Appendix 3 to Opinion No 02/2019

Draft Annex X to draft Decision 201X/XXX/R

Acceptable Means of Compliance (AMC) and Guidance Material (GM) to Commission Regulation (EU) No 965/2012

related to RMT.0271 (MDM.073(a)) & RMT.0272 (MDM.073(b))

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

1. deleted text is ~~struck through~~;
2. new or amended text is highlighted in blue;
3. an ellipsis (…) indicates that the rest of the text is unchanged.

ANNEX I

Definitions for terms used in Annexes II to VIII

GM16 Annex I Definitions

FLIGHT RECORDER

A flight recorder may be crash-protected or lightweight. Crash-protected flight recorders are capable of withstanding very severe crash conditions such as those encountered during some accidents of large aeroplanes and large helicopters. Crash protected flight recorders comprise one or more of the following systems: a flight data recorder (FDR), a cockpit voice recorder (CVR), an airborne image recorder (AIR), or a data link recorder (DLR). Lightweight flight recorders are usually designed to meet less demanding crash-protection requirements, which allows them to be lighter.

ANNEX III

ORGANISATION REQUIREMENTS FOR AIR OPERATIONS [PART-ORO]

SUBPART AOC

AIR OPERATOR CERTIFICATION

AMC1 ORO.AOC.130 Flight data monitoring — aeroplanes

(...)

(l) Airborne systems and equipment used to obtain FDM data should range from an already installed full quick access recorder (QAR), in a modern aircraft with digital systems, to a basic crash-protected flight recorder in an older or less sophisticated aircraft.

(...)

AMC3 ORO.MLR.100 Operations manual — general

CONTENTS — CAT OPERATIONS

(...)

11 HANDLING, NOTIFYING AND REPORTING ACCIDENTS, INCIDENTS AND OCCURRENCES AND USING THE CVR RECORDING

(...)

(g) Procedures for the preservation of recordings of the flight recorders following an accident or a serious incident or when so directed by the investigating authority. These procedures should include:

(1) a full quotation of point (a) of CAT.GEN.MPA.195~~(a)~~; and

(2) instructions and means to prevent inadvertent reactivation, repair or reinstallation of the flight recorders by personnel of the operator or of third parties, and to ensure that flight recorder recordings are preserved for the needs of the investigating authority.

ANNEX IV

COMMERCIAL AIR TRANSPORT OPERATIONS [PART-CAT]

SUBPART A

GENERAL REQUIREMENTS

SECTION 1

Motor-powered aircraft

AMC1 CAT.GEN.MPA.195(b) Handling of flight recorder recordings: preservation, production, protection and use

INSPECTIONS AND CHECKS OF RECORDINGS

~~Whenever a flight recorder is required to be carried:~~

(…)

(c) The operator should perform, at time intervals not exceeding 2 years, an inspection of the recording of flight recorders other than an FDR, which are carried on an aircraft in order to ensure compliance with CAT.IDE.A.191 or CAT.IDE.H.191;

(d~~c~~) when installed, the aural or visual means for preflight checking of the flight recorders for proper operation should be used ~~every day~~ on each day when the aircraft is operated. When no such means is available for a flight recorder, the operator should perform an operational check of this flight recorder at ~~time~~ intervals not exceeding 150 flight hours or seven calendar days of operation, whichever is considered more suitable by the operator.

(e~~d~~) (...)

GM1 CAT.GEN.MPA.195(b) Handling of flight recorder recordings: preservation, production, protection and use

INSPECTION OF THE FLIGHT RECORDERS' RECORDINGS

(a) The inspection of recorded flight data ~~the FDR recording~~ usually consists of the following:

(1) Making a copy of the complete recording file.

(2) Converting the recording to parameters expressed in engineering units in accordance with the documentation required to be held.

(3) Examining a whole flight in engineering units to evaluate the validity of all mandatory parameters — this could reveal defects or noise in the measuring and processing chains and indicate necessary maintenance actions. The following should be considered:

(i) when applicable, each parameter should be expressed in engineering units and checked for different values of its operational range — for this purpose, some parameters may need to be inspected at different flight phases; and

(ii) (only applicable to an FDR) if the parameter is delivered by a digital data bus and the same data are utilised for the operation of the aircraft, then a reasonableness check may be sufficient; otherwise a correlation check may need to be performed:

(A) a reasonableness check is understood in this context as a subjective, qualitative evaluation, requiring technical judgement, of the recordings from a complete flight; and

(B) a correlation check is understood in this context as the process of comparing data recorded by the flight data recorder against the corresponding data derived from flight instruments, indicators or the expected values obtained during specified portion(s) of a flight profile or during ground checks that are conducted for that purpose.

(4) Retaining the most recent copy of the complete recording file and the corresponding recording inspection report that includes references to the documentation required to be held.

(b) When performing the CVR recording inspection, precautions need to be taken to comply with CAT.GEN.MPA.195(f)(1a). The inspection of the CVR recording usually consists of:

(1) checking that the CVR operates correctly for the nominal duration of the recording;

(2) examining~~, where practicable,~~ a sample of in-flight recording of the CVR for evidence that the signal is acceptable on each channel; and

(3) preparing and retaining an inspection report.

(c) (…)

(d) When inspecting images recorded by a flight recorder, precautions need to be taken to comply with CAT.GEN.MPA.195(f)(3a). The inspection of such images usually consists of the following:

(1) checking that the flight recorder operates correctly for the nominal duration of the recording;

(2) examining a sample of images recorded in different flight phases for evidence that the images of each camera are of a quality sufficient for reading the instruments' indications; and

(3) preparing and retaining an inspection report.

AMC1 CAT.GEN.MPA.195(f)(1) Handling of flight recorder recordings: preservation, production, protection and use

USE OF AUDIO ~~CVR~~ RECORDINGS FOR MAINTAINING OR IMPROVING SAFETY

(a) The procedure related to the handling of audio recordings from flight recorders ~~cockpit voice recorder (CVR) recordings~~ should be ~~written in a document which should be~~ documented and signed by all parties (~~airline management~~ aircraft operator, crew member representatives nominated either by the union or the crew themselves, maintenance personnel representatives if applicable). This procedure should take into account Regulation (EU) 2016/679[1] and as a minimum, define:

(1) the method to obtain the consent of all crew members and maintenance personnel concerned;

(2) an access and security policy that restricts access to audio recordings from flight recorders and identified transcripts thereof ~~CVR recordings and identified CVR transcripts~~ to specifically authorised persons identified by their position;

(3) a retention policy and accountability, including the measures to be taken to ensure the security of audio recordings from flight recorders and transcripts thereof ~~the CVR recordings and CVR transcripts~~ and their protection from misuse. The retention policy should specify the period of time after which such audio ~~CVR~~ recordings and identified ~~CVR~~ transcripts are destroyed;

(4) a description of the uses made of audio recordings from flight recorders and transcripts thereof ~~the CVR recordings and of their transcripts~~;

(5) the participation of flight crew member representatives in the assessment of audio recordings from flight recorders and transcripts thereof ~~the CVR recordings or their transcripts~~;

(6) 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; and

(7) the conditions under which actions other than advisory briefing or remedial training may be taken for reasons of gross negligence or significant continuing safety concern.

