

**Acceptable Means of Compliance and Guidance Material to Part-SPA  
Issue 1, Amendment 17**

**Annex II to ED Decision 2025/020/R**

**‘AMC and GM to Part-SPA — Issue 1, Amendment 17’**

The text of the amendment is arranged to show deleted, new or amended text as follows:

- deleted text is ~~struck through~~;
- new or amended text is highlighted in **blue**;
- an ellipsis ‘[...]’ indicates that the rest of the text is unchanged.

**Note to the reader**

*In amended, and in particular in existing (i.e. unchanged) text, ‘Agency’ is used interchangeably with ‘EASA’. The interchangeable use of these two terms is more apparent in the consolidated versions. Therefore, please note that both terms refer to the ‘European Union Aviation Safety Agency (EASA)’.*

The Annex to Decision 2012/019/R of the Executive Director of the Agency of 24 October 2012 ('Acceptable Means of Compliance and Guidance Material to Part-SPA') is amended as follows:

## SUBPART K: HELICOPTER

### OFFSHORE OPERATIONS

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

##### ORGANISATION OF THE FDM PROGRAMME

- (a) Safety manager's responsibilities: refer to point (a) of AMC1 ORO.AOC.130.
- (b) Contribution to the management system: refer to point (b) of AMC1 ORO.AOC.130.
- (c) FDM analysis techniques: refer to point (c) of AMC1 ORO.AOC.130.
- (d) FDM analysis, assessment and process control tools: refer to point (d) of AMC1 ORO.AOC.130.
- (e) Safety information and promotion: refer to point (e) of AMC1 ORO.AOC.130.
- (f) Accident and incident data requirements: refer to point (f) of AMC1 ORO.AOC.130.
- (g) Incident reporting: refer to point (g) of AMC1 ORO.AOC.130.
- (h) Data recovery and validation: the data recovery and validation strategy should ensure a sufficiently representative capture of flight information to maintain an overview of operations and that data is recovered from all helicopters that are within the scope of point SPA.HOFO.145. In addition, the validation of FDM events and measurements should be performed sufficiently frequently to enable action to be taken on significant safety issues. Data recovery and validation should incorporate all the points below.
  - (1) To ensure that a sufficiently representative subset of flights is monitored by the FDM programme, the number of flights available for processing by the FDM programme and that contain valid data should amount to:
    - (i) at least 60 % of the total number of flights performed in the past 12 months by helicopters that are in the scope of SPA.HOFO.145, if the operator operates fewer than 20 such aircraft; or
    - (ii) at least 80 % of the total number of flights performed in the past 12 months by helicopters that are in the scope of SPA.HOFO.145, if the operator operates 20 or more such aircraft.

This condition is not applicable to helicopters that performed fewer than 50 flights in the previous 12 months.

- (2) To limit the maximum duration during which no flight data may be received from an individual helicopter, the operator should:
  - (i) have means and procedures to identify a failure of the means to collect data from any individual helicopter that is within the scope of point SPA.HOFO.145 either within 22 calendar days after the failure occurs or before 10 more flights are performed after the failure occurs; and
  - (ii) correct any failure of the means to collect data from any individual helicopter that is within the scope of point SPA.HOFO.145 within 120 days of being made aware of the failure.

- (3) To ensure that significant FDM events (events that correspond to the most significant deviations from the standard operating procedures (SOPs) and circumstances potentially affecting the airworthiness of the aircraft) can be identified without unnecessary delays, the flights for which flight data is collected within the FDM programme (hereafter called 'collected flights') should be processed in a timely manner. At least 80 % of the collected flights that were performed in the previous 12 months should have been processed by the FDM software either within 22 calendar days after completion of the collected flight or before 10 flights following the collected flight were performed by the same aircraft.
- (4) For each helicopter that is within the scope of point SPA.HOFO.145 and first issued with an individual certificate of airworthiness (CofA) on or after 1 January 2029:
- (i) the operator should ensure that, within 90 calendar days after it starts operating the helicopter, the data collected for processing by the FDM software include all the flight parameters required to be recorded by a flight data recorder in accordance with AMC1.2 CAT.IDE.H.190; and
  - (ii) the operator should verify, within 90 calendar days after it starts operating the helicopter, that the recorded flight parameters specified in point (i) meet the performance specifications (range, sampling intervals, accuracy limits and resolution in read-out) as defined in EUROCAE Document 112A or any later equivalent standard produced by EUROCAE — this verification may be based on the documentation provided by the aircraft manufacturer or the installer of the airborne systems used to collect the flight data.
- (5) The operator should explain, upon request by its competent authority, the principles it uses for validating an FDM event, that is, how it determines whether an FDM event genuinely reflects a deviation that is considered abnormal for the flight in which the FDM event occurred.
- (6) The operator should validate significant FDM events as a matter of priority. At least 80 % of significant FDM events should be validated within 15 calendar days after their first detection by the FDM software.
- (i) Data retention strategy: refer to point (i) of AMC1 ORO.AOC.130.
  - (j) Data access and security policy: refer to point (j) of AMC1 ORO.AOC.130.
  - (k) Procedure to prevent disclosure of crew identity: refer to point (k) of AMC1 ORO.AOC.130.
  - (l) Access to information on flight parameters and FDM algorithms: refer to point (l) of AMC1 ORO.AOC.130.
  - (m) Airborne systems and equipment: refer to point (m) of AMC1 ORO.AOC.130.

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

**SCOPE OF THE FLIGHT DATA MONITORING (FDM) PROGRAMME** A set of core FDM events or FDM measurements should be selected to cover, as far as possible, the most significant risks identified by the operator. The definitions of FDM events and FDM measurements in this core set should be designed to help identify deviations from the standard operating procedures (SOPs) that are beyond what is considered normal practice and not only occurrences that require reporting to the competent authority or unscheduled continued airworthiness activity. The definitions of FDM events and measurements in this core set should be continuously reviewed to reflect the operator's current operating procedures and any newly identified safety risks.

