

**GHANA CIVIL AVIATION  
(FLIGHT STANDARDS) DIRECTIVES**



**PART 16: ENVIRONMENTAL  
PROTECTION**

**VOLUME I - NOISE**

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GHANA

## **INTRODUCTION**

Part 16 Volume I) contains requirements for noise certification applicable to the classification of aircraft specified in individual chapters of ICAO Annex 16 Volume I, where such aircraft are engaged in international air navigation.

GHANA

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**16.1 VOLUME 1 – NOISE****16.1.1 GENERAL****16.1.1.1 DEFINITIONS**

When the following terms are used in these Directives they have the following meanings:

**Aeroplanes.** A power-driven heavier-than-air aircraft, deriving its lift in flight chiefly from aerodynamic reactions on surfaces which remain fixed under given conditions of flight.

**Aircraft.** Any machine that can derive support in the atmosphere from the reactions of the air other than the reactions of the air against the earth's surface.

**Associated aircraft systems.** Those aircraft systems drawing electrical/pneumatic power from an auxiliary power unit during ground operations.

**Auxiliary power-unit (APU).** A self-contained power unit on an aircraft providing electrical/pneumatic power to aircraft systems during ground operations or in flight, separate from the propulsion engine(s).

**By-pass ratio.** The ratio of the air mass flow through the by-pass ducts of a gas turbine engine to the air mass flow through the combustion chambers calculated at maximum thrust when the engine is stationary in an international standard atmosphere at sea level.

**Derived version of an aircraft.** An aircraft which, from the point of view of airworthiness, is similar to the noise certificated prototype but incorporates changes in type design which may affect its noise characteristics adversely.

*Note 1.— Where the certificating authority finds that the proposed change in design, configuration, power or mass is so extensive that a substantially new investigation of compliance with the applicable airworthiness directives is required, the aircraft should be considered to be a new type design rather than a derived version.*

*Note 2.— “Adversely” refers to an increase of more than 0.10 dB in any one of the noise certification levels unless the cumulative effects of changes in type design are tracked by an approved procedure in which case “adversely” refers to a cumulative increase in the noise level in any one of the noise certification levels of more than 0.30 dB or the margin of compliance, whichever is smaller*

**Derived version of a helicopter.** A helicopter which, from the point of view of airworthiness, is similar to the noise certificated prototype but incorporates changes in type design which may affect its noise characteristics adversely.

*Note 1.— In applying the Standards of this Annex, a helicopter that is based on an existing prototype but which is considered by the certificating authority to be a new type design for airworthiness purposes shall nevertheless be considered as a derived version if the noise source characteristics are judged by the certificating authority to be the same as the prototype.*

Note 2.— “Adversely” refers to an increase of more than 0.30 EPNdB in any one of the noise certification levels for helicopters certificated according to Chapter 8 and 0.30 dB(A) in the certification level for helicopters certificated according to Chapter 11 of Annex 16 Volume I.

**External equipment (helicopter).** Any instrument, mechanism, part, apparatus, appurtenance, or accessory that is attached to or extends from the helicopter exterior but is not used nor is intended to be used for operating or controlling a helicopter in flight and is not part of an airframe or engine.

**Helicopter .**A heavier-than-air aircraft supported in flight chiefly by the reactions of the air on one or more power driven rotors on substantially vertical axes.

**Human performance.** Human capabilities and limitations which have an impact on the safety and efficiency of aeronautical operations.

**Powered-lift.** A heavier-than-air aircraft capable of vertical take-off, vertical landing, and low-speed flight, which depends principally on engine-driven lift devices or engine thrust for the lift during these flight regimes and on non-rotating aerofoil(s) for lift during horizontal flight.

**Re-certification.** Certification of an aircraft with or without are vision to its certification noise levels, to a Standard different to that to which it was originally certificated.

**Self-sustaining powered sailplane.** A powered aircraft with available engine power which allows it to maintain level flight but not to take off under its own power.

**State of Design.** The State having jurisdiction over the organization responsible for the type design.

**State of Registry.** The State on whose register the aircraft is entered.

**Subsonic aircraft.** An aircraft incapable of sustaining  
i. level flight at speeds exceeding flight Mach number of 1.

**Tilt-rotor.** A powered-lift capable of vertical take-off, vertical landing, and sustained low-speed flight, which depends principally on engine-driven rotors mounted on tiltable nacelles for the lift during these flight regimes and on nonrotating aerofoil(s) for lift during high-speed flight.