(b) Each time an audio recording file from flight recorders ~~a CVR recording file~~ is read out under the conditions defined by CAT.GEN.MPA.195(f)(1):

(1) parts of the CVR recording file that contain information with a privacy content should be deleted to the extent possible, and it should not be permitted that the detail of information with a privacy content is transcribed; and

(2) the operator should retain, and when requested, provide to the competent authority:

(i) information on the use made (or the intended use) of the ~~CVR~~ recording; and

(ii) evidence that the persons concerned consented to the use made (or the intended use) of the ~~CVR~~ recording file.

[1] Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation) (OJ L 119, 4.5.2016, p. 1).

(c) The safety manager or the person identified by the operator to fulfil this role should be responsible for the protection and use of audio recordings from flight recorders and transcripts thereof ~~the CVR recordings and of their transcripts, as well as the assessment of issues and their transmission to the manager(s) responsible for the process concerned~~.

(d) In case a third party is involved in the use of audio recordings from flight recorders ~~CVR recordings~~, contractual agreements with this third party should, when applicable, cover the aspects enumerated in (a) and (b).

~~**GM1 CAT.GEN.MPA.195(f)(1) Handling of flight recorder recordings: preservation, production, protection and use**~~

~~USE OF CVR RECORDINGS FOR MAINTAINING OR IMPROVING SAFETY~~

~~(a) The CVR is primarily a tool for the investigation of accidents and serious incidents by investigating authorities. Misuse of CVR recordings is a breach of the right to privacy and it works against an effective safety culture inside the operator.~~

~~(b) It is noteworthy that the flight data recorder (FDR) may be used for a flight data monitoring (FDM) programme; however, in that case the principles of confidentiality and access restriction of the FDM programme apply to the FDR recordings. Because the CVR is recording the voices of the crew and verbal communications with a privacy content, the CVR recordings must be protected and handled with even more care than FDM data.~~

~~(c) Therefore, the use of a CVR recording, when for purposes other than CVR serviceability or those laid down by Regulation (EU) No 996/2010, should be subject to the free prior consent of the persons concerned, and framed by a procedure that is endorsed by all parties and that protects the privacy of crew members and (if applicable) maintenance staff.~~

AMC1 CAT.GEN.MPA.195(f)(1a) Handling of flight recorder recordings: preservation, production, protection and use

~~CVR RECORDING~~ INSPECTION OF AUDIO RECORDING FOR ENSURING SERVICEABILITY

(a) When an inspection of the audio recording from a flight recorder ~~the CVR recording~~ is performed for ensuring audio quality and intelligibility of recorded communications:

(1) the privacy of the audio ~~CVR~~ recording should be ensured (e.g. by locating the CVR replay equipment in a separated area and/or using headsets);

(2) access to the ~~CVR~~ replay equipment should be restricted to specifically authorised persons;

(3) provision should be made for the secure storage of the ~~CVR~~ recording medium, the audio ~~CVR~~ recording files and copies thereof;

(4) the audio ~~CVR~~ recording files and copies thereof should be destroyed not earlier than two months and not later than one year after completion of the ~~CVR~~ recording inspection, except that audio samples with no privacy content may be retained for enhancing the ~~CVR~~ recording inspection (e.g. for comparing audio quality);

(5) only the accountable manager of the operator, and when identified to comply with ORO.GEN.200, the safety manager should be entitled to request a copy of the audio ~~CVR~~ recording files.

(b) The conditions enumerated in (a) should also be complied with if the inspection of the audio ~~CVR~~ recording is subcontracted to a third party. The contractual agreements with the third party should explicitly cover these aspects.

AMC1 CAT.GEN.MPA.195(f)(3) Handling of flight recorder recordings: preservation, production, protection and use

USE OF IMAGE RECORDINGS FOR MAINTAINING OR IMPROVING SAFETY

(a) The procedure laid down in point (f)(3)(i) of CAT.GEN.MPA.195 should be documented and signed by all parties involved (aircraft operator, crew member representatives nominated either by the union or the crew themselves, maintenance personnel representatives if applicable). This procedure should take into account Regulation (EU) 2016/679 and, as a minimum, define the following aspects:

(1) the method to obtain the consent of all crew members and maintenance personnel concerned;

(2) an access and security policy that restricts access to the image recordings to authorised persons identified by their position;

(3) a retention policy and accountability, including the measures to ensure the security of the image recordings and their protection from misuse;

(4) a description of the uses made of the image recordings;

(5) the participation of flight crew member representatives in the assessment of the image recordings;

(6) 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; and

(7) the conditions under which actions other than advisory briefing or remedial training may be taken for reasons of gross negligence or significant continuing safety concern.

(b) Each time a recording file containing images of the flight crew compartment is read out for purposes other than ensuring the serviceability of the flight recorder, the operator should retain, and when requested, provide the competent authority with:

(1) information on the use made (or the intended use) of the recording files; and

(2) evidence that the crew members concerned consented to the use made (or the intended use) of the flight crew compartment images.

(c) The safety manager or the person identified by the operator to fulfil this role should be responsible for the protection and use of the recordings of flight crew compartment images, as well as the assessment of issues and their transmission to the manager(s) responsible for the process concerned.

(d) In case a third party is involved in the use of recordings of flight crew compartment images, contractual agreements with this third party should, when applicable, cover the aspects enumerated in (a) and (b).

AMC1 CAT.GEN.MPA.195(f)(3a) Handling of flight recorder recordings: preservation, production, protection and use

IMAGE RECORDING INSPECTION FOR ENSURING SERVICEABILITY

(a) When images of the flight crew compartment recorded by a flight recorder are inspected for ensuring the serviceability of the flight recorder, and any body part of a crew member is likely to be visible on these images, then:

(1) the privacy of the image recordings should be ensured (e.g. by locating the replay equipment in a separated area);

(2) access to the replay equipment should be restricted to authorised persons;

(3) provisions should be made for the secure storage of the image recording medium, the image recording files and copies thereof;

(4) the image recording files and copies thereof should be destroyed not earlier than 2 months and not later than 1 year after completion of the image recording inspection; images that do not contain any body part of a person may be retained for enhancing the image recording inspection (e.g. for comparing image quality); and

(5) only the accountable manager of the operator and, when identified to comply with ORO.GEN.200, the safety manager should be entitled to request a copy of the image recording files.