- (b) For all helicopters that are within the scope of point SPA.HOFO.145 and first issued with an individual certificate of airworthiness (CofA) on or after 1 January 2016, the FDM programme should monitor, to the extent possible with the available flight data and without requiring overly complex algorithms, precursors of the following key risk areas:
- (1) risk of aircraft upset,
  - (2) risk of collision with terrain,
  - (3) risk of obstacle collision in flight, during take-off or landing, and
  - (4) risk of excursion from the touchdown and lift-off area, during take-off or landing.
- (c) If the necessary flight parameters are collected by the airborne system used to obtain flight data, the FDM programme should monitor:
- (1) exceedances indicating that the airworthiness of the aircraft may be affected and that are related to any of the following parameters:
    - (i) speed,
    - (ii) altitude,
    - (iii) accelerations,
    - (iv) attitude angles,
    - (v) aircraft weight,
    - (vi) engine torque; and
  - (2) caution and warning alerts to the flight crew, indicating that the airworthiness of the aircraft may be affected.
- (d) Upon request by its competent authority, the operator should provide documentation identifying which types of occurrences are monitored with the FDM programme. This documentation should cover at least occurrences subject to mandatory reporting and listed in Commission Implementing Regulation (EU) 2015/1018, Annex I, Section 1 (excluding paragraph 1.5, point (3)) and Section 5. This documentation should include a short description of the applicable FDM event(s) or FDM measurement(s) for each type of occurrence monitored by the FDM programme.

## GM1 SPA.HOFO.145 Flight data monitoring (FDM) programme

### IMPLEMENTATION ~~DEFINITION~~ OF AN FDM PROGRAMME

Refer to ~~GM1-ORO.AOC.130~~, except for the examples that are specific to aeroplane operation.

'Flight data monitoring' (FDM) is defined in Annex I to this Regulation. It should be noted that the requirement to establish an FDM programme is applicable to all individual aircraft that are within the scope of point SPA.HOFO.145, and not to a subset selected by the operator.

#### (a) FDM analysis techniques

##### (1) Exceedance detection / FDM event

- (i) FDM programmes are used for detecting what are known as 'FDM events', such as deviations from rotorcraft flight manual limits, standard operating procedures (SOPs) or good airmanship. It is advisable to monitor deviations from the SOPs in all phases of flight, including when the aircraft is on the ground.

Examples of FDM events for helicopters: low or high pitch rotation rate on take-off, high pitch attitude on landing, excessive roll attitude, low ground speed on approach.

- (ii) Trigger conditions of FDM event algorithms may be as simple as detecting that a 'redline value' was exceeded. The majority, however, are composites that define a certain flight phase or configuration. In addition, it might be valuable to define several levels of FDM event severity (such as low, medium and high severity). While such severity levels can help identify significant FDM events and relevant trends, they should not be considered safety risk levels; assessing the safety risk level associated with an occurrence or trend requires a more thorough assessment and consideration of all the relevant data available to the operator.

Example of composite trigger conditions for helicopters: conditions dependent on location or time of day, such as being able to differentiate between day and night operations and/or whether take-off / approach was conducted towards an airfield or an offshore installation.

Examples of significant (high-severity) FDM events for helicopters: high rate of descent below 500 ft, high torque on take-off, terrain awareness warning system 'PULL UP' warning, low airspeed on departure.

- (iii) FDM events provide useful information, which can complement that provided in crew reports.

Examples for helicopters: engine failure(s), engine / gearbox overtorque, high/low rotor speed, airborne collision avoidance system, stabilisation augmentation system status, system malfunctions.

- (iv) The operator may also modify the standard set of core FDM events to account for unique situations it regularly experiences or the SOPs it uses.

Example for helicopters: arrival profiles for helicopter-specific landing areas.

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

Example for helicopters: to monitor compliance with temporary operating restrictions mandated by an airworthiness directive.

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

(vii) The choice of appropriate trigger conditions and severity level threshold values for all FDM events is very important for an effective FDM programme. In particular, it is important that the trigger conditions of an FDM event algorithm are set so that it detects not only the most severe deviations (which are subject to mandatory occurrence reporting or require unscheduled inspection or maintenance) but also deviations that are beyond normal piloting practice. This is important for the effective and timely detection of outliers and unsafe trends. It is advisable to document how trigger conditions and severity level threshold values are determined.

## (2) All-flight measurements / FDM measurements

FDM data is retained from all flights, not just the ones producing FDM events. A selection of parameters is retained that is sufficient to characterise each flight and enable a comparative analysis of a wide range of operational variability. The distribution of flight parameter values, which can typically be produced with FDM measurements, may contain a wealth of information on common piloting practices and outliers. By analysing such distributions, emerging trends and tendencies may be identified and monitored before the trigger conditions associated with an FDM event are reached.

Examples of parameters monitored for helicopters: maximum torque during take-off, pitch attitude and rotation rates during take-off, gear retraction and extension heights, maximum speed with gear extended.

Examples of comparative analyses for helicopters: pitch attitude, rotation rates achieved during night departures versus day departures.

## (3) Statistics

Series of data are collected to support the analysis process: these usually include the number of flights flown per aircraft and details sufficient to generate rate and trend information.

## (4) Investigation of incident flight data by the operator

Recorded flight data provides valuable information for follow-up to incident reports and other technical reports. 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:

- unstable approaches (excessive ground speed, excessive rate of descent, downwind approach, etc.),
- loss of control in flight (incorrect autopilot mode engaged, vortex ring state, etc.),
- exceeding prescribed operating limitations (e.g. related to engine / main gearbox torque, engine temperature, main rotor rpm),
- turbulence encounters or other events causing significant vertical accelerations.

It should be noted that recorded flight data have limitations. For example, not all the information displayed to the flight crew is recorded, the source of recorded data may be different from the source used by a flight instrument, and the sampling rate or the recording resolution of a parameter may be insufficient to capture accurate information.

(5) Continuing airworthiness

Data of FDM measurements and FDM events can be utilised to assist the continuing airworthiness function. For example, engine-monitoring programmes look at measures of engine performance to determine operating efficiency and predict impending failures.

Examples of continuing airworthiness use for helicopters: avionics and other system performance monitoring, gearbox overtorque, engine temperature exceedance.

(b) FDM equipment, FDM software and FDM service

(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 are needed for effective FDM programmes:

- (i) an on-board device to capture and record data on a wide range of in-flight parameters,
- (ii) means to transfer the data recorded on board the aircraft to a secure repository where it can be processed and analysed, and
- (iii) software or a service to process and analyse the data, identify deviations from expected performance, generate reports to assist in interpreting the read-outs, etc.

(2) Airborne equipment

Several technical solutions are available, including the following.

