

Evaluation report

Deliverable of safety action EVT.0009
‘Evaluation on European operators flight data monitoring’
of the European Plan for Aviation Safety (EPAS) for 2020–2024

*Evaluation of the relevance and the effectiveness
of the EOFDM Best-Practices Documents*
(including an assessment of the new actions)

January 2021

Evaluation conducted by EASA



Executive Summary

The European Operators Flight Data Monitoring forum (EOFDM)¹ was established in 2011, and is a voluntary partnership between European operators and the European Union Aviation Safety Agency (EASA). Through the publication of industry best-practices documents (BPDs), the EOFDM aims to facilitate the implementation of flight data monitoring (FDM) by European operators, and to help them gain the maximum benefits from their FDM programmes. The activities of the EOFDM are tracked in the European Plan for Aviation Safety (EPAS) since 2016 and they support the implementation of the EASA Data4Safety programme.

Since its establishment, the EOFDM has produced more than 300 pages of technical guidance and supported EASA in running six successful conferences. It is a productive forum gathering some of the best industry experts in the field Europe-wide. However, despite its size, the EOFDM only represents 5 % of all European operators.

Therefore, an evaluation of the impact of the EOFDM was performed to assess the awareness and the implementation of the EOFDM BPDs among European operators, their relevance, and to identify potential needs for adapting the EOFDM strategy (evaluation task EVT.0009 of the EPAS for 2020–2024). The evaluation was based on phone interviews of a sample of 15 operators that were not members to the EOFDM.

The evaluation showed that overall the EOFDM BPDs are partially effective thanks to:

- the relevant content of the safety objectives for European operators;
- the clear and useful explanations; and
- their publication on the internet.

The main factors that limit the effectiveness of the EOFDM BPDs seem to be the following:

- the lack of awareness of the existence of these documents among the professional air operators concerned;
- the limited resources allocated by many small to medium-sized operators to their FDM programmes (before the economic crisis triggered by the COVID-19 pandemic) do not allow to achieve more than mere compliance with the applicable rules;
- the available technologies or technological choices made by many small to medium-sized operators hinder the full implementation of the EOFDM BPDs; and
- some EOFDM recommendations need to be more in-depth and practical.

Based on the above conclusions, this evaluation report proposes 4 strategic objectives and 15 recommendations to enhance the impact of the EOFDM BPDs, especially for small to medium-sized operators. These recommendations can be addressed as part of the already existing actions in the EPAS and/or without any increase of resources.

Note: This evaluation report is based on data collected in the first half of 2019, i.e. before the economic crisis that resulted from the COVID-19 pandemic. However, the recommendations of this evaluation take into account the COVID-19-related economic crisis and the situation faced by the aviation industry and authorities in 2020.

¹ <https://www.easa.europa.eu/domains/safety-management/safety-promotion/european-operators-flight-data-monitoring-eofdm-forum>

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1. Introduction

1.1. The European Operators Flight Data Monitoring forum (EOFDM)

1.1.1. Flight data monitoring (FDM)

A flight data monitoring (FDM) programme may be defined as a programme for gathering and analysing data recorded during routine flights with the objective to improve safety. An FDM programme is required by the EU Air Operations Regulation² for aeroplanes with a maximum certificated take-off mass (MCTOM) of over 27 000 kg and used for commercial air transport (CAT). It is also required for some categories of helicopters that are used for CAT offshore operations³. This Regulation requires that the FDM programme is integrated in the operator's safety management system (SMS).

Note: For the FDM regulatory framework that is applicable in the EASA Member States, please refer to Section 1.3 of this document.

1.1.2. A brief history of the EOFDM

The EOFDM was established in 2011, and it is a voluntary partnership between European operators and the European Union Aviation Safety Agency (EASA). Its aim is to facilitate the implementation of FDM programmes by operators and to help them gain the maximum safety benefits from their FDM programmes.

The EOFDM is composed of three working groups:

- 'Working Group A': monitoring of operational safety issues;
- 'Working Group B': programming- and equipment-related aspects; and
- 'Working Group C': integration of the FDM programme into the operator's processes.

Currently, there are 30 operators that participate in the EOFDM, which make about 5 % of the total number of aeroplane operators in the EASA Member States (MSs). These are mostly medium-sized to very large operators (refer to Annex 4).

Since its establishment, the EOFDM has produced and published several BPDs for the purpose of enhancing the development and implementation of FDM programmes (see Annex 1). These make more than 300 pages of technical guidance developed by the industry for the industry. The EOFDM activities have been tracked through EPAS actions since the EPAS for 2016–2020 (actions SPT.076 and SPT.077). The BPDs of the EOFDM are published in the 'Safety Management & Promotion' section of the EASA website⁴.

In parallel with the production of the BPDs, EASA organises every year, with the help of the EOFDM, a conference dedicated to FDM best practices and solutions presented by the industry. Five dedicated FDM conferences have taken place from 2012 until 2017 (130 participants each time), and since 2019

² <https://www.easa.europa.eu/document-library/general-publications/easy-access-rules-air-operations>

³ Annex III (Part-ORO) 'Organisation Requirements for Air Operations', Subpart AOC, point ORO.AOC.130, and Annex V (Part-SPA) 'Specific Approvals', Subpart K, point SPA.HOFO.145.

⁴ <https://www.easa.europa.eu/easa-and-you/safety-management/safety-promotion/european-operators-flight-data-monitoring-eofdm-forum>



the FDM topic is part of a bigger conference named ‘SAFE 360’ (Safety in Aviation Forum for Europe) organised by EASA⁵.

Since its establishment, the EOFDM has been an active and productive forum, showing that its way of working keeps attracting stakeholders and that the industry need for BPDs has not reduced. Likewise, all five FDM conferences organised by EASA were overbooked and the feedback received from all the participants was very positive.

1.1.3. The role of the EOFDM in relation to the EASA strategic objectives

By contributing to the enhancement of the FDM programmes, the EOFDM fosters a better implementation of the SMS, which has been one of the strategic safety objectives of the EPAS. Indeed, FDM is required to be part of the SMS of an operator, and it is a reliable source of safety data for the SMS. When properly implemented, an FDM programme can significantly enhance the SMS performance of an operator.

Further to that, the EOFDM has paved the way for the EASA Data4Safety programme by creating a network that comprises some of the best industry experts in the field of FDM, and by developing technical concepts and algorithms that are reused in the Data4Safety programme.

It should also be highlighted that the EOFDM BPDs are used to support EASA’s position in the development of international taxonomies for large data exchange programmes (such as Data4Safety, the FAA ASIAS programme or the IATA FDX programme). This standardisation activity is currently led by the Flight Data Metrics Definition (FDMD) working group under the aegis of the CAST/ICAO Common Taxonomy Team (CICTT).

1.2. Important considerations about the evaluation of safety promotion activities

Safety promotion⁶ is a set of means, processes and procedures that are used to develop, sustain and improve aviation safety through awareness raising and changing behaviours.

Safety promotion is a key enabler to reach the ultimate objectives of the EU Safety Management Strategy and contributes to the continuous improvement of the aviation safety system in Europe and worldwide, together with regulations and oversight.

Safety promotion is mainly about sharing authority and industry best practices. The use of all communications media available and social marketing are the key safety promotion elements.

Since the best practices advocated through safety promotion are not mandatory, there is no established framework for assessing the effectiveness of a given safety promotion activity.

1.3. What did EASA want to achieve with the establishment of the EOFDM?

1.3.1. The regulatory framework for flight data monitoring (FDM) in Europe

The establishment of an FDM programme is required by the EU Air Operations Regulation, which is applicable to large aeroplanes operated for CAT and to helicopters operated for offshore CAT⁷.

⁵ More information can be found at <https://www.easa.europa.eu/easa-and-you/safety-management/safety-promotion/european-operators-flight-data-monitoring-eofdm-forum/easa-fdm-conference>.

⁶ <https://www.easa.europa.eu/domains/safety-management/safety-promotion>

⁷ See <https://www.easa.europa.eu/document-library/general-publications/easy-access-rules-air-operations>.



Point ORO.AOC.130 of Annex III (Part-ORO) to Commission Regulation (EU) No 965/2012 contains the requirements that are applicable to aeroplanes:

'ORO.AOC.130 Flight data monitoring — aeroplanes

(a) The operator shall establish and maintain a flight data monitoring system, which shall be integrated in its management system, for aeroplanes with a maximum certificated take-off mass of more than 27 000 kg.

(b) The flight data monitoring system shall be non-punitive and contain adequate safeguards to protect the source(s) of the data.'

Point SPA.HOFO.145 of Annex V (Part-SPA) to Commission Regulation (EU) 965/2012 contains the requirements that are applicable to helicopters:

'SPA.HOFO.145 Flight data monitoring (FDM) system

(a) When conducting CAT operations with a helicopter equipped with a flight data recorder, the operator shall establish and maintain a FDM system, as part of its integrated management system, by 1 January 2019.

(b) The FDM system shall be non-punitive and contain adequate safeguards to protect the source(s) of the data.'

The EU Air Operations Regulation is complemented by acceptable means of compliance (AMCs) issued by EASA. AMCs are non-binding standards which illustrate the means to establish compliance with a rule⁸.

However, the effective implementation of the FDM cannot be achieved only through regulation and oversight, because:

- the FDM, unlike airborne equipment or procedures, does not provide a direct safety benefit. The actual safety benefit brought by an FDM programme is indirect and more difficult to measure. As a consequence, there are no obvious and simple criteria for assessing whether an FDM programme is effective;
- in order to be effective, the FDM programme must be accepted and endorsed by all stakeholders within the operator (from top management to flight crews). This cannot be decreed by rules nor enforced;
- the diversity of operational contexts for the application of FDM is considerably wide and cannot be captured in rules or even in regulator guidance. Industry best practices are needed to fill the gap; and
- FDM teams are often small and isolated. The confidential nature of the FDM data does not facilitate the exchange of experience among operators.

⁸ The AMCs issued by EASA are not of a legally binding nature. They do not create additional obligations for the regulated persons, who may decide to show compliance with the applicable requirements using other means. However, as the legislator wanted such material to provide for legal certainty and to contribute to uniform implementation, it provided the AMCs adopted by EASA with a presumption of compliance with the rules, so that it commits competent authorities to recognise regulated persons that comply with the EASA AMCs as compliant with the corresponding applicable rules.



1.3.2. The objectives of the EOFDM

As mentioned above, the EOFDM was established to achieve two objectives:

- facilitate the implementation of FDM by European operators⁹; and
- help European operators gain the maximum safety benefits from an FDM programme.

The expected impacts of the EOFDM are increased European operators' awareness of and familiarity with the EOFDM BPDs, widespread use of the EOFDM BPDs for the enhancement of the FDM programmes of European operators, and ultimately better monitoring of operational risks through FDM programmes (see Figure 1).

While the results/immediate deliverables are visible and could be easily assessed, they could not provide information on the actual impact on the FDM programmes of European operators, which make a much bigger community than the EOFDM members. Therefore, the evaluation is mainly focused on understanding the impact of the EOFDM on the FDM programmes of European operators that are not members to the EOFDM. The EOFDM members were not interviewed because they co-authored the EOFDM BPDs.

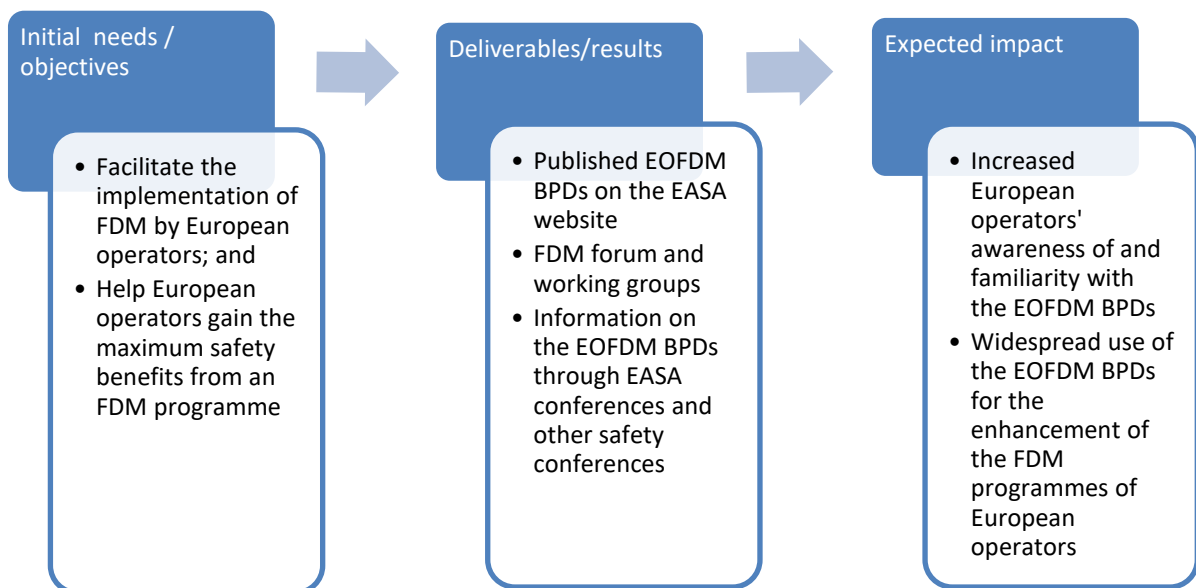


Figure 1 — Needs, deliverables, and their expected impact

⁹ The term 'European' refers to the EASA Member States. The term 'operators' refers to aircraft operators. Operators that have their principal place of business in an EASA Member State, are referred to in this document as 'European operators'.