(b) The conditions enumerated in (a) should also be complied with if the inspection of the image recording is subcontracted to a third party. The contractual agreements with the third party should explicitly cover these aspects.

GM1 CAT.GEN.MPA.195(f) Handling of flight recorder recordings: preservation, production, protection and use

FLIGHT CREW COMPARTMENT

If there are no compartments to physically segregate the flight crew from the passengers during the flight, the 'flight crew compartment' in point (f) of CAT.GEN.MPA.195 should be understood as the area including:

(a) the flight crew seats;

(b) aircraft and engine controls;

(c) aircraft instruments;

(d) windshield and windows used by the flight crew to get an external view while seated at their duty station; and

(e) circuit breakers accessible by the flight crew while seated at their duty station.

SUBPART D

INSTRUMENTS, DATA, EQUIPMENT

SECTION 1

Aeroplanes

AMC1 CAT.IDE.A.191 Lightweight flight recorder

OPERATIONAL PERFORMANCE REQUIREMENTS

(a) The flight recorder may record images or flight data, or a combination thereof.

(b) If the flight recorder records flight data, it should record at least the following parameters:

(1) pitch attitude or pitch rate,

(2) roll attitude or roll rate,

(3) heading (magnetic or true) or yaw rate,

(4) latitude,

(5) longitude,

(6) positioning system: estimated error (if available),

(7) pressure altitude or altitude from a positioning system,

(8) time,

(10) ground speed,

(11) positioning system: track (if available),

(12) normal acceleration,

(13) longitudinal acceleration, and

(14) lateral acceleration.

(c) If the flight recorder records images, it should capture views of the main instrument displays at the pilot station, or at both pilot stations when the aeroplane is certified for operation with a minimum crew of two pilots. The recorded image quality should allow reading the following indications during most of the flight:

(1) magnetic heading,

(2) time,

(3) pressure altitude,

(4) indicated airspeed,

(5) vertical speed,

(6) turn and slip,

(7) attitude,

(8) Mach number (if displayed), and

(9) stabilised heading, and

(10) tachometer indication or equivalent indication of propulsive thrust or power.

(d) If the flight recorder records flight data and images, each flight parameter listed in (b) should be recorded as flight data or by means of images.

(e) The flight parameters listed in (b), which are recorded as flight data, should meet the performance specifications (range, sampling intervals, accuracy limits and resolution in read-out) as defined in the relevant table of EUROCAE Document 112 (Minimum Operational Performance Specification for Crash Protected Airborne Recorder Systems) dated March 2003, or EUROCAE Document ED-155 (Minimum Operational Performance Specification for Lightweight Flight Recording Systems) dated July 2009, or any later equivalent standard accepted by EASA.

(f) The operational performance requirements for the flight recorder should be those laid down in:

(1) EUROCAE Document ED-155 or any later equivalent standard accepted by EASA for lightweight flight recorders; or

(2) EUROCAE Document 112 or any later equivalent standard accepted by EASA for crash-protected flight recorders.

GM1 CAT.IDE.A.191 Lightweight flight recorder

ADDITIONAL USEFUL INFORMATION

(a) Experience has shown the usefulness, for analysing incidents and for training purposes, of recording additional information. In particular, audio of the flight crew compartment, additional instrument indications (such as position of flight controls, position of engine controls, fuel and oil indications, aircraft configuration selection), and an external view are very useful for such purposes. To capture such information, simple equipment such as an integrated microphone and integrated camera can be sufficient.

(b) If the flight recorder includes optional capabilities such as described in (a), their recording duration is recommended to be at least 2 hours for maximum usefulness.

(c) If the flight recorder is capable of acquiring flight parameters from some aircraft system, it is advised to give priority to the flight parameters listed in Annex II-B of ED-155 or the flight parameters listed in Annex II-A of ED-112. Indeed, these flight parameters were selected based on their relevance in many safety investigations.

GM2 CAT.IDE.A.191 Lightweight flight recorder

INSTALLATION OF CAMERAS

It is advised, when practicable, to install any camera so that it does not capture images of head and shoulders of the flight crew members whilst seated in their normal operating position, in order to avoid identification of persons.

GM3 CAT.IDE.A.191 Lightweight flight recorder

RECORDING ACCURACY OF ATTITUDE RATE PARAMETERS

In the case of attitude rate parameters (pitch rate parameter, yaw rate parameter, roll rate parameter), the accuracy limit specified in EUROCAE Document 155 dated July 2009 was found to be unclear. Therefore the following additional guidance is provided:

(a) If the attitude rate parameter is provided by an approved system of the aeroplane, accuracy greater than as provided by this system is not expected for this attitude rate parameter.

(b) If the attitude rate parameter is provided by a dedicated gyroscope, it is advisable that the gyroscope meets the following performance:

(1) errors due to linear accelerations less than ±3°/sec (equivalent to ±1% of 300°/sec recording range) for all combinations of parameter values and linear acceleration values in the respective ranges [-300°/sec; +300°/sec] and [-3g; +6g];

(2) errors due to temperature less than ±5°/sec for all combinations of parameter values and temperature values in the respective ranges [-300°/sec; +300°/sec] and [-40°C; +85°C];

(3) angular random walk of the gyroscope equal to or less than 2°/sqrt(hour); and

(4) bias stability of the gyroscope significantly less than 360°/hour (for instance, 50°/hour).

GM1 CAT.IDE.A.191(e) Lightweight flight recorder

FUNCTION TO MODIFY THE RECORDINGS OF IMAGES AND AUDIO

The purpose of the function modifying the image recordings and audio recordings is to allow the flight crew to protect their privacy by making the recording of images and audio inaccessible using normal techniques. The activation of this function is subject to the commander's approval (refer to CAT.GEN.MPA.105). However, the equipment manufacturer or a safety investigation authority might still be able to retrieve the recorded data using special techniques.

SECTION 2

Helicopters

AMC1 CAT.IDE.H.191 Lightweight flight recorder

OPERATIONAL PERFORMANCE REQUIREMENTS

(a) The flight recorder may record images or flight data, or a combination thereof.

