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SAFETY PROMOTION
Good Practice document

EUROPEAN OPERATORS FLIGHT DATA MONITORING FORUM WORKING GROUP C

PREPARING A MEMORANDUM OF UNDERSTANDING FOR AN FDM PROGRAMME

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Note

This document was produced by the working group C of the European Operators FDM forum (EOFDM WG C – Integration of an FDM programme into operator processes).

According to its terms of reference, the EOFDM WG C has the following objectives:

- a. to define solutions for the integration of FDM into an operator Safety Management System (SMS)
- b. to provide guidance that will help an operator to best manage:
 1. limited resources;
 2. the relations with top-management and unions;
 3. the application of “just culture” or “safety culture” to the use of FDM data;
 4. the dissemination of the safety teachings of FDM inside the company.
- c. to identify best practice with regards to data handling:
 1. during day-to-day operation (transfer from the aircraft to the ground, handling of memory media, etc.);
 2. on the long term: storage of data in a secure way and de-identification of data.

According to its terms of reference, the EOFDM is a voluntary and independent safety initiative. Therefore this document should be considered as complementary and not alternative to any applicable regulatory requirement, and it should not be considered as official guidance from EASA.

If you would like to give your comments or a feedback on this document, please write to fdm@easa.europa.eu.

Information on the EOFDM forum can be consulted on EASA website.

Introduction

A Flight Data Monitoring (FDM) programme is mandatory for all commercial air transport operators having their principal place of business in an EASA Member State and operating aeroplanes with a maximum certificated take-off mass in excess of 27 000 kg. Due to the sensitive nature of FDM data, the implementation of an FDM programme is facilitated if a Memorandum of Understanding (MoU) between all internal stakeholders of an operator is established. The MoU is part of an operator's Safety Management System (SMS), whose specific manuals and documents it should be linked to, but might be regarded as a standalone document. The objective of this document is to provide operators with:

- (a) an overview of the actual regulatory framework with regard to FDM; and
- (b) information on the principal issues to be taken into account, as well as industry best practices and advice on how to best prepare an MoU.

The chapters of this document are therefore written using the above structure. The contents of this document is based on the actual regulatory requirements in force in the European Union (EU) and inspired by operator's experience. Since an MoU touches all aspects of an FDM programme, this document does also. It can be, therefore, used as guideline to develop Flight Data Monitoring Documentation, for all those aspects connected with the MoU and required by Regulation.

Basic Requirement, Acceptable Means of Compliance and Guidance Material

The requirement to establish an FDM programme as one of the minimum conditions for an EASA Member States based operator to obtain and maintain an Air Operator Certificate (AOC) is, as of October 2014, contained in Annex III (Part-ORO) to Commission Regulation (EU) No 965/2012:

“(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.”

[Annex III (Part-ORO) to Commission Regulation (EU) No 965/2012 – Subpart AOC – ORO.AOC.130 Flight data monitoring — aeroplanes]

The aforementioned requirement is complemented by Acceptable Means of Compliance (AMC) and Guidance Material (GM) to Annex III (Part-ORO), contained in paragraph AMC1 ORO.AOC.130, GM1 ORO.AOC.130, and GM2 ORO.AOC.130 of the Annex to ED Decision 2012/017/R and its amendments. A specific item related to the MoU is contained herein:

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

1. the aim of the FDM programme;
2. a data access and security policy that should restrict access to information to specifically authorised persons identified by their position;
3. the method to obtain de-identified crew feedback on those occasions that require specific flight follow-up for contextual information; where such crew contact is required the authorised person(s) need not necessarily be the programme manager or safety manager, but could be a third party (broker) mutually acceptable to unions or staff and management;
4. the data retention policy and accountability including the measures taken to ensure the security of the data;
5. the conditions under which advisory briefing or remedial training should take place; this should always be carried out in a constructive and non-punitive manner;
6. the conditions under which the confidentiality may be withdrawn for reasons of gross negligence or significant continuing safety concern;
7. the participation of flight crew member representative(s) in the assessment of the data, the action and review process and the consideration of recommendations; and
8. the policy for publishing the findings resulting from FDM.

[AMC and GM to Part-ORO – Subpart AOC – AMC1 ORO.AOC.130 Flight data monitoring — aeroplanes]

These eight items, which should be defined in the procedure, have been taken as the main guideline in the development of this document.

1. Aim of the FDM Programme

According to paragraph AMC1 ORO.AOC.130(k)(1), the procedure should describe the aim of the FDM programme. According to Annex I (DEF) to Commission Regulation (EU) No 965/2012, FDM means the proactive and non-punitive use of digital flight data from routine operations to improve aviation safety. To obtain and maintain an AOC, the operator shall integrate the FDM programme in its Management System (MS). Hence, the FDM programme becomes a means by which the operator may achieve one of the objectives of its MS:

“(a) The operator shall establish, implement and maintain a management system that includes:

[...]

3. the identification of aviation safety hazards entailed by the activities of the operator, their evaluation and the management of associated risks, including taking actions to mitigate the risk and verify their effectiveness; [...].”

[Annex III (Part-ORO) to Commission Regulation (EU) No 965/2012 – Subpart AOC – ORO.GEN.200 Management System]

Detailed objectives of the FDM programme are described in paragraph AMC1 ORO. AOC.130:

“(b) An FDM programme should allow an operator to:

1. identify areas of operational risk and quantify current safety margins;
2. identify and quantify operational risks by highlighting occurrences of nonstandard, unusual or unsafe circumstances;
3. use the FDM information on the frequency of such occurrences, combined with an estimation of the level of severity, to assess the safety risks and to determine which may become unacceptable if the discovered trend continues;
4. put in place appropriate procedures for remedial action once an unacceptable risk, either actually present or predicted by trending, has been identified; and
5. confirm the effectiveness of any remedial action by continued monitoring.”

[AMC and GM to Part-ORO – Subpart AOC – AMC1 ORO.AOC.130 Flight Data Monitoring – Aeroplanes]

When describing the FDM programme’s aim and objectives, it is worth to extend the analysis and to clarify the way these objectives are achieved, the tools used, and the person(s) responsible to achieve these objectives. The AMC and GM hereby assists in describing the major activities comprised in an FDM programme:

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

1. Exceedance detection: searching for deviations from aircraft flight manual limits and standard operating procedures. A set of core events should be selected to cover the main areas of interest to the operator. A sample list is provided in Appendix 1 to AMC1 ORO.AOC.130. The event detection limits should be continuously reviewed to reflect the operator’s current operating procedures.
2. All flights measurement: a system defining what is normal practice. This may be accomplished by retaining various snapshots of information from each flight.
3. Statistics - a series of data collected to support the analysis process: this technique should include the number of flights flown per aircraft and sector details sufficient to generate rate and trend information.”