1.4. Purpose and scope of the evaluation

This evaluation report is the deliverable of the evaluation task EVT.0009 of the EPAS for 2020–2024¹⁰. The purpose of this evaluation is to assess the impact of the BPDs developed by the EOFDM on FDM programmes of European operators that are not members to the EOFDM.

The general objective of the evaluation is to take stock of the current level of awareness and implementation of the EOFDM BPDs by European operators, to evaluate the relevance and the effectiveness of those documents, and to assess the potential need to adapt the scope of the EOFDM and the related EPAS actions. To this end, special focus is on gathering evidence on how well are the EOFDM BPDs fit for purpose (expected results versus achieved results), identifying success factors and limiting factors of the EOFDM approach, as well as assessing the unintended and/or unexpected effects of the EOFDM BPDs.

The evaluation was conducted by EASA staff.

1.5. Methodology for data collection

1.5.1. General aspects

Prior to the conduct of the evaluation, some preparatory work was necessary. To this end, the evaluation team:

- collected the contact details of safety managers and FDM programme managers through various channels (as EASA has no access to a European database of contacts of safety managers);
- sent in advance an introductory email to the selected operators with a short description of the EOFDM Evaluation Project and an extract from the Terms of Reference of the evaluation project to get their buy-in and facilitate the proceedings.

Following the completion of these initial steps, the focused interviews were carried out with 15 CAT operators of aeroplanes with an MCTOM of over 5 700 kg and with their principal place of business in an EASA Member State. For the selection of those operators, the diversity of operations in the EASA Member States was taken into account, and in particular with regard to the size and type of operations and the geographical location (see Section 1.4.2).

The criteria for selecting operators from the ASCEND database can be found in Annex 2. The short-list of the operators to be interviewed was finalised in August 2018.

The number of the selected operators (15) represented 2,3 % of the total number of operators (649) that hold an air operator certificate (AOC) and were based in an EASA Member State in 2018.

Due to the fact that the evaluation places emphasis on collecting insight information and detailed evidence rather than general information, the interviews contained detailed questions and offered sufficient time for operators to express their views. Because of that, each interview involved a significant amount of work (preparation, interview time, and post-interview processing). Therefore, the sample number was kept small (15 operators), but it is considered to be representative enough to draw conclusions and put forward recommendations.

¹⁰ <https://www.easa.europa.eu/domains/safety-management/european-plan-aviation-safety>



The interviews with the safety managers and/or the FDM programme managers were conducted via teleconferences for a maximum duration of 90 minutes and, to the extent possible, with the application of the ‘four-ears principle’ (presence of at least two EASA evaluation team members). The interviews took place in the period from 24 January to 5 April 2019.

As an initial step, two trial interviews were performed. Based on the experience gained, the questions were then slightly adjusted for greater coherence. In addition, a short introduction of the operator was added (describing the fleet size, type of operation and geographical location).

During the interviews notes were taken by the evaluation team members, which were then sent to the interviewed operators for validation.

1.5.2. Statistical aspects

1.5.2.1. Regional distribution of operators

The EASA Member States (covering eastern, northern, southern and western Europe) were grouped as shown in Table 1. The distribution of the selected operators according to region is presented in Table 2.

Table 1 — Grouping of the EASA Member States in regions

Region	North (5)	South (7)	East (10)	West (10)
Countries	Denmark	Croatia	Bulgaria	Austria
	Finland	Cyprus	Czech Republic	Belgium
	Iceland	Greece	Estonia	France
	Norway	Italy	Hungary	Germany
	Sweden	Malta	Latvia	Ireland
		Portugal	Lithuania	Liechtenstein
		Spain	Poland	Luxembourg
			Romania	Netherlands
			Slovakia	Switzerland
			Slovenia	United Kingdom

Table 2 — Distribution of the interviewed operators and of the Member States where they have their principal place of business

Region	Number of interviewed operators	Number of Member States where the interviewed operators were based
North	4	3
South	3	1
East	3	3
West	5	3
Total	15	10



1.5.2.2. Fleet range

The distribution of the selected operators according to the range of their aeroplanes is presented in Table 3.

Note: The following definitions of the ranges have been applied:

- short haul: range \leq 1 500 km
- medium haul: 1 500 km < range \leq 4 000 km
- long haul: range > 4 000 km

Table 3 — Distribution of the interviewed operators according to the range of their fleets

Range	Number of interviewed operators
Short and medium haul	8
Long-haul only	4
Short, medium and long haul	3
Total	15

1.5.2.3. Fleet size

The distribution of the selected operators according to the size of their fleets is presented in Table 4.

Note 1: The operators were sorted according to the following classification criteria:

- small: fleet size is less than 10 aircraft
- medium: fleet size between 10 and 49 aircraft
- large: fleet composed of 50 aircraft or more

Note 2: The sample set gives more weight to small-size fleets, which is consistent with the distribution of European operators per fleet size. Most of the EOFDM members would belong to the 'large' category according to the fleet-size criteria.

Table 4 — Distribution of the interviewed operators according to the size of their fleets

Size of fleet	Number of interviewed operators
Small	7
Medium	4
Large	4
Total	15



1.5.2.4. Type of operation

The distribution of the selected operators according to the type of operation is presented in Table 5.

Note: Scheduled passenger operators often transport cargo or mail too.

Table 5 — Distribution of the interviewed operators according to type of operation

Type of operation	Number of interviewed operators	Primary use
Passengers — scheduled	5	Passenger
Passengers — unscheduled	3	Air taxi, air charter, aeromedical purposes (emergency medical services, air ambulance, airborne hospital)
Cargo	7	Cargo
Total	15	



2. Evaluation questions

The evaluation questions were defined by EASA in the Terms of Reference for this evaluation project (EVT.0009), and are presented in Table 6 below.

Table 6 — Evaluation questions covered during the interviews with the operators

<i>Criteria</i>	<i>Evaluation questions (EQs)</i>	<i>Purpose of the questions</i>
Context	<p>EQ 1 Experience of the operator with the FDM programme</p> <p>1) For how many years has the FDM programme of your company been in place?</p>	Indication of the level of experience with FDM.
Context	<p>EQ 2 Operator resources involved in the FDM programme</p> <p>1) Where does your FDM team fit in the organigram of the operator?</p> <p>2) List people in the FDM team. (Part- or Full-time? Pilots, engineers, others?)</p> <p>3) Interface with other departments with whom data are exchanged: describe how data communication takes place.</p> <p>4) Is FDM in-house or outsourced? What part of the FDM processes remains with the operator (validation of FDM events, analysis of FDM events, FDM statistics?)</p> <p>5) Which FDM software provider is used?</p> <p>6) To what extent is the FDM software customised (FDM events, FDM measurements, statistics and scoreboards, other visualisation, etc.)?</p>	Understand how FDM is structured/organised. Indication of the level of resources dedicated to the FDM programme and of the level of technical competence regarding FDM.
Current situation	<p>EQ 3 Familiarity of the operator with the EOFDM BPDs</p> <p>1) Were you aware of EOFDM documents before we first contacted you? If yes:</p> <p>1.1) How were you made aware?</p>	Understand the level of the familiarity of the operator with the EOFDM BPDs, and how the operator learned about the existence of the EOFDM BPDs.



Criteria	Evaluation questions (EQs)	Purpose of the questions
	<p>1.2) What was your level of familiarity with these documents before we contacted you (just aware of them, read them once, studied them intensively)</p>	
<p>Relevance</p>	<p>EQ4 Relevance of the EOFDM precursors for the safety objectives of the operator</p> <p>The EOFDM precursors cover the four categories of occurrence: runway excursion, loss of control in flight, controlled flight into terrain and mid-air collision.</p> <p>1) To what extent does this scope cover your top safety objectives?</p> <p>2) Can you list top safety objectives for your company, which in your opinion are FDM-relevant and are not well covered by EOFDM documents?</p>	<p>Assess whether the four categories of occurrence in the scope of the EOFDM precursors are also perceived as priority by the operator. Identify any important issue that is not well captured by the EOFDM precursors.</p>
<p>Relevance</p>	<p>EQ5 Usefulness of the EOFDM precursors</p> <p>1) In your opinion, is the list of FDM precursors, as published by EOFDM useful for the enhancement of your FDM programme?</p> <p>2) Have you tried to implement any measurement or event, as proposed in the EOFDM documents?</p> <ul style="list-style-type: none"> • If yes, which ones? • If no, why? <p>3) Example: EOFDM precursors related to take-off performance (RE01, RE02, RE05, RE07, RE08, RE09, LOC08 and LOC10). Do you find the level of detail and the explanations workable and user-friendly?</p>	<p>Know whether the operator finds the EOFDM precursors useful, and whether it has actually tried to implement any of the EOFDM precursors and the outcome.</p>



Criteria	Evaluation questions (EQs)	Purpose of the questions
	<ol style="list-style-type: none"> 1. For which ones of these precursors do you have similar FDM events or measurements in your FDM programme? 2. Which one do you consider too complex to implement or not worth implementing, and why? 	
Relevance	<p>EQ 6 Usefulness of EOFDM documents (other than EOFDM precursors)</p> <p>EOFDM has also published documents on preparing a memorandum of understanding (MoU) for a FDM programme and Key Performance Indicators (KPI) for a FDM programme.</p> <ol style="list-style-type: none"> 1) What do you feel relevant in these documents for your FDM programme? 2) In your opinion, what could hinder the implementation of these documents in your company? 	Know whether the operator finds the other EOFDM BPDs more useful than the EOFDM precursors, and whether it has considered implementing the best practices provided by these documents.
Relevance	<p>EQ 7 Other FDM-related topics that are important for the operator</p> <p>Which topic(s) would you recommend EOFDM to focus on in support of operators' FDM programmes?</p>	Identify topics of importance for operators, which might not have been captured so far by the EOFDM activities.
Effectiveness	<p>EQ 8 Clarity of the presentation/format of the EOFDM outputs</p> <p>In your opinion, how the presentation/format of EOFDM outputs could be improved to make them easier to use?</p>	Identify possible improvements to the way the EOFDM promotes the FDM best practices.
Effectiveness	<p>EQ 9 Clarity of the description of the EOFDM precursors</p> <p>EOFDM documents on precursors:</p>	Assess whether the description of the EOFDM precursors is understandable and convenient for operator staff that lead and run the FDM programme.



Criteria	Evaluation questions (EQs)	Purpose of the questions
	In your opinion, what could be improved in the description of precursors to facilitate their understanding and their implementation into your FDM programme?	
Effectiveness	<p>EQ 10 Overall effectiveness of the EOFDM documents</p> <p>Which of the EOFDM documents have you already used or intend to use in the near future? Why?</p>	Know which EOFDM documents are perceived as the most useful ones by the operators and understand why. Understand the reasons why an operator does not use the EOFDM documents.
Effectiveness	<p>EQ 11 Contribution of Member States to FDM promotion</p> <p>Has your national authority promoted flight data monitoring? (i.e. promoting the benefits, facilitating exchange of experience between operators on flight data monitoring). If yes:</p> <p>What did the promotion activities consisted of?</p> <p>What is your opinion on the relevance of these activities?</p>	Know whether the operators are aware of any FDM promotion activity by their competent authority, and what they consist of.



3. Answers to the evaluation questions

Note: The interviews of the European operators were performed from January to April 2019, that is, well before the COVID-19 pandemic and the resulting economic crisis.

3.1. EQ1: Experience of the operator with the FDM programme

Evaluation question:

- 1) For how many years has the FDM programme of your company been in place?

Objective of the question: Indication of the level of experience with FDM

Summary of the results:

All interviewed operators had experience with FDM, and for the majority of them, the FDM programme had been running for a period significantly longer than necessary to develop an FDM programme.

Analysis and explanation:

12 out of the 15 interviewed operators had been running an FDM programme for more than 5 years, and 9 out of these 12 had even been running an FDM programme for more than 10 years. This shows that the majority of the interviewed operators had been running an FDM programme for a long enough period to gain considerable experience.

All interviewed operators had been running an FDM programme for 2 years or more. 2 years is often considered sufficient time to develop an FDM programme.

3.2. EQ2 Operator resources involved in the FDM

Evaluation questions:

- 1) Where does your FDM team fit in the organigram of the operator?
- 2) List people in the FDM team.
- 3) Interface with other departments with whom data are exchanged: describe how data communication takes place.
- 4) Is FDM in-house or outsourced? What part of the FDM processes remains with the operator (validation of FDM events, analysis of FDM events, FDM statistics?)
- 5) Which FDM software provider is used?
- 6) To what extent is the FDM software customised (FDM events, FDM measurements, statistics and scoreboards, other visualisation, etc.)?

Objective of the question: Understand how FDM is structured/organised. Indication of the level of resources dedicated to the FDM programme and of the level of technical competence regarding FDM.

