REPÚBLICA DE MOÇAMBIQUE

INSTITUTO DA AVIAÇÃO CIVIL DE MOÇAMBIQUE

Technical Circular

CT 120-006 – ESTABLISHMENT OF AN OPERATOR'S FLIGHT DATA MONITORING (FDM) PROGRAMME

Effectivity Date: **30/05/2016**

SECTION 1 GENERAL

1.1 OBJECTIVE

This Technical Circular (TC) provides guidance to air operators on the establishment of a Flight Data Monitoring Programme (FDM) in accordance with the requirements in Part 121.

Acknowledgement: This TC incorporates the guidance material provided in EASA GM ORO.AOC.130

1.2 APPLICABILITY

This TC applies to all commercial air transport operators certified under MOZCAR Part 121 and operating aircraft with MCTOM exceeding 27 000 Kg.

1.3 REFERENCES

(1) MOZCAR 121.10.115;

(2) EASA CR 965/2012 Annex III, ORO.AOC.130

(3) EAFDM – Good practice on the oversight of FDM programmes (Version 1, Jan. 2015)

(4) TC 100-003 SMS;

(5) ICAO Doc 10 000 - Flight Data Analysis Programmes Manual

1.4 CHANGES

This is an original issuance of this TC.

1.5 BACKGROUND

1.5.1 For the purpose of this guidance material an FDM may be defined as a proactive and non-punitive programme for gathering and analyzing data recorded during routine flights to improve aviation safety".

1.5.2 Flight data monitoring (FDM) can be a powerful tool for an operator to improve and monitor its operational safety. Although it is only required for large aeroplanes (over 27 000 kg maximum certificated take-off mass), it has proved to be very beneficial for operators of lighter aeroplanes and operators of helicopters.

1.5.3 In addition, a mature FDM programme may benefit operators through the feedback of representative FDM derived information to their training departments and flight crews.

1.5.4 With the advent of the concept of the Safety Management System (SMS), operators are required to integrate the FDM programme into their SMS, which includes, as key processes, 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.

1.5.5 Together with a reporting system, FDM is a vital part of a well-functioning Safety Management System for an aircraft operator, and it acts as one of the main data sources for monitoring the operational safety level.

1.5.6 An FDM programme shall be intrinsically non-punitive, featuring as part of a positive safety culture. As such it has to function within a just culture and the operator's overall responsibilities related to its SMS. This means that in cases of gross negligence or a significant continuing safety concern, the decision to sanction an individual flight crew member may be in part based on FDM data, however such a decision has to be made within the operator's management system framework and procedures and require preliminary safety assessment by the Safety Manager.

SECTION 2 – THE FDM PROGRAMME

2.1 Implementing an FDM programme

2.1.1 General considerations

(1) Typically, the following steps are necessary to implement an FDM programme:

(a) implementation of a formal agreement between management and flight crew;

(b) establishment and verification of operational and security procedures;

(c) installation of equipment;

(d) selection and training of dedicated and experienced staff to operate the programme; and

(e) commencement of data analysis and validation.

(2) An operator with no FDM experience may need a year to achieve an operational FDM programme. Another year may be necessary before any safety and cost benefits appear. Improvements in the analysis software, or the use of outside specialist service providers, may shorten these time frames. (

2.1.2 Aims and objectives of an FDM programme

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

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

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

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

(a) Short-term goals:

– establish data download procedures, test replay software and identify aircraft defects;

– validate and investigate exceedance data; and

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

(b) Medium-term goals:

– Produce an annual report

— include key performance indicators;

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

– plan for the next fleet to be added to programme.

(c) Long-term goals:

– Network FDM information across all of the operator's safety information systems; and

– use utilisation and condition monitoring to reduce spares holdings.

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

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

2.1.3 The FDM team

(1) 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 fl eet or training managers and fl ight 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 fl ight 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 is responsible for the day-to-day running of the system, producing reports and analysis.

(2) 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.

2.2 FDM equipment

2.2.1 General

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

(1) an on-board device to capture and record data on a wide range of in-flight parameters;

(2) a means to transfer the data recorded on board the aircraft to a ground-based processing station.