[AMC and GM to Part-ORO – Subpart AOC – AMC1 ORO.AOC.130 Flight Data Monitoring – Aeroplanes]

The AMC and GM clearly states the Safety Manager is the person responsible for informing the nominated post holder(s) of any safety issue(s) discovered through the FDM system. This is part of the broader responsibility of the Safety Manager to develop, administer, and maintain an effective SMS. However, this does not relieve the Accountable Manager from the ultimate responsibility for the operator’s SMS:

“(a) The safety manager, as defined under AMC1 ORO.GEN.200(a)(1), should be responsible for the identification and assessment of issues and their transmission to the manager(s) responsible for the process(es) concerned. The

latter should be responsible for taking appropriate and practicable safety action within a reasonable period of time that reflects the severity of the issue.”

[AMC and GM to Part-ORO – Subpart AOC – AMC1 ORO.AOC.130 Flight Data Monitoring — Aeroplanes]

What to keep in mind when preparing MoU provisions regarding ‘1. Aim of the FDM Programme’

FDM is the proactive and non-punitive use of digital flight data from routine operations to improve aviation safety. The requirements for an operator to establish and maintain an FDM programme are contained in Annex III (Part-ORO) to Commission Regulation (EU) 965/2012, paragraph ORO.AOC.130. The aforementioned requirement is complemented by Acceptable Means of Compliance (AMC) and Guidance Material (GM) to Annex III (Part-ORO), contained in paragraph AMC1 ORO.AOC.130, GM1 ORO.AOC.130, and GM2 ORO.AOC.130 of the Annex to ED Decision 2012/017/R and its amendments. The aim and objectives of an FDM programme are:

- a. to identify areas of operational risk and quantify current safety margins;
- b. to identify and quantify operational risks by highlighting when nonstandard, unusual, or unsafe circumstances occur;
- c. to act proactively in order to prevent unsafe aircraft states;
- d. to establish appropriate procedures for remedial action once an unacceptable risk or trend has been identified; and
- e. to confirm the effectiveness of any remedial action by continued monitoring.

Digital flight data downloaded from the aircraft is analysed to determine if deviations from structural aircraft limits or Standard Operating Procedures (SOPs) have occurred. The events that are monitored constitute a dynamic set continuously evolving in order to best adapt to the company procedures in place and to help in the identification and measurement of safety risks. The event detection limits are continuously reviewed and updated to reflect the current operating procedures. Applicable regulation provides a minimum set of data to be monitored. This set can be enlarged based on the availability of a larger set of parameters recorded by the aircraft. Statistical analysis is performed on a set of validated data to identify adverse trend or hazards.

2. Data Access and Security Policy

According to paragraph AMC1 ORO.AOC.130(k)(2), the procedure should describe the data access and security policy that should restrict access to information to authorized persons:

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

[AMC and GM to Part-ORO – Subpart AOC – AMC1 ORO.AOC.130 Flight Data Monitoring — Aeroplanes]

The GM further clarifies the need for a data access and security policy:

“(d) Preconditions for an effective FDM programme

1. Protection of FDM data

The integrity of FDM programmes rests upon protection of the FDM data. Any disclosure for purposes other than safety management can comprise the voluntary provision of safety data, thereby comprising flight safety.

2. Essential trust

The trust established between management and flight crew is the foundation for a successful FDM programme. This trust can be facilitated by:

iii. data security, optimised by:

(B) the operator strictly limiting data access to selected individuals

(C) maintaining tight control to ensure that identifying data is kept securely;”

[AMC and GM to Part-ORO – Subpart AOC – GM1 ORO.AOC.130 Flight Data Monitoring — Aeroplanes]

Access to FDM data should be limited only to authorized persons, who should be agreed upon and listed in the operator’s documentation. The majority of the FDM software suites available on the market allow the definition of specific function-based access levels. This allows restricting identifiable information to key persons, without comprising the effective performance of the analysis work of the FDM team.

The regulation does not establish a specific model according to which to define the function-based access levels. A possible solution defines the Safety Manager as the only person holding the right to access the totality of FDM data. Other operators choose to nominate a person, commonly referred to as broker or gatekeeper, agreed between the operator and the flight crew member representative(s), who may access the data when requested to provide contextual information regarding an event. This person has the duty to maintain the contacts with the concerned flight crew member(s) in those situations where clarification, feedback or a mandatory written report is required.

The data access and security policy is not limited to the definition of the different access levels. The procedure should describe how the operator intends to protect the identity of the flight crew members in all phases of the process, from when the data are downloaded from the aircraft until their ultimate storage or destruction, after being processed and de-identified.

Depending on the technology installed on the aircraft, data are removed and transmitted to the ground-based computer systems in different ways, the most common being through removable media or via secure wireless systems. In the first case, the task to download the data, transmit the data, or send the media in any form to the safety department, is usually performed by departments external to the safety department. In some cases, when the operator uses external maintenance service providers, the operation is accomplished by persons not even employed by the operator itself. As raw data still contain identifiable information, the operator should define, in the procedure, how raw data are managed and protected against any form of unauthorised reading.

The operator should also define when and in which form data can be read for airworthiness and aircraft maintenance purposes. Although the regulation does not cover this aspect of the FDM programme, FDM data can be very useful either in those cases where a structural limit exceedance is suspected or for preventive actions

that assure the continued airworthiness of the aircraft (i.e. Engine Health Monitoring or Aircraft Performance Monitoring).

In the first case, the readout of specific parameters can be requested by the maintenance manual as a necessary step in the troubleshooting procedure to restore the airworthiness. The second case, for example, can be the result of procedures and activities agreed among the engineering and flight operations department. In addition, when the aircraft experiences an event due to a possible system failure, the manufacturer typically asks to get a snapshot of relevant parameters or even to have a copy of the raw data.