(b) If the flight recorder records flight data, it should record at least the following parameters:

(1) relative time count,

(2) pitch attitude or pitch rate,

(3) roll attitude or roll rate,

(4) heading (magnetic or true) or yaw rate,

(5) latitude,

(6) longitude,

(7) positioning system: estimated error (if available),

(8) pressure altitude or altitude from a positioning system,

(9) time,

(10) ground speed,

(11) positioning system: track (if available),

(12) normal acceleration,

(13) longitudinal acceleration, and

(14) lateral acceleration.

(c) If the flight recorder records images, it should capture views of the main instrument displays at the pilot station, or at both pilot stations when the helicopter is certified for operation with a minimum crew of two pilots. The recorded image quality should allow reading the following indications during most of the flight:

(1) magnetic or true heading,

(2) time (if presented on the front instrument panel),

(3) pressure altitude,

(4) indicated airspeed,

(5) vertical speed,

(6) slip,

(7) outside air temperature,

(8) attitude (if displayed), and

(9) stabilised heading (if displayed), and

(10) main rotor speed.

(d) If the flight recorder records flight data and images, each flight parameter listed in (b) should be recorded as flight data or by means of images.

(e) The flight parameters listed in (b), which are recorded as flight data, should meet the performance specifications (range, sampling intervals, accuracy limits and resolution in read-out) as defined in the relevant table of EUROCAE Document 112 (Minimum Operational Performance Specification for Crash Protected Airborne Recorder Systems) dated March 2003, or EUROCAE Document ED-155 (Minimum Operational Performance Specification for Lightweight Flight Recording Systems) dated July 2009, or any later equivalent standard accepted by EASA.

(f) The operational performance requirements for the flight recorder should be those laid down in:

(1) EUROCAE Document ED-155 or any later equivalent standard accepted by EASA for lightweight flight recorders; or

(2) EUROCAE Document 112 or any later equivalent standard accepted by EASA for crash-protected flight recorders.

GM1 CAT.IDE.H.191 Lightweight flight recorder

ADDITIONAL USEFUL INFORMATION

Refer to GM1 CAT.IDE.A.191.

GM2 CAT.IDE.H.191 Lightweight flight recorder

INSTALLATION OF CAMERAS

Refer to GM2 CAT.IDE.A.191.

GM3 CAT.IDE.H.191 Lightweight flight recorder

RECORDING ACCURACY OF ATTITUDE RATE PARAMETERS

Refer to GM3 CAT.IDE.A.191.

GM1 CAT.IDE.H.191(e) Lightweight flight recorder

FUNCTION TO MODIFY THE RECORDINGS OF IMAGES AND AUDIO

Refer to GM1 CAT.IDE.A.191(e).

ANNEX VI

NON-COMMERCIAL AIR OPERATIONS WITH COMPLEX MOTOR-POWERED AIRCRAFT [PART-NCC]

SUBPART A

GENERAL REQUIREMENTS

AMC1 NCC.GEN.145(b) Handling of flight recorder recordings: preservation, production, protection and use

INSPECTIONS AND CHECKS OF RECORDINGS

~~Whenever a flight recorder is required to be carried:~~
(…)

(c) The operator should perform, at time intervals not exceeding 2 years, an inspection of the recording of flight recorders other than an FDR, which are carried on an aircraft in order to ensure compliance with CAT.IDE.A.191 or CAT.IDE.H.191;

(d~~c~~) when installed, the aural or visual means for preflight checking of the flight recorders for proper operation should be used ~~every day~~ on each day when the aircraft is operated. When no such

means is available for a flight recorder, the operator should perform an operational check of this flight recorder at time intervals not exceeding 150 flight hours or seven calendar days of operation, whichever is considered more suitable by the operator.

(ed) (…)

GM1 NCC.GEN.145(b) Handling of flight recorder recordings: preservation, production, protection and use

INSPECTION OF THE FLIGHT RECORDERS' RECORDING

(a) The inspection of recorded flight data ~~the FDR recording~~ usually consists of the following:

(1) Making a copy of the complete recording file.

(2) Converting the recording to parameters expressed in engineering units in accordance with the documentation required to be held.

(3) Examining a whole flight in engineering units to evaluate the validity of all mandatory parameters – this could reveal defects or noise in the measuring and processing chains and indicate necessary maintenance actions. The following should be considered:

(i) when applicable, each parameter should be expressed in engineering units and checked for different values of its operational range – for this purpose, some parameters may need to be inspected at different flight phases; and

(ii) (only applicable to an FDR) if the parameter is delivered by a digital data bus and the same data are utilised for the operation of the aircraft, then a reasonableness check may be sufficient; otherwise a correlation check may need to be performed:

(A) a reasonableness check is understood in this context as a subjective, qualitative evaluation, requiring technical judgement, of the recordings from a complete flight; and

(B) a correlation check is understood in this context as the process of comparing data recorded by the flight data recorder against the corresponding data derived from flight instruments, indicators or the expected values obtained during specified portion(s) of a flight profile or during ground checks that are conducted for that purpose.

(4) Retaining the most recent copy of the complete recording file and the corresponding recording inspection report that includes references to the documentation required to be held.

(b) When performing the CVR recording inspection, precautions need to be taken to comply with NCC.GEN.145(f)(1a). The inspection of the CVR recording usually consists of:

(1) checking that the CVR operates correctly for the nominal duration of the recording;

(2) examining~~, where practicable,~~ a sample of in-flight recording of the CVR for evidence that the signal is acceptable on each channel; and

(3) preparing and retaining an inspection report.

(c) (…)

(d) When inspecting images recorded by a flight recorder, precautions need to be taken to comply with NCC.GEN.145(f)(3a). The inspection of such images usually consists of the following:

(1) checking that the flight recorder operates correctly for the nominal duration of the recording;

(2) examining a sample of images recorded in different flight phases for evidence that the images of each camera are of a quality sufficient for reading the instruments' indications; and

(3) preparing and retaining an inspection report.

AMC1 NCC.GEN.145(f)(1) Handling of flight recorder recordings: preservation, production, protection and use

USE OF AUDIO ~~CVR~~ RECORDINGS FOR MAINTAINING OR IMPROVING SAFETY

(a) The procedure related to the handling of audio recordings from flight recorders ~~cockpit voice recorder (CVR) recordings~~ should be ~~written in a document which should be signed~~ documented and signed by all parties (aircraft operator, crew members, maintenance personnel if applicable). This procedure should take into account Regulation (EU) 2016/679[2] and, as a minimum, define:

(1) the method to obtain the consent of all crew members and maintenance personnel concerned;

(2) an access and security policy that restricts access to audio recordings from flight recorders and identified transcripts thereof ~~CVR recordings and identified CVR transcripts~~ to specifically authorised persons identified by their position;

(3) a retention policy and accountability, including the measures to be taken to ensure the security of audio recordings from flight recorders and transcripts thereof ~~the CVR recordings and CVR transcripts~~ and their protection from misuse. The retention policy should specify the period of time after which such audio ~~CVR~~ recordings and identified ~~CVR~~ transcripts are destroyed; ~~and~~

(4) a description of the uses made of audio recordings from flight recorders and transcripts thereof ~~the CVR recordings and of their transcripts.~~;

(5) the participation of flight crew member representatives in the assessment of audio recordings from flight recorders and transcripts thereof;

(6) 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; and

(7) the conditions under which actions other than advisory briefing or remedial training may be taken for reasons of gross negligence or significant continuing safety concern.