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

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

2.2.2) Airborne equipment

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

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

(b) Some systems automatically download the recorded information via secure wireless systems when the aircraft is in the vicinity of the gate. There are also systems that enable the recorded data to be analysed on board while the aircraft is airborne.

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

2.2.3 Ground replay and analysis equipment

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

(2) FDM programmes generate large amounts of data requiring specialised analysis software.

(3) The analysis software checks the downloaded flight data for abnormalities.

(4) The analysis software may include: annotated data trace displays, engineering unit listings, visualisation for the most significant incidents, access to interpretative material, links to other safety information and statistical presentations.

2.3 FDM analysis techniques

2.3.1 *Exceedance detection*

(1) FDM programmes are used for detecting exceedances, such as deviations from flight manual limits, standard operating procedures (SOPs), or good airmanship. Typically, a set of core events establishes the main areas of interest to operators.

Examples: high lift-off rotation rate, stall warning, ground proximity warning system (GPWS) warning, flap limit speed exceedance, fast approach, high/low on glideslope, and heavy landing.

(2) Trigger logic expressions may be simple exceedances such as redline values. The majority, however, are composites that define a certain flight mode, aircraft configuration or payload related condition. Analysis software can also assign different sets of rules dependent on airport or geography. For example, noise sensitive airports may use higher than normal glideslopes on approach paths over populated areas. In addition, it might be valuable to define several levels of exceedance severity (such as low, medium and high).

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

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

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

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

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

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

2.3.2 *All-flights measurements.* FDM data are retained from all flights, not just the ones producing significant events. A selection of parameters is retained that is sufficient to characterise each flight and allow a comparative analysis of a wide range of operational variability. Emerging trends and tendencies may be identified and monitored before the trigger levels associated with exceedances are reached.

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

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

2.3.3 *Statistics*. Series of data are collected to support the analysis process: these usually include the numbers of flights fl own per aircraft and sector details sufficient to generate rate and trend information.

2.3.4 *Investigation of incidents flight data*. Recorded flight data provide valuable information for follow-up to incidents and other technical reports. They are useful in adding to the impressions and information recalled by the flight crew. They also provide an accurate indication of system status and performance, which may help in determining cause and effect relationships.

Examples of incidents where recorded data could be useful:

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

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

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

– wake vortex encounters, turbulence encounters or other vertical accelerations. It should be noted that recorded flight data have limitations, e.g. not all the information displayed to the flight crew is recorded, the source of recorded data may be diff erent from the source used by a flight instrument, the sampling rate or the recording resolution of a parameter may be insufficient to capture accurate information.

2.3.5 *Continuing airworthiness.* Data of all-flight measurements and exceedance detections can be utilized to assist the continuing airworthiness function. For example, engine-monitoring programmes look at measures of engine performance to determine operating efficiency and predict impending failures.

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

2.4 FDM in practice

2.4.1 FDM process

Typically, operators follow a closed-loop process in applying an FDM programme, for example:

(1) Establish a baseline: initially, operators establish a baseline of operational parameters against which changes can be detected and measured.

Examples: rate of unstable approaches or hard landings.

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

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

(3) Identify unsafe trends: based on the frequency and severity of occurrence, trends are identified. Combined with an estimation of the level of severity, the risks are assessed to determine which may become unacceptable if the trend continues.

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

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

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

(5) Monitor effectiveness: once a remedial action has been put in place, its effectiveness is monitored, confirming that it has reduced the identifi ed risk and that the risk has not been transferred elsewhere.

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

2.4.2 Analysis and follow-up

(1) 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.

(2) 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) 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.

(3) 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?

(4) All events are usually archived in a database. The database is used to sort, validate and display the data in easy-to-understand management reports. Over time, this archived data can provide a picture of emerging trends and hazards that would otherwise go unnoticed.

(5) 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.

(6) All successes and failures are recorded, comparing planned programme objectives with expected results. This provides a basis for review of the FDM programme and the foundation for future programme development.