**Type Certificate.** A document issued by a Contracting State to define the design of an aircraft, engine or propeller type and to certify that this design meets the appropriate airworthiness requirements of that State.

## 16.1.1.2 NOMENCLATURE: SYMBOLS AND UNITS

### 1.1 Velocity

<i>Symbol</i>	<i>Unit</i>	<i>Meaning</i>
$c_R$	m/s	<i>Reference speed of sound.</i> Speed of sound at reference conditions.

MATR	—	<i>Helicopter rotor reference advancing blade tip Mach number.</i> The sum of the reference rotor rotational tip speed and the reference speed of the helicopter, divided by the reference speed of sound.
M <sub>H</sub>	—	<i>Propeller helical tip Mach number.</i> The square root of the sum of the square of the propeller test rotational tip speed and the square of the test airspeed of the aircraft, divided by the test speed of sound.
M <sub>HR</sub>	—	<i>Propeller reference helical tip Mach number.</i> The square root of the sum of the square of the propeller reference rotational tip speed and the square of the reference speed of the aircraft, divided by the reference speed of sound.
Best R/C	m/s	<i>Best rate of climb.</i> The certificated maximum take-off rate of climb at the maximum power setting and engine speed.
VAR	km/ h	<i>Adjusted reference speed.</i> On a non-standard test day, the helicopter reference speed adjusted to achieve the same advancing tip Mach number as the reference speed at reference conditions.
V <sub>CON</sub>	km/ h	<i>Maximum airspeed in conversion mode.</i> The never-exceed airspeed of a tilt-rotor when in conversion mode.
V <sub>G</sub>	km/ h	<i>Ground speed.</i> The aircraft velocity relative to the ground.
V <sub>GR</sub>	km/ h	<i>Reference ground speed.</i> The aircraft true velocity relative to the ground in the direction of the ground track under reference conditions. V <sub>GR</sub> is the horizontal component of the reference aircraft speed V <sub>R</sub> .
V <sub>H</sub>	km/ h	<i>Maximum airspeed in level flight.</i> The maximum airspeed of a helicopter in level flight when operating at maximum continuous power.
V <sub>MCP</sub>	km/ h	<i>Maximum airspeed in level flight.</i> The maximum airspeed of a tilt-rotor in level flight when operating in aircraft mode at maximum continuous power.
V <sub>MO</sub>	km/ h	<i>Maximum operating airspeed.</i> The maximum operating limit airspeed of a tilt-rotor that may not be deliberately exceeded.
V <sub>NE</sub>	km/ h	<i>Never-exceed airspeed.</i> The maximum operating limit airspeed that may not be deliberately exceeded.
VR	km/ h	<i>Reference speed.</i> The aircraft true velocity at reference conditions in the direction of the reference flight path.  <i>Note.— This symbol should not be confused with the symbol commonly used for aircraft take-off rotation speed.</i>
V <sub>REF</sub>	km/ h	<i>Reference landing airspeed.</i> The speed of the aircraft, in a specific landing configuration, at the point where it descends through the landing screen height, in the determination of the landing distance for manual landings.
VS	km/ h	<i>Stalling airspeed.</i> The minimum steady airspeed in the landing configuration.
V <sub>tip</sub>	m/s	<i>Tip speed.</i> The rotational speed of a rotor or propeller tip at test conditions, excluding the aircraft velocity component.
V <sub>tipR</sub>	m/s	<i>Reference tip speed.</i> The rotational speed of a rotor or propeller tip at reference conditions, excluding the aircraft velocity component.

VY	km/ h	<i>Speed for best rate of climb. The test airspeed for best take-off rate of climb.</i>
V2	km/ h	<i>Take-off safety speed. The minimum airspeed for a safe take-off.</i>

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**1.2 Time**

<i>Symbol</i>	<i>Unit</i>	<i>Meaning</i>
$t_0$	s	<i>Reference duration.</i> The length of time used as a reference in the integration equation for computing EPNL, where $t_0 = 10$ s.
$t_R$	s	<i>Reference reception time.</i> The reference time of reception calculated from time of reference aircraft position and distance between aircraft and microphone used in the integrated procedure.
$\Delta t$	s	<i>Time increment.</i> The equal time increment between one-third octave band spectra, where $\Delta t = 0.5$ s.
$\square t_R$	s	<i>Reference time increment.</i> The effective duration of a time increment between reference reception times associated with PNLT points used in the integrated method.

