.3. Review of the cost impact of AMC amendments introduced by Option 1 for small operators A and H

Description of amendment introduced by Option 1	**Applicable to**	**Estimated level of cost for small operators A and H**
Amend the condition regarding airborne systems and equipment as follows: • airborne systems and equipment used to obtain FDM data should continuously collect the flight data used for FDM throughout the flight; and • the retrieval of flight data from the aircraft for the purpose of the FDM programme should not affect the availability or serviceability of a flight recorder required for accident investigation.	Aeroplanes and helicopters first issued with an individual CofA on or after [date of publication + 3 years]	Neutral or very low
Introduce the following condition. At least 80 % of the flights of any individual aeroplane that were performed in the past 12 months should be available for analysis with the FDM software and have valid data, or, if needed to avoid a disproportionate cost impact, an objective of 60 % of the flights of any individual aeroplane can be agreed with the competent authority.	Operators in the scope of ORO.AOC.130 or SPA.HOFO.145, as of [date of publication + 2 years]	Low
Introduce the following condition. The operator should have means to identify a failure to collect flight data from any individual aircraft within 15 days, or, if needed to avoid a disproportionate cost impact, a time objective of 22 days can be agreed with the competent authority.	Operators in the scope of ORO.AOC.130 or SPA.HOFO.145, as of [date of publication + 2 years]	Neutral or very low
Introduce the following condition. The time between completion of a flight and routine processing of the data of that flight by the FDM software should not exceed 15 calendar days (aeroplanes) / 7 calendar days (helicopters) for at least 80 % of flights collected with the FDM programme. If needed to avoid a disproportionate cost impact, a time objective for routine processing of data after a flight of 22 calendar days (aeroplanes) / 15 calendar days (helicopters) can be agreed with the competent authority.	Operators in the scope of ORO.AOC.130 or SPA.HOFO.145, as of [date of publication + 2 years]	Neutral or very low

Description of amendment introduced by Option 1	Applicable to	Estimated level of cost for small operators A and H
Introduce the following conditions: • the data collected for analysis by the FDM software should include all the flight parameters recorded by a flight data recorder in accordance with AMC1.2 CAT.IDE.A.190 (aeroplanes) / AMC1.2 CAT.IDE.H.190 (helicopters); and • these flight parameters should meet the performance specifications as defined in EUROCAE Document 112A or any later equivalent standard.	Aeroplanes and helicopters first issued with an individual CofA on or after [date of publication + 3 years]	Neutral or very low
Introduce the following conditions: • the operator should document the principles it uses for identifying significant FDM events; • validation of a significant FDM event should be performed as a matter of priority and within 15 calendar days after detection by the FDM software, for at least 80 % of significant FDM events.	Operators in the scope of ORO.AOC.130 or SPA.HOFO.145, as of [date of publication + 2 years]	Neutral or very low
Introduce the following condition. The operator should maintain documentation on: (1) the data source and the performance of all the flight parameters that are collected for the purpose of the FDM programme; and (2) the algorithms used to produce FDM events or FDM measurements on the data collected from that aircraft, including: (i) a description of the logic of each algorithm; and (ii) for each algorithm, the flight parameters needed by the algorithm and their minimum performance for the algorithm to deliver reliable results.	Aeroplanes and helicopters first issued with an individual CofA on or after [date of publication + 3 years]	Low

Description of amendment introduced by Option 1	Applicable to	Estimated level of cost for small operators A and H
Introduce the following condition. The FDM analysis and assessment tools should include: (1) specialised software (‘FDM software’) for processing the flight data; and (2) in order to easily link FDM data with occurrence reports and other data: (i) software capable of automatically and uniquely identifying individual flights in the data files collected for FDM; and (ii) to the extent the necessary data is collected, providing, for each FDM event detection, the aircraft geographical position and altitude, the UTC date and time, the flight identification and the aircraft registration.	Operators in the scope of ORO.AOC.130 or SPA.HOFO.145, as of [date of publication + 2 years]	Low
Introduce the following condition. 80 % or more of raw or decoded flight data recording files of the aircraft required to be part of the FDM programme should be retained and readily retrievable for analysis for at least 2 years.	Operators in the scope of ORO.AOC.130 or SPA.HOFO.145, as of [date of publication + 2 years]	Neutral or very low
Introduce the following condition. **Aeroplanes.** The FDM programme should monitor at least the following key risk areas: • risk of runway excursion (at take-off and at landing), • risk of airborne collision, • risk of aircraft upset, • risk of collision with terrain. **Helicopters.** The FDM programme should monitor at least the following key risk areas: • risk of aircraft upset, • risk of collision with terrain,	Aeroplanes and helicopters with an individual CofA first issued on or after 1 January 2016 Applicable as of [date of publication + 2 years]	Low