In addition, more and more operators opt to outsource FDM activities as an effective way to organize a fully functional FDM programme. The advantages would be that such an FDM programme can be set up relatively quickly without the need to recruit flight data experts and purchase associated systems and infrastructure. The data will be analyzed and presented to the airline in a format ready to be used for safety improvements and actions. As with any subcontracted service, a service level agreement should cover the FDM activities and should identify measurable specifications that can be monitored to ensure that service requirements are being fulfilled by the provider. Data protection and security of information should be included in the scope of the contract. The operator should have processes in place to monitor the performance of the FDM provider, to ensure that requirements affecting the safety of operations and security of data are being fulfilled. This can, for example, be obtained through regular audits and inspections.

In all the aforementioned circumstances, it is important that the procedure describes how the identity of the flight crew member(s) is protected and how the Safety Manager is kept informed of raw data sent outside the operator.

What to keep in mind when preparing MoU provisions regarding '2. Data Access and Security Policy'

Access to FDM data should be limited to as few persons as possible and only authorized persons, who should be agreed upon and listed in the operator's documentation should have access to the FDM system. The operator and the flight crew member representative(s) should agree what level of access is granted and to whom, and how data is protected when provided to other persons, departments, and third parties. Operators should always ensure that data is secured and encrypted as much as possible, and should verify compliance with procedures in place in a continued manner.

3. Crew Contact and Crew Feedback

According to paragraph AMC1 ORO.AOC.130(k)(3), the procedure should define the method to obtain de-identified crew feedback on those occasions that require specific flight follow-up for contextual information. Where a crew contact is required, this should be carried out by an authorized person, not necessarily the FDM Programme manager or Safety Manager. This can also be carried out by a third party, such as a broker or gatekeeper, recognized by flight crew member(s) and management, and by unions, where present.

The purpose of a crew contact is to obtain contextual information for the SMS database on the occurrence that is being investigated. This information has the benefit of providing better information for the safety department when evaluating the occurrence, and for the flight operations, crew training, and other departments using safety data as feedback, to correct and improve procedures or to verify the effectiveness of training activities. The GM further clarifies when a crew contact or crew feedback may be required:

“(c) FDM in practice

2. Analysis and follow-up [..]

- ii. *If deficiencies in pilot handling technique are evident, the information is usually de-identified in order to protect the identity of the flight crew. The information on specific exceedances is passed to a person (safety manager, agreed flight crew representative, honest broker) assigned by the operator for confidential discussion with the pilot. The person assigned by the operator provides the necessary contact with the pilot in order to clarify the circumstances, obtain feedback and give advice and recommendations for appropriate action. Such appropriate action could include re-training for the pilot (carried out in a constructive and non-punitive way), revisions to manuals, changes to ATC and airport operating procedures.”*

[AMC and GM to Part-ORO – Subpart AOC – GM1 ORO.AOC.130 Flight Data Monitoring – Aeroplanes]

Before concluding that deficiencies in pilot handling technique are present, it is crucial to gather contextual information through a crew contact or crew feedback. Only when this information is available and consequently analyzed, it is possible to identify hazards and associated risks, and possibly conclude that indeed a deficiency in pilot handling technique is present.

An element that is vital to the success of the FDM programme is to gain and maintain the trust of the flight crew member community in the FDM programme, including the FDM team and the crew contact and crew feedback process. There should of course be an emphasis on the non-punitive just culture approach. The role of broker, or gatekeeper where possible, should be introduced and his leeway clarified and described in the operator’s documentation. Within a small operator, this function may be fulfilled by a member of the FDM team or Safety Manager. The GM further clarifies the role of the gatekeeper:

“(e) [...]

- d. Gate-keeper: this person provides the link between the fleet or training managers and flight crew involved in events highlighted by FDM. The position requires good people skills and a positive attitude towards safety education. The person is typically a representative of the flight crew association or an ‘honest broker’ and is the only person permitted to connect the identifying data with the event. It is essential that this person earns the trust of both management and flight crew.”

[AMC and GM to Part-ORO – Subpart AOC – GM1 ORO.AOC.130 Flight Data Monitoring – Aeroplanes]

Upon request or in agreement with the Safety Manager, the gatekeeper may be invited to contact the flight crew member(s) concerned in order to discuss a specific event. The evaluation of the necessity of a crew contact should be done in accordance to predefined criteria or methods. To maintain the trust of the flight crew members and to guarantee the objectivity of the activity, these criteria should be defined in the operator’s documentation, as part of a crew contact and crew feedback procedure, and might be related to a severity scale or to other assessment tools.

Different forms and formats of crew contact are possible such as e-mail, letter, telephone, and a face-to-face meeting. Formats can include an initial e-mail followed by telephone communication once an initial contact

has been established. The possible contact means, as defined and agreed by the Safety Manager, the gatekeeper, and the person nominated as responsible for Flight Operations, should be described in the operator's documentation.

Besides the crew contact process, a follow-up process must be established. Essentially, the crew contact feedback needs to be placed in an appropriate database. The database is normally an integral part of the SMS, such as a safety reporting system or an FDM system which has a database element. A special circumstance of crew contact is related to those FDM findings or events subjected to mandatory reporting:

"1. Occurrences which may represent a significant risk to aviation safety and which fall into the following categories shall be reported by the persons listed in paragraph 6 through the mandatory occurrence reporting systems pursuant to this Article:

- a. occurrences related to the operation of the aircraft [...];
- b. occurrences related to technical conditions, maintenance and repair of aircraft [...];
- c. occurrences related to air navigation services and facilities [...];
- d. occurrences related to aerodromes and ground services [...];

[..]

6. The following natural persons shall report the occurrences referred to in paragraph 1 through the system established in accordance with paragraph 2 by the organisation which employs, contracts or uses the services of the reporter, or failing that, through the system established in accordance with paragraph 3 by the Member State of establishment of their organisation, or by the State which issued, validated or converted the pilot's license, or through the system established in accordance with paragraph 4 by the Agency:

- a. the pilot in command, or, in cases where the pilot in command is unable to report the occurrence, any other crew member next in the chain of command of an aircraft registered in a Member State or an aircraft registered outside the Union but used by an operator for which a Member State ensures oversight of operations or an operator established in the Union;"

[Regulation (EU) No 376/2014 – Article 4 – Mandatory Reporting]

The AMC explicitly address that:

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

[AMC and GM to Part-ORO – Subpart AOC – AMC1 ORO.AOC.130 Flight Data Monitoring – Aeroplanes]

The operator may decide to adopt the crew contact and crew feedback procedure used to gather contextual information or follow-up, and therefore to use the gatekeeper, also in those cases where the flight crew member did not fulfill its responsibility to report a mandatory occurrence. As an alternative, the operator may decide to develop a specific procedure to be used only in case of retrospective submission of mandatory reports. Whatever procedure is adopted, the organization should ensure that all provisions of Regulation (EU) No 376/2014 are respected, and in particular:

"2. Each organization established in a Member State shall ensure that all personal details are made available only to staff of that organization other than persons designated in accordance with Article 6(1) only where absolutely necessary in order to investigate occurrences with a view to enhancing aviation safety."