2.5 Preconditions for an effective FDM programme

2.5.1 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 compromise the voluntary provision of safety data, thereby compromising flight safety.

2.5.2 Essential trust

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

(1) early participation of the flight crew representatives in the design, implementation and operation of the FDM programme;

(2) a formal agreement between management and fl ight crew, identifying the procedures for the use and protection of data; and

(3) data security, optimised by:

(a) adhering to the agreement;

(b) the operator strictly limiting data access to selected individuals;

(c) maintaining tight control to ensure that identifying data is kept securely; and

(d) ensuring that operational problems are promptly addressed by management.

2.5.3 Requisite safety culture Indicators of an effective safety culture typically include:

(1) top management's demonstrated commitment to promoting a proactive safety culture;

(2) a non-punitive operator policy that cover the FDM programme;

(3) FDM programme management by dedicated staff under the authority of the safety manager, with a high degree of specialisation and logistical support;

(4) involvement of persons with appropriate expertise when identifying and assessing the risks (for example, pilots experienced on the aircraft type being analysed);

(5) monitoring fleet trends aggregated from numerous operations, not focusing only on specific events;

(6) a well-structured system to protect the confidentiality of the data; and

(7) an efficient communication system for disseminating hazard information (and subsequent risk assessments) internally and to other organisations to permit timely safety action.

2.6 FDM evaluation

2.6.1 The IACM performs, as part of its safety oversight obligations, the evaluation and continuing surveillance of the operator's FDM, which, being part of its SMS, shall be acceptable to the IACM.

2.6.2 To facilitate an operator in ensuring that its FDM programme satisfies the applicable regulatory requirements, the operator may use the checklist included in Appendix 1 in its internal audit activities to monitor compliance.

Approved

Capt. João Martins Abreu
Chairman of the Board

APPENDIX 1

Form F120-111 - CHECKLIST/JOB AID - EVALUATION OF AN OPERATORS FLIGHT DATA MONITORING PROGRAMME (FDM)

CHECKLIST/JOB AID - EVALUATION OF AN OPERATORS FLIGHT DATA MONITORING PROGRAMME (FDM)	
Section 1. Operators information	
Name of Air Operator :	AOC Nº:
Name of Representative:	
Function:	
Safety Management Manual (SMM) Rev. Nr. _______	SMM Revision Date ____/____/____
I hereby declare that all the following items are included in the form of procedures acceptable to the Authority in the SMM mentioned in MOZCAR 121.10.110 and Part 1.04.215, as applicable, on pages listed bellow: Signature ____ Date ____ / ____/ ____	
Section 2. Compliance List	
Instructions: 1. Column 1 is to be completed by the operator. Detailed references about the location of the required policy or procedure should be given. *(Ex: SMM, Ch 1, 1.25, Pag. 21).* 2. Columns 2 to 5 are completed by the IACM. (*A – Acceptable; U – Unacceptable; N/A – Not Applicable)* 3. Enter a sequential note number in column 5 when column 3 is checked (*item is unacceptable)*. Describe the finding in Section 3.	
Note: *Checks in the Check Item Column are distinguished as 'basic' [B] or 'advanced' [A]. These are guidelines to help the inspector when overseeing FDM programmes with different levels of maturity. Any operator with an FDM programme is expected to be able to provide satisfactory responses to the 'basic' checks proposed. However, as the operator programme matures, it is expected that more advanced aspects of the FDM programme will be explored. Once the 'basic' capability of the FDM programme is established, it is recommended that the aspects covered under the 'advanced' checks are introduced, as relevant, and checked accordingly*	