(b) Each time an audio recording file from flight recorders ~~a CVR recording file~~ is read out under the conditions defined by NCC.GEN.145(f)(1):

(1) parts of the ~~CVR~~ recording file that contain information with a privacy content should be deleted to the extent possible, and it should not be permitted that the detail of information with a privacy content is transcribed; and

[2] Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation) (OJ L 119, 4.5.2016, p. 1).

(2) the operator should retain, and when requested, provide to the competent authority:

(i) information on the use made (or the intended use) of the ~~CVR~~ recording; and

(ii) evidence that the persons concerned consented to the use made (or the intended use) of the ~~CVR~~ recording file.

(c) The person who fulfils the role of a safety manager should be responsible for the protection and use of audio recordings from flight recorders and transcripts thereof ~~the CVR recordings and of their transcripts~~.

(d) In case a third party is involved in the use of audio recordings from flight recorders ~~CVR recordings~~, contractual agreements with this third party should, when applicable, cover the aspects enumerated in (a) and (b).

~~**GM1 NCC.GEN.145(f)(1) Handling of flight recorder recordings: preservation, production, protection and use**~~

~~USE OF CVR RECORDINGS FOR MAINTAINING OR IMPROVING SAFETY~~

~~(a) The CVR is primarily a tool for the investigation of accidents and serious incidents by investigating authorities. Misuse of CVR recordings is a breach of the right to privacy and it works against an effective safety culture inside the operator.~~

~~(b) Therefore, the use of a CVR recording, when for purposes other than CVR serviceability or those laid down by Regulation (EU) No 996/2010, should be subject to the free prior consent of the persons concerned, and framed by a procedure that is endorsed by all parties and that protects the privacy of crew members and (if applicable) maintenance staff.~~

AMC1 NCC.GEN.145(f)(1a) Handling of flight recorder recordings: preservation, production, protection and use

~~CVR RECORDING~~ INSPECTION OF AUDIO RECORDING FOR ENSURING SERVICEABILITY

(a) When an inspection of the audio recording from a flight recorder ~~the CVR recording~~ is performed for ensuring audio quality and intelligibility of recorded communications:

(1) the privacy of the audio ~~CVR~~ recording should be ensured (e.g. by locating the CVR replay equipment in a separated area and/or using headsets);

(2) access to the ~~CVR~~ replay equipment should be restricted to specifically authorised persons;

(3) provision should be made for the secure storage of the ~~CVR~~ recording medium, the audio ~~CVR~~ recording files and copies thereof;

(4) the audio ~~CVR~~ recording files and copies thereof should be destroyed not earlier than two months and not later than one year after completion of the ~~CVR~~ recording inspection, except that audio samples with no privacy content may be retained for enhancing the ~~CVR~~ recording inspection (e.g. for comparing audio quality);

(5) only the accountable manager of the operator, and when identified to comply with ORO.GEN.200, the person fulfilling the role ofsafety manager should be entitled to request a copy of the audio ~~CVR~~ recording files.

(b) The conditions enumerated in (a) should also be complied with if the inspection of the audio ~~CVR~~ recording is subcontracted to a third party. The contractual agreements with the third party should explicitly cover these aspects.

AMC1 NCC.GEN.145(f)(3) Handling of flight recorder recordings: preservation, production, protection and use

USE OF IMAGE RECORDINGS FOR MAINTAINING OR IMPROVING SAFETY

(a) The procedure laid down in point (f)(3)(i) of NCC.GEN.145 should be documented and signed by all parties involved (aircraft operator, crew member representatives nominated either by the union or the crew themselves, maintenance personnel representatives if applicable). This procedure should take into account Regulation (EU) 2016/679 and, as a minimum, define the following aspects:

(1) the method to obtain the consent of all crew members and maintenance personnel concerned;

(2) an access and security policy that restricts access to the image recordings to authorised persons identified by their position;

(3) a retention policy and accountability, including the measures to ensure the security of the image recordings and their protection from misuse;

(4) a description of the uses made of the image recordings;

(5) the participation of flight crew member representatives in the assessment of the image recordings;

(6) 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; and

(7) the conditions under which actions other than advisory briefing or remedial training may be taken for reasons of gross negligence or significant continuing safety concern.

(b) Each time a recording file containing images of the flight crew compartment is read out for purposes other than ensuring the serviceability of the flight recorder, the operator should retain, and when requested, provide the competent authority with:

(1) information on the use made (or the intended use) of the recording file; and

(2) evidence that the crew members concerned consented to the use made (or the intended use) of the flight crew compartment images.

(c) The safety manager or the person identified by the operator to fulfil this role should be responsible for the protection and use of the recordings of flight crew compartment images, as well as the assessment of issues and their transmission to the manager(s) responsible for the process concerned.

(d) In case a third party is involved in the use of recordings of flight crew compartment images, contractual agreements with this third party should, when applicable, cover the aspects enumerated in (a) and (b).

AMC1 NCC.GEN.145(f)(3a) Handling of flight recorder recordings: preservation, production, protection and use

IMAGE RECORDING INSPECTION FOR ENSURING SERVICEABILITY

(a) When images of the flight crew compartment recorded by a flight recorder are inspected for ensuring the serviceability of the flight recorder, and any body part of a crew member is likely to be visible on these images, then:

(1) the privacy of the image recordings should be ensured (e.g. by locating the replay equipment in a separated area);

(2) access to the replay equipment should be restricted to authorised persons;

(3) provisions should be made for the secure storage of the image recording medium, the image recording files and copies thereof;

(4) the image recording files and copies thereof should be destroyed not earlier than 2 months and not later than 1 year after completion of the image recording inspection; images that do not contain any body part of a person may be retained for enhancing the image recording inspection (e.g. for comparing image quality); and

(5) only the accountable manager of the operator and, when identified to comply with ORO.GEN.200, the safety manager should be entitled to request a copy of the image recording files.