- (i) Some systems are installed in the aircraft and record flight data onto a removable medium.
- (ii) Some systems automatically transmit the recorded data via secure wireless systems after completion of the flight.
- (iii) Some systems preprocess the recorded data to be analysed while the aircraft is airborne. Whatever the flight data processing performed by such systems, a complete set of raw flight data still needs to be recovered after the flight, as this is needed for in-depth analysis by the FDM team.

(3) FDM software or service

- (i) Processing and analysing flight data require specialised FDM software or a specialised FDM service.
- (ii) The FDM software or service typically converts the raw flight data into flight parameters expressed in engineering units and textual interpretation ('flight parameter decoding') and applies FDM algorithms to the flight parameters (refer to points (a)(1) and (a)(2)).
- (iii) The FDM software or service typically includes the capability to produce parameter plots and parameter tables, the capability to drill down and visualise flight parameter values for the portion of the flight during which an event was detected,

access to interpretative material, links to other safety information and statistical presentations.

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

(A) In the case of FDM software, the capability to program FDM algorithms, and the capability to interface with advanced processing tools and access advanced functions libraries beyond those offered as part of the FDM software.

(B) The capability to link flight data with other data sources (e.g. occurrence reports or weather data) to facilitate the analysis of events and trends. This capability should be used in accordance with data protection policies and procedures and its output should be restricted to authorised users (refer to AMC1 SPA.HOFO.145).

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

(D) The capability to export outputs in formats compatible with geographical information systems.

(E) The capability to replay flight data in a flight animation, thereby facilitating visual reconstruction of an occurrence.

(F) The capability to design and provide individual FDM summary reports or dashboards that can be confidentially consulted by flight crew members. It is more safety-relevant that such reports focus on compliance with the SOPs and aircraft flight manual limits rather than on comparing the performance of an individual pilot with that of their peers.

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

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

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

An example of an applicable standard is ARINC specification 647A (Flight Recorder Electronic Documentation).

(H) In the case of FDM software, the capability to generate documentation on the flight parameters that are used to produce FDM events and measurements, and the capability to generate documentation describing the logic of the algorithms used to produce FDM events and measurements, and for which type of reportable occurrences these algorithms are relevant.

(v) In case of a change of FDM software or FDM service provider, it is advisable to keep the previous FDM software or service operative for several months to ensure business continuity and validate the outputs of the new FDM software or service.

(c) FDM in practice

(1) FDM process

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

- (i) Establish a baseline: initially, operators establish a baseline of operational parameters against which changes can be detected and measured. They also determine ranges of flight parameter values that correspond to normal operations, which facilitates the determination of the appropriate trigger conditions for an FDM event definition.

Examples for helicopters: rate of unstable approaches, rate of incorrect pitch rate / pitch attitude at take-off.

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

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

- (iii) Identify potentially unsafe trends: based on the frequency and severity of FDM events, trends are identified. If a trend shows a significant increase in the frequency and/or severity of FDM events, a safety risk assessment may be necessary, as part of the operator safety risk management. More guidance on the identification of trends can be consulted in the [European Operators Flight Data Monitoring forum \(EOFDM\) document \*Flight Data Monitoring — Analysis techniques and principles\*](#).

Example for helicopters: increases in unstable approaches at particular locations.

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

Example for helicopters: confirm that the change has resulted in a reduction in events and that no new additional events have been generated.

- (v) Adapt the FDM programme to monitor new risks stemming from operational changes.

Example for helicopters: significant changes to the area of operation or business model.

## (2) Analysis and follow-up

- (i) FDM data is typically processed at short intervals. The data is then reviewed to identify and validate specific FDM events and emerging undesirable trends. Validating an FDM event means determining whether it corresponds to a genuine and abnormal event. It does not include analysing the possible causes or consequences of the event or assessing its safety risks.

- (ii) If deviations from the SOPs are detected, motivating an analysis of the causes and circumstances, the information about these deviations is passed (in accordance with point (k) of AMC1 SPA.HOFO.145) to the person responsible for flight crew contact. The decision to initiate flight crew contact (e.g. notification, request for additional information or confidential discussion) should be made after an initial

assessment that takes contextual information into account. If a confidential discussion with the flight crew is deemed necessary, the responsible person provides the necessary contact with the pilot in order to clarify the circumstances and obtain feedback for a more thorough safety assessment.

- (iii) All FDM events are usually archived in such a way that they can be sorted, validated and presented in easy-to-understand management reports. Over time, these archived data can provide a picture of emerging trends and hazards that would otherwise go unnoticed. In addition, the FDM team may wish to retain samples of de-identified full-flight data for various safety purposes (detailed analysis, training, benchmarking, etc.).
- (iv) Sharing safety information is necessary to maintain a competent workforce and support an effective management system (refer to point ORO.GEN.200). Therefore, lessons learnt from the FDM programme may warrant inclusion in the operator's safety promotion programmes. Safety promotion media may include newsletters, flight safety magazines, emails, video recordings and information on the company's intranet, highlighting examples in training and simulator exercises. Care is required, however, to ensure that any information acquired through FDM is de-identified before using it in any training or promotional initiative. In addition, it is recommended to not provide individual flight crew members with personalised access to FDM-based information (e.g. individual FDM summary reports or the possibility of replaying one's flight) without support from an FDM specialist on how to use these systems and correctly interpret the information provided. The safety manager is normally responsible for the transmission of FDM-based information (refer to AMC1 SPA.HOFO.145), which includes defining processes to ensure that such information is validated, clear and relevant to the recipient and provided in accordance with the procedure to prevent disclosure of crew identity.
- (v) All successes and failures are recorded, comparing planned programme objectives with expected results. This provides a basis for review of the FDM programme and the foundation for future programme development.

(d) Preconditions for an effective FDM programme

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

The integrity of FDM programmes rests upon protection of the FDM data. Any disclosure for purposes other than safety management can compromise the voluntary provision of safety data, thereby compromising flight safety. It is advisable to consider Regulation (EU) 2016/679 (General Data Protection Regulation), where applicable. In addition, the inherent protection of reporters and of persons mentioned in occurrence reports under Regulation (EU) No 376/2014 applies to flight crew members, whether their reports are voluntarily provided or retrospectively requested by the operator after an FDM event. Note that, after an official safety investigation of an accident or serious incident is initiated, the data recorded on a crash-protected flight data recorder should be preserved as part of the investigation data (point CAT.GEN.MPA.195).

(2) Essential trust

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

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

- (ii) a formal agreement between management and flight crew, identifying the procedures for the use and protection of data; and
- (iii) data security, optimised by:
  - (A) adhering to the agreement;
  - (B) the operator strictly limiting data access to selected individuals;
  - (C) maintaining tight control to ensure that identifying data is kept securely; and
  - (D) ensuring that operational problems are promptly addressed by management.