**1.3 Indices**

<i>Symbol</i>	<i>Unit</i>	<i>Meaning</i>
$i$	—	<i>Frequency band index.</i> The numerical indicator that denotes any one of the 24 one-third octave bands with nominal geometric mean frequencies from 50 to 10 000 Hz.
$k$	—	<i>Time increment index.</i> The numerical indicator that denotes any one of the 0.5 second spectra in a noise time history. For the integrated method, the adjusted time increment associated with each value of $k$ will likely vary from the original 0.5 second time increment when projected to reference conditions.
$k_F$	—	<i>First time increment identifier.</i> Index of the first 10 dB-down point in the discrete measured PNLT time history.
$k_{FR}$	—	<i>Reference first time increment identifier.</i> Index of the first 10 dB-down point in the discrete PNLT time history for the integrated method.
$k_L$	—	<i>Last time increment identifier.</i> Index of the last 10 dB-down point in the discrete measured PNLT time history.
$k_{LR}$	—	<i>Reference last time increment identifier.</i> Index of the last 10 dB-down point in the discrete PNLT time history for the integrated method.
$k_M$	—	<i>Maximum PNLTM time increment index.</i> Time increment index of PNLTM.
$t$	s	<i>Elapsed time.</i> The length of time measured from a reference zero.
$t_1$	s	<i>Time of first 10 dB-down point.</i> The time of the first 10 dB-down point in a continuous function of time. (See $k_F$ .)
$t_2$	s	<i>Time of last 10 dB-down point.</i> The time of the last 10 dB-down point in a continuous function of time. (See $k_L$ .)



## 1.4 Noise metrics

Symbol	Unit	Meaning
EPNL	EPNdB	<i>Effective perceived noise level.</i> A single-number evaluator for an aircraft pass-by, accounting for the subjective effects of aircraft noise on human beings, consisting of an integration over the noise duration of the perceived noise level (PNL) adjusted for spectral irregularities (PNLT), normalized to a reference duration of 10 seconds. (See Appendix 2, Section 4.1 for specifications.)
EPNL <sub>A</sub>	EPNdB	<i>Approach EPNL.</i> Effective perceived noise level at the aircraft approach reference measurement points.
EPNL <sub>F</sub>	EPNdB	<i>Flyover EPNL.</i> Effective perceived noise level at the aircraft flyover reference measurement points.
Symbol	Unit	Meaning
EPNLL	EPNdB	<i>Lateral EPNL.</i> Effective perceived noise level at the aircraft lateral reference measurement points.
LAE	dB SEL	<i>Sound exposure level (SEL).</i> A single event noise level for an aircraft pass-by, consisting of an integration over the noise duration of the A-weighted sound level (dBA), normalized to a reference duration of 1 second. (See Appendix 4, Section 3 for specifications.)
LAS	dB(A)	<i>Slow A-weighted sound level.</i> Sound level with frequency weighting A and time weighting S for a specified instance in time.
LAS <sub>max</sub>	dB(A)	<i>Maximum slow A-weighted sound level.</i> The maximum value of LAS over a specified time interval.
LAS <sub>maxR</sub>	dB(A)	<i>Reference maximum slow A-weighted sound level.</i> The maximum value of LAS over a specified time interval corrected to reference conditions.
LIMITA	EPNdB	<i>Approach EPNL limit.</i> The maximum permitted noise level at the aircraft approach reference measurement points.
LIMITF	EPNdB	<i>Flyover EPNL limit.</i> The maximum permitted noise level at the aircraft flyover reference measurement points.
LIMITL	EPNdB	<i>Lateral EPNL limit.</i> The maximum permitted noise level at the aircraft lateral reference measurement points.
n	noy	<i>Perceived noisiness.</i> The perceived noisiness of a one-third octave band sound pressure level in a given spectrum.
N	noy	<i>Total perceived noisiness.</i> The total perceived noisiness of a given spectrum calculated from the 24 values of n.
PNL	PNdB	<i>Perceived noise level.</i> A perception-based noise evaluator representing the subjective effects of broadband noise received at a given point in time during an aircraft pass-by. It is the noise level empirically determined to be equally as noisy as a 1 kHz one-third octave band sample of random noise. (See Appendix 2, Section 4.2 for specifications.)