(b) The conditions enumerated in (a) should also be complied with if the inspection of the image recording is subcontracted to a third party. The contractual agreements with the third party should explicitly cover these aspects.

GM1 NCC.GEN.145(f) Handling of flight recorder recordings: preservation, production, protection and use

FLIGHT CREW COMPARTMENT

If there are no compartments to physically segregate the flight crew from the passengers during the flight, the 'flight crew compartment' in point (f) of NCC.GEN.145 should be understood as the area including:

(a) the flight crew seats;

(b) aircraft and engine controls;

(c) aircraft instruments;

(d) windshield and windows used by the flight crew to get an external view while seated at their duty station; and

(e) circuit breakers accessible by the flight crew while seated at their duty station.

ANNEX VIII

SPECIALISED OPERATIONS [Part-SPO]

SUBPART A

GENERAL REQUIREMENTS

AMC1 SPO.GEN.145(b) Handling of flight recorder recordings: preservation, production, protection and use

INSPECTIONS AND CHECKS OF RECORDINGS

~~Whenever a flight recorder is required to be carried:~~

(...)

(c) The operator should perform at time intervals not exceeding 2 years, an inspection of the recording of flight recorders other than an FDR, which are carried on an aircraft in order to ensure compliance with SPO.IDE.A.146 or SPO.IDE.H.146.

(d~~c~~) When installed, the aural or visual means for preflight checking of the flight recorders for proper operation should be used ~~every day~~ on each day when the aircraft is operated. When no such means is available for a flight recorder, the operator should perform an operational check of this flight recorder at ~~time~~ intervals not exceeding 150 flight hours or seven calendar days of operation, whichever is considered more suitable by the operator.

(e~~d~~) (...)

GM1 SPO.GEN.145(b) Handling of flight recorder recordings: preservation, production, protection and use

INSPECTION OF THE FLIGHT RECORDERS' RECORDINGS

(a) The inspection of the recorded flight data ~~FDR recording~~ usually consists of the following:

(1) Making a copy of the complete recording file.

(2) Converting the recording to parameters expressed in engineering units in accordance with the documentation required to be held.

(3) Examining a whole flight in engineering units to evaluate the validity of all mandatory parameters. This could reveal defects or noise in the measuring and processing chains and indicate necessary maintenance actions. The following should be considered:

(i) when applicable, each parameter should be expressed in engineering units and checked for different values of its operational range. For this purpose, some parameters may need to be inspected at different flight phases; and

(ii) (only applicable to an FDR) if the parameter is delivered by a digital data bus and the same data are utilised for the operation of the aircraft, then a reasonableness check may be sufficient; otherwise a correlation check may need to be performed:

(A) a reasonableness check is understood in this context as a subjective, qualitative evaluation, requiring technical judgement, of the recordings from a complete flight; and

(B) a correlation check is understood in this context as the process of comparing data recorded by the flight data recorder against the corresponding data derived from flight instruments, indicators or the expected values obtained during specified portion(s) of a flight profile or during ground checks that are conducted for that purpose.

(4) Retaining the most recent copy of the complete recording file and the corresponding recording inspection report that includes references to the documentation required to be held.

(b) When performing the CVR recording inspection, precautions need to be taken to comply with SPO.GEN.145(f)(1a). The inspection of the CVR recording usually consists of:

(1) checking that the CVR operates correctly for the nominal duration of the recording;

(2) examining~~, where practicable,~~ a sample of in-flight recording of the CVR for evidence that the signal is acceptable on each channel; and

(3) preparing and retaining an inspection report.

(c) (...)

(d) When inspecting images recorded by a flight recorder, precautions need to be taken to comply with SPO.GEN.145(f)(3a). The inspection of such images usually consists of the following:

(1) checking that the flight recorder operates correctly for the nominal duration of the recording;

(2) examining a sample of images recorded in different flight phases for evidence that the images of each camera are of a quality sufficient for reading the instruments' indications; and

(3) preparing and retaining an inspection report.

AMC1 SPO.GEN.145(f)(1) Handling of flight recorder recordings: preservation, production, protection and use

USE OF AUDIO ~~CVR~~ RECORDINGS FOR MAINTAINING OR IMPROVING SAFETY

(a) The procedure related to the handling of audio recordings from flight recorders ~~cockpit voice recorder (CVR) recordings~~ should be ~~written in a document which should be~~ documented and signed by all parties (aircraft operator, crew members, maintenance personnel if applicable). This procedure should take into account Regulation (EU) 2016/679 and, as a minimum, define:

(1) the method to obtain the consent of all crew members and maintenance personnel concerned;

(2) an access and security policy that restricts access to audio recordings from flight recorders and identified transcripts thereof ~~CVR recordings and identified CVR transcripts~~ to specifically authorised persons identified by their position;

(3) a retention policy and accountability, including the measures to be taken to ensure the security of audio recordings from flight recorders and transcripts thereof ~~the CVR recordings and CVR transcripts~~ and their protection from misuse. The retention policy should specify the period of time after which such audio ~~CVR~~ recordings and identified ~~CVR~~ transcripts are destroyed; ~~and~~

(4) a description of the uses made of audio recordings from flight recorders and transcripts thereof ~~the CVR recordings and of their transcripts.~~;

(5) the participation of flight crew member representatives in the assessment of audio recordings from flight recorders and transcripts thereof;

(6) 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; and

(7) the conditions under which actions other than advisory briefing or remedial training may be taken for reasons of gross negligence or significant continuing safety concern.

(b) Each time an audio recording file from flight recorders ~~a CVR recording file~~ is read out under the conditions defined by SPO.GEN.145(f)(1):

(1) parts of the ~~CVR~~ recording file that contain information with a privacy content should be deleted to the extent possible, and it should not be permitted that the detail of information with a privacy content is transcribed; and

(2) the operator should retain, and when requested, provide to the competent authority:

(i) information on the use made (or the intended use) of the ~~CVR~~ recording; and

(ii) evidence that the persons concerned consented to the use made (or the intended use) of the ~~CVR~~ recording file.

(c) The person who fulfils the role of a safety manager should be responsible for the protection and use of audio recordings from flight recorders and transcripts thereof ~~the CVR recordings and of their transcripts~~.

(d) In case a third party is involved in the use of audio recordings from flight recorders ~~CVR recordings~~, contractual agreements with this third party should, when applicable, cover the aspects enumerated in (a) and (b).