Summary of the results:

The placement of the FDM teams in organisations was harmonised across operators and in line with the EU requirements regarding operator personnel and placement of the FDM programme. However, operators allocated limited human resources to the FDM programme (2 full-time equivalents (FTEs) or less), except for the 2 operators with the largest fleets. It should be noted that most of the



interviewed operators were small or medium-sized, i.e. had a fleet of less than 50 aircraft (refer to Section 1.5.2).

The usual communication channel between the FDM team and other departments was through scheduled meetings at 1- to 3-month intervals and scheduled reports (on a weekly or monthly basis). For the majority of the interviewed operators, the FDM team controlled the access to flight data by other internal users (such as maintenance staff).

About half of the interviewed operators had an in-house FDM programme, and almost all of these operators had the same FDM software provider. With one exception, the interviewed operators did not design the FDM event definitions; they relied on their FDM software provider for this task. However, a few operators had developed alternative solutions for the visualisation of the FDM output to the functionalities offered by their FDM software.

Analysis and explanation:

All 15 interviewed operators indicated that the FDM team reported to a manager in charge of safety (and often, in charge of compliance and/or security). Depending on the operator, this manager directly reported to the accountable manager or to a senior manager, who in turn reported to the accountable manager. This set-up reflects the principles specified in the AMCs to the EU Air Operations Regulation, in particular regarding the safety manager (see Annex III (Part-ORO) to Commission Regulation (EU) No 965/2012, AMC1 ORO.GEN.200(a)(1) and AMC1 ORO.AOC.130).

13 out of the 15 interviewed operators dedicated 2 FTEs or less to the FDM programme (not including the time of the gatekeepers). Out of these 13 operators, 8 allocated 1 FTE or less to the FDM programme. The 2 operators that allocated more than 2 FTEs to the FDM programme also operated the largest aircraft fleets (90 and 79 respectively). For the 10 out of the 15 interviewed operators, there was at least 1 staff member fully dedicated to the FDM programme. For the remaining 5, the staff assigned to the FDM programme were part-time pilots. Pilots made more than 50 % of the FTEs allocated to the FDM programme in 6 out of the 15 interviewed operators.

All 15 interviewed operators replied that their FDM teams provided information to the departments in charge of flight operations and training at the operator. For 8 operators out of the 15, a meeting was scheduled every month to every quarter between the FDM team and these other departments (typically called 'safety review group') to review the most significant outputs of the FDM programme. 6 operators out of 15 indicated that an FDM summary was sent to the other departments at regular intervals (ranging from 1 week to 1 month). Regarding other users of flight data than the FDM team (staff in charge of aircraft maintenance, continued airworthiness, fuel conservation, etc.), 4 operators indicated that these other users had direct access to the flight data that was useful for their needs, while it seems that for the remaining operators, the FDM team provided data to these other users on an ad hoc basis.

8 out of the 15 interviewed operators had an in-house FDM programme, i.e. they did not rely on a third party for the processing of flight data or the analysis of the FDM software output. The other 7 operators outsourced the processing of flight data and part of the analysis work.

9 out of the 15 interviewed operators had the same FDM software provider, out of which 6 had an in-house FDM programme. The remaining 6 operators relied on various FDM software from 5 providers.



All 15 interviewed operators indicated that the FDM software can be customised. However, most of them did not create nor change any FDM event definition; they just adjusted the thresholds of the predefined FDM event definitions depending on their SOPs. When a new FDM event definition was needed, it was usually designed by the FDM software provider based on the specifications provided by the operator. Only 1 operator indicated that it had created FDM event definitions (these operator-established FDM event definitions represented about one third of the operator's FDM event definitions set but produced two thirds of the genuine FDM events).

4 operators had used other tools for the visualisation and the statistics than those embedded in their FDM software because they were more advanced and/or more flexible.

3.3. EQ3 Familiarity of the operator with the EOFDM BPDs

Evaluation questions:

1) Were you aware of EOFDM documents before we first contacted you?

If yes:

1.1) How were you made aware?

1.2) What was your level of familiarity with these documents before we contacted you (just aware of them, read them once, studied them intensively)

Objective of the questions: Understand the level of the familiarity of the operator with the EOFDM BPDs, and how the operator learned about the existence of the EOFDM BPDs.

Summary of the results:

Slightly more than half of the interviewed operators stated they were aware of the EOFDM BPDs prior to being contacted, but few had studied them.

Most of those operators that had been aware of the EOFDM BPDs before the interviews had been informed through a conference, their national aviation authority or their peers: this shows that the publication of the EOFDM BPDs on the EASA website does not raise sufficiently the awareness of European operators in this regard.

Analysis and explanation:

9 out of the 15 interviewed operators were aware of the existence of the EOFDM BPDs prior to being contacted for the interview, while 6 operators were not.

Out of the 9 operators that were aware of the existence of the EOFDM BPDs, 2 were simply aware without having read them, 5 read some of these documents at least once, and 2 studied at least one of these documents.

Out of the 9 operators that were aware of the existence of the EOFDM BPDs, 3 learned about them at safety conferences where the EOFDM activities had been presented, 3 were informed by their national aviation authority (out of which 2 were informed by the same national aviation authority), 2 were informed by their industry peers, and 1 found out by searching on the internet.



3.4. EQ4 Relevance of the EOFDM precursors for the safety objectives of the operator

Evaluation question:

The EOFDM precursors cover the four categories of occurrence: runway excursion, loss of control in flight, controlled flight into terrain and mid-air collision.

- 1) To what extent does this scope cover your top safety objectives?

Objective of the question: Assess whether the four categories of occurrence in the scope of EOFDM precursors are also perceived as priority by the operator. Identify any important issue that is not well captured by EOFDM precursors.

Summary of the results:

The four categories of occurrences (RE, LOC-I, CFIT and MAC) covered by the EOFDM precursors match the main safety objectives for most of the interviewed operators. The FDM event definitions and the FDM measurement definitions used by those operators partially match the definitions of the EOFDM precursors.

Analysis and explanation:

Most of the interviewed operators considered that the four categories of occurrences (RE, LOC-I, CFIT and MAC) covered by the EOFDM documentation match their main safety objectives. Documentation from other forums, such as the 'Significant Seven'¹¹ published by the Civil Aviation Authority of the United Kingdom, also includes these categories among the top safety objectives. 3 operators considered that RE was the most important to focus on for various reasons, such as the electronic flight bag (EFB) integration in the operations or new aircraft being phased in. In general, operators adapt their FDM programmes to the operational risks they are more exposed to.

'RE' was always present in the answers, 'LOC-I' and 'CFIT' to a lesser degree, and for 'MAC' the operators were mainly relying on occurrence reporting and were using FDM as a complement.

Despite some differences among the operators, the FDM event definitions partially match the proposed definitions for the EOFDM precursors. This was the case for 'unstable approach' and 'long flare'. An operator had created safety performance targets for each category, produced a safety risk assessment, and the outcome was included in its SOPs.

A small operator mentioned that due to the limited amount of FDM events (because of the limited flight activity), it was difficult to establish trends.

¹¹ CAA PAPER 2011/03, CAA 'Significant Seven' Task Force Reports (https://publicapps.caa.co.uk/docs/33/2011_03.pdf).



Evaluation question:

The EOFDM precursors cover the four categories of occurrence: runway excursion, loss of control in flight, controlled flight into terrain and mid-air collision.

2) Can you list top safety objectives for your company, which in your opinion are FDM-relevant and are not well covered by EOFDM documents?

Objective of the question: Assess whether the four categories of occurrence in the scope of EOFDM precursors are also perceived as priority by the operator. Identify any important issue that is not well captured by EOFDM precursors.

Summary of the results:

Most of the interviewed operators found that 'unstable approaches' and 'take-off performance' were the main safety issues that could be better addressed in the EOFDM BPDs.

Some safety issues not related to FDM were mentioned, such as the training of FDM staff and flight crew fatigue.

Other safety issues were mentioned, for which FDM data would need to be combined with data from other sources in order to get a good insight: meteorological phenomena, effect of flight crew fatigue, cabin safety, and risk of collision during take-off or landing.

Analysis and explanation:

The safety objectives that were mentioned the most by the interviewed operators were 'unstable approaches' and 'take-off performance' (in particular, the pitch rate at take-off). There was though a great diversity of safety objectives identified by the operators, which in turn reflected the diversity of the risks encountered in their operations. Most of the safety objectives identified were already covered by the EOFDM precursors. For example, the risk of tailstrike, excessive bank angle at landing and bank angle call-out, hard landings, structural overspeeds (e.g. VMO, MMO, VFE, VLE) and alerts of the terrain awareness and warning system (TAWS) were all considered to be covered. Not all operators were at the same level of development of their FDM programmes nor did they have the same experience in this regard.

An operator identified staff competencies as the top safety objective in order to ensure staff are trained to the appropriate level and have considerable and practical experience, in particular that they are trained in flying skills. However, this cannot be monitored by an FDM programme.

Some improvements to the EOFDM documentation were suggested, in particular regarding aircraft limitation exceedances (such as flap exceedances, VMO/MMO). Other issues not covered by the EOFDM precursors were mentioned, such as flight crew fatigue (related to night operations), cabin safety (related to crew injuries and turbulence), meteorological conditions during the flight (windshear, storms), and collision during take-off and landing (CTOL). However, FDM data may only provide a good insight into these issues when combined with data from other sources.



3.5. EQ5 Usefulness of the EOFDM precursors

Evaluation question:

1) In your opinion, is the list of FDM precursors, as published by EOFDM useful for the enhancement of your FDM programme?

Objective of the question: Know whether the operator finds EOFDM precursors useful, whether it has actually tried to implement any EOFDM precursor and the outcome.

Summary of the results:

Most of the interviewed operators considered that the EOFDM precursors were helpful to enhance their FDM event definitions or for flight crew acceptance of the FDM programme.

Analysis and explanation:

A significant proportion of the interviewed operators (10 out of 15) provided positive feedback regarding the EOFDM precursors, and 2 operators did not have enough knowledge of these precursors to reply to the question.

An operator explained that this guidance material allowed it to establish an initial set of FDM event definitions and that it found it helpful in making the flight crews familiar with the definitions of the FDM events and measurements. The reference to the EOFDM documentation facilitated acceptance of the FDM programme by flight crews.

Some operators stated that their FDM programme was already monitoring most of the EOFDM precursors.

Evaluation question:

2) Have you tried to implement any measurement or event, as proposed in the EOFDM documents?

If yes, which ones?

If no, why?

Objective of the questions: Know whether the operator finds EOFDM precursors useful, whether it has actually tried to implement any EOFDM precursor and the outcome.

Summary of the results:

Most of the interviewed operators did not try to implement the EOFDM precursors in their FDM programme. The most frequently quoted reasons were the following:

1. lack of awareness of the EOFDM documentation;
2. reliance on FDM software vendors to perform modifications;
3. insufficient human resources allocated to the FDM programme and/or lack of know-how;
4. some essential flight parameters not recorded.

The reasons above are consistent with the fact that most of the interviewed operators had small or medium-size fleets (see also Section 1.5.2).



Analysis and explanation:

Most of the interviewed operators did not try to implement any the EOFDM precursors.

The first reason invoked by the interviewed operators was the lack of awareness of the EOFDM documentation. Several operators were simply not aware of its existence. An operator was aware of the documents produced by the European authorities coordination group on FDM (EAFDM) but it was not aware of the EOFDM BPDs.

Most of the interviewed operators relied on their FDM software vendors to implement the modifications to the definitions of measurements and events. An operator had provided the guidance material to the software vendors for some changes to be incorporated into the FDM programme.

An operator indicated that most of the contents of the EOFDM precursors were already part of their FDM programme, so that in practice there was little from the EOFDM precursors to be considered for enhancing their FDM programme.

Another operator stated that it had tried to implement the EOFDM precursors but was faced with the fact that it was missing flight parameters or that it was difficult to find the necessary flight parameters among those recorded.

A third operator used the documentation for different risk areas, and in particular for LOC-I, CFIT and MAC.

The non-implementation of the EOFDM precursors is also related to insufficient human resources allocated to the FDM programme. This is especially critical for small-sized operators. In order to process the information in the BPDs, an operator has to dedicate time and resources to implement and customise the precursors. This is why the interviewed operators prioritised the customisation of their FDM programme according to their main safety objectives.

Evaluation questions:

3) Example: EOFDM precursors related to take-off performance (RE01, RE02, RE05, RE07, RE08, RE09, LOC08 and LOC10)

- Do you find the level of detail and the explanations workable and user-friendly?
- For which ones of these precursors do you have similar FDM events or measurements in your FDM programme?
- Which one do you consider too complex to implement or not worth implementing, and why?

Objective of the questions: Know whether the operator finds EOFDM precursors useful, whether it has actually tried to implement any EOFDM precursor and the outcome.

Summary of the results:

The details and explanations regarding the EOFDM precursors related to take-off performance were found by most of the interviewed operators to be rather clear and user-friendly, although for some EOFDM precursors flight parameters were needed that were not always available or other sources of data needed to be accessed.



Analysis and explanation:

The EOFDM precursors related to take-off performance were considered by most of the interviewed operators to be workable and user-friendly, although 3 operators indicated that they did not have enough knowledge of the BPDs to answer this question.