PNLT	TPNdB	<i>Tone-corrected perceived noise level.</i> The value of the PNL of a given spectrum adjusted for spectral irregularities.
PNLTR	TPNdB	<i>Reference tone-corrected perceived noise level.</i> The value of PNLTR adjusted to reference conditions.
PNLTM	TPNdB	<i>Maximum tone-corrected perceived noise level.</i> The maximum value of PNLTR in a specified time history, adjusted for the bandsharing adjustment $\square B$ .
PNLTMR	TPNdB	<i>Reference maximum tone-corrected perceived noise level.</i> The maximum value of PNLTR in a specified time history, adjusted for the bandsharing adjustment $\square B$ in the simplified method and $\square BR$ in the integrated method.
<i>Symbol</i>	<i>Unit</i>	<i>Meaning</i>
SPL	dB	<i>Sound pressure level.</i> The level of sound, relative to the reference level of 20 $\mu\text{Pa}$ , at any instant of time that occurs in a specified frequency range. The level is calculated as ten times the logarithm to the base 10 of the ratio of the time-mean-square pressure of the sound to the square of the reference sound pressure of 20 $\mu\text{Pa}$ . <i>Note/ — Typical aircraft noise certification usage refers to a specific one-third octave band, e.g. SPL(i,k) for the i-th band of the k-th spectrum in an aircraft noise time-history.</i>
SPL <sub>R</sub>	dB	<i>Reference sound pressure level.</i> The one-third octave band sound pressure levels adjusted to reference conditions.
SPL <sub>S</sub>	dB	<i>Slow weighted sound pressure level.</i> The value of one-third octave band sound pressure levels with time weighting S applied.
$\Delta_1$ B	TPNd  dB(A)	<i>PNLTM adjustment.</i> In the simplified adjustment method, the adjustment to be added to the measured EPNL to account for noise level changes due to differences in atmospheric absorption and noise path length, between test and reference conditions at PNLTM.  For propeller-driven aircraft not exceeding 8 618 kg, the adjustment to be added to $L_{ASmax}$ to account for noise level changes due to the difference between test and reference aircraft heights.
$\Delta_2$ B	TPNd  dB(A)	<i>Duration adjustment.</i> In the simplified adjustment method, the adjustment to be added to the measured EPNL to account for noise level changes due to the change in noise duration, caused by differences between test and reference aircraft speed and position relative to the microphone.  For propeller-driven aircraft not exceeding 8 618 kg, the adjustment to be added to $L_{ASmax}$ to account for the propeller helical tip Mach number.

$\Delta_3$		
B	TPNd	<i>Source noise adjustment.</i> In the simplified or integrated adjustment method, the adjustment to be added to the measured EPNL to account for noise level changes due to differences in source noise generating mechanisms, between test and reference conditions.
	dB(A)	For propeller-driven aircraft not exceeding 8 618 kg, the adjustment to be added to $L_{ASmax}$ to account for engine power.

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$\Delta_4$	dB(A)	<i>Atmospheric absorption adjustment.</i> For propeller-driven aircraft not exceeding 8 618 kg, the adjustment to be added to the measured $L_{ASmax}$ for noise level changes due to the change in atmospheric absorption, caused by the difference between test and reference aircraft heights.
$\Delta_B$	TPNdB	<i>Bandsharing adjustment.</i> The adjustment to be added to the maximum PNL <sub>T</sub> to account for possible suppression of a tone due to one-third octave bandsharing of that tone. PNL <sub>T</sub> <sub>M</sub> is equal to the maximum PNL <sub>T</sub> plus $\Delta_B$ .
<i>Symbol</i>	<i>Unit</i>	<i>Meaning</i>
$\Delta_{BR}$	TPNdB	<i>Reference bandsharing adjustment.</i> The adjustment to be added to the maximum PNL <sub>R</sub> in the integrated method to account for possible suppression of a tone due to one-third octave bandsharing of that tone. PNL <sub>T</sub> <sub>M</sub> <sub>R</sub> is equal to the maximum PNL <sub>T</sub> <sub>R</sub> plus $\Delta_{BR}$ .
$\Delta_{peak}$	TPNdB	<i>Peak adjustment.</i> The adjustment to be added to the measured EPNL for when the PNL <sub>T</sub> for a secondary peak, identified in the calculation of EPNL from measured data and adjusted to reference conditions, is greater than the PNL <sub>T</sub> for the adjusted PNL <sub>T</sub> <sub>M</sub> spectrum.