MOZCAR/CATS	CHECK ITEM *(Note)*	1	2	3	4	5
		SMM Refer.	IACM			
			A	U	N/A	Note Nr
Principle 1 (P1): Basic requirement MOZCAR 121.10.115: "(1) The operator shall establish and maintain a flight data monitoring programme, as part of its safety management system, for aeroplanes with a maximum certificated take-off mass of more than 27 000 kg. (2) The flight data monitoring system shall be non-punitive and contain adequate safeguards to protect the source(s) of the data."	a. [B] Statement of safety objectives, including adherence to just/safety culture principles in the implementation of the SMS, signed by the accountable manager.					
	b. [B] Safety policy statement explicitly addressing the use of FDM data for identifying, monitoring and mitigating safety risks, signed by the accountable manager. This should mention that no punitive use of FDM data is made at the FDM programme level.					
	c. [B] Statement on the general condition of use and protection of the FDM data.					
	d. [B] The flight crew members have access to the safety policy statement and the corresponding documents signed by the accountable manager.					
	e. [B] Flight data for all aeroplanes with MCTOM of over 27 000 kg are scanned and analysed on a regular basis					
	f. [B] Evidence of analysis since the introduction of a fleet or of developing the FDM programme for any new					

	fleet					
	g. [B] Inclusion of the FDM programme into the SMS processes.					
Principle 2 (P2): Responsibilities MOZCATS 121.10.115: "(a) The safety manager, as required in Part 1.04.205, shall be responsible for the identification and assessment of issues and their transmission to the manager(s) responsible for the process(es) concerned. The latter shall be responsible for taking appropriate and practicable safety action within a reasonable period of time that reflects the severity of the issue." MOZCATS 1.04.135: "The organisation may decide to contract certain activities to external organisations but the ultimate responsibility for the product or service provided by external organisations shall always remain with the organisation."	a. [B] Inclusion of FDM in the safety manager's responsibilities.					
	b. [B] How does the operator assure themselves that the time allocated to their safety personnel/number of personnel on the FDM programme is adequate, given the operator's activity and fleet size?					
	c. [B] Safety risk internal information process which includes: i. Allocation of responsibility for discovery and transmission. ii. In case of an agreement with a third party to analyse data that details the operator's overall responsibility: What is the timeframe for reporting? Are the analysis needs specified? Who are the recipients inside the operator? Who is doing the data quality checks? (e.g. see Principle 4g. Principle 5b and Principle 5c).					
	d. [B] Management responsibilities: i. Responsibilities of the nominated persons identified by 121.06.145 should include implementing safety actions to address issues identified by the safety manager.					
	ii. Evidence on a given example, of timely action by the responsible manager after being informed.					
	e. [A] How is FDM knowledge transferred to new staff/successors? Is FDM included in staff succession planning? Potential consequence of no activity: Following staff turnover, FDM programme loses key knowledge impacting upon its standards and development, with negative impact on the operator's management system.					
	f. If the operator contracts out the operation of the FDM: i. Is there in place a formal written agreement between the operator and the FDM service provider for the processing of flight data ?					
	ii. Do operator's procedures and the agreement state that the overall responsibility for the programme lies with the operator ?					
	iii. Is the scope of the agreement clearly defined ?					
	iv. Does the agreement cover, when applicable, the protection of FDM data ?					
Principle 3 (P3): Objectives MOZCATS 121.10.115: "(2) An FDM programme shall	a. [B] Policy Statement & Procedures on hazard identification methods and risk management includes the FDM programme (as part of the operator's SMS).					