There was no major issue regarding the clarity of the explanations, except for the precursor related to 'slow acceleration during take-off' (RE05), which was found difficult to understand without additional information (this information had been provided in a presentation at an EASA FDM conference but it had not been incorporated into the document).

The main hindrance mentioned by the interviewed operators was that some essential flight parameters needed for implementing the EOFDM precursors related to take-off performance were not recorded. This seemed to be particularly problematic for older fleets. Some operators found ways to overcome this issue. As an example, a slow pitch rate during take-off may indicate a problem with the centre-of-gravity position, when the latter is not recorded. For operators with newer fleets, the lack of flight parameters could be addressed by data frame customisation, but this solution was not implemented by the interviewed operators.

Other comments were made, such as the fact that some EOFDM precursors related to take-off performance require access to data from other sources, in particular the load sheet (in the case of LOC08). An operator commented about RE15 (computing the runway distance remaining ahead after lift-off) and questioned the relevance of this precursor¹². Another operator found that guidance for specific fleets and types of operation would be beneficial (today, the EOFDM precursors are meant to be applicable to all aircraft types).

Despite this, most of the interviewed operators stated that they had in place events and measurements related to take-off performance that are similar to the EOFDM precursors.

3.6. EQ6 Usefulness of the EOFDM documents (other than the EOFDM precursors)

Evaluation questions: EOFDM has also published documents on preparing a memorandum of understanding (MoU) for a FDM programme and Key Performance Indicators (KPI) for a FDM programme.

- 1) What do you feel relevant in these documents for your FDM programme?
- 2) In your opinion, what could hinder the implementation of these documents in your company?

Objective of the questions: Know whether the operator finds the other EOFDM BPDs than EOFDM precursors useful, and whether it has considered implementing the best practices provided by these documents.

Summary of the results:

The MoU and KPI documents were positively assessed by the operators: those operators that were aware of these documents found their contents useful. The MoU and KPI documents were also used more by the interviewed operators than the EOFDM precursors. The main reasons why these documents were not or only partially used were related to technology and human resources. Only 1 operator identified the pilot unions as a possible barrier.

¹² Although not listed in question 3, RE15 may also be used to monitor the risk of accident caused by insufficient performance at take-off.



Analysis and explanation:

The feedback on the documentation regarding the MoU and KPI guidance was positive. The answers revealed three types of operators:

- those that did not have any previous knowledge of these documents (5 operators);
- those that were partially aware of these documents (1 operator); and
- those that were fully aware of these documents (9 operators).

The operators that had been aware of the EOFDM BPDs on KPIs commented that the contents were useful for their FDM programme and that they were considering the extension of their set KPIs based on the EOFDM BPDs. An operator stated that it did not use the KPI documentation because it considered that KPIs were rather high-level indicators for management purposes.

Both the extent of use and the number of KPIs varied across operators. When considering small operators where the small number of staff allows the direct interaction between the safety manager and other managers, KPIs might be less helpful.

The document on preparing an MoU was mainly used for the interaction between operators and pilot unions. For those operators that had an MoU in place, some declared that they took into consideration the contents of the document from the EOFDM guidance material. Others planned to compare this documentation with their MoU.

Regarding the reasons for not using these documents, the explanations provided by the operators were rather pointing at technological limitations and lack of resources:

- flight parameters not recorded;
- aircraft recording technology is a limiting factor (does not allow frequent downloads);
- limited number of resources allocated to the FDM programme;
- FDM software providers with limited aviation knowledge;
- lack of staff with programming skills to customise the FDM software.

Only 1 operator identified pilot unions as a possible hindrance.

3.7. EQ7 Other FDM-related topics that are important for the operator

Evaluation question: Which topic(s) would you recommend EOFDM to focus on in support of operators' FDM programmes?

Objective of the question: Identify topics of importance for operators, which might not have been captured so far by EOFDM activities.

Summary of the results:

Various topics were suggested, which are not yet covered by the EOFDM BPDs.

In the area of EOFDM precursors:

- the EOFDM precursors for take-off performance and runway incursion;
- identification of the relations between the EOFDM precursors;



- definitions of the EOFDM precursors that work when some flight parameters are not recorded;
- application of machine-learning to FDM.

Regarding the integration of the FDM programme with other processes:

- how to evaluate the risk associated to an FDM event; and
- database of FDM-based KPIs.

Analysis and explanation:

The interviewed operators made various recommendations, which can be summarised as follows:

1. Provide guidance on the merging of flight data with data from other data sources.
2. Communication, reporting and feedback to pilots and other departments, such as flight operations and training.
3. Develop further the guidance on 'take-off performance' topics.
4. Cover runway incursions (RIs) in the EOFDM BPDs.
5. Provide guidance for possible event correlation (e.g. hard landing and deep landing).
6. Provide guidance on how to perform FDM with a limited set of flight parameters.
7. Provide guidance on an appropriate data retention time.
8. Increase the number of KPIs addressed in the documentation and provide a more extensive approach. Create a European database of FDM-based KPIs so that small operators have some reference outside their FDM programme. Propose target values for the KPIs.
9. Provide guidance addressing the aspects of risk evaluation and integration into the risk management system — in particular, if the operators use the aviation risk management solutions (ARMS) methodology for assessing their incidents, including the FDM events.
10. Facilitate the exchange of new ideas, in particular new/advanced algorithms, to study data making use of machine-learning techniques.

It should be noted that points 1 and 2 are addressed by the EOFDM BPD titled 'Breaking the silos'. This document was published after the survey was performed.



3.8. EQ8 Clarity of the presentation and the format of the EOFDM outputs

Evaluation question: In your opinion, how could the presentation/format of EOFDM outputs be improved to make them easier to use?

Objective of the question: Identify possible improvement to the way EOFDM promotes FDM best practices.

Summary of the results:

The current presentation and the format (PDF) of the EOFDM BPDs are considered to be clear and convenient by the interviewed operators. However, a few suggestions were made to make their contents even more user-friendly by using modern digital technologies to permit a more flexible use of the BPDs' contents and making some explanations more clear.

Analysis and explanation:

Format of the information

The PDF format was considered appropriate by the interviewed operators because it is a widespread industry standard. However, several operators found that it does not enable a quick and agile visualisation of the technical content. They stated that dashboard visualisation and search functions would be helpful.

Raise awareness of the EOFDM BPDs

Some ideas were suggested by the interviewed operators to raise the operators' awareness of the EOFDM BPDs:

- increase the EOFDM activities to present and explain the content of the BPDs via workshops, trainings, meetings, conferences;
- develop introduction to / summary of the BPDs.

Editorial aspects

An operator commented that the explanations for some of the concepts used in the BPDs could be more clear.

3.9. EQ9 Clarity of the description of the EOFDM precursors

Evaluation question: In your opinion, what could be improved in the description of precursors to facilitate their understanding and their implementation into your FDM programme?

Objective of the question: Assess whether the description of EOFDM precursors is understandable and convenient for operator's staff leading and running the FDM programme.

Summary of the results:

Overall, the interviewed operators provided a very positive feedback about how the EOFDM precursors are described and explained in the current EOFDM BPDs, especially from a conceptual point of view (e.g. pseudocode). However, they made recommendations to have even more complete descriptions of the EOFDM precursors (thresholds, limitations, references to other sources) and to



facilitate their implementation (e.g. alternative FDM event definitions that can be programmed with only basic flight parameters).

Analysis and explanation:

Overall, the description of the EOFDM precursors was considered to be clear and user-friendly.

Regarding the description of the EOFDM precursors, the interviewed operators suggested the following:

- propose values for the thresholds of the EOFDM precursors (depending on the main families of aircraft products);
- propose alternative FDM event definitions using basic flight parameters, when all the required flight parameters are not available;
- better explain complex EOFDM precursors, including references/links to other documentation;
- provide more information on the technical limitations (e.g. required flight parameters, other required sources of data).

Regarding the implementation of the EOFDM precursors, the interviewed operators suggested the following:

- provide visibility on the actual level of implementation of the EOFDM precursors across the operators (and, if possible, an up-to-date picture);
- provide an example of 'implementation road map' to ensure a coherent and logical implementation of the EOFDM precursors (step-by-step guidance).

3.10. EQ10 Overall effectiveness of the EOFDM documents

Evaluation question: Which of the EOFDM documents have you already used or intend to use in the near future? Why?

Objective of the question: Know which EOFDM documents are perceived as the most useful ones by operators and understand why. Understand the reasons why an operator does not use the EOFDM documents.

Summary of the results:

7 documents were available at the time of the interviews. They can be grouped in three categories:

- memorandum of understanding (MoU) for an FDM programme;
- key performance indicators (KPIs) for an FDM programme;
- EOFDM precursors documents (5 documents at the time the interviews were performed).

The MoU and KPIs BPDs were used more by the interviewed operators than the FDM precursors, possibly because they tackle the integration of the FDM programme with other processes.

The use of the EOFDM precursors documents by the interviewed operators was limited. Most operators declared their intent to use the EOFDM precursors in the near future. However, it seemed that they would implement the EOFDM precursors only on new fleets or when an FDM event definition



would need to be changed or added. The possible reasons for the limited use of the EOFDM precursors are identified in EQ5.

Analysis and explanation:

The operators' answers were not always clear and definitive. Table 7 below provides an indicative overview of their answers.

Table 7 — Use of the EOFDM BPDs by the interviewed operators

	Already used	Will be used in the near future	Not replied
MoU	5	2	8
KPIs	4	3	8
EOFDM precursors	2	11	2

The **MoU BPD** was the most commonly used document because it provides:

- a baseline for establishing an agreement with the pilot unions regarding the FDM programme; and
- an overview of the regulatory framework (regulations, AMCs, GM).

The second most commonly used document was the **KPI BPD**.

The EOFDM precursors documents were used only by few of the interviewed operators, but the majority of the operators declared their intention to use them in the near future. Apart from the reasons listed in EQ5, the following comments were provided regarding the limited use of these documents:

- it seems more relevant to use the EOFDM precursors documents when new aircraft are included in the FDM programme; and
- when an FDM programme is already established, the EOFDM precursors documents are rather used to enhance the FDM programmes.



3.11. EQ11 Contribution of the Member States to the FDM promotion

Evaluation questions:

1) Has your national authority promoted flight data monitoring? (i.e. promoting the benefits, facilitating exchange of experience between operators on flight data monitoring).

2) If yes:

What did the promotion activities consisted of?

What is your opinion on the relevance of these activities?

Objective of the questions: Know whether the operators are aware of any FDM promotion activity by their competent authority, and what they consist of.

Summary of the results:

An EPAS safety action recommends that EASA Member States promote FDM and encourage operators to use the EOFDM BPDs.

The interviews show that out of the 10 EASA Member States, 5 were promoting FDM to their operators or had tried to promote FDM, 1 had just provided information about the EOFDM or other FDM promotion activities, and 4 had seemingly not undertaken any action.

The interviewed operators that could attend the FDM promotion activities organised by their competent authorities were very thankful for the possibility to exchange their experience with their peers.

2 operators reported that their Member States' initiatives to promote FDM failed due to the insufficient number of CAT operators based in them. This seems to indicate that the promotion of FDM at national level is challenging for those Member States where only a handful of CAT operators are based. However, out of the 4 Member States that seemingly had not undertaken any action, 2 had more than 20 CAT operators.

Analysis and explanation:

5 of the interviewed operators replied that their competent authorities were promoting FDM at the time of the interview, which means 3 EASA Member States (because 3 out of these 5 operators were based in the same EASA Member State).

2 operators explained that their respective competent authorities had tried to promote FDM in the past, and that they had ceased that promotion activity because there were not enough industry members (both operators were based in EASA Member States that only have a small number of CAT operators).

2 other operators indicated that their respective competent authorities had not promoted FDM, but they had provided information about the EOFDM activities or an FDM workshop taking place elsewhere. 1 of these competent authorities had tried to promote FDM before, according to another operator.

The remaining 6 operators were not aware of any FDM promotion activity or even official information regarding FDM at their competent authorities. This means 4 EASA Member States (3 out of these 6



operators were based in the same EASA Member State), of which at least 2 EASA Member States have more than 20 CAT operators.

According to the explanations provided by the interviewed operators, the 3 competent authorities that were promoting FDM organised meetings dedicated to sharing FDM best practices with their operators once or twice a year. The interviewed operators whose competent authorities were promoting or had tried to promote FDM expressed very positive feedback. However, 3 operators were of the opinion that the FDM promotion activities at national level do not work when there is a small number of CAT operators (in one case, only 5 operators) in the EASA Member State concerned. This seems to indicate that the implementation of the EPAS safety action MST.003 of the EPAS for 2018–2022 has been challenging for those Member States where only a handful of CAT operators are based.

Note:

Safety action MST.003 of the EPAS for 2018–2022 recommends the following:

'States should maintain a regular dialogue with their operators on FDM programmes, with the objectives of:

- *promoting the operational safety benefits of FDM and the exchange of experience between subject matter experts, and*
- *encouraging operators to make use of good-practice documents produced by EOFDM and similar safety initiatives.'*

MST.003 is a continuous safety action and it also appeared in the EPAS for 2019–2023 and in the EPAS for 2020–2024.