### (3) Requisite safety culture

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

- (i) top management's demonstrated commitment to promoting a positive safety culture;
- (ii) a non-punitive operator policy that covers the FDM programme;
- (iii) FDM programme management by dedicated staff under the authority of the safety manager, with a high degree of specialisation and logistical support;
- (iv) involvement of persons with appropriate expertise when assessing FDM events, FDM measurements and trends (refer to point (e)(3));
- (v) monitoring fleet trends aggregated from numerous operations, not focusing only on specific events;
- (vi) a well-structured system to protect the confidentiality of the data; and
- (vii) communicating relevant information on the general trends identified by and lessons learnt from the FDM programme in the communications on safety matters specified in AMC1 ORO.GEN.200(a)(4).

### (4) Integration with the operator's management system

Point SPA.HOFO.145 requires the integration of the FDM programme with the operator's management system. Because of this, FDM programme outputs are expected to be used together with other relevant data sources to support safety risk management (SRM). The SRM process is not an internal process within the FDM programme but part of the operator's management system. AMC1 SPA.HOFO.145 specifies that the safety manager should be responsible for identifying and assessing issues, which are the first steps of the SRM process. The EOFDM document *Breaking the Silos* details industry good practices regarding integration of the FDM programme within the management system.

### (5) Complete access to flight parameter decoding information

- (i) The flight parameter decoding information is the information sufficient for extracting flight parameter values from the recorded data files and decoding them into values expressed in engineering units or textually interpreting them. This information, which is usually provided by the installer of the airborne systems used to collect the flight data, is essential for programming the FDM software to decode the flight parameters.
- (ii) Therefore, it is recommended that complete access to the flight parameter decoding information is obtained at the time of aircraft delivery and that unhindered access is maintained. To facilitate the management of this information

it is recommended that it is consigned in documentation that complies with an electronic documentation standard and has a general public licence policy. In addition, it is advisable to have a versioning system that allows quick identification of the applicable documentation for any individual aircraft and any time period. Such documentation could be fully or partially generated by the FDM software if the software has this capability.

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

## (6) Objectives to ensure a good overview of operations

Internal objectives regarding the proportion of collected flights, the time from performing the flight to processing its data with the FDM software or the time to detect that no flight data is being collected any more from an individual helicopter are important to ensure a good overview of operations. It is advisable to set targets that are ambitious enough for this purpose.

Examples of internal targets:

- (i) collect data from at least 90 % of the total number of flights performed in the past 12 months by helicopters that are within the scope of point SPA.HOFO.145;
- (ii) identify within 10 calendar days a failure of the means to collect data from any individual helicopter that is within the scope of point SPA.HOFO.145;
- (iii) process the data of at least 90 % of the collected flights that were performed in the past 12 months within 10 calendar days of the flights' completion.

## (e) Implementing an FDM programme

### (1) General considerations

- (i) Typically, the following steps are necessary to implement an FDM programme:
  - (A) implementation of a formal agreement between management and flight crew,
  - (B) establishment and verification of operational and security procedures,
  - (C) installation of equipment,
  - (D) selection and training of dedicated and experienced staff to operate the programme, and
  - (E) commencement of data analysis and validation.
- (ii) An operator with no FDM experience may need a year to achieve an operational FDM programme. Another year may be necessary before any safety and cost benefits appear. Improvements in the analysis software, or the use of outside specialist service providers, may shorten these time frames.

### (2) Aims and objectives of an FDM programme

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

Example: with a modular system, begin by looking at basic safety-related issues only.

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

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

(A) Short-term goals

- Establish an FDM team (refer to point (e)(3)).
- Establish data download procedures and test FDM software.
- Verify, for all aircraft in the FDM programme, that the flight parameters used for FDM events and measurements are valid and correctly decoded. GM1 CAT.GEN.MPA.195—point (b) contains guidance on evaluating the validity of flight parameters.
- Verify that the flight parameter decoding information (see point (d)) is complete and correct.
- Design and/or adapt FDM algorithms and test them, and validate and investigate FDM events. For an FDM event algorithm, this includes verifying that the event trigger conditions and the severity level threshold values take into account any applicable aircraft flight manual limit, the SOPs and the distribution of values collected from all operations.
- Establish a user-acceptable routine report format to highlight individual FDM events and facilitate the acquisition of relevant statistics.

(B) Medium-term goals

- Ensure that the FDM programme meets the minimum data recovery and validation objectives and the data retention objectives.
- Produce reports and dashboards that include key performance indicators, in accordance with an established schedule and at a frequency that is sufficient for the proactive handling of safety risks.
- Add other modules to the analysis (e.g. continuing airworthiness).
- Plan for the next fleet to be added to the FDM programme.

(C) Long-term goals

- Network FDM information across all of the operator's safety information systems.

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

Examples for helicopters: monitoring onshore and offshore approaches and onshore and offshore take-off profiles. Analysis of such known problem areas may generate useful information for the analysis of other areas.

(3) The FDM team

- (i) Experience has shown that the team necessary to run an FDM programme could vary in size from one person for a small fleet, to a dedicated section for large fleets. The descriptions below identify various functions to be fulfilled, not all of which need a dedicated position. As the safety manager should be responsible for the FDM programme, and FDM outputs should, as much as possible, be analysed in relation to other safety data sources, the FDM team leader is expected to be part of the safety manager's team.
- (A) Team leader: it is essential that the team leader earns the trust and full support of both management and flight crew. The individual requires good analytical, presentation and management skills.
- (B) Flight operations interpreter: this person is usually a qualified pilot (or perhaps a recently retired senior captain or instructor), who knows the operator's route network and aircraft. This team member's in-depth knowledge of SOPs, aircraft handling characteristics, aerodromes and routes is used to place the FDM data in a credible context.
- (C) Technical interpreter: this person interprets FDM data with respect to the technical aspects of the aircraft operation and is familiar with the information required by the departments in charge of power plant, structures and systems, and with any other engineering monitoring programmes in use by the operator.
- (D) Gatekeeper: this person provides the link between the fleet or training managers and flight crew involved in events highlighted by FDM. The position requires good people skills and a positive attitude towards safety education. The person is typically a representative of the flight crew association or an 'honest broker' and is the only person permitted to connect the identifying data with the event. It is essential that this person earns the trust of both management and flight crew.
- (E) Engineering technical support: this person is usually an avionics specialist. This team member is knowledgeable about FDM and the associated systems needed to run the programme.
- (F) FDM analyst: this person is responsible for the design and validation of FDM algorithms and the analysis of FDM outputs. This usually requires at least basic knowledge of statistics; basic programming skills; detailed knowledge of FDM data flows, from the data collection on board the aircraft to the production of FDM-based indicators and dashboards; and in-depth knowledge of the FDM software or service. If the processing of data or the validation of FDM events is subcontracted to a service provider, the FDM analyst should have the necessary skills to effectively control and direct the work performed by that service provider.
- (G) FDM administrator: this person is responsible for the day-to-day recovery and processing of the flight data by the FDM software.
- (ii) All FDM team members need appropriate training or experience for their respective area of data analysis. Each team member is allocated a realistic amount of time to regularly spend on FDM tasks.