AMC~~12~~ SPO.GEN.145(f)(1a) Handling of flight recorder recordings: preservation, production, protection and use

~~CVR RECORDING~~ INSPECTION OF AUDIO RECORDING FOR ENSURING SERVICEABILITY

(a) When an inspection of the audio recording from a flight recorder ~~the CVR recording~~ is performed for ensuring audio quality and intelligibility of recorded communications:

(1) the privacy of the audio ~~CVR~~ recording should be ensured (e.g. by locating the CVR replay equipment in a separated area and/or using headsets);

(2) access to the ~~CVR~~ replay equipment should be restricted to specifically authorised persons;

(3) provision should be made for the secure storage of the ~~CVR~~ recording medium, the audio ~~CVR~~ recording files and copies thereof;

(4) the audio ~~CVR~~ recording files and copies thereof should be destroyed not earlier than two months and not later than one year after completion of the ~~CVR~~ recording inspection, except that audio samples with no privacy content may be retained for enhancing the ~~CVR~~ recording inspection (e.g. for comparing audio quality);

(5) only the accountable manager of the operator, and when identified to comply with ORO.GEN.200, the person fulfilling the role of safety manager should be entitled to request a copy of the audio ~~CVR~~ recording files.

(b) The conditions enumerated in (a) should also be complied with if the inspection of the audio ~~CVR~~ recording is subcontracted to a third party. The contractual agreements with the third party should explicitly cover these aspects.

~~**GM1 SPO.GEN.145(f) Handling of flight recorder recordings: preservation, production, protection and use**~~

~~USE OF CVR RECORDINGS FOR MAINTAINING OR IMPROVING SAFETY~~

~~(a) The CVR is primarily a tool for the investigation of accidents and serious incidents by investigating authorities. Misuse of CVR recordings is a breach of the right to privacy and it works against an effective safety culture inside the operator.~~

~~(b) Therefore, the use of a CVR recording, when for purposes other than CVR serviceability or those laid down by Regulation (EU) No 996/2010, should be subject to the free prior consent of the persons concerned, and framed by a procedure that is endorsed by all parties and that protects the privacy of crew members and (if applicable) maintenance staff.~~

AMC1 SPO.GEN.145(f)(3) Handling of flight recorder recordings: preservation, production, protection and use

USE OF IMAGE RECORDINGS FOR MAINTAINING OR IMPROVING SAFETY

(a) The procedure indicated in point (f)(3)(i) of SPO.GEN.145 should be documented and signed by all parties (aircraft operator, crew members, maintenance personnel if applicable). This procedure should take into account Regulation (EU) 2016/679 and, as a minimum, define the following aspects:

(1) the method to obtain the consent of all crew members and maintenance personnel concerned;

(2) an access and security policy that restricts access to the image recordings to authorised persons identified by their position;

(3) a retention policy and accountability, including the measures to ensure the security of the image recordings and their protection from misuse;

(4) a description of the uses made of the image recordings.

(b) Each time a recording file containing images of the flight crew compartment is read out for purposes other than to ensure the serviceability of the flight recorder, the operator should retain and, when requested, provide the competent authority with:

(1) information on the use made (or the intended use) of the recording file; and

(2) evidence that the flight crew members concerned consented to the use made (or the intended use) of the flight crew compartment images.

(c) The safety manager or the person identified by the operator to fulfil this role should be responsible for the protection and use of the recordings of flight crew compartment images, as well as the assessment of issues and their transmission to the manager(s) responsible for the process concerned.

(d) In case a third party is involved in the use of recordings of flight crew compartment images, contractual agreements with this third party should, when applicable, cover the aspects enumerated in (a) and (b).

AMC1 SPO.GEN.145(f)(3a) Handling of flight recorder recordings: preservation, production, protection and use

IMAGE RECORDING INSPECTION FOR ENSURING SERVICEABILITY

(a) When images of the flight crew compartment recorded by a flight recorder are inspected for ensuring the serviceability of the flight recorder, and any body part of a crew member is likely to be visible on these images, then:

(1) the privacy of the image recordings should be ensured (e.g. by locating the replay equipment in a separated area);

(2) access to the replay equipment should be restricted to authorised persons;

(3) provisions should be established for the secure storage of the image recording medium, the image recording files and copies thereof;

(4) the image recording files and copies thereof should be destroyed not earlier than 2 months and not later than 1 year after completion of the image recording inspection. Images that do not contain any body part of a person may be retained for enhancing the image recording inspection (e.g. for comparing image quality); and

(5) only the accountable manager of the operator and, when identified to comply with ORO.GEN.200, the safety manager should be entitled to request a copy of the image recording files.

(b) The conditions enumerated in (a) should also be complied with if the inspection of the image recording is subcontracted to a third party. The contractual agreements with the third party should explicitly cover these aspects.

GM1 SPO.GEN.145(f) Handling of flight recorder recordings: preservation, production, protection and use

FLIGHT CREW COMPARTMENT

If there are no compartments to physically segregate the flight crew from the passengers during the flight, the 'flight crew compartment' in point (f) of SPO.GEN.145 should be understood as the area including:

(a) the flight crew seats;

(b) aircraft and engine controls;

(c) aircraft instruments;

(d) windshield and windows used by the flight crew to get an external view while seated at their duty station; and

(e) circuit breakers accessible by the flight crew while seated at their duty station.

SUBPART D

INSTRUMENTS, DATA, EQUIPMENT

SECTION 1

Aeroplanes

AMC1 SPO.IDE.A.146 Lightweight flight recorder

OPERATIONAL PERFORMANCE REQUIREMENTS

(a) The flight recorder may record images or flight data, or a combination thereof.

(b) If the flight recorder records flight data, it should record at least the following parameters:

(1) relative time count,

(2) pitch attitude or pitch rate,

(3) roll attitude or roll rate,

(4) heading (magnetic or true) or yaw rate,

(5) latitude,

(6) longitude,

(7) positioning system: estimated error (if available),

(8) pressure altitude or altitude from a positioning system,

(9) time,

(10) ground speed,

(11) positioning system: track (if available),

(12) normal acceleration,

(13) longitudinal acceleration,

(14) lateral acceleration.

(c) If the flight recorder records images, it should capture views of the main instrument displays at the pilot station, or at both pilot stations when the aeroplane is certified for operation with a minimum crew of two pilots. The recorded image quality should allow reading the following indications during most of the flight:

(1) magnetic heading,

(2) time,

(3) pressure altitude,

(4) indicated airspeed,

(5) vertical speed,

(6) turn and slip,

(7) attitude,

(8) Mach number (if displayed), and

(9) stabilised heading, and

(10) tachometer indication or equivalent indication of propulsive thrust or power.

(d) If the flight recorder records flight data and images, each flight parameter listed in (b) should be recorded as flight data or by means of images.