MST.003 was amended and renumbered 'MST.0003' in the EPAS for 2021–2025 (see Section 4.2).



4. Conclusions and recommendations

Note: The interviews of the European operators were performed from January to April 2019, that is, well before the economic crisis triggered by the COVID-19 pandemic. Therefore, the economic crisis should not be invoked to analyse and explain the results of the interviews.

4.1. Conclusions

The analysis of the replies (see Chapter 3) provides a good picture of the current situation as regards the awareness and the implementation of the EOFDM BPDs, before the start of the COVID-19 pandemic, among those European operators that were not members to the EOFDM. The analysis also allows to better assess the relevance and the effectiveness of those documents EU-wide. It also identifies 'success factors' and 'limiting factors' of the EOFDM approach.

The analysis of the replies was shared with the interviewed operators and with the operators that are members to the EOFDM. The feedback received was very positive, so that the analysis of the replies can be considered a solid basis for drawing conclusions on the EOFDM impact on European operators.

Experience of the operators with FDM and dedicated resources (refer to EQ1 and EQ2)

All interviewed operators had experience with FDM, and for the majority of them their FDM programmes had been running for a time period enough to reach a good level of maturity. However, they all had allocated limited human resources to the FDM programme (2 FTEs or less), except for larger operators.

About half of the interviewed operators outsourced their FDM programmes, and most of the remaining operators were using the same FDM software. Only 1 interviewed operator implemented own-established FDM event definitions, while the others relied on the FDM event definitions provided by the FDM software provider. It seems that most of the interviewed operators did not get any FDM event definitions customised for their needs; they used instead the predefined FDM event definitions provided with their FDM software tool and they just got the thresholds of these predefined FDM event definitions adjusted.

Both the allocation of very limited human resources and the reliance on predefined FDM event definitions seem to indicate that the amount of resources allocated to the FDM programme by small to medium-sized operators is mainly driven by the compliance with the FDM requirements in the applicable rules (refer to Section 1.3). This is a factor that strongly limits the effectiveness of the FDM promotion activities. In addition, since the EOFDM members are rather large operators that are more involved and more knowledgeable in the field of FDM than most of the interviewed operators, they should not be considered as a representative sample of European operators with regard to the FDM resources.

Familiarity of the operators with the EOFDM BPDs (refer to EQ3)

Slightly more than half of the interviewed operators stated that they were aware of the EOFDM BPDs prior to being contacted, and few had studied them. Hence, the awareness of the EOFDM BPDs among European operators could be increased.



The publication of the BPDs on the EASA website does not seem to be a sufficient means to ensure adequate visibility. Often operators were informed about the EOFDM BPDs through a conference, their national aviation authorities or their peers. This should be put in the perspective of statistics of internet traffic as regards the EOFDM webpage: it was viewed about 300 times per month in 2018, and about 500 times per month in 2019. While most of the page views were recorded in the Member States in western and southern Europe (refer to Table 2), it seems that the EOFDM webpage was never viewed from 6 out of the 32 EASA Member States. On the other hand, apart from the EASA Member States, other States have significantly viewed the webpage (Belarus, USA, Russia, Iran, Turkey, Taiwan, UAE, etc.).

It was found that when key words such as ‘flight data monitoring’ or ‘FDM’ were entered in the search field of most commonly used web search engines, ‘EOFDM’ did not appear among the listed results. The first hits were often Wikipedia, Skybrary, and the websites of commercial FDM service providers.

Also, it should be noted that currently EASA relies on its advisory bodies and on various forums to disseminate safety information to aviation professionals, which is an indirect and probably not the most efficient way to reach out to all safety specialists at operator level. It should be reminded that in 2019 there were about 650 European operators, and that the 30 operators taking part to the EOFDM represented about 5 % of this number.

Clarity of the presentation/format and of the contents of the EOFDM BPDs (refer to EQ5, EQ8 and EQ9)

The presentation and the PDF format of the EOFDM BPDs were considered clear and user-friendly by the interviewed operators.

The main suggestions for improvement were the following:

- to permit a more flexible use of the documents’ contents by using modern digital technologies; and
- promote more actively the EOFDM BPDs.

When focusing on the example of the EOFDM precursors related to ‘take-off performance’, the details and explanations were found by most of the interviewed operators to be rather clear and user-friendly, although for some EOFDM precursors, flight parameters were needed that were not always available or other sources of data needed to be accessed.

Usefulness and effectiveness of the EOFDM BPDs (refer to EQ4, EQ5, EQ6 and EQ10)

EOFDM precursors documents

Overall, the EOFDM precursors were assessed as useful by the interviewed operators. They considered that the list of the EOFDM precursors helped them enhance their FDM event definitions and get flight crews to accept the FDM programme.

The four categories of occurrences (RE, LOC-I, CFIT and MAC) addressed by the EOFDM match the main safety objectives of most of the interviewed operators. The definitions of FDM events and measurements used by those operators partially match the definitions of the EOFDM precursors.



However, most of the interviewed operators did not try to implement the EOFDM precursors proposed in the EOFDM BPDs. Besides the lack of awareness of the EOFDM documentation, the main reasons seemed to be that:

- some necessary flight parameters are not recorded (and it is not foreseen to include them in the data frames, even for modern aircraft models);
- insufficient human resources are allocated to the FDM programme and/or lack of technical know-how; and
- reliance on FDM software providers to perform modifications to the FDM event definitions.

In addition, some of the interviewed operators wished that ‘unstable approaches’ and ‘take-off performance’ be addressed in more detail in the EOFDM documents. Some safety issues were mentioned, for which FDM data would need to be combined with data from other sources for getting a good insight: meteorological phenomena, effect of flight crew fatigue, cabin safety, and risk of collision during take-off or landing.

Most of the operators declared their intent to use the EOFDM precursors in the near future. However, it seems that they would implement the EOFDM precursors only for new fleets or when an FDM event definition would need to be changed or added.

Although the interviewed operators found the EOFDM precursors useful, it seemed unlikely that many of them would make the investment (increase the human resources, modify data frames) needed to make intensive use of the EOFDM precursors. This seems to be linked with the fact that most of the interviewed operators were small or medium-sized. If the necessary flight parameters were readily available with sufficient sampling rate and recording resolution in the data frames, this would probably facilitate the implementation of the EOFDM precursors.

Other EOFDM BPDs

The MoU and KPI documents were positively assessed by the interviewed operators: those operators that were aware of these documents found their contents useful.

The interviewed operators also used more the MoU and KPI documents than the EOFDM precursors, possibly because they tackle the integration of the FDM programme with other processes.

The main reasons why some operators did not use those documents were related to technology and human resources, which confirms that the limited resources allocated by many small to medium-sized operators to their FDM programme make the implementation of the EOFDM BPDs difficult.

Other FDM-related topics that are important for operators (refer to EQ7)

Various topics were suggested regarding the integration of the FDM programme with other processes:

- how to evaluate the risk associated to an FDM event;
- feeding back to pilots and to other departments;
- guidance on the appropriate data retention time;
- database of FDM-based KPIs.



In the area of the EOFDM precursors:

- the interviewed operators found that ‘unstable approaches’ and ‘take-off performance’ could be better addressed.

The interviewed operators recommended an even more detailed description of the EOFDM precursors (propose threshold values, address limitations, provide references to other sources) to facilitate their implementation (e.g. by proposing alternative FDM event definitions that only use basic flight parameters).

Following the interviews, the EOFDM started drafting a document which will provide best practices for developing and testing FDM event definitions. Hence, part of the needs expressed by the interviewed operators will be addressed. The need for detailed guidance should may be explained by the fact that most of the interviewed operators were small to medium-sized and allocated limited human and technical resources to their FDM programmes.

Contribution of the EASA Member States to the FDM promotion

Safety action MST.003 of the EPAS for 2018–2022 recommends that EASA Member States promote the FDM and encourage operators to use the EOFDM BPDs. The promotion of FDM by the EASA Member States is important because EASA-led safety promotion tasks often reach out only to a fraction of all European operators. It appeared that 5 out of the 10 EASA Member States where the interviewed operators were based were promoting FDM or had promoted FDM before, 1 EASA Member State had just provided information to their national operators about the EOFDM or other FDM promotion activities, and 4 EASA Member States had seemingly not undertaken any action at all.

Promoting FDM seems challenging for those EASA Member States that only have a handful of CAT operators based in their territory and, therefore, cannot establish a group of a sufficient size to gain momentum. However, the interviews also showed that at least 2 EASA Member States that had more than 20 CAT operators had not tried to promote FDM. Further to that, making operators aware of the EOFDM and encouraging them to use the EOFDM BPDs was achievable by all EASA Member States. As mentioned already, internet traffic statistics of the EOFDM webpage show that it was not viewed at all in 6 out of the 32 EASA Member States. In order to address these issues,

- safety action MST.003 should take better into account those EASA Member States that have only a few CAT operators; and
- the description of the objectives of safety action MST.003 should be made more specific, so that they are understood by the EASA Member States and implemented in a more harmonised manner.

It should be noted that the most recent report on the implementation of the EPAS safety actions owned by the Member States is the *States’ implementation report — Based on EPAS 2017–2021*¹³, published on 9 February 2018. However, Article 7 of Regulation (EU) 2018/1139 requires each Member State to establish and maintain a State safety programme (SSP), and Article 8 of the same Regulation requires that the SSP shall include a State Plan for Aviation Safety (SPAS). In addition, Article 8 states that the Member State [concerned] shall inform the Agency of the risks and actions identified in the European Plan for Aviation Safety that it considers not to be relevant for its national

¹³ <https://www.easa.europa.eu/sites/default/files/dfu/EPAS%20Implementation%20Report.pdf>



aviation safety system and the reasons thereof. The standardisation activities that address the requirements related to the SSP and the SPAS are planned to start in 2021. These standardisation activities are expected to trigger better reporting of the Member States on the implementation of the safety actions owned by them.

General conclusions

Overall, the EOFDM BPDs are considered partially effective.

The factors which help meet the objectives ('success factors') of the EOFDM BPDs are:

- the contents of the EOFDM BPDs are relevant for the safety objectives of the operators;
- the contents of the EOFDM BPDs are clear and useful; and
- the EOFDM BPDs are publicly available.

Nevertheless, there are some factors which limit ('limiting factors') the use of the EOFDM BPDs:

- The insufficient awareness of the EOFDM BPDs among the professionals concerned (safety managers and FDM specialists at European operators) because the online visibility of the EOFDM is insufficient and the information about the EOFDM is not well disseminated by the EASA advisory bodies and its Member States.
- Some of the EOFDM recommendations, and particularly some of the EOFDM precursors, are not straightforward (it is difficult to define an appropriate threshold, some precursors require the recording of flight parameters that are not available, links to other documentation sources are sometimes missing), making them difficult to implement.
- 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). This result is based on data collected during a period of economic stability and it is not related to the economic crisis that resulted from the COVID-19 pandemic.
- The available technologies used or the technological choices made by many small to medium-sized European operators hinder the full implementation of the EOFDM precursors (flight parameters missing or their performance is not sufficient to implement the EOFDM precursors). This result is based on data collected during a period of economic stability and it is not related to the economic crisis that resulted from the COVID-19 pandemic.

It should be noted that EASA alone might not be able to act on all limiting factors. However, the list of recommendations in Section 4.2 addresses these points which are within the EASA competence.

Having regard to the results of the evaluation, the comparison between the expected and the achieved impacts, together with the factors which support (success factors) / hinder (limiting factors) the achievement of the expected impacts, are summarised in Figure 2.