[Regulation (EU) No 376/2014 – Article 16 – Protection of the information source]

The flowchart in Appendix I presents an example of a crew contact process whereby the role of the gatekeeper has been introduced also to collect the reports following the discovery of an event subject to the mandatory reporting scheme.

What to keep in mind when preparing MoU provisions regarding ‘3. Crew Contact and Crew Feedback’

The operator should foresee, when defining FDM related procedures, eventually recalled in the MoU, in what cases and according to what criteria, the flight crew member is contacted to obtain contextual information on FDM findings or occurrences when the follow-up is required. Every flight crew member should be reminded of its responsibility to report significant risk-bearing events subject to the mandatory reporting scheme. If such an occurrence has not been reported, the flight crew member is contacted and a retrospective report should be submitted and included under the normal reporting process without prejudice.

The operator should select a person with sufficient knowledge on safety concepts, regulations related to FDM activity, FDM, and trusted by the management and flight crew, who becomes the only interface between the flight crew and the operator, in all the circumstances where FDM feedback is required. The ways that can be used for contact should be described in the procedure as well as the modalities to store the information collected. It should be clearly described what procedure is followed when a flight crew member is reluctant to provide the requested feedback.

4. Data Retention Policy and Accountability

According to paragraph AMC1 ORO.AOC.130(k)(4), the procedure should define the data retention policy and accountability, including the measures taken to ensure the security of the data. The AMC further clarify this requirement:

“(i) The data retention strategy should aim to provide the greatest safety benefits practicable from the available data. A full dataset should be retained until the action and review processes are complete; thereafter, a reduced dataset relating to closed issues should be maintained for longer-term trend analysis. Programme managers may wish to retain samples of de-identified full-flight data for various safety purposes (detailed analysis, training, benchmarking etc.)”

[AMC and GM to Part-ORO – Subpart AOC – GM1 ORO.AOC.130 Flight Data Monitoring – Aeroplanes]

All the data and events are usually archived in a database and can be used to provide reports on a specific flight. Over time, this archived data can provide a picture of emerging trends and hazards that would otherwise go unnoticed. For this second type of analysis, only part of the information related to a flight is needed, specifically the list of events triggered or the specific value that a pre-defined parameter has assumed. This implies that data should be retained for a sufficient period to allow effective safety analysis on the specific flight or events.

After this period all aspects of the data that allow re-identification of the data shall be removed. There is no specific indication on how long to keep the data, with or without identification. A possible choice is to de-identify the data after six months and to keep the de-identified data for 5 years. This is in line with the recording keeping requirements specified paragraph AMC1 ORO.GEN.220(b).

The procedure describing the operator’s retention policy should include the clear statement about who is the person responsible for the data while they are stored. Indeed in many cases the database is placed outside the ground stations, due to limited space available on this latter. When placed outside, normally in company servers, attention should be given to the people (IT personnel, consultants etc.) that have access to the servers.

What to keep in mind when preparing MoU provisions regarding ‘4. Data Retention Policy and Accountability’

Data should be retained for a sufficient period to allow effective safety analysis. Aspects of the data that allow re-identification of the data are removed after a short period. The definition of the length of this period should be based on the capability of the organisation to cope with the analysis and to the time usually needed to achieve feedbacks when the contact with the crew is necessary.

5. Advisory Briefing or Remedial Training

According to paragraph AMC1 ORO.AOC.130(k)(5), the procedure should define the conditions under which advisory briefing or remedial training should take place, maintaining the constructive and non-punitive approach, fundamental in a safety culture environment. The GM further clarifies when an advisory briefing or remedial training may be required, including the follow-up procedure:

“(c) FDM in practice

2. Analysis and follow-up

- ii. *If deficiencies in pilot handling technique are evident, the information is usually de-identified in order to protect the identity of the flight crew. The information on specific exceedances is passed to a person (safety manager, agreed flight crew representative, honest broker) assigned by the operator for confidential discussion with the pilot. The person assigned by the operator provides the necessary contact with the pilot in order to clarify the circumstances, obtain feedback and give advice and recommendations for appropriate action. Such appropriate action could include re-training for the pilot (carried out in a constructive and non-punitive way), revisions to manuals, changes to ATC and airport operating procedures.”*
- iii. *Follow-up monitoring enables the effectiveness of any corrective actions to be assessed. Flight crew feedback is essential for the identification and resolution of safety problems and could be collected through interviews, for example by asking the following:*
 - a. Are the desired results being achieved soon enough?
 - b. Have the problems really been corrected, or just relocated to another part of the system?
 - c. Have new problems been introduced?”

[AMC and GM to Part-ORO – Subpart AOC – GM1 ORO.AOC.130 Flight Data Monitoring — Aeroplanes]

Training after identification of a safety issue has two objectives:

- a. addressing the identified risk, and;
- b. ensuring that it is understood as a non-punitive corrective action.

The FDM outputs should be carefully analysed in light of other safety information such as occurrence reports before being provided to the crew training department. An appropriate training programme cannot be developed using FDM outputs alone.

Training may address an individual weakness, a problem with a fleet, an area of operation or a group of flight crew members. If the issue is related to individual flight crew members, additional discrete training may be required. If the issue is of a more general nature, then it may be addressed through tailoring of the normal training programme, internal communication or through a safety campaign. The sole purpose of using FDM data analysis for training activities is related to safety improvement. The process should not be used with any purposes of performance evaluation or ranking, or in a perspective of career progression.