(f) Other uses of flight data

It is recommended to establish a written procedure to prevent the disclosure of crew identity whenever access to flight data or flight-data-based information is requested to meet

operational needs, such as fuel use optimisation, aircraft performance and preventive maintenance. As a minimum, it is advisable that such a procedure contains:

- (1) the aim of the programme in which flight data or flight-data-based information is to be used;
- (2) clear data access and security principles regarding access to flight data and flight-data-based information by staff members and service providers;
- (3) data and information retention principles; and
- (4) the method to obtain de-identified flight crew feedback on those occasions that require specific flight follow-up for contextual information.

In case a service provider is granted frequent access to flight data, a non-disclosure agreement is also advisable.

**(g) The FDM programme and large data exchange programmes**

Some States and organisations have set up so-called large data exchange programmes, in which very large amounts of data (including FDM data) provided by many operators and by other industry stakeholders are gathered, centrally processed and analysed. Participation in a large data exchange programme may offer an operator various benefits, such as the ability to compare its safety performance with that of comparable operators or access to other types of data (weather, traffic, etc.) or to advanced data integration capabilities. In addition, if an operator with a small fleet produces small amounts of flight data that do not allow reliable trend identification, joining a large data exchange programme may help to overcome this limitation. However, taking part in a large data exchange programme does not in itself satisfy point ORO.AOC.130, and every operator remains responsible for implementing its FDM programme. In addition, the FDM programme needs to be well integrated into the operator's management system for it to benefit from a large data exchange programme.

## GM2 SPA.HOFO.145 Flight data monitoring (FDM) programme

### ADDITIONAL GUIDANCE, ~~AND~~ INDUSTRY GOOD PRACTICE ~~AND~~ EXAMPLES OF FDM METHODS

- (a) Additional guidance material for the establishment of an FDM programme can be found in:
  - (1) International Civil Aviation Organization (ICAO) Doc 10000 — Manual on Flight Data Analysis Programmes (FDAP), [second edition, 2021](#); and
  - (2) United Kingdom Civil Aviation Authority (UK CAA) CAP 739 — Flight Data Monitoring, [second edition, 2013](#).
- (b) Examples of industry good practice for the establishment of FDM can be found in:
  - (1) HeliOffshore — [Helicopter flight data monitoring \(HFDM\) recommended practice for offshore operations \(HO-HFDM-RP\)](#) ~~Recommended Practice for Oil and Gas Passenger Transport Operations, Version 1.0, September 2020 (HO-HFDM-RP-v1.0)~~;
  - (2) the documents published by the [European Operators Flight Data Monitoring forum \(EOFDM\)](#); and ~~European Operators Flight Data Monitoring forum (EOFDM) — Preparing a memorandum of understanding for an FDM programme;~~
  - (3) International Association of Oil & Gas Producers — IOGP Report 690-2, Aircraft Operations.

~~(3) EOFDM — Best practice document: Key performance indicators for a Flight Data Monitoring programme; and~~

~~(4) EOFDM — ‘Breaking the silos’, Fully integrating Flight Data Monitoring into the Safety Management System.~~

- (c) Table 1 of this GM provides examples of potential precursors of incidents that could be monitored through an FDM programme, by means of FDM events or FDM measurements ~~examples of FDM event definitions that~~. These examples may be further developed using operator- and helicopter-specific limits. This table is considered illustrative and non-exhaustive. ~~Appendix 5 to HO-HFDM-RP-v1.0 contains other examples of FDM event definitions.~~ More important than the number of FDM event definitions that are programmed in the FDM software is that those definitions cover, as much as practicable, the operational risks that have been identified by the operator.

**Note 1:** Key risk areas, as described in the Annex to Commission Delegated Regulation (EU) 2020/2034, correspond to the aviation occurrence categories defined by the Commercial Aviation Safety Team / International Civil Aviation Organization Common Taxonomy Team, as follows:

- ‘aircraft upset’ corresponds to ‘loss of control in flight’ (LOC-I);
- ‘terrain collision’ corresponds to ‘controlled flight into terrain’ (CFIT);
- ‘obstacle collision in flight’ corresponds to elements of ‘controlled flight into terrain’ (CFIT) and of ‘collision with obstacle(s) during take-off and landing’ (CTOL);
- ‘excursion’ corresponds to elements of ‘runway excursion’ (RE) and ‘abnormal runway contact’ (ARC).

**Note 2:** The far-right column of Table 1 only indicates the occurrence types directly related to the precursors of incidents among those listed in Annex I ‘Occurrences related to the operation of the aircraft’ to Commission Implementing Regulation (EU) 2015/1018. The precursors listed in Table 1 may be used to detect occurrence types other than those indicated in the far-right column.

**Note 3:** Table 1 does not include additional information that can provide useful context, such as time of day, accrued hours and latitude/longitude.

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

**Note 5:** The examples of precursors described in Table 1 were developed with a primary focus on passenger transport. For other types of offshore operations, other precursors of incidents may need to be monitored.