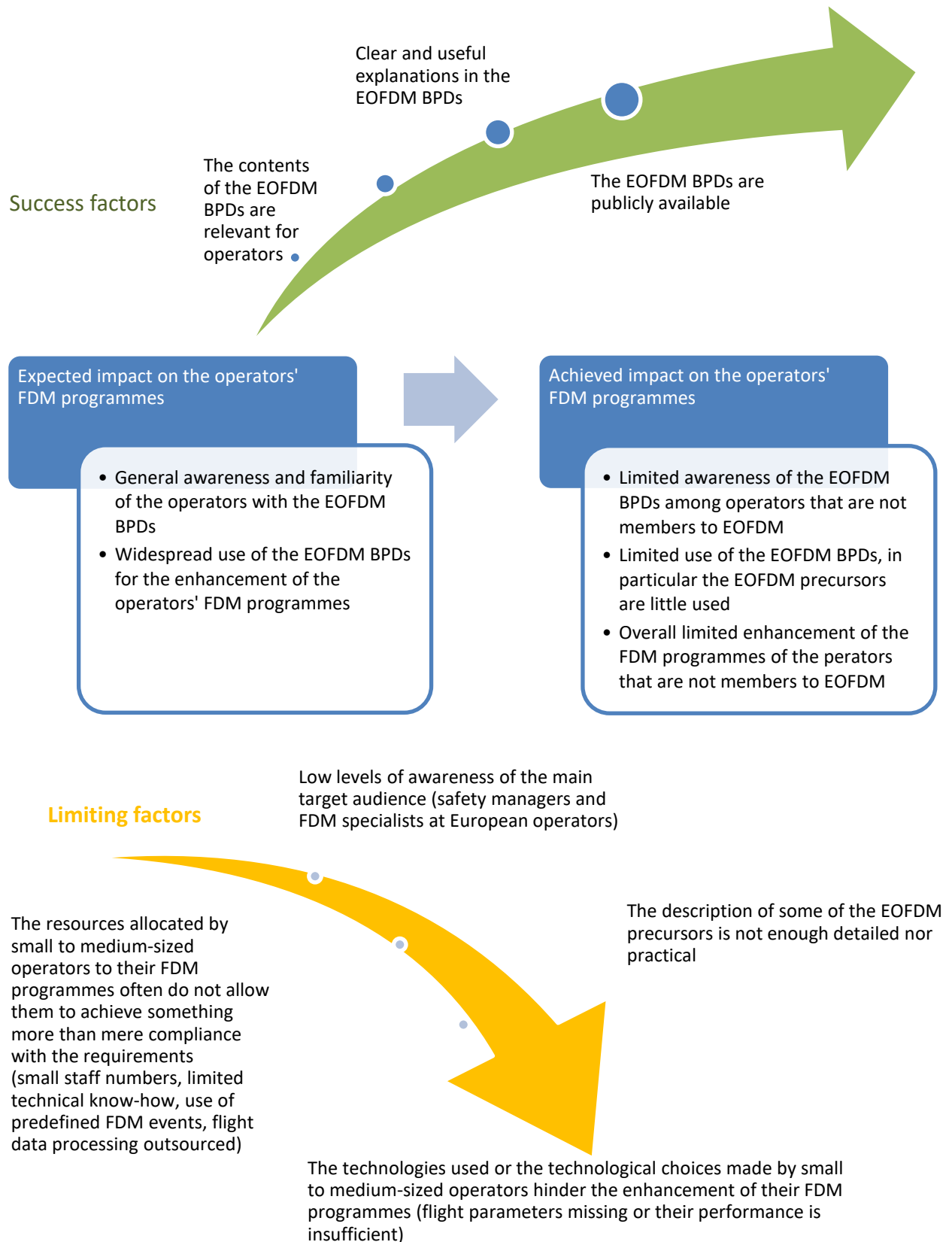


Figure 2 — Expected impact versus achieved impact



4.2. Recommendations

Based on the conclusions drawn, 4 strategic objectives and 15 recommendations were defined. The recommendations take into account the economic crisis caused by the COVID-19 pandemic and the difficult situation faced by the aviation industry and national aviation authorities at the time this report was written.

All 15 recommendations are intended to be addressed by EPAS actions. It should be noted that:

- 9 out of the 15 recommendations of this report can be addressed through actions in the EPAS for 2020-2024 and without a significant impact on the workload;
- 5 recommendations (recommendations Nos 10, 11, 12, 13 and 14) are addressed by two actions (SPT.0112 ‘Flight data monitoring (FDM) precursors of operational safety risks’ and SPT.0113 ‘Flight data monitoring (FDM) analysis techniques’) that are included in the EPAS for 2021–2025; SPT.0112 and SPT.0113 replace two actions of the EPAS for 2020–2024 and they do not require any increase in resources; the impact assessment for SPT.0112 and SPT.0113 is presented in **Annex 3 — Impact analysis of the new safety actions**;
- regarding the last recommendation (recommendation No 15), no EPAS action is proposed at this stage, because the scope of the possible actions has not been defined exactly yet.

Table 8 contains the strategic objectives.

Table 9¹⁴ contains the summary list of the recommendations with the related EPAS actions.

Table 10 presents the relevant EPAS actions and the recommendations of this evaluation report addressed by each EPAS action.

Table 11 presents the rationale of each recommendation, a proposed action owner, a proposed time frame, and the potential challenges.

¹⁴ Note: As regards Tables 10 and 11:

‘short-term’ means less than 6 months, ‘mid-term’ means 6 to 18 months, and ‘long-term’ means more than 18 months;

‘SM’ means the Strategy and Safety Management Directorate of EASA;

‘FS’ means the Flight Standards Directorate of EASA;

‘SM.1’ means the SM Safety Intelligence and Performance Department;

‘SM.2’ means the SM Strategy and Programmes Department;

‘FS.2’ means the FS Air Operations Department.



Table 8 — Strategic objectives to enhance the impact of the EOFDM BPDs

Strategic objectives (presented in order of priority)	Limiting factor(s) addressed by the strategic objectives
A. Increase the awareness of the main target audience (safety managers and FDM specialists at European operators) as regards the EOFDM BPDs.	The level of awareness of the EOFDM BPDs among the professionals concerned is rather low.
B. Achieve that European operators allocate sufficient resources to their FDM programmes and use them in a more safety-effective manner.	The resources allocated by part of the European operators to their FDM programmes do not allow to achieve more than mere compliance with the rules.
C. Provide a more detailed and practicable description of the EOFDM precursors.	Some recommendations in the EOFDM BPDs, and particularly some EOFDM precursors, are still difficult to implement.
D. Improve the performance of the technologies used to run the FDM programmes.	The available technologies or technological choices made by a significant proportion of the European operators hinder the full implementation of the EOFDM precursors.



Table 9 — Summary of the recommendations to enhance the impact of EOFDM activities, showing the related EPAS actions

Recommendation number	Corresponding strategic objective	Recommendation	Proposed time frame	Corresponding ongoing action and/or action covered in EPAS for 2020–2024	Corresponding action in the EPAS for 2021–2025
1	A	Regarding aviation professionals, increase the online visibility of the EOFDM, including social media.	Short-term	The ‘EASA aviation community’ website ¹⁵ has been launched. <i>The Safety Promotion Strategy is addressed in Section 3.2.2.</i>	<i>The Safety Promotion Strategy is addressed in Volume I, Section 3.2.2.</i>
2	A	Strengthen the link between the FDM programme and the operators’ SMS in EASA public documentation and/or safety promotion material supporting the implementation of SMS.	Mid-term	SPT.057 ‘SMS international cooperation’ (continuous) <i>This recommendation will be implemented without modifying the scope nor the timelines of SPT.057.</i>	
3	A	Introduce references to the EOFDM BPDs in the guidance material to the FDM rules.	Mid-term	RMT.0271 ‘In-flight recording for light aircraft’	RMT.0271 ‘In-flight recording for light aircraft’ <i>This recommendation will be implemented without modifying the scope nor the timelines of RMT.0271.</i>
4	A	Implement a solution to better inform all safety managers at European operators of the EOFDM developments, with at least 95 % coverage.	Mid-term	The ‘EASA aviation community’ website ¹⁵ has been launched. <i>The Safety Promotion Strategy is addressed in Section 3.2.2.</i>	<i>The Safety Promotion Strategy is addressed in Volume I, Section 3.2.2.</i>
5	A	Involve more actively Member States in the promotion of the FDM best practices.	Long-term	MST.003 ‘Member States should maintain a regular dialogue with their national aircraft operators on flight data	MST.0003 ‘Member States should maintain a regular dialogue with their national aircraft operators on flight data monitoring programmes’

¹⁵ <https://www.easa.europa.eu/community/>



Recommendation number	Corresponding strategic objective	Recommendation	Proposed time frame	Corresponding ongoing action and/or action covered in EPAS for 2020–2024	Corresponding action in the EPAS for 2021–2025
				monitoring programmes' (continuous)	<i>The implementation of this recommendation required the modification of the scope of MST.003.</i>
6	A	Actively involve industry partners in the promotion of the EOFDM deliverables.	Long-term	The 'EASA aviation community' website ¹⁶ has been launched. <i>The Safety Promotion Strategy is addressed in Section 3.2.2.</i>	<i>The Safety Promotion Strategy is addressed in Volume I, Section 3.2.2.</i>
7	B	Introduce conditions in the AMC to ORO.AOC.130 and to SPA.HOFO.145 to ensure that the FDM programmes effectively support the safety risk management by the operator.	Long-term	RMT.0392 'Regular update of air operations rules'	RMT.0392 'Regular update of air operations rules' <i>This recommendation will be implemented without modifying the scope nor the timelines of RMT.0392.</i>
8	B	Create the conditions for a more effective oversight of the FDM programmes by the Member States.	Long-term	MST.032 'Oversight capabilities / focus areas' and RMT.0392 'Regular update of air operations rules'	MST.0032 'Oversight capabilities / focus areas' and RMT.0392 'Regular update of air operations rules' <i>This recommendation will be implemented without modifying the scope nor the timelines of MST.0032 and RMT.0392.</i>
9	C	Complete editorial review of the EOFDM precursors document.	Mid-term	(The editorial review is a support activity, and it is not within the scope of the EPAS)	(The editorial review is a support activity, and it is not within the scope of the EPAS)

¹⁶ <https://www.easa.europa.eu/community/>



Recommendation number	Corresponding strategic objective	Recommendation	Proposed time frame	Corresponding ongoing action and/or action covered in EPAS for 2020–2024	Corresponding action in the EPAS for 2021–2025
10	C	Strengthen the link between the EOFDM precursors and international aviation safety taxonomies.	Mid-term		SPT.0112 ‘Flight data monitoring (FDM) precursors of operational safety risks’ <i>(new action; see also Annex 3)</i>
11	C	Cover in more detail ‘unstable approaches’ and ‘take-off performance’ in the EOFDM precursors documents.	Mid-term		SPT.0112 ‘Flight data monitoring (FDM) precursors of operational safety risks’ <i>(new action; see also Annex 3)</i>
12	C	Propose a general method for defining and implementing a relevant FDM event set.	Mid-term		SPT.0113 ‘Flight data monitoring (FDM) analysis techniques’ <i>(new action; see also Annex 3)</i>
13	C	Address the risk of ‘runway incursion (RI)’ in the EOFDM precursors documents.	Long-term		SPT.0112 ‘Flight data monitoring (FDM) precursors of operational safety risks’ <i>(new action; see also Annex 3)</i>
14	C	Make the guidance for the implementation of the EOFDM precursors more practical.	Long-term		SPT.0112 ‘Flight data monitoring (FDM) precursors of operational safety risks’ <i>(new action; see also Annex 3)</i>
15	D	Promote through the EOFDM a minimum level of performance of the FDM technologies.	Long-term	EUROCAE working group 118 ‘Crash-Protected and Lightweight Flight Recorders’ (performance specifications for flight recorders) will update the performance applicable to flight parameters.	No corresponding action for aspects other than flight parameters (SPT foreseen for introduction in the EPAS for 2022–2026).



Table 10 — EPAS actions and related recommendations made in this evaluation report

Action number or designator	EPAS edition where the action can be found	Description of the action in the EPAS	Recommendations of this report that can be addressed by the action
EVT.0009	EPAS for 2020–2024	'The European Operators Flight Data Monitoring forum (EOFDM), established in 2011, is a voluntary partnership between European operators and EASA. The overall objective of the evaluation is to take stock of the current level of awareness and implementation of EOFDM best-practice documents by European operators and to assess potential needs for the adaptation of the scope and/or the promotion strategy of EOFDM. The project is exemplary for the ex post assessment of safety promotion actions in EASA.'	(This evaluation report is the deliverable of safety action EVT.0009)
SPT.057	EPAS for 2020–2024	'Promote the common understanding of safety management and human factors principles and requirements in different countries, share lessons learned and encourage progress and harmonisation, through active participation in the Safety Management International Collaboration Group (SMICG)82 and dissemination of safety promotion material to support effective SMS implementation, including but not limited to SMICG deliverables [...].'	Recommendation No 2
SPT.0057	EPAS for 2021–2025	'Promote the common understanding of safety management and human factors principles within and outside Europe, share lessons learned and encourage progress and harmonisation, through active participation in the Safety Management International Collaboration Group (SMICG) and dissemination of safety promotion material to support effective SMS implementation [...].'	
SPT.0112	EPAS for 2021–2025	'Ensure the alignment of EOFDM precursors with the needs of operators and the evolution of the safety risks for large aircraft.'	Recommendations Nos 10, 11, 13 and 14
SPT.0113	EPAS for 2021–2025	'Produce good practice documentation for operators on techniques to implement FDM events and measurements and to tailor FDM results for use by the SMS.'	Recommendation No 12
RMT.0392	EPAS for 2020–2024 and EPAS for 2021–2025	'Necessary update reflecting technological and market developments	Recommendations Nos 7 and 8



Action number or designator	EPAS edition where the action can be found	Description of the action in the EPAS	Recommendations of this report that can be addressed by the action
		This regular update task will lead to changes at IR level and at AMC & GM level. For the latter, for those changes that are not dependant on changes at IR level, a first Decision is expected in 2022/Q4 [...].'	
RMT.0271	EPAS for 2020–2024 and EPAS for 2021–2025	'Assess the need for in-flight recording and make proportionate suggestions for categories of aircraft and types of operation covered by the air operations rules for which there is no flight recorder carriage requirement.'	Recommendation No 3
MST.003	EPAS for 2020–2024	'States should maintain a regular dialogue with their operators on FDM programmes, with the objectives of: <ul style="list-style-type: none"> — promoting the operational safety benefits of FDM and the exchange of experience between subject matter experts, and — encouraging operators to make use of good-practice documents produced by EOFDM and similar safety initiatives. The document titled 'Guidance for National Aviation Authorities on setting up a national flight data monitoring forum' (produced by EAFDM) is offering guidance for this purpose.'	Recommendation No 5
MST.0003	EPAS for 2021–2025	'Member States should maintain a regular dialogue with their national aircraft operators on flight data monitoring programmes <p>a) Making the professionals concerned aware of the European operators FDM forum (EOFDM) Member States shall publish on their website, as part of SMS-related information, general information on EOFDM activities.</p> Member States should organise an information event to present EOFDM good-practice documents to their CAT operators. Safety managers and FDM programme managers of all the operators concerned should be invited. <p>b) Promoting FDM good practice</p> Member States that have 10 or more operators running an FDM programme, should organise a workshop dedicated to EOFDM good-practice documents with the FDM specialists at these operators.'	