allow an operator to: (a) identify areas of operational risk and quantify current safety margins; (b) identify and quantify operational risks by highlighting occurrences of non-standard, unusual or unsafe circumstances; (c) 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; (d) put in place appropriate procedures for remedial action once an unacceptable risk, either actually present or predicted by trending, has been identified; and (e) confirm the effectiveness of any remedial action by continued monitoring.”	b. [B] In case the FDM data analysis has been subcontracted to a third party, the operator has the ownership of the specifications for the FDM events and measurements.					
	c. [B] Evidence of use of FDM data together with other sources to identify and assess operational risks					
	d. [B] Evidence on a given type of incident that FDM data were used to quantify the safety margins.					
Principle 4 (P4): analysis techniques MOZCATS 121.10.115: “(3) FDM analysis techniques should comprise the following: (a) Exceedance detection: searching for deviations from AFM limits and SOPs. A set of core events should be selected to cover the main areas of interest to the operator. The event detection limits shall be continuously reviewed to reflect the operator’s current operating procedures. (b) All flights measurement: a system defining what is normal practice. This may be accomplished by retaining various snapshots of information from each flight. (c) 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. “	a. [B] Exceedence detection program tailored to operating standards i.e. SOPs in general and aircraft type.					
	b. [A] Exceedence detection program tailored to specific operating scenarios: for example, the category of approach, specific aerodromes, IFR/VFR, winter operations. Potential consequence of no activity: FDM event detections are not representative of operational context and genuine event occurrences may be missed due to inappropriate event thresholds.					
	c. [B] FDM programme adapted to existing and new operational risks/safety issues/ safety priorities, e.g. events thresholds and/or measurements to support monitoring: i. Existing issues/risks, changing safety issues and operational changes (such as new SOPs, new missions, new population of pilots) ii. Common operational issues identified by the APIRG Aviation Safety Plan and the State Safety Plan					
	d. [A] Review process in place to keep up to date and history of changes. Potential consequence of no activity: FDM program does not evolve and is not synchronised with the operator’s risks. The FDM programme has no traceability, limiting internal oversight and the operator is unable to interpret historical reports.					

	e. [A] The all flights measurements (E.g. speed at touchdown) cover the FDM events (existing and new) when possible e.g. for monitoring normality and quality of operations. Potential consequence of no activity: Limited understanding and analysis of normal operations (e.g. plotting and analysing the distribution of specific flight data measurements for all flights) for identifying/monitoring new/existing risks. Inability to rationalise existing events (e.g. their thresholds) that may be tailored to SOPs versus actual operational results that may fall outside the scope of what can be captured by these events. Lack of monitoring quality of performance beyond SOPs to support continuous improvement.					
	f. [B] Support statistics compiled, for instance including number of flights flown or scanned by the FDM programme (by departure and arrival airfield and by fleet), in order to be able to compute rates.					
	g. [A] Are operational departments and aircraft system experts involved when necessary in the design of new events or in setting event threshold? Potential consequence of no activity: FDM staff do not have the full context/information necessary to optimise the development and use of certain events.					
	h. [A] How are FDM events/all flights measurements tested and evaluated? Potential consequence of no activity: Issues that are expected to be captured by events/all flights measurements are not, giving a false result or hidden errors introduced into the system with uncontrolled consequences.					
	i. [B] Statistical analyses used to monitor safety levels and trends.					
	j. [B] Where data sample size is not sufficient for statistical analyses, how else is the data used for safety analysis?					
Principle 5: tools for analysis, assessment and process control	a. [B] Provision of dedicated analysis software (in the operator premises or accessible by the operator, for instance in the case where FDM data processing is subcontracted)					
MOZCATS 121.10.115: "(4) FDM analysis, assessment and process control tools: the effective assessment of information obtained from digital flight data is dependent on the provision of appropriate information technology tool sets."	b. Initial validation process used (e.g. integrity of FDM files). i. [B] Does the operator conduct basic data quality checks following data replay and software analysis of the events /'all flights measurements', e.g.: 1. For the time period of the data replayed, for a given aircraft, is the number of flights extracted from the data the same as the number based on operator flight					

	logs? 2. Does each replayed flight file contain all the expected phases of flight? 3. If applicable, do they review whether their FDM 'all flights measurements' produce values for each flight as expected?					
	ii. [A] Is the operator aware of the validation processes (and how they work) of the software? Potential consequence of no activity: Limited investigative capacity in identifying technical issues with the output of the software for resolution by the software provider. Assumed quality standards leading to unsatisfactory results.					
	c. [B] Data verification and validation process: i. [B] Evidence of validation of the quality of flight parameters used for the FDM events (consistency and accuracy);					
	ii. [B] How are 'nuisance' events tracked and sorted out?					
	iii. [B] Validation of FDM events triggered by the system;					
	d. [B] Data displays – traces and listings, other visualisations.					
	e. [B] The FDM analyst(s) has access to interpretive material, such as weather data, aircraft flight manuals, flight plans, airport charts, to support their analysis.					
	f. [B] How is contextual data integrated into the assessment process of occurrences together with FDM?					
	g. [B] Links with other safety information and safety processes, such as the internal reporting system, the training programme.					
	h. [B] The software has the technical capability to define various levels of access to the data. If not, how does the operator overcome this?					
	i. [B] The operator can adjust the definition of FDM events and all flights measurements in a timely manner (by themselves or through a third party).					
	j. [B] Is the Operator aware of how the FDM events/ all flight measurements work and their limitations? Evidence on a relevant example.					
Principle 6: **safety communication** MOZCATS 121.10.115: "(5) Education and publication: sharing safety information should be a fundamental	a. [B] FDM findings are communicated to relevant parties once discovered. i. Is there an adequate means to report important messages outside of the regular reporting processes?					