**~~Table 1 — Examples of FDM event definitions~~**

‘Table 1 — Examples of FDM event definitions’ is replaced by ‘Table 1 — Examples of potential precursors of incidents that could be monitored through an FDM programme’:

**Table 1 — Examples of potential precursors of incidents that could be monitored through an FDM programme**

Ref.	Title	Description	Relevant key risk area as described in the Annex to Commission Delegated Regulation (EU) 2020/2034	Occurrence types as defined in Annex I to Commission Implementing Regulation (EU) 2015/1018 that are directly related to the precursor
<b>Before take-off and after landing (onshore and offshore)</b>				
GND-01	Ground taxi, high power	Detect when excessive power is used during ground taxiing	Excursion	1.3(1) Taxiway or runway excursion
GND-02	Ground taxi, high speed	Detect when the helicopter is ground taxiing at high speed	Excursion	1.3(1) Taxiway or runway excursion
GND-03	Ground taxi, excessive inputs on the pedals	Detect when the pedals are used to excess on the ground (excludes control check prior to rotor start)	Excursion	1.3(1) Taxiway or runway excursion
GND-04	Ground taxi, high lateral acceleration	Detect high levels of lateral acceleration when ground taxiing, indicating high cornering speed	Excursion	1.3(1) Taxiway or runway excursion
GND-05	Ground taxi, high longitudinal acceleration	Detect high levels of longitudinal acceleration when ground taxiing, indicating excessive braking	Excursion	1.3(1) Taxiway or runway excursion
GND-06	Ground taxi, excessive cyclic position	Detect excessive movement of the rotor disc when running on the ground (excludes control check prior to rotor start)	Excursion	1.4(6) Exceedance of aircraft flight manual limitation
GND-07	Ground taxi, excessive rate of cyclic	Detect an excessive rate of movement of cyclic control when running on the ground (excludes control check prior to rotor start)	Excursion	1.4(6) Exceedance of aircraft flight manual limitation

Ref.	Title	Description	Relevant key risk area as described in the Annex to Commission Delegated Regulation (EU) 2020/2034	Occurrence types as defined in Annex I to Commission Implementing Regulation (EU) 2015/1018 that are directly related to the precursor
GND-08	Ground taxi, excessive roll	Detect the risk of a helicopter rollover when ground taxiing	Excursion	1.4(6) Exceedance of aircraft flight manual limitation
GND-09	Ground taxi, high yaw rate	Detect when the helicopter yaws at a high rate during ground taxiing (could also catch 'tight' turns causing tyre scrubbing)	Excursion	1.4(6) Exceedance of aircraft flight manual limitation
GND-10	Hover, high yaw rate	Detect when the helicopter yaws at a high rate when in a hover	Aircraft upset	1.4(2) Aircraft upset, exceeding normal pitch attitude, bank angle or airspeed inappropriate for the conditions
GND-11	Air taxi, high speed	Detect when the helicopter is air taxiing at high speed	Excursion	1.4(2) Aircraft upset, exceeding normal pitch attitude, bank angle or airspeed inappropriate for the conditions
GND-12	Pitch attitude limits	Detect when the helicopter is operated at the sloping ground limits or the moving helideck limits	Aircraft upset	1.4(6) Exceedance of aircraft flight manual limitation
GND-13	Roll attitude limits	Detect when the helicopter is operated at the sloping ground limits or the moving helideck limits	Aircraft upset	1.4(6) Exceedance of aircraft flight manual limitation

Ref.	Title	Description	Relevant key risk area as described in the Annex to Commission Delegated Regulation (EU) 2020/2034	Occurrence types as defined in Annex I to Commission Implementing Regulation (EU) 2015/1018 that are directly related to the precursor
GND-14	Rotor brake applied early	Detect when the rotor brake is applied at excessive main rotor rotation speed	Ground damage	1.4(6) Exceedance of aircraft flight manual limitation
<b>Flight — take-off and landing</b>				
TOL-01	Gear extension and retraction — airspeed	Detect when the landing gear is extended at excessive airspeed or retracted early (based on airspeed)	Other injuries	1.3(6) Actual or attempted take-off, approach or landing with incorrect configuration setting
TOL-02	Gear extension — distance	Detect when the landing gear is extended late (based on distance)	Other injuries	1.3(6) Actual or attempted take-off, approach or landing with incorrect configuration setting
TOL-03	Gear extension and retraction — height	Detect when the landing gear is extended late, or retracted early (based on height)	Other injuries	1.3(6) Actual or attempted take-off, approach or landing with incorrect configuration setting
TOL-04	Cabin heater on (take-off and landing)	Detect use of engine bleed air during periods of high-power demand	Aircraft upset, terrain collision	1.3(6) Actual or attempted take-off, approach or landing with incorrect configuration setting

Ref.	Title	Description	Relevant key risk area as described in the Annex to Commission Delegated Regulation (EU) 2020/2034	Occurrence types as defined in Annex I to Commission Implementing Regulation (EU) 2015/1018 that are directly related to the precursor
				5(1) A collision or a near collision on the ground or in the air, with another aircraft, terrain or obstacle
TOL-05	Heavy landing	Detect when hard/heavy landings take place	Excursion	1.3(12) Hard landing
TOL-06	Offshore landing with tailwind landing	Detect an offshore landing with a tailwind out of limits	Aircraft upset	1.3(8) Approach continued against air operator stabilised approach criteria
TOL-07	High ground speed prior to touchdown	Detect 'quick stop' approaches	Aircraft upset	1.4(2) Aircraft upset, exceeding normal pitch attitude, bank angle or airspeed inappropriate for the conditions
TOL-08	Rig take-off, rotation height outside take-off decision point limits	Detect a rotation height too low (risk of deck strike in the event of an engine failure) or too high (risk of heavy landing in the event of an engine failure) based on rotorcraft flight manual requirements for radio altimeter and SOPs	Collision on runway Excursion Obstacle collision in flight	1.4(6) Exceedance of aircraft flight manual limitation 1.4(2) Aircraft upset, exceeding normal pitch attitude, bank angle or airspeed inappropriate for the conditions

Ref.	Title	Description	Relevant key risk area as described in the Annex to Commission Delegated Regulation (EU) 2020/2034	Occurrence types as defined in Annex I to Commission Implementing Regulation (EU) 2015/1018 that are directly related to the precursor
				5(1) A collision or a near collision on the ground or in the air, with another aircraft, terrain or obstacle
TOL-09	Rig take-off, pitch attitude outside limits	Detect a pitch attitude too low (risk of deck strike in the event of an engine failure) or too high during offshore take-off	Collision on runway Obstacle collision in flight	1.4(6) Exceedance of aircraft flight manual limitation 1.4(2) Aircraft upset, exceeding normal pitch attitude, bank angle or airspeed inappropriate for the conditions 5(1) A collision or a near collision on the ground or in the air, with another aircraft, terrain or obstacle
TOL-10	Rig take-off, pitch rate outside limits	Detect a pitch rate too low (risk of deck strike in the event of an engine failure) or too high during offshore take-off	Collision on runway Obstacle collision in flight	1.4(6) Exceedance of aircraft flight manual limitation 1.4(2) Aircraft upset, exceeding normal pitch attitude, bank angle or