When an FDM event or an FDM trend is analysed and confirmed, the Crew Training post holder and other entities, for example the Flight Operations post holder, should be involved in defining the corrective actions. In a small organization, where the Safety Manager covers other functions related to the training of crew, it is recommended to first complete the analysis of the FDM event before defining corrective training programme. In any case, a follow-up of the corrective training is needed:

- a. if the training is provided to a population of pilots, a follow-up of the FDM trend should be set up to confirm effectiveness of the corrective action; In this case, the flight crew members or representative(s), where applicable, should be informed that a safety compromising trend was discovered, personalised FDM analysis has taken place according to established protocol(s), and the analysis is intended to be used for additional training of a certain group of individuals. If not already existing and agreement should be written that formulates reasons, objectives and scope of the additional training.
- b. if the training is given to correct an individual weakness, FDM may help in confirming that the training was effective for this individual pilot; In this case, a confidential record of the individual corrective training

should be retained to perform necessary evaluations. Records should be kept confidential for a period of time to be defined by the operator. In the case where the non-effectiveness of the training is demonstrated as continuing safety concerns appear, or where more weaknesses are highlighted during the training, the records should be passed to the Crew Training post holder. Then appropriate measures should be taken in accordance with the operator's procedures and managed in accordance with the following chapter.

Attention should be paid to the confidentiality around the advisory meeting and remedial training. In the case of remedial training, the Crew Training post holder should brief or nominate one or more instructors to deal upon confidentiality in connection with the Safety Manager. In small operators, Flight Safety Officers might have also instructor's qualifications and so are able to perform the remedial training in respect of the confidentiality.

Where an operator has established an ATQP, it should comply with the acceptable means of compliance of Part ORO, AMC1 ORO.FC.A.245 Alternative training and qualification programme. In particular, there should be an advanced FDM programme including all flight crew members covered by the ATQP, and the ATQP manager should have access to the FDM outputs.

What to keep in mind when preparing MoU provisions regarding '5. Advisory Briefing or Remedial Training'

FDM may be used, in conjunction with other information sources such as ASR and incident reports, to optimise training tools as well as to verify the effectiveness of the training methods used. Specific attention shall be given when the operator uses FDM data to identify adverse trends or safety related events of a specific pilot/crew. In this case the procedure followed and described and agreed through the MoU, shall explain how the identity of the crew is protected until the decision to identify it. This can be achieved, for example, through a number-coding feature of the software used, where the number is univocal for each pilot of the organisation.

When it is evident that the adverse trend identified by FDM and corresponding to a specific number is the subject of poor practice, which may require an advisory briefing or remedial training, the pilot(s) involved may be identified.

The identification process will follow the procedure established in the company (through the gate keeper or else). The Crew Training post holder will implement a remedial training programme. This programme could take the form of an advisory briefing in order that the bad practice can be self-corrected or he/she may recommend a programme of simulator and/or line training. Whatever approach is followed by the operator (individual monitoring, general briefing), the MoU should clarify the limits and characteristics of the method followed.

It should not be forgotten however, that "individual weakness" may also arise from the set up or even a change in training/ procedures/ quality and qualification standards, etc. With the introduction, in Regulation 965/2012, of the Management System, operators are now recommended to assess, from a risk related point of view, any change affecting internal or external processes. Therefore, an initial evaluation of possible adverse trends due to a change of training, procedures and any related process should have been accomplished before the implementation of the change. However, an in-depth analysis of the above mentioned "individual weaknesses" could represent part of the reactive evaluation in order to verify the effectiveness of the mitigation actions related to the implemented change.

6. Gross Negligence or Significant Continuing Safety Concern

According to paragraph AMC1 ORO.AOC.130(k)(6), the procedure should describe the conditions under which the confidentiality may be withdrawn for reasons of gross negligence or significant continuing safety concern.

One of the preconditions for an effective FDM programme is an high and well established level of safety culture. Safety culture, or just culture, is defined in several ways. According to Regulation (EU) No 376/2014, just culture means a culture in which front-line operators or other persons are not punished for actions, omissions or decisions taken by them that are commensurate with their experience and training, but in which gross negligence, willful violations and destructive acts are not tolerated.

For a functioning just culture, much more is required than a simple statement of intent and a definition. Just culture principles must pervade the organization every day in all activities. They must become a set of principles and ethics which define how the organization defines itself and must become a way of life for the people within the organization.

In a Just Culture environment, no blame will be apportioned to individuals following their reporting, in accordance with Regulation (EU) No 376/2014, of operational incidents or other risk exposures, including those where they unintentionally may have committed breaches of Standard Operating Procedures.

However, there might be very rare instances where investigation of an incident reveals unacceptable behavior, such as recklessness or gross negligence, on the basis of various information sources, including FDM data. Disciplinary actions may be justified in that case.

In such cases it is very important to proceed and, at a later stage, communicate in a transparent way to all concerned parties in order to avoid jeopardizing the trust of the crew community in the organization and to lessen the safety benefits of an FDM programme.

Such events should be treated on a case-by-case basis, mindful of the context in which they happened. Involvement of the crew representatives should be highly welcome and a common position should be sought. Publications such as the Global Aviation Safety Network's 'Roadmap to a Just Culture'¹ and others can provide clarification and assistance to organizations.

What to keep in mind when preparing MoU provisions regarding '6. Gross Negligence or Significant Continuing Safety Concern'

A just culture facilitates an atmosphere of trust in which people are encouraged to provide essential safety-related information, which will be used to improve safety, but in which they also understand that a line must be drawn between acceptable and unacceptable behavior. The definition of the line between acceptable and unacceptable is one of the pillars of the agreement between the organization management and the flight crew. The procedure shall clearly define all the circumstances where the protection of the crew is removed as well as the possible consequences or disciplinary actions that can follow the unacceptable behavior.

1 The document is available on the Flight Safety Foundation website.

7. The Participation of Flight Crew Member Representative(s) in the Assessment of the Data, the Action and Review Process and the Consideration of Recommendations

According to paragraph AMC1 ORO.AOC.130(k)(7), the procedure should describe the participation of flight crew member representative(s) in the assessment of the data, the action and review process and the consideration of recommendations.

One of the milestones of an effective FDM programme is the maintaining of a high level of trust between the management and the flight crew. To facilitate the achievement of this trust, it would be important to involve some flight crew representatives, when establishing and running the FDM programme.

The regulation doesn't prevent these representatives to have an active role when assessing data or evaluating the actions required after the identification of a safety related event or trend, provided that the level of involvement of the crew representative is defined in the operator procedures. Participation may include attendance at any FDM Review Groups meetings, training courses, and project work associated with developing and promoting the FDM programme.

Nevertheless, the opinion of the flight crew representative should not bind the management of the company when exercising their authority to make decisions degrading the tolerability of any safety risk, provided that the decision respects the no-blame criterion, if applicable and the operator's agreed procedures.