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."	ii. Does the FDM reporting cover the safety priorities identified by the operator? E.g. from their risk register.					
	b. [B] Examples of means of distribution of safety messages (e.g. Newsletter or flight safety magazine, urgent safety communications.)					
	c. [A] Does the operator follow-up to check the uptake of FDM messages, e.g.: i. Do FDM trends correlate with the uptake of safety messages by flight crew members as expected? Example: after communication on a given safety issue and recommendations to the flight crews, a positive event trend can be observed in the FDM data .Potential consequence of no activity: Operator is unable to determine whether their safety communications have been effective.					
	d. [B] Simulator/training feedback: are lessons-learnt fed back to training? Is any feedback taken into account from the training function e.g. areas to monitor?					
	e. [B] Do the flight crew have the opportunity to request and view their own data, e.g. for a specific flight where they were the handling pilots? Is assistance provided for interpretation of the flight data?					
	f. [B] Evidence that operational departments (for example, maintenance, ground operations) receive relevant information for their area of responsibility.					
	g. [B] Presentation of FDM-based safety performance indicators (SPIs): How are the SPIs contextualised and what is done to support the recipients in understanding their context? Are the SPIs relevant?					
	h. [A] The operator engages with external stakeholders (e.g. aviation authorities) to inform them of relevant safety issues (e.g. ATC vectoring causing unstable approaches or other ongoing risks with ATC or an aerodrome). Potential consequence of no activity: Industry/the regulator does not benefit from potentially unique insights into safety issues that are common/new in industry. Likewise the operator does not benefit from the experiences of the rest of industry/the regulator on topics relevant to them.					
Principle 7: **official safety investigation requirements**	a. [B] Procedures in the Operations Manual to retain and protect original FDR data where an accident or a serious incident has taken place					

MOZCATS 121.10.115: "(6) Accident and incident data requirements specified in 121.04.180 take precedence over the requirements of an FDM programme. In these cases the FDR data shall be retained as part of the investigation data and may fall outside the de-identification agreements."	b. [B] The case of an official safety investigation is included in the confidentiality procedure (refer to Principle 12).					
Principle 8: **integration of FDM with occurrence reporting** MOZCATS 121.10.115: "(7) Every crew member shall 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 analysing hazards, incidents and accidents."	a. [B] Means of confirming if an FDM exceedence detection has been the subject of an internal occurrence report (e.g. a crew safety report or air safety report) and vice versa.					
	b. [B] Procedure for assessing internal occurrence reports using FDM data to help determine whether they should be subject to mandatory reporting to the Authority. How does the operator determine when analysis of FDM data is needed?					
	c. [B] Procedures for requesting an internal occurrence report if needed.					
Principle 9: **data recovery** MOZCATS 121.10.115: "(8) The data recovery strategy shall ensure a sufficiently representative capture of flight information to maintain an overview of operations. Data analysis shall be performed sufficiently frequently to enable action to be taken on significant safety issues."	a. [B] Statement on recovery objectives and targets: what is the data collection rate (flights scanned versus flights flown; what is the delay between flight and analysis (in particular when the analysis is subcontracted), for example on one individual aircraft: when was the latest flight for this aircraft collected for FDM? When was the latest flight for this aircraft scanned by FDM software?					
	b. [B] The operator has in place procedures for the timely download and analysis of data					
	c. [B] How does the operator determine a representative sample? (for example, proportion of a fleet, of aircraft at each base, flight destinations, etc. scanned by FDM). i. In the cases of small % recovery, does the entire data sample get analysed?					
	d. [B] Method used to achieve timely processing and targets.					
	e. [B] What process (for example in the maintenance programme or the MEL) does the operator have to follow-up on the serviceability of the FDM recorder?					
	f. [B] Recent FDM data - is there enough data? Is any one of the main airfields operated or any fleet missing in these?					
Principle 10:	a. [B] Statement on data retention policy, including, if data eventually					