Action number or designator	EPAS edition where the action can be found	Description of the action in the EPAS	Recommendations of this report that can be addressed by the action
MST.032	EPAS for 2020–2024	<p>(a) Availability of adequate personnel in CAs [...]</p> <p>(b) Cooperative oversight in all sectors [...]</p> <p>(c) Organisations management system in all sectors</p> <p>Member States to foster the ability of CAs to assess and oversee the organisation's management system in all sectors. This will focus in particular on safety culture [...], the use of inspection findings and safety information such as occurrences, incidents, and accidents. This should lead CAs to adaptation and improvement of their oversight system.'</p>	Recommendation No 8
MST.0032	EPAS for 2021-2025	<p><i>(a) Availability of adequate personnel in CAs</i> [...]</p> <p><i>(b) Cooperative oversight in all sectors</i> [...]</p> <p><i>(c) Organisations management system in all sectors</i></p> <p>Member States shall foster the ability of CAs to assess and oversee the organisations' management system in all sectors. This shall focus in particular on safety culture, [...], the use of inspection findings and safety information such as occurrences, incidents, and accidents and, where applicable, flight data monitoring. This should lead CAs to adapt and improve their oversight system.'</p>	
Safety Promotion Strategy	EPAS for 2020–2024 and EPAS for 2021–2025	'From the beginning of 2019, EASA has launched a new Safety Promotion Strategy that will take an increasingly proactive approach to the way EASA communicates with the European aviation community. This will position EASA's as a safety promotion leader in Europe and worldwide having a	Recommendations Nos 1, 4 and 6



Action number or designator	EPAS edition where the action can be found	Description of the action in the EPAS	Recommendations of this report that can be addressed by the action
		recognised brand that creates interest, engagement and helps to improve safety.'	



Table 11 — Recommendations to enhance the impact of the EOFDM activities, with rationale, action owner, time frames and the potential challenges

Recommendation No	Rationale	Who should be in charge?	Potential challenges and other considerations	Proposed time frame and reference to existing actions
<p>A. Increase the awareness of the main target audience (safety managers and FDM specialists at European operators) as regards the EOFDM BPDs</p>				
<p>1. Regarding aviation professionals, increase the online visibility of the EOFDM, including social media.</p>	<p>Safety managers and FDM specialists use the internet to search for guidance. Apart from using search engines (Google, Bing, etc.), they consult online libraries for aviation safety professionals, such as Skybrary. For example, the FDM webpage of Skybrary could refer to the EOFDM. In addition, some professional networks are very much used by aviation professionals (e.g. LinkedIn). The ‘EASA aviation community’ website¹⁷, developed as part of the EASA Safety Promotion Strategy, could also serve as a repository to store EOFDM and FDM material. Additionally, the EOFDM-related web content should be restructured to focus more on the</p>	<p>SM.1</p>	<p>This may require the support of a webteam. The ‘EASA aviation community’¹⁷ website, developed as part of the EASA Safety Promotion Strategy described in the EPAS for 2020–2024, provides a way to better structure the information and optimise search engine results as regards finding FDM-related material. The improved use of LinkedIn is a key element of the EASA Safety Promotion Strategy and is expected to improve the situation. Risk of being misused by some companies for marketing purposes.</p>	<p>Short-term (already in progress)</p>

¹⁷ <https://www.easa.europa.eu/community/>



Recommendation No	Rationale	Who should be in charge?	Potential challenges and other considerations	Proposed time frame and reference to existing actions
	<p>solutions offered in the EOFDM BPDs for safety managers and operators. Further to that, the increased use of professional networks could help improve the situation and capture additional industry needs with regard to FDM.</p>			
<p>2. Strengthen the link between the FDM programme and the operator SMS in EASA public documentation and safety promotion material supporting the implementation of SMS.</p>	<p>According to the requirements of ORO.AOC.130 and SPA.HOFO.145, the FDM programme shall be integrated in the management system of the operator. FDM is a natural component of the SMS. Therefore, EASA guidance on implementing the SMS (such as the EASA Management System Assessment Tool¹⁸) should include FDM. In addition, the link between FDM-related safety actions and the strategic priorities regarding SMS is not clearly established in the EPAS editions published until 2020.</p>	<p>FS.2 and SM.1</p>	<p>Safety action MST.0026 of the EPAS for 2021–2025 states that ‘States should make use of the EASA management system assessment tool to support risk and performance-based oversight’. In addition, SPT.0057 aims to promote a common understanding of safety management through the active participation in the Safety Management International Collaboration Group (SM ICG). The SM ICG has produced an SMS evaluation tool. A best intervention strategy (BIS) document is being</p>	<p>Mid-term To be addressed under SPT.057 ‘SMS international cooperation’.</p>

¹⁸ https://www.easa.europa.eu/sites/default/files/dfu/214081_EASA_MANAGEMENT_SYSTEM_ASSESSMENT_TOOL.pdf



Recommendation No	Rationale	Who should be in charge?	Potential challenges and other considerations	Proposed time frame and reference to existing actions
			<p>prepared, which will include updating the EASA guidance on SMS. Safety management and FDM are better linked in Volume I of the EPAS for 2021–2025.</p>	
<p>3. Introduce references to the EOFDM BPDs in the guidance material (GM) to the FDM rules.</p>	<p>All European operators refer to the GM to ORO.AOC.130 (for aeroplanes) and to SPA.HOFO.145 (for helicopters) for the implementation of the applicable rules. Today, the GM to ORO.AOC.130 and the GM to SPA.HOFO.145 refer to the guidance published by other regulators (ICAO, CAA UK).</p>	<p>SM.1 and SM.2</p>	<p>GM does not constitute a requirement nor an acceptable means of compliance (AMC). Reference to the EOFDM BPDs in the GM is only meant to increase awareness among European operators; it will not create any new obligation.</p> <p>It is not necessary to create/launch a rulemaking task just to amend GM; the amendments can be incorporated in an ongoing rulemaking task.</p>	<p>Mid-term Part of the draft GM prepared under RMT.0271 ‘In-flight recording for light aircraft’.</p>
<p>4. Implement a solution to better inform all safety managers at European operators of the EOFDM</p>	<p>The interviews showed that many European operators are not aware of EOFDM despite several communications addressed to the EASA advisory bodies</p>	<p>SM.1 and FS.2</p>	<p>This issue is not specific to the EOFDM BPDs and it affects all the safety promotion material that is aimed for European operators. This</p>	<p>Mid-term (Part of the objectives of the ‘EASA aviation</p>



Recommendation No	Rationale	Who should be in charge?	Potential challenges and other considerations	Proposed time frame and reference to existing actions
developments, with at least 95 % coverage.	(ABs) and safety action MST.003 of the EPAS for 2018-2022. There are hundreds of AOC holders to which the EOFDM has not reached out because they have no direct contact to EASA and are not informed through their competent authorities or operator associations.		may require the establishment of a dedicated safety action in the EPAS.	community' website ¹⁹⁾
5. Involve more actively Member States in the promotion of the FDM best practices.	Safety action MST.003 of the EPAS for 2018–2022 recommends that Member States promote FDM and encourage operators to use the EOFDM BPDs. However, the interviews showed that some Member States do not have a sufficient number of CAT operators to promote FDM, and that other Member States with a seemingly sufficient number of CAT operators had not implemented safety action MST.003.	SM.1 and SM.2	Article 8 'State Plan for Aviation Safety' of Regulation (EU) 2018/1139 (the Basic Regulation) states that 'The Member State shall inform the Agency of the risks and actions identified in the European Plan for Aviation Safety that it considers not to be relevant for its national aviation safety system and the reasons thereof.' This will allow for better reporting by the Member States on safety actions owned by them. It is also expected that the SSP and the SPAS will be included in	Long-term Related action: MST.003.

¹⁹ <https://www.easa.europa.eu/community/>



Recommendation No	Rationale	Who should be in charge?	Potential challenges and other considerations	Proposed time frame and reference to existing actions
			<p>the scope of standardisation visits as of 2021. In addition, MST.003 is updated (and renumbered ‘MST.0003’) in the EPAS for 2021–2025.</p>	
<p>6. Actively involve industry partners in the promotion of the EOFDM deliverables.</p>	<p>Several interviewed FDM specialists at operators learned about the EOFDM through presentations made by peers at industry meetings or conferences. However, the staff and mission budget allocated to the FDM promotion is limited and it is not sufficient for active communication campaigns. The EASA Safety Promotion Strategy includes roles within the ‘EASA aviation community’ website²⁰ for organisations as ‘Safety Partners’ and for individuals as ‘Safety Ambassadors’. This should be used to help raise awareness of the EOFDM activities. In addition, operator associations are members to the EASA Advisory Bodies,</p>	<p>SM.1, FS.2, EOFDM, FS.TEC</p>	<p>The promotion of the EOFDM by industry members has already been implemented on an occasional basis. However, the EASA policy does not allow the sponsoring of travel expenses of the EOFDM members, and due to the economic crisis resulting from the COVID-19 pandemic, many industry events are cancelled due to travel restrictions. In addition, a mechanism should be established to keep control of the contents of the presentations on the EOFDM (e.g. avoid misuse for marketing purposes).</p>	<p>Long-term Part of the EASA Safety Promotion Strategy.</p>

²⁰ <https://www.easa.europa.eu/community/>



Recommendation No	Rationale	Who should be in charge?	Potential challenges and other considerations	Proposed time frame and reference to existing actions
	and they could, through the EASA Advisory Body concerned (i.e. FS.TEC), help make their members aware of the EOFDM.			

B. Achieve that European operators allocate sufficient resources to their FDM programmes and use them in a more safety-effective manner

<p>7. Introduce conditions in the AMC to ORO.AOC.130 and in the AMC to SPA.HOFO.145 to ensure that FDM programmes effectively support the safety risk management by the operator.</p>	<p>It appears from the interviews that a significant proportion of the European operators do not allocate resources that would allow them to achieve more than mere compliance with the rules (ORO.AOC.130) and the related AMC. This conclusion is based on data collected during a period of economic stability and it is not related to the economic crisis that resulted from the COVID-19 pandemic. The AMC to ORO.AOC.130 and the AMC to SPA.HOFO.145 do not contain any conditions whatsoever to ensure a minimum level of performance of the FDM</p>	<p>FS and SM.1</p>	<p>Amending the AMC to ORO.AOC.130 and the AMC to SPA.HOFO.145 will require rulemaking. It will be done in two steps: the first step will be to just strengthen the link to the SMS, and the second step will be to define the minimum performance objectives. As regards the minimum performance objectives, the limitations of the technologies currently used by operators and the cost impact of any technological change will need to be taken into account. In addition, due to the economic crisis resulting from the COVID-19 pandemic, the</p>	<p>Mid-term for the first step (strengthening the link to the SMS). Long-term for the second step (establishing performance objectives). This is part of the rulemaking activities planned under RMT.0392 ‘Regular update of air operations rules’.</p>
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Recommendation No	Rationale	Who should be in charge?	Potential challenges and other considerations	Proposed time frame and reference to existing actions
	<p>programme²¹. As a result, an operator can comply with these rules and their AMC and still not meet the objective of FDM, which is to provide to the SMS relevant and accurate information from flight data. Establishing minimum performance objectives as regards the FDM programme would lead those operators to invest in more efficient technologies and human resources. Introducing conditions in the AMC so that the FDM event definitions are adapted to the safety risk portfolio of the operator would discourage some operators from using predefined FDM event definitions — a cheaper, but often not a safety-relevant alternative.</p>		<p>introduction of new requirements might be delayed.</p>	
<p>8. Create the conditions for a more effective oversight of the FDM</p>	<p>The interviews showed that a significant proportion of the interviewed operators do not meet the objective of FDM, which is to provide to the SMS relevant and</p>	<p>FS.2 and SM.1</p>	<p>FDM should be addressed in the framework of the SMS oversight and not as a separate item. The EASA FS.2 has been active in</p>	<p>Long-term To be addressed under MST.0032 ‘Oversight</p>

²¹ For example, AMC1 ORO.AOC.130 does not specify a minimum list of flight parameters to be recorded for use by the FDM, or a minimum percentage of the flights to be covered by the FDM programme, or a maximum time between the flight taking place and the corresponding flight recording being processed by the FDM software, etc. Performance objectives that are not very demanding or expensive could be set to ensure that the basic conditions for an effective FDM programme are met by all the operators concerned.