(e) The flight parameters listed in (b), which are recorded as flight data, should meet the performance specifications (range, sampling intervals, accuracy limits and resolution in read-out) as defined in the relevant table of EUROCAE Document 112 (Minimum Operational Performance Specification for Crash Protected Airborne Recorder Systems) dated March 2003, or EUROCAE Document ED-155 (Minimum Operational Performance Specification for Lightweight Flight Recording Systems) dated July 2009, or any later equivalent standard accepted by EASA.

(f) The operational performance requirements for the flight recorder should be those laid down in:

(1) EUROCAE Document ED-155 or any later equivalent standard accepted by EASA for lightweight flight recorders; or

(2) EUROCAE Document 112 or any later equivalent standard accepted by EASA for crash-protected flight recorders.

GM1 SPO.IDE.A.146 Lightweight flight recorder

ADDITIONAL USEFUL INFORMATION

(a) Experience has shown the usefulness, for analysing incidents and for training purposes, of recording additional information. In particular, cockpit audio, additional instrument indications (such as position of flight controls, position of engine controls, fuel and oil indications, aircraft

configuration selection), and an external view are very useful for such purposes. To capture such information, simple equipment such as an integrated microphone and integrated camera can be sufficient.

(b) If the flight recorder includes optional capabilities such as described in (a), their recording duration is recommended to be at least 2 hours for maximum usefulness.

(c) If the flight recorder is capable of acquiring flight parameters from some aircraft system, it is advised to give priority to the flight parameters listed in Annex II-B of ED-155 or the flight parameters listed in Annex II-A of ED-112. Indeed, these flight parameters were selected based on their relevance in many safety investigations.

GM2 SPO.IDE.A.146 Lightweight flight recorder

INSTALLATION OF CAMERAS

It is advised, when practicable, to install any camera so that it does not capture images of head and shoulders of the flight crew members whilst seated in their normal operating position, in order to avoid identification of persons.

GM3 SPO.IDE.A.146 Lightweight flight recorder

RECORDING ACCURACY OF ATTITUDE RATE PARAMETERS

In the case of attitude rate parameters (pitch rate parameter, yaw rate parameter, roll rate parameter), the accuracy limit specified in EUROCAE Document 155 dated July 2009 was found to be unclear. Therefore the following additional guidance is provided:

(a) If the attitude rate parameter is provided by an approved system of the aeroplane, accuracy greater than as provided by this system is not expected for this attitude rate parameter.

(b) If the attitude rate parameter is provided by a dedicated gyroscope, it is advisable that the gyroscope meets the following performance:

(1) errors due to linear accelerations less than ±3°/sec (equivalent to ±1% of 300°/sec recording range) for all combinations of parameter values and linear acceleration values in the respective ranges [-300°/sec; +300°/sec] and [-3g; +6g];

(2) errors due to temperature less than ±5°/sec for all combinations of parameter values and temperature values in the respective ranges [-300°/sec; +300°/sec] and [-40°C; +85°C];

(3) angular random walk of the gyroscope equal to or less than 2°/sqrt(hour); and

(4) bias stability of the gyroscope significantly less than 360°/hour (for instance, 50°/hour).

GM1 SPO.IDE.A.146(e) Lightweight flight recorder

FUNCTION TO MODIFY THE RECORDINGS OF IMAGES AND AUDIO

The purpose of the function modifying image recordings and audio recordings is to allow the flight crew to protect their privacy by making the recording of images and audio inaccessible using normal techniques. The activation of this function is subject to the approval of the pilot-in-command (refer to

SPO.GEN.107). However, the equipment manufacturer or a safety investigation authority might still be able to retrieve the recorded data using special techniques.

SECTION 2

Helicopters

AMC1 SPO.IDE.H.146 Lightweight flight recorder

OPERATIONAL PERFORMANCE REQUIREMENTS

(a) The flight recorder may record images or flight data, or a combination thereof.

(b) If the flight recorder records flight data, it should record at least the following parameters:

(1) relative time count,

(2) pitch attitude or pitch rate,

(3) roll attitude or roll rate,

(4) heading (magnetic or true) or yaw rate,

(5) latitude,

(6) longitude,

(7) positioning system: estimated error (if available),

(8) pressure altitude or altitude from a positioning system,

(9) time,

(10) ground speed,

(11) positioning system: track (if available),

(12) normal acceleration,

(13) longitudinal acceleration, and

(14) lateral acceleration.

(c) If the flight recorder records images, it should capture views of the main instrument displays at the pilot station, or at both pilot stations when the helicopter is certified for operation with a minimum crew of two pilots. The recorded image quality should allow reading the following indications during most of the flight:

(1) magnetic or true heading,

(2) time (if presented on the front instrument panel),

(3) pressure altitude,

(4) indicated airspeed,

(5) vertical speed,

(6) slip,

(7) outside air temperature,

(8) attitude (if displayed),

(9) stabilised heading (if displayed), and

(10) main rotor speed.

(d) If the flight recorder records flight data and images, each flight parameter listed in (b) should be recorded as flight data or by means of images.

(e) The flight parameters listed in (b), which are recorded as flight data, should meet the performance specifications (range, sampling intervals, accuracy limits and resolution in read-out) as defined in the relevant table of EUROCAE Document 112 (Minimum Operational Performance Specification for Crash Protected Airborne Recorder Systems) dated March 2003, or EUROCAE Document ED-155 (Minimum Operational Performance Specification for Lightweight Flight Recording Systems) dated July 2009, or any later equivalent standard accepted by EASA.

(f) The operational performance requirements for the flight recorder should be those laid down in:

(1) EUROCAE Document ED-155 or any later equivalent standard accepted by EASA for lightweight flight recorders; or

(2) EUROCAE Document 112 or any later equivalent standard accepted by EASA for crash-protected flight recorders.

GM1 SPO.IDE.H.146 Lightweight flight recorder

ADDITIONAL USEFUL INFORMATION

Refer to GM1 SPO.IDE.A.146.

GM2 SPO.IDE.H.146 Lightweight flight recorder

INSTALLATION OF CAMERAS

Refer to GM2 SPO.IDE.A.146.

GM3 SPO.IDE.H.146 Lightweight flight recorder

RECORDING ACCURACY OF ATTITUDE RATE PARAMETERS

Refer to GM3 SPO.IDE.A.146.

GM1 SPO.IDE.H.146(e) Lightweight flight recorder

FUNCTION TO MODIFY THE RECORDINGS OF IMAGES AND AUDIO

Refer to GM1 SPO.IDE.A.146(e).