data retention MOZCATS 121.10.115: "(9) The data retention strategy shall aim to provide the greatest safety benefits practicable from the available data. A full dataset shall 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.)."	needs to be de-identified: i. Identification period (period during which the identification of individuals in the dataset is still possible by authorised personnel);					
	ii. De-identification policy and timescales.					
	b. [B] Clear policy for FDM data retention in case of an occurrence subject to mandatory reporting to the Authority.					
	c. [B] Dataset relating to closed issues or for retrospective analysis: How does the operator assure themselves that they have enough information for trending over a given fleet, a given airfield, a given season etc., as appropriate					
Principle 11: **data protection** MOZCATS 121.10.115: "(10) The data access and security policy shall restrict information access to authorised persons. When data access is required for airworthiness and maintenance purposes, a procedure shall be in place to prevent disclosure of crew identity."	a. [B] Access policy statement, including: i. List of persons/posts with access, data views, their use of data;					
	ii. Procedure for secure Continued Airworthiness use of FDM data;					
	iii. Procedure for secure use of FDM data for training.					
	b. [B] In case where FDM is subcontracted, data access policy of the subcontractor.					
Principle 12: **confidentiality procedure** MOZCATS 121.10.115: "(11) The procedure to prevent disclosure of crew identity shall be written in a document, which should be signed by all parties (e.g. airline management, flight crew member representatives nominated either by the union or the flight crew themselves). This procedure shall, as a minimum, define: (a) the aim of the FDM programme; (b) a data access and security policy that shall restrict access to information to specifically authorised persons identified by their position; (c) 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	a. [B] There is a written procedure addressing all the bullet points of MOZCATS 121.10.115 (11), i.e. the 'procedure to prevent disclosure of crew identity';					
	b. [B] Does this written procedure cover all operations under the AOC? Are copies readily available to flight crew members? Did the safety manager and flight crew representatives sign this procedure?					

acceptable to unions or staff and management; (d) the data retention policy and accountability including the measures taken to ensure the security of the data; (e) 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; (f) the conditions under which the confidentiality may be withdrawn for reasons of gross negligence or significant continuing safety concern; (g) 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 (h) the policy for publishing the findings resulting from FDM."						
Principle 13: airborne equipment MOZCATS 121.10.115: "(12) Airborne systems and equipment used to obtain FDM data may range from an already installed full quick access recorder (QAR), in a modern aircraft with digital systems, to a basic crash-protected recorder in an older or less sophisticated aircraft. The analysis potential of the reduced data set available in the latter case may reduce the safety benefits obtainable. The operator shall ensure that FDM use does not adversely affect the serviceability of equipment required for accident investigation."	a. [B] Procedure for the safe storage and handling of the recording media. Documentation needed for data decoding (i.e. Data Frame Layout documentation*. Documentation on installation, test and maintenance procedures for the FDM recorder. ** Documentation that presents the necessary information to convert FDM binary data into parameters expressed in engineering units*					
	b. [B] Procedures to ensure serviceability of the FDR if it is used for FDM, in light of any additional wear on FDR.					
	c. [A] There is an entry for the FDM recorder (normally the QAR) in the MEL which is compliant with MMEL, Item 31-31-3 (Quick Access Recorder). Potential consequence of no activity: Aircraft can be grounded if the FDM recorder is discovered to be unserviceable, without any lead time to rectify the problem.					
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