Ref.	Title	Description	Relevant key risk area as described in the Annex to Commission Delegated Regulation (EU) 2020/2034	Occurrence types as defined in Annex I to Commission Implementing Regulation (EU) 2015/1018 that are directly related to the precursor
				<p>airspeed inappropriate for the conditions</p> <p>5(1) A collision or a near collision on the ground or in the air, with another aircraft, terrain or obstacle</p>
<b>Flight — speed</b>				
SPD-01	High airspeed with power	Detect limitation exceedance (maximum normal operating speed (VNO) / never exceed speed (VNE))	Aircraft upset	1.4(6) Exceedance of aircraft flight manual limitation
SPD-02	High airspeed without power	Identify limitation exceedance of power-off airspeed	Aircraft upset	1.4(6) Exceedance of aircraft flight manual limitation
SPD-03	High airspeed at low altitude	Detect excessive airspeed in low-level flight; also for bird strike prevention	Aircraft upset Terrain collision	<p>1.4(2) Aircraft upset, exceeding normal pitch attitude, bank angle or airspeed inappropriate for the conditions</p> <p>5(1) A collision or a near collision on the ground or in</p>

Ref.	Title	Description	Relevant key risk area as described in the Annex to Commission Delegated Regulation (EU) 2020/2034	Occurrence types as defined in Annex I to Commission Implementing Regulation (EU) 2015/1018 that are directly related to the precursor
				the air, with another aircraft, terrain or obstacle
SPD-04	Low airspeed	Identify low airspeed in flight apart from take-off and landing	Aircraft upset	1.4(2) Aircraft upset, exceeding normal pitch attitude, bank angle or airspeed inappropriate for the conditions
SPD-05	Low airspeed on departure	Detect low airspeed during departure climb	Aircraft upset	1.4(2) Aircraft upset, exceeding normal pitch attitude, bank angle or airspeed inappropriate for the conditions
<b>Flight — height</b>				
HGT-01	High altitude	Detect flight outside the published flight envelope	Aircraft upset	1.4(6) Exceedance of aircraft flight manual limitation
HGT-02	High rate of climb	Detect excessive rate of climb	Aircraft upset	1.4(2) Aircraft upset, exceeding normal pitch attitude, bank angle or airspeed inappropriate for the conditions

Ref.	Title	Description	Relevant key risk area as described in the Annex to Commission Delegated Regulation (EU) 2020/2034	Occurrence types as defined in Annex I to Commission Implementing Regulation (EU) 2015/1018 that are directly related to the precursor
HGT-03	High rate of descent	Detect excessive rate of descent	Aircraft upset Terrain collision	1.4(2) Aircraft upset, exceeding normal pitch attitude, bank angle or airspeed inappropriate for the conditions
HGT-04	High rate of descent at low speed	Detect high rate of descent at low speed	Aircraft upset Terrain collision	1.4(2) Aircraft upset, exceeding normal pitch attitude, bank angle or airspeed inappropriate for the conditions
HGT-05	Minimum altitude in autorotation	Detect a minimum altitude exceedance when practising autorotation at height	Terrain collision	5(1) A collision or a near collision on the ground or in the air, with another aircraft, terrain or obstacle
<b>Flight — attitude and controls</b>				
AAC-01	Excessive pitch attitude	Detect excessive pitch attitude during flight (can be height and/or speed limited)	Aircraft upset	1.4(2) Aircraft upset, exceeding normal pitch attitude, bank angle or airspeed inappropriate for the conditions
AAC-02	Excessive pitch rate	Detect excessive pitch rate in flight (can be height or speed limited)	Aircraft upset	1.4(2) Aircraft upset, exceeding normal pitch

Ref.	Title	Description	Relevant key risk area as described in the Annex to Commission Delegated Regulation (EU) 2020/2034	Occurrence types as defined in Annex I to Commission Implementing Regulation (EU) 2015/1018 that are directly related to the precursor
				attitude, bank angle or airspeed inappropriate for the conditions
AAC-03	Excessive roll attitude	Detect excessive roll attitude in flight (can be height or speed limited)	Aircraft upset	1.4(2) Aircraft upset, exceeding normal pitch attitude, bank angle or airspeed inappropriate for the conditions
AAC-04	Excessive roll rate	Detect excessive roll rate in flight (can be height or speed limited)	Aircraft upset	1.4(2) Aircraft upset, exceeding normal pitch attitude, bank angle or airspeed inappropriate for the conditions
AAC-05	Excessive yaw rate	Detect excessive yaw rates in flight (can be height, speed or torque limited)	Aircraft upset	1.4(2) Aircraft upset, exceeding normal pitch attitude, bank angle or airspeed inappropriate for the conditions
AAC-06	Excessive cyclic input	Detect excessive cyclic control input in flight (lateral and longitudinal)	Aircraft upset	1.4(2) Aircraft upset, exceeding normal pitch attitude, bank angle or

Ref.	Title	Description	Relevant key risk area as described in the Annex to Commission Delegated Regulation (EU) 2020/2034	Occurrence types as defined in Annex I to Commission Implementing Regulation (EU) 2015/1018 that are directly related to the precursor
				airspeed inappropriate for the conditions
AAC-07	Excessive pedal input	Detect movement of the tail rotor pedals to extreme left and right positions in flight	Aircraft upset	1.4(2) Aircraft upset, exceeding normal pitch attitude, bank angle or airspeed inappropriate for the conditions
AAC-08	Excessive vertical acceleration	Detect excessive G loading of the rotor disc, both positive and negative, due to manoeuvring or turbulence or helideck heave	Aircraft upset	1.4(2) Aircraft upset, exceeding normal pitch attitude, bank angle or airspeed inappropriate for the conditions 1.4(6) Exceedance of aircraft flight manual limitation
<b>Flight — general</b>				
GEN-01	High outside air temperature	Detect when the helicopter is operated at the limits of outside air temperature including in hot gas	Aircraft upset	1.4(6) Exceedance of aircraft flight manual limitation
GEN-02	One engine inoperative	Detect when one engine is inoperative in flight	Aircraft upset	2.1(3) Loss of redundancy of a system