Description of amendment introduced by Option 1	Applicable to	Estimated level of cost for small operators A and H
• risk of obstacle collision in flight during take-off or landing, • risk of excursion from the touchdown and lift-off area.		
Introduce the following condition. If the necessary flight parameters are collected, the FDM programme should monitor: • (for aeroplanes) exceedances indicating that the airworthiness of the aircraft may be affected and that are related to speed and configuration, altitude, accelerations, attitude angles, engine limitations or aircraft weight; • (for helicopters) exceedances indicating that the airworthiness of the aircraft may be affected and that are related to speed, altitude, accelerations, attitude angles or aircraft weight; • caution and warning alerts to the flight crew and indicating that the airworthiness of the aircraft may be affected.	Operators in the scope of ORO.AOC.130 or SPA.HOFO.145, as of [date of publication + 2 years]	Low
Introduce the following condition. The operator should establish and maintain a document identifying which classes of occurrence are monitored with the FDM programme. This document should cover at least occurrences subject to mandatory reporting and listed in Regulation (EU) 2015/1018, Annex I, Sections 1 and 5. This document should provide a short description of the applicable FDM event(s) or FDM measurement(s) for each class of occurrence that is monitored with the FDM programme.	Operators in the scope of ORO.AOC.130 or SPA.HOFO.145, as of [date of publication + 2 years]	Neutral or very low

Description of amendment introduced by Option 1	**Applicable to**	**Estimated level of cost for small operators A and H**
Remove the two-phases condition regarding the proportion of flights to be collected by the FDM programme to support an ATQP (60 % before granting ATQP approval, 80 % before a request to extend the ATQP), and replace it with a reference to AMC1 ORO.AOC.130 (where 80 % is the minimum).	Operators in the scope of ORO.FC.A.245, as of [date of publication + 2 years]	Neutral or very low

Appendix C — Detailed review of cost impact of Option 1 of IA B

Cost impact of Option 1 on aircraft operators

Table C.1 presents the individual AMC amendments introduced by Option 1 of IA B and their estimated impact on cost for aircraft operators. This table shows that some AMC amendments could necessitate limited and temporary costs to adapt procedures and update agreements with flight crew representatives regarding FDM programmes.

Table C.1. Review of the cost impact of AMC amendments introduced by Option 1 for aircraft operators

Description of AMC amendment introduced by Option 1	**Applicable to**	**Estimated level of cost**	**Comment**
Introduce the following conditions: • the safety manager should ensure effective use of the FDM programme for SRM; • the safety review board should include the FDM programme in its monitoring of the effectiveness of the operator's safety management processes.	Complex operators in the scope of ORO.AOC.130 or SPA.HOFO.145, as of [date of publication]	Neutral or very low	The FDM programme must already be part of the operator's management system in accordance with ORO.AOC.130, and the safety manager should already be responsible for the FDM programme in accordance with AMC1 ORO.AOC.130. The safety review board will look at the effectiveness of the FDM programme as part of monitoring the effectiveness of the SMS (if an FDM programme is required). This change does not require changes to the operator's procedures.
Introduce the following conditions: • hazard identification schemes should include the FDM programme when the latter is required; • safety performance monitoring and measurement should include the FDM programme, for those aircraft required to be included in such a programme.	Complex operators in the scope of ORO.AOC.130 or SPA.HOFO.145, as of [date of publication + 2 years]	Neutral or very low	ORO.AOC.130 already requires the FDM programme to be integrated in the operator's management system. In addition, point (b) of AMC1 ORO.AOC.130 already specifies that the FDM programme should be used to help detect and assess risks, and to monitor the effectiveness of corrective actions. This change just clarifies the expected use of the FDM programme to support the SRM steps. It might lead to minor changes to procedures and ways of working at operators.
Introduce the following condition. Compliance monitoring should include procedures applicable to the FDM programme as part of management system procedures.	Operators in the scope of ORO.AOC.130 or SPA.HOFO.145, as of [date of publication]	Neutral or very low	This is just a clarification that the FDM programme is in the scope of compliance monitoring, as it is part of the management system that is already in the scope of compliance monitoring. No impact on internal resources is expected, and only a limited impact on the compliance monitoring documentation (manuals and/or checklists) is expected.