What to keep in mind when preparing MoU provisions regarding '7. The Participation of Flight Crew Member Representative(s) in the Assessment of the Data, the Action and Review Process and the Consideration of Recommendations'

The company role or affiliation of the flight crew member representative(s), as well as its involvement in any review process, assessment of data or recommendations definition depend on a company choice and on its SMS structure. Nevertheless, one of the duties of the organisation is to define and indicate in the manuals the kind of involvement and the task assigned to the flight crew member representative in all the processes related to FDM data. The level of technical or safety related competences should be commensurate with the kind and degree of involvement. Among the possible choices the flight crew member representative(s) could be involved in the initial setting of events and thresholds and when a major modification is required, in order to maintain high flight crew awareness in the system settings and the flight crew's trust in the output of the system. A further possibility is to strongly involve flight crew member representatives in every safety campaign where FDM data has a major role, so to increase the effectiveness and the dissemination of information among crews. The possibility to invite the flight crew member representative to join the Safety Management System board meetings or to give him a long-term role in it should be also considered as industry best practice.

8. The Policy for Publishing the Findings Resulting from FDM

According to paragraph AMC1 ORO.AOC.130(k)(8), the procedure should describe the policy for publishing the findings resulting from FDM. Communication of the outputs of the FDM programme is a cornerstone of an efficient SMS as the operator should pass on lessons learnt to all relevant personnel:

“(e) Education and publication: sharing safety information should be a fundamental principle of aviation safety in helping to reduce accident rates. The operator should pass on the lessons learnt to all relevant personnel and, where appropriate, industry.”

[AMC and GM to Part-ORO – Subpart AOC – AMC1 ORO.AOC.130 Flight Data Monitoring — Aeroplanes]

The GM further clarifies this requirement:

“(c) FDM in practice

2. Analysis and follow-up

- i. *FDM data are typically compiled every month or at shorter intervals. The data are then reviewed to identify specific exceedances and emerging undesirable trends and to disseminate the information to flight crews.*
- v. *Lessons learned from the FDM programme may warrant inclusion in the operator’s safety promotion programmes. Safety promotion media may include newsletters, flight safety magazines, highlighting examples in training and simulator exercises, periodic reports to industry and the competent authority. Care is required, however, to ensure that any information acquired through FDM is de-identified before using it in any training or promotional initiative.*

[AMC and GM to Part-ORO – Subpart AOC – GM1 ORO.AOC.130 Flight Data Monitoring — Aeroplanes]

A variety of methods can be used by an operator to convey information from the FDM programme. They combine printed materials (brochure, newsletters), posted and recorded materials (on websites, videos) and personal contact (briefings, trainings, and conversations).

Flight animation provides the ability to better understand and analyze events instead of looking at digital read-outs (tabulars, curves) that are sometimes difficult to interpret. Provision should be taken to allow pilot access to replay for self-education purposes.

A successfully implemented and established FDM programme relies on an effective communication policy. As underlined by regulation, a good FDM programme shares results internally and externally to the operator. Among the operator departments, interactions have to be kept between FDM Activities and:

- a. Safety Office: all the FDM related activities are, in many organizations, carried out within the Safety Office. Therefore, strong interactions between FDM activities and outcomes, and the other MS activities should be easy to maintain. Nevertheless, it is important that processes and interactions, within the Safety Office, are described in the operator manuals. In particular, the operator should define if and how the data extracted from FDM can be used in order to complete the information received through the safety reports, or to perform investigation of occurrences. All data from the FDM programme should also be used as an input for the definition and monitoring of the operator’s safety performance indicators (SPIs).
- b. Crew Training department: De-identified data from the FDM programme provides a quantitative measure of compliance with trained procedures during daily operations. This data can be utilized by the Training Department, when devising new procedures or developing training exercises, to assess the effectiveness of training methods. Recurrent training presentations are an effective way to directly provide comments on trends and events feedbacks and to present de-identified safety case studies. In certain circumstances, it will be necessary to provide the Training department with fully identified data in order that full benefit can be achieved from a specific crew re-training and checking module.
- c. Flight Operations department : Much valuable operational oversight and insight can be achieved from analysis of FDM data, e.g. validity of weather forecast, planned versus actual fuel consumption, flight

planned distances against actual distances flown, flight times and speeds etc. The Flight Operations department should develop processes to utilize this aspect of the FDM programme in validating the accuracy of flight plans.

- d. Safety Review Board: As the senior stakeholder in the SMS, the Safety Review Board must be regularly appraised of operational performance as measured by the FDM programme. De-identified reports setting out performance in a selection of key operational risk areas should be reviewed and corrective actions assigned. The FDM programme needs to be understood by final users assuming nobody is an FDM expert.
- e. Pilot Community: In order to effectively close the feed-back loop, the FDM programme, information briefings and presentations in electronic and paper media must be shared among pilot community. The advantages of keeping the Community informed of FDM Programmes findings goes from a major awareness and understanding of risks of the individual to an increase of general culture of safety among the organization.

Mutual advantages of sharing data may come also from exchanges with external entities: other operators or with the industries. In some cases it is necessary to provide fully identifiable FDM data to State Agencies and regulatory Authorities as part of an investigation process. On other occasions, de-identified data can be shared with third party groups e.g. when discussing operational statistics for CDAs, Level-busts or TCAS events with ATS providers. A number of initiatives are carried out at European or world level for sharing FDM data.