Ref.	Title	Description	Relevant key risk area as described in the Annex to Commission Delegated Regulation (EU) 2020/2034	Occurrence types as defined in Annex I to Commission Implementing Regulation (EU) 2015/1018 that are directly related to the precursor
GEN-03	Torque limits exceeded	Detect rotorcraft flight manual torque exceedances including five-minute take-off, maximum take-off, maximum continuous, etc., as appropriate	Aircraft upset	1.4(6) Exceedance of aircraft flight manual limitation
GEN-04	Torque split	Detect a torque differential and hence possible engine-related issues	Aircraft upset	2.2 Propulsion (including engines, propellers and rotor systems) and auxiliary power units (APUs)
GEN-05	Rotor speed outside limits — power	Detect when main rotor speed is above or below limits in flight	Aircraft upset	1.4(6) Exceedance of aircraft flight manual limitation
GEN-06	High rotor speed — power off	Detect high rotor speed with power off	Aircraft upset	1.4(6) Exceedance of aircraft flight manual limitation
GEN-07	Fuel content low	Detect low-fuel alerts	Aircraft upset	4(8) Critically low fuel quantity or fuel quantity at destination below required final reserve fuel
GEN-08	Helicopter terrain awareness and warning system (HTAWS) / enhanced ground proximity warning	Detect when helicopter terrain awareness and warning system / enhanced ground proximity warning system alerts (including automatic voice alert device) have been activated and which mode	Terrain collision	5(3) Activation of genuine ground collision system such as GPWS (Ground Proximity Warning System)/TAWS (Terrain

Ref.	Title	Description	Relevant key risk area as described in the Annex to Commission Delegated Regulation (EU) 2020/2034	Occurrence types as defined in Annex I to Commission Implementing Regulation (EU) 2015/1018 that are directly related to the precursor
	system (EGPWS) alert triggered			Awareness and Warning System) 'warning'
GEN-09	Traffic collision avoidance system (TCAS) traffic advisory or resolution advisory	Detect traffic collision avoidance system traffic or resolution advisory	Airborne collision	5(2) ACAS RA (Airborne Collision Avoidance System, Resolution Advisory)
<b>Flight — approach and landing</b>				
APP-01	Low airspeed	Detect low airspeed on approach (part of unstable approach)	Aircraft upset	1.3(8) Approach continued against air operator stabilised approach criteria
APP-02	High ground speed change	Detect excessive ground speed fluctuation on approach and landing (part of unstable approach)	Aircraft upset	1.3(8) Approach continued against air operator stabilised approach criteria
APP-03	High ground speed	Detect high ground speed on approach and landing (part of unstable approach)	Aircraft upset	1.3(8) Approach continued against air operator stabilised approach criteria
APP-04	Excessive pitch attitude	Detect high or low pitch on approach and landing (part of unstable approach)	Aircraft upset	1.3(8) Approach continued against air operator stabilised approach criteria

Ref.	Title	Description	Relevant key risk area as described in the Annex to Commission Delegated Regulation (EU) 2020/2034	Occurrence types as defined in Annex I to Commission Implementing Regulation (EU) 2015/1018 that are directly related to the precursor
APP-05	High pitch rate	Detect high pitch rate on approach and landing (part of unstable approach)	Aircraft upset	1.3(8) Approach continued against air operator stabilised approach criteria
APP-06	High roll attitude	Detect excessive roll attitude on approach and landing (part of unstable approach)	Aircraft upset	1.3(8) Approach continued against air operator stabilised approach criteria
APP-07	High roll rate	Detect high roll rate on approach and landing (part of unstable approach)	Aircraft upset	1.3(8) Approach continued against air operator stabilised approach criteria
APP-08	Excessive altitude	Detect high or low altitude on approach relative to deck/runway (part of unstable approach)	Aircraft upset	1.3(8) Approach continued against air operator stabilised approach criteria
APP-09	High rate of descent on approach	Detect high rates of descent on approach (part of unstable approach)	Aircraft upset Obstacle collision in flight	1.3(8) Approach continued against air operator stabilised approach criteria 5(1) A collision or a near collision on the ground or in the air, with another aircraft, terrain or obstacle

Ref.	Title	Description	Relevant key risk area as described in the Annex to Commission Delegated Regulation (EU) 2020/2034	Occurrence types as defined in Annex I to Commission Implementing Regulation (EU) 2015/1018 that are directly related to the precursor
APP-10	High heading difference	Detect excessive difference between current heading and final approach heading (part of unstable approach); alternatively detect an unstable ground track	Aircraft upset Obstacle collision in flight	1.3(8) Approach continued against air operator stabilised approach criteria 5(1) A collision or a near collision on the ground or in the air, with another aircraft, terrain or obstacle
APP-11	Glideslope deviation	Detect excessive glideslope deviation on instrument landing system approaches (part of unstable approach)	Aircraft upset Terrain collision	1.3(8) Approach continued against air operator stabilised approach criteria 5(1) A collision or a near collision on the ground or in the air, with another aircraft, terrain or obstacle
APP-12	Localiser deviation	Detect excessive localiser deviation on instrument landing system approaches (part of unstable approach)	Aircraft upset	1.3(8) Approach continued against air operator stabilised approach criteria
APP-13	Go-around	Detect missed approaches	Excursion Terrain collision Aircraft upset	1.3(1) Taxiway or runway excursion

Ref.	Title	Description	Relevant key risk area as described in the Annex to Commission Delegated Regulation (EU) 2020/2034	Occurrence types as defined in Annex I to Commission Implementing Regulation (EU) 2015/1018 that are directly related to the precursor
				<p>1.3(8) Approach continued against air operator stabilised approach criteria</p> <p>5(1) A collision or a near collision on the ground or in the air, with another aircraft, terrain or obstacle</p>
<b>Flight — automation</b>				
AUT-01	Stability augmentation system (SAS) / autopilot (AP) disengaged	Detect flight without SAS/AP engaged, per channel for multichannel SAS/AP	Aircraft upset	1.4(2) Aircraft upset, exceeding normal pitch attitude, bank angle or airspeed inappropriate for the conditions
AUT-02	SAS/AP disengaged on take-off	Detect inadvertent lift-off without SAS/AP engaged	Aircraft upset	1.3(6) Actual or attempted take-off, approach or landing with incorrect configuration setting
AUT-03	Higher modes engaged out of limits	Detect engagement of upper modes outside prescribed flight manual limits	Aircraft upset	1.4(6) Exceedance of aircraft flight manual limitation