Description of AMC amendment introduced by Option 1	**Applicable to**	**Estimated level of cost**	**Comment**
Link the condition regarding identification and assessment of safety risks and the monitoring of remedial actions with FDM to the identification of safety hazards, their evaluation and the management of associated risks that are required by ORO.GEN.200 (‘Operator’s management system’).	Operators in the scope of ORO.AOC.130 or SPA.HOFO.145, as of [date of publication]	Neutral or very low	This change just clarifies the expected use of the FDM programme to support the SRM steps. This change might lead to minor changes to procedures and ways of working at operators.
Change the condition regarding education and publication as follows. The output of the FDM programme should be used, in compliance with the procedure specified in (k), to support safety information shared with flight crew members.	Operators in the scope of ORO.AOC.130 or SPA.HOFO.145, as of [date of publication + 2 years]	Neutral or very low	This rephrased condition is already implemented by most operators, for example by issuing FDM newsletters, special FDM bulletins, FDM-based dashboards, etc. This change might lead to minor changes to procedures and ways of working at operators.
Change the condition regarding withdrawal of confidentiality as follows. The procedure to protect flight crew identity should define the conditions under which the protection of the information source may be withdrawn. These conditions should be consistent with provisions laid out in Regulation (EU) No 376/2014 and the operator’s SRM procedures.	Operators in the scope of ORO.AOC.130 or SPA.HOFO.145, as of [date of publication + 2 years]	Low	For many operators, this change could trigger some discussions or negotiations with flight crew representatives. Indeed, the procedure described in point (k) of AMC1 ORO.AOC.130 needs to be agreed and signed by all parties, including flight crew representatives. However, this change is meant to provide for more consistent protection of flight crew identity. Therefore, it is not expected to be controversial.

Description of AMC amendment introduced by Option 1	**Applicable to**	**Estimated level of cost**	**Comment**
Change the condition regarding FDM data gathering for an ATQP as follows. The FDM programme should provide to the ATQP responsible person information that is needed for ATQP purposes. Subject to the procedure to prevent disclosure of crew identity in AMC1 ORO.AOC.130, the level of detail of that information should allow for targeted changes to the training programme to be defined.	Operators in the scope of ORO.FC.A.245, as of [date of publication + 2 years]	Neutral or very low	This change might lead to minor changes to the procedure addressing FDM data transmission to the ATQP responsible person. This change clarifies principles regarding the information transmitted to the ATQP responsible person and it increases the protection of the identity of flight crew members. Therefore, this change is not expected to be controversial.
Rephrase the condition regarding FDM data handling in the framework of an ATQP as follows. The operator should establish a procedure to ensure confidentiality of FDM-based information transmitted to the ATQP responsible person, which should be consistent with the procedure to prevent disclosure of crew identity specified in AMC1 ORO.AOC.130.	Operators in the scope of ORO.FC.A.245, as of [date of publication + 2 years]	Neutral or very low	This change only improves the wording of a point for the sake of clarity. It is not expected to trigger any change to procedures.

Cost impact of Option 1 on aircraft manufacturers

Table C.2 presents the individual AMC amendments introduced by Option 1 of IA B, and their estimated impact on cost for aircraft manufacturers. This table shows that none of the AMC amendments have a cost impact on aircraft manufacturers. In addition, the GM amendments are considered to have a neutral impact on cost.

Table C.2. Review of the cost impact of AMC amendments introduced by Option 1 for aircraft manufacturers

Description of AMC amendment introduced by Option 1	**Applicable to**	**Estimated level of cost**	**Comment**
Introduce the following conditions: • the safety manager should ensure effective use of the FDM programme for SRM; • the safety review board should include the FDM programme in its monitoring of the effectiveness of the operator's safety management processes.	Complex operators in the scope of ORO.AOC.130 or SPA.HOFO.145, as of [date of publication]	Neutral	No impact on aircraft manufacturers.
Introduce the following conditions: • hazard identification schemes should include the FDM programme when the latter is required; • safety performance monitoring and measurement should include the FDM programme, for those aircraft required to be included in such a programme.	Complex operators in the scope of ORO.AOC.130 or SPA.HOFO.145, as of [date of publication + 2 years]	Neutral	No impact on aircraft manufacturers.
Introduce the following condition. Compliance monitoring should include procedures applicable to the FDM programme as part of management system procedures.	Operators in the scope of ORO.AOC.130 or SPA.HOFO.145, as of [date of publication]	Neutral	No impact on aircraft manufacturers.
Link the condition regarding identification and assessment of safety risks and the monitoring of remedial actions with FDM to the identification of safety hazards, their evaluation and the management of associated risks that are required by ORO.GEN.200 ('Operator's management system').	Operators in the scope of ORO.AOC.130 or SPA.HOFO.145, as of [date of publication]	Neutral	No impact on aircraft manufacturers.