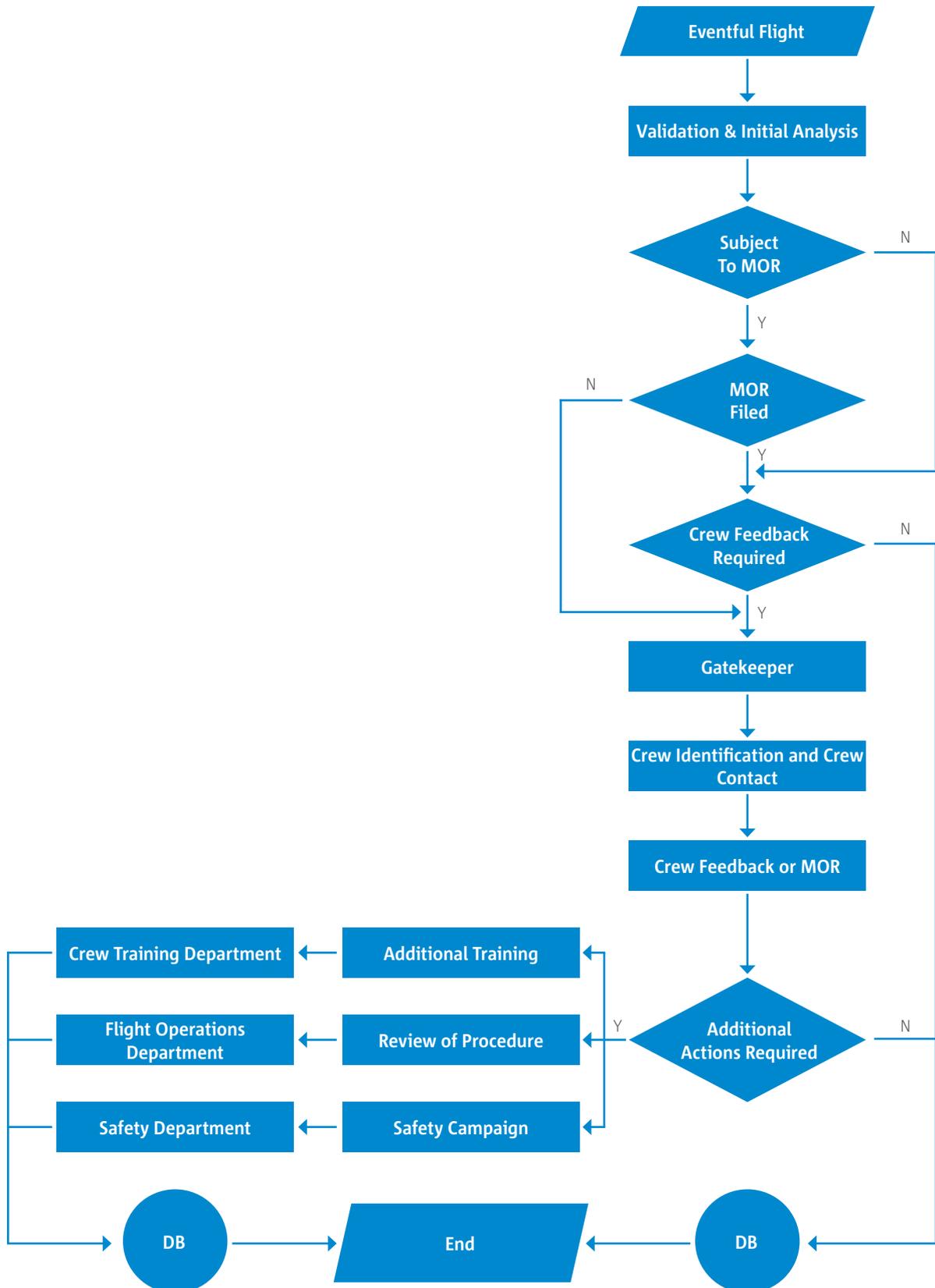
What to keep in mind when preparing MoU provisions regarding '8. The Policy for Publishing the Findings Resulting from FDM'

Outputs from the FDM programme should be shared with the Flight Operations, Safety, Quality, Crew Training department, as well as with the Pilot community. The sharing of safety information from the FDM programme is carried out through the issuing of specific reports to each relevant section. Articles highlighting FDM events and trends might be included in Safety Office newsletters or Flight Operations Line Operations Bulletins. A dedicated FDM module may be part of the annual recurrent ground school, showing trend information and specific event feedback.

Whatever method is chosen to disseminate FDM results, when drafting the MoU provision or any operator procedure recalled in the MoU, the operator should pay attention in clarifying at what extent it intends to spread results and what are the limitations.

Especially when data are shown outside the operator and not for reasons that imply the mandatory shared of information (request from SIAs, accidents), the operator should describe all the precautions taken to prevent any sensitive data to be published or the image of the company to be threatened.

Appendix I: Crew Contact and Crew Feedback Process Example



Appendix II: FDM Team

The activities composing an FDM programme are usually run by a single person or group of persons among the operator; the FDM team. To reach the goal of an effective FDM programme, the FDM team should be composed of experienced individuals with good CRM qualities and SMS knowledge. The recognition of the environment of professionalism and confidentiality of the team is very important.

The team should be comprised of professionals from the different areas involved in the FDM programme; engineers, safety experts, training, and pilots. Small operators can organize the team with pilots acting as principal analysts, supported by full-time or part-time ground staff. The experience and knowledge of the pilot is not necessary during the initial flight data analysis, but is vital for a rapid understanding and comprehension of pilot behavior during some events.

The regulation does not specify any requirements for team members, whereas the GM provides some indication on the functions that need to be fulfilled. Nevertheless, it should be underlined that personnel involved in FDM activities is subject to the requirements of Commission Regulation (EU) No 965/2012 regarding competence and training of personnel:

“(a) The operator shall establish, implement and maintain a management system that includes:

4. maintaining personnel trained and competent to perform their tasks;”

[Annex III (Part-ORO) to Commission Regulation (EU) No 965/2012 - Subpart GEN - ORO.GEN.200 Management System]

“(c) The operator shall have sufficient qualified personnel for the planned tasks and activities to be performed in accordance with the applicable requirements.”

[Annex III (Part-ORO) to Commission Regulation (EU) No 965/2012 - Subpart GEN - ORO.GEN.210 Personnel Requirements]

Therefore, a specific training path for the personnel involved in FDM activities should be included in the operator’s procedures. The GM also identifies some key roles that should be covered by the team in charge of the FDM activities. Besides the description of the functions, the regulation does not restrict the size of the team as long as the operator guarantees resources to perform the required tasks:

“(e) Implementing an FDM programme

3. The FDM team

- i. *Experience has shown that the ‘team’ necessary to run an FDM programme could vary in size from one person for a small fleet, to a dedicated section for large fleets. The descriptions below identify various functions to be fulfilled, not all of which need a dedicated position.*
 - a. Team leader: It is essential that the team leader earns the trust and full support of both management and flight crew. The team leader acts independently of others in line management to make recommendations that will be seen by all to have a high level of integrity and impartiality. The individual requires good analytical, presentation and management skills.
 - b. Flight operations interpreter: this person is usually a current pilot (or perhaps a recently retired senior captain or instructor), who knows the operator’s route network and aircraft. This team member’s in-depth knowledge of SOPs, aircraft handling characteristics, aerodromes and routes is used to place the FDM data in a credible context.
 - c. Technical interpreter: this person interprets FDM data with respect to the technical aspects of the aircraft operation and is familiar with the power plant, structures and systems departments’ requirements for information and any other engineering monitoring programmes in use by the operator.