Recommendation No	Rationale	Who should be in charge?	Potential challenges and other considerations	Proposed time frame and reference to existing actions
<p>programmes by the Member States.</p>	<p>accurate information from flight data. The rules and the AMC related to FDM are applicable since 2014 and all interviewed operators had been running an FDM programme for 2 years or more (12 out of 15 operators for 5 years or more), so that their FDM programmes had been within the scope of oversight activities for several years. In addition, the interviews were performed from January to April 2019, hence well before the COVID-19 pandemic and the resulting economic crisis.</p>		<p>promoting the better implementation of the SMS by operators with an Air OPS SMS workshop in February 2019 and an Air OPS Continuous Monitoring Bulletin dedicated to the oversight of SMSs in May 2019 (not public). Further to that, the better oversight of the organisations' SMSs is part of the objectives of safety action MST.0032 of the EPAS for 2021–2025, which recommends to focus, among others, on FDM. Amendments to the AMC to ARO.GEN.305 (Oversight programmes) and to the AMC to ORO.GEN.200 (Management system) could help integrate FDM in the scope of the SMS oversight activities. Establishing minimum performance objectives in the AMC to ORO.AOC.130 (flight data monitoring programme) would help</p>	<p>capabilities / focus area' and RMT.0392 'Regular update of air operations rules'</p>



Recommendation No	Rationale	Who should be in charge?	Potential challenges and other considerations	Proposed time frame and reference to existing actions
			make the oversight of the FDM programmes more effective (refer to Recommendation No 7).	



C. Provide a more detailed and practicable description of the EOFDM precursors

9. Complete editorial review of the EOFDM precursors documents.	It was mentioned during the interviews that the description of the EOFDM precursors was not always user-friendly. The clarity of the text (logical flow and use of correct English) could be improved, and references to other documentation sources is sometimes missing and could be added. Official guidance documents are normally editorially reviewed.	SM.1 and SM.2	The need to involve professional editors and proofreaders to improve the linguistic quality of the documents. The EASA in-house editorial services team agreed to review new or revised EOFDM documents subject to capacity (lower priority task).	Mid-term (Activity has already started for the EOFDM document 'Guidance for the implementation of FDM precursors')
10. Strengthen the link between the EOFDM precursors and international aviation safety taxonomies.	The CAST/ICAO Common Taxonomy Team (CICTT) is a joint initiative of the Commercial Aviation Safety Team (CAST) and the International Civil Aviation Organization (ICAO) for the production of internationally recognised aviation safety taxonomies for use by accident and incident reporting systems. They include taxonomies for flight phases and taxonomies for occurrence categories. The better linking of the EOFDM precursors with these taxonomies will facilitate the integration of FDM into SMSs and occurrence reporting.	SM.1 with the EOFDM	This would require agreement with the EOFDM, since it might imply changes to the content or classification of the EOFDM precursors. However, this recommendation is not about aligning the EOFDM precursors with the flight data metrics definitions produced by the CICTT; it is only about the better integration of the EOFDM precursors into the international aviation safety taxonomies, in particular the taxonomies applicable to occurrence categories.	Mid-term Planned to be addressed under action SPT.0112 of the EPAS for 2021–2025 (see also Annex 3).



11. Cover in more detail ‘unstable approaches’ and ‘take-off performance’ in the EOFDM precursors documents.	Several interviewed operators found that ‘take-off performance’ and ‘unstable approaches’ could be better addressed in the EOFDM precursors documents.	SM.1 with the EOFDM		Mid-term Planned to be addressed under action SPT.0112 of the EPAS for 2021–2025 (see also Annex 3).
12. Propose a general method for defining and implementing a relevant FDM event set.	Most of the interviewed operators just used the predefined FDM event definitions provided with their FDM software tool. Predefined FDM event definitions are less effective than FDM event definitions that are tailored to the operator’s safety priorities; however, today, a BPD on developing and testing FDM event definitions is missing.	SM.1 with the EOFDM	This should contribute to a greater consistency between the FDM programme and the operator’s SMS.	Mid-term Planned to be addressed under action SPT.0113 of the EPAS for 2021–2025 (see also Annex 3). The drafting of a BPD on FDM analysis techniques has started. Delivery is planned in 2021.
13. Address the risk of ‘runway incursion’ in the EOFDM precursors documents.	Several interviewed operators recommended including ‘runway incursions’ (RIs) in the scope of the EOFDM BPDs.	SM.1 with the EOFDM	This probably means significant work as it entails defining the EOFDM precursors for an occurrence category that was so far not within the scope of the EOFDM BPDs.	Long-term Planned to be addressed under action SPT.0112 of the EPAS for 2021–



				2025 (see also Annex 3).
14. Make the guidance for the implementation of the EOFDM precursors more practical.	Several interviewed operators recommended that the EOFDM BPD titled ‘Guidance for the implementation of FDM precursors’ should suggest values for the thresholds of the EOFDM precursors (depending on the main families of aircraft products). In addition, several interviewed operators emphasised that some of the aircraft they operated were not recording all the flight parameters needed to implement the recommendations in this BPD. Alternative FDM event definitions that can be implemented with more basic flight parameters would be helpful for those operators.	SM.1 with the EOFDM, Data4Safety	This would require significant work since there are about 90 EOFDM precursors to be reviewed.	Long-term Planned to be addressed under action SPT.0112 of the EPAS for 2021–2025 (see also Annex 3).

D. Improve the performance of the technologies used to run the FDM programmes

15. Promote through the EOFDM a minimum level of performance of the FDM technologies.	The interviews showed that the available technologies or the technological choices made by some of the European operators (airborne equipment, ground processing capability) hinder the full implementation of the EOFDM precursors. While there is no justification for recommending a particular technology for an FDM	SM.1 with the EOFDM	The recommendations regarding the minimum FDM technological performance would include flight parameters performance (sampling rate and recording resolution), the airborne equipment, the means to store and transfer the flight data, the means to program the	Long-term The EOFDM has made proposals regarding flight parameters performance, passed over to
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programme, guidance could assist European operators to identify the technological performance needed for a more effective FDM programme, without waiting for the FDM requirements to be amended (refer to Recommendation No 7).

definitions of the FDM events and measurements, the means to analyse the FDM data and combine it with other data, and the means to present and communicate the FDM results. These recommendations would need to be prepared in partnership with the industry.

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5. Annexes

5.1. Annex 1 — List of the EOFDM Best-Practices Documents considered for the evaluation

1. EOFDM WGA [REVIEW OF ACCIDENT PRECURSORS](#)
2. EOFDM WGB [GUIDANCE FOR THE IMPLEMENTATION OF FDM PRECURSORS](#)
3. EOFDM WGC [PREPARING A MEMORANDUM OF UNDERSTANDING FOR AN FDM PROGRAMME](#)
4. EOFDM WGC [BEST PRACTICE DOCUMENT: KEY PERFORMANCE INDICATORS FOR A FLIGHT DATA MONITORING PROGRAMME](#)

Note: 7 EOFDM BPDs were considered at the time of the interviews with the operators. 4 of them were merged into a single document in 2019 (EOFDM WGA — REVIEW OF ACCIDENT PRECURSORS), so that only 4 BPDs are listed here.



5.2. Annex 2 — Criteria applied for the selection of operators

The following criteria were applied:

1. Commercial operators of aeroplanes with an MCTOM of over 5 700 kg and with their principal place of business in the EASA Member States.
2. Operators based in at least eight different EASA Member States, covering eastern, northern, southern and western Europe, and including smaller and larger States (from a population point of view).
3. Inclusion of short- and long-range operations.
4. Inclusion of various fleet sizes (small (< 10), medium (> 10 and < 50), large fleets (> 50)).
5. Inclusion of scheduled and unscheduled passenger transport and cargo operations.
6. A small proportion of the targeted operators (not more than 20 %) are members to the EOFDM.



5.3. Annex 3 — Impact analysis of the new safety actions

According to Table 11, most of the recommendations presented in Section 4.2 of this document can be addressed as part of existing, ongoing actions of the EPAS for 2020–2024 without significant impact on the workload of the owners of the actions. Therefore, no impact analysis is presented for these recommendations.

SPT.0112 and SPT.0113 are new safety actions that are included in the EPAS for 2021–2025.

Table 12 — New safety actions related to FDM in the EPAS for 2021–2025

Action number or designator	EPAS edition where the new safety actions can be found	Description of the action in the EPAS	Recommendations of this evaluation report that can be addressed by the new safety actions
SPT.0112	EPAS for 2021–2025	'Ensure the alignment of EOFDM precursors with the needs of operators and the evolution of the safety risks for large aircraft.'	Recommendations Nos 10, 11, 13 and 14
SPT.0113	EPAS for 2021–2025	'Produce good practice documentation for operators on techniques to implement FDM events and measurements and to tailor FDM results for use by the SMS.'	Recommendation No 12

A *light* impact assessment can be found on the next pages for these actions to estimate the related costs and expected benefits, timelines for implementation, and scope of work.

The following information has been extracted from Table 10 and Table 12.

Objectives

The primary objective of SPT.0112 and SPT.0113 is to facilitate the implementation of the FDM programmes by operators, and to help them gain the maximum safety benefits from their FDM programmes (EOFDM objectives according to its Terms of Reference).

The secondary objective of SPT.0112 and SPT.0113 is to produce technical specifications that can be used for the EASA Data4Safety programme.

In charge: SM.1 with the EOFDM.



Analysis for SPT.0112 ‘Flight data monitoring (FDM) precursors of operational safety risks’Content:

The objective of SPT.0112 is to:

- strengthen the link between the EOFDM precursors documents and the international aviation safety taxonomies (Recommendation No 10);
- cover in more detail ‘unstable approaches’ and ‘take-off performance’ in the EOFDM precursors documents (Recommendation No 11);
- address the risk of ‘runway incursion’ in the EOFDM precursors documents (Recommendation No 13); and
- make the guidance for the implementation of the EOFDM precursors more practical (Recommendation No 14).

Timeline: SPT.0112 is planned to be completed by the end of 2022.

Resources:

With regard to SPT.0112: Recommendation No 13 entails defining the EOFDM precursors for an occurrence category that was so far not within the scope of the EOFDM precursors, and Recommendation No 14 entails reviewing approximately 90 EOFDM precursors. However, it should be noted that SPT.0112 replaces SPT.076 that was completed in 2020. The amount of work needed to support SPT.0112 is estimated to be about 350 hours (25 % of an FTE) per year over 2 years, meaning about 700 hours. The annual amount of hours is similar to that of SPT.076. The SM.1 flight data experts who managed SPT.076 have continued working on the EOFDM precursors with the help of the EOFDM. They can support SPT.0112 without any increase in their workload.

Therefore, SPT.0112 can be managed without any increase in the resources or a negative impact on the current SM.1 activities.

Analysis for SPT.0113 ‘Flight data monitoring (FDM) analysis techniques’Content:

SPT.0113 is intended to provide a general method for defining, testing and implementing a relevant FDM event set (Recommendation No 12). This should contribute to achieving greater consistency between the FDM programme and the operator’s SMS.

Timeline: SPT.0113 is planned to be completed by the end of 2021.

Resources:

An SM.1 flight data expert is already drafting the deliverable of SPT.0113, with the help of the EOFDM. Work is progressing without claiming an increase in the workload. It is estimated that fewer than 100 hours will be needed to complete SPT.0113.

Therefore, SPT.0113 can be managed without any increase in the resources or a negative impact on the current SM.1 activities.



5.4. Annex 4 — List of operators that were members to the EOFDM in September 2020**Table 13 — List of operators that were members to the EOFDM on 1 September 2020**

AERLINGUS
AIR EUROPA EXPRESS
AIR FRANCE
AIR EUROPA
AIRMALTA
AIRTANKER
ALITALIA
BRITISH AIRWAYS
BRUSSELS AIRLINES
CARGOLUX
CORRENDON AIRLINES
DHL
EMIRATES
ETIHAD
EUROPEAN AIR TRANSPORT
JET2
KLM
LEASE FLY
NETJETS EUROPE
NETWORK AVIATION
NORWEGIAN AIR SHUTTLE
PEGASUS
RYANAIR
TAP
TITAN AIRWAYS
VISTAJET
VOLOTEA
VUELING
WIZZAIR



5.5. Annex 5 — Abbreviations

AMC	acceptable means of compliance
AOC	air operator certificate
BPD	best practices document
CAST	Commercial Aviation Safety Team of the U.S. Federal Aviation Administration (FAA)
CAT	commercial air transport
CFIT	controlled flight into terrain
CICTT	Commercial Aviation Safety Team (CAST) / International Civil Aviation Organization (ICAO) Common Taxonomy Team
EASA	European Union Aviation Safety Agency
EAFDM	European Authorities Coordination Group on Flight Data Monitoring
EOFDM	European Operators Flight Data Monitoring forum
EPAS	European Plan for Aviation Safety
EU	European Union
FDM	flight data monitoring
FTE	full-time equivalent
GM	guidance material
ICAO	International Civil Aviation Organization
LOC-I	loss of control in flight
KPI	key performance indicator
MAC	mid-air collision
MCTOM	maximum certificated take-off mass
MoU	memorandum of understanding
MST	Member State task
RE	runway excursion
RI	runway incursion
SMS	safety management system
SOP	standard operating procedure
SPT	safety promotion task