Description of AMC amendment introduced by Option 1	**Applicable to**	**Estimated level of cost**	**Comment**
Change the condition regarding education and publication as follows. The output of the FDM programme should be used, in compliance with the procedure specified in (k), to support safety information shared with flight crew members and all other relevant personnel.	Operators in the scope of ORO.AOC.130 or SPA.HOFO.145, as of [date of publication + 2 years]	Neutral	No impact on aircraft manufacturers.
Change the condition regarding withdrawal of confidentiality as follows. The procedure to prevent disclosure of flight crew identity should define the conditions under which the protection of the information source may be withdrawn. These conditions should be consistent with provisions laid out in Regulation (EU) No 376/2014 and the operator's SRM procedures.	Operators in the scope of ORO.AOC.130 or SPA.HOFO.145, as of [date of publication + 2 years]	Neutral	No impact on aircraft manufacturers.
Change the condition regarding FDM data gathering for an ATQP as follows. The FDM programme should provide to the ATQP responsible person information that is needed for ATQP purposes. Subject to the procedure to prevent disclosure of crew identity in AMC1 ORO.AOC.130, the level of detail of that information should allow for targeted changes to the training programme to be defined.	Operators in the scope of ORO.FC.A.245, as of [date of publication + 2 years]	Neutral	No impact on aircraft manufacturers.

Description of AMC amendment introduced by Option 1	Applicable to	Estimated level of cost	Comment
Rephrase the condition regarding FDM data handling in the framework of an ATQP as follows. The operator should establish a procedure to ensure confidentiality of FDM-based information transmitted to the ATQP responsible person, which should be consistent with the procedure to prevent disclosure of crew identity specified in AMC1 ORO.AOC.130.	Operators in the scope of ORO.FC.A.245, as of [date of publication + 2 years]	Neutral	No impact on aircraft manufacturers.

11. Quality of the NPA

To continuously improve the quality of its documents, EASA welcomes your feedback on the quality of this NPA with regard to the following aspects.

11.1. The regulatory proposal is of technically good/high quality

Please choose one of the options below and place it as a comment in CRT; if you disagree or strongly disagree, please provide a brief justification.

Fully agree / Agree / Neutral / Disagree / Strongly disagree

11.2. The text is clear, readable and understandable

Please choose one of the options below and place it as a comment in CRT; if you disagree or strongly disagree, please provide a brief justification.

Fully agree / Agree / Neutral / Disagree / Strongly disagree

11.3. The regulatory proposal is well substantiated

Please choose one of the options below and place it as a comment in CRT; if you disagree or strongly disagree, please provide a brief justification.

Fully agree / Agree / Neutral / Disagree / Strongly disagree

11.4. The regulatory proposal is fit for purpose (capable of achieving the objectives set)

Please choose one of the options below and place it as a comment in CRT; if you disagree or strongly disagree, please provide a brief justification.

Fully agree / Agree / Neutral / Disagree / Strongly disagree

11.5. The impact assessment (IA), as well as its qualitative and quantitative data, is of high quality

Please choose one of the options below and place it as a comment in CRT; if you disagree or strongly disagree, please provide a brief justification.

Fully agree / Agree / Neutral / Disagree / Strongly disagree

11.6. The regulatory proposal applies the 'better regulation' principles[64]

Please choose one of the options below and place it as a comment in CRT; if you disagree or strongly disagree, please provide a brief justification.

Fully agree / Agree / Neutral / Disagree / Strongly disagree

[64] For information and guidance, see:
- European Commission, 'Better regulation: Why and how' (https://ec.europa.eu/info/law/law-making-process/planning-and-proposing-law/better-regulation-why-and-how_en);
- European Commission, 'Better regulation: Guidelines and toolbox' (https://ec.europa.eu/info/law/law-making-process/planning-and-proposing-law/better-regulation-why-and-how/better-regulation-guidelines-and-toolbox_en).

11.7. Any other comments on the quality of this NPA (please specify)

Note: Your comments on Chapter 11 will be considered for internal quality assurance and management purposes only and will not be published in the related CRD.