- d. Gate-keeper: this person provides the link between the fleet or training managers and flight crew involved in events highlighted by FDM. The position requires good people skills and a positive attitude towards safety education. The person is typically a representative of the flight crew association or an ‘honest broker’ and is the only person permitted to connect the identifying data with the event. It is essential that this person earns the trust of both management and flight crew.
 - e. Engineering technical support: this person is usually an avionics specialist, involved in the supervision of mandatory serviceability requirements for FDR systems. This team member is knowledgeable about FDM and the associated systems needed to run the programme.
 - f. Replay operative and administrator: this person responsible for the day-to-day running of the system, producing reports and analysis.
- ii. *All FDM team members need appropriate training or experience for their respective area of data analysis. Each team member is allocated a realistic amount of time to regularly spend on FDM tasks.”*

[AMC and GM to Part-ORO – Subpart AOC – GM1 ORO.AOC.130 Flight Data Monitoring — Aeroplanes]

The FDM team members should be briefed and need to thoroughly understand the peculiarities and restrictions of the role covered: the access to the FDM information implies some privacy related obligations, such as the discussion of the results only in restricted meetings, or the production of very impartial events reports to be distributed only to specific function holders among the Team. Team members are usually very meticulous and accurate in keeping track of all the tasks and actions carried out or decisions taken. FDM Team member are usually invited to sign a ‘confidentiality agreement’ summarizing the obligations to be respected.

Appendix III: FDM and Investigations

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

[AMC and GM to Part-ORO – Subpart AOC – GM1 ORO.AOC.130 Flight Data Monitoring – Aeroplanes]

Conditions established by CAT.GEN.MPA.195, which take precedence over an FDM programme, are the following:

“(a) Following an accident or incident that is subject to mandatory reporting, the operator of an aircraft shall preserve the original recorder data for a period of 60 days unless otherwise directed by the investigating authority.

(b) The operator shall conduct operational checks and evaluations of flight data recorder recordings, cockpit voice recorder (CVR) and data link recordings to ensure continued serviceability of the recorders.

(c) The operator shall save the recordings for the period of operating time of the FDR as required by CAT.IDE.A.190 or CAT.IDE.H.190, except that, for the purpose of testing and maintaining the FDR, up to one hour of the oldest recorder material at the time of testing may be erased.

(d) The operator shall keep and maintain up-to-date documentation that presents the necessary information to convert FDR raw data into parameters expressed in engineering units.

(e) The operator shall make available any flight recorder recording that has been preserved, if so determined by the competent authority.

(f) Without prejudice to Regulation (EU) No 996/2010 of the European Parliament and of the Council:

(1) CVR recordings shall only be used for purposes other than for the investigation of an accident or an incident subject to mandatory reporting, if all crew members and maintenance personnel concerned consent.

(2) FDR recordings or data link recordings shall only be used for purposes other than for the investigation of an accident or incident which is subject to mandatory reporting, if such recorders are:

- i. *used by the operator for airworthiness or maintenance purposes only; or*
- ii. *de-identified; or*
- iii. *disclosed under secure procedures.”*

[Annex IV (Part-CAT) to Commission Regulation (EU) No 965/2012 – Subpart A – CAT.GEN.MPA.195 Preservation, production and use of flight recorder recordings]

The requirements indeed assure the availability of the information contained in the crash-protected flight recorder to be preserved, following an accident or serious incident on which an ICAO Annex 13 investigation is conducted, as well as in those incidents where the Safety Investigation Authority requires having access to the original recorder data. Regulation (EU) No 996/2010 on the investigation and prevention of accidents and incidents in civil aviation describes in depth the circumstances when the requirements of the investigation prevail on the provisions to be followed by the FDM programme. According to Article 11, the investigator-in-charge has unlimited access to evidence, including flight recorder recordings and FDM recordings:

“2. Notwithstanding any confidentiality obligations under the legal acts of the Union or national law, the investigator-in-charge shall in particular be entitled to:

(c) have immediate access to and control over flight recorders, their contents and any other relevant recordings;

(g) have free access to any relevant information or records held by the owner, the certificate holder of the type design, the responsible maintenance organisation, the training organisation, the operator or the

manufacturer of the aircraft, the authorities responsible for civil aviation, EASA and air navigation service providers or aerodrome operators. “

[Regulation (EU) No 996/2010 - Article 11 - Status of the safety investigators]

Article 13 places a duty on an aircraft operator involved in an accident or serious incident to preserve all documents and recordings related to an investigated occurrence:

“3. Any person involved shall take all necessary steps to preserve documents, material and recordings in relation to the event, in particular so as to prevent erasure of recordings of conversations and alarms after the flight.”

[Regulation (EU) No 996/2010 - Article 13 - Preservation of evidence]

Article 14 defines strict protection rules for recordings, in particular when they bear privacy content. However, the judicial authorities have the possibility to disclose protected information for the need of the judicial investigation:

“Flight data recorder recordings shall not be made available or used for purposes other than those of the safety investigation, airworthiness or maintenance purposes, except when such records are de-identified or disclosed under secure procedures.”

[Regulation (EU) No 996/2010 - Article 14 - Protection of sensitive safety information]

Article 15 places a duty on participants to a safety investigation to maintain confidentiality of the information shared during an investigation:

“1. The staff of the safety investigation authority in charge, or any other person called upon to participate in or contribute to the safety investigation shall be bound by applicable rules of professional secrecy, including as regards the anonymity of those involved in an accident or incident, under the applicable legislation.”

[Regulation (EU) No 996/2010 - Article 15 - Communication of information]

Some of the reported occurrences may be subject to an official safety investigation, such as governed by the principles of ICAO Annex 13. In Europe, Regulation (EU) No 996/2010 on the investigation and prevention of accidents and incidents in civil aviation establishes the common rules applicable to official safety investigations. The operator could describe the impact of the provisions of Regulation (EU) No 996/2010 on their FDM programme in their procedure. Alternatively, the operator could describe the impact of the aforementioned regulation in the Emergency Response Plan, related to the investigation and the protection and assistance of the crew in case of accident and serious incident.

In any case, the crew should be informed that, in case an occurrence is subject to an official investigation, the original FDM data will be retained in a secure place for 60 days, and that the Safety Investigation Authority is entitled to get a copy of the original FDM data. In addition, the crew should be informed that, in case an occurrence is subject to an official investigation, the Safety Investigation Authority has the authority on the disclosure of information related to the investigation.



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