### 1.5 Calculation of PNL and tone correction

<i>Symbol</i>	<i>Unit</i>	<i>Meaning</i>
$C$	dB	<i>Tone correction factor.</i> The factor to be added to the PNL of a given spectrum to account for the presence of spectral irregularities, such as tones.
$f$	Hz	<i>Frequency.</i> The nominal geometric mean frequency of a one-third octave band.
$F$	dB	<i>Delta-dB.</i> The difference between the original sound pressure level and the final broadband sound pressure level of a one-third octave band in a given spectrum.
$\log n(a)$	—	<i>Noy discontinuity coordinate.</i> The $\log n$ value of the intersection point of the straight lines representing the variation of SPL with $\log n$ .
$M$	—	<i>Noy inverse slope.</i> The reciprocals of the slopes of straight lines representing the variation of SPL with $\log n$ .
$s$	dB	<i>Slope of sound pressure level.</i> The change in level between adjacent one-third octave band sound pressure levels in a given spectrum.

$\Delta s$	dB	<i>Change in slope of sound pressure level.</i>
$s_{\square}$	dB	<i>Adjusted slope of sound pressure level. The change in level between adjacent adjusted one-third octave band sound pressure levels in a given spectrum.</i>
$\bar{s}$	dB	<i>Average slope of sound pressure level.</i>
SPL(a)	dB	<i>Noy discontinuity level. The SPL value at the discontinuity coordinate of the straight lines representing the variation of SPL with log <math>n</math>.</i>
SPL(b) SPL(c)	dB	<i>Noy intercept levels. The intercepts on the SPL-axis of the straight lines representing the variation of SPL with log <math>n</math>.</i>

Symbol	Unit	Meaning
SPL( <i>d</i> )	dB	<i>Noy discontinuity level.</i> The SPL value at the discontinuity coordinate where $\log n$ equals $-1$ .
SPL( <i>e</i> )	dB	<i>Noy discontinuity level.</i> The SPL value at the discontinuity coordinate where $\log n$ equals $\log 0.3$ .
SPL $\square$	dB	<i>Adjusted sound pressure level.</i> The first approximation to broadband sound pressure level in a one-third octave band of a given spectrum.
SPL $\square$	dB	<i>Final broadband sound pressure level.</i> The second and final approximation to broadband sound pressure level in a one-third octave band of a given spectrum.

### 1.6 Flight path geometry

Symbol	Unit	Meaning
H	m	<i>Height.</i> The aircraft height when overhead or abeam of the centre microphone.
H <sub>R</sub>	m	<i>Reference height.</i> The reference aircraft height when overhead or abeam of the centre microphone.
X	m	<i>Aircraft position along the ground track.</i> The position coordinate of the aircraft along the x-axis at a specific point in time.
Y	m	<i>Lateral aircraft position relative to the reference ground track.</i> The position coordinate of the aircraft along the y-axis at a specific point in time.
Z	m	<i>Vertical aircraft position relative to the reference ground track.</i> The position coordinate of the aircraft along the z-axis at a specific point in time.
$\theta$	degrees	<i>Sound emission angle.</i> The angle between the flight path and the direct sound propagation path to the microphone. The angle is identical for both the measured and reference flight paths.
$\psi$	degrees	<i>Elevation angle.</i> The angle between the sound propagation path and a horizontal plane passing through the microphone, where the sound propagation path is defined as a line between a sound emission point on the measured flight path and the microphone diaphragm.
$\psi_R$	degrees	<i>Reference elevation angle.</i> The angle between the reference sound propagation path and a horizontal plane passing through the reference microphone location, where the reference sound propagation path is defined as a line between a sound emission point on the reference flight path and the reference microphone diaphragm.

## 1.7 Miscellaneous

<i>Symbol</i>	<i>Unit</i>	<i>Meaning</i>
antilog	—	<i>Antilogarithm to the base 10.</i>
D	m	<i>Diameter.</i> Propeller or rotor diameter.
D <sub>15</sub>	m	<i>Take-off distance.</i> The take-off distance required for an aircraft to reach 15 m height above ground level.
e	—	<i>Euler's number.</i> The mathematical constant that is the base number of the natural logarithm, approximately 2.71828.
log	—	<i>Logarithm to the base 10.</i>
N	rpm	<i>Propeller speed.</i>
N <sub>1</sub>	rpm	<i>Compressor speed.</i> The turbine engine low pressure compressor first stage fan speed.
RH	%	<i>Relative humidity.</i> The ambient atmospheric relative humidity.
T	°C	<i>Temperature.</i> The ambient atmospheric temperature.
u	m/s	<i>Wind speed along-track component.</i> The component of the wind speed vector along the reference ground track.
v	m/s	<i>Wind speed cross-track component.</i> The component of the wind speed vector horizontally perpendicular to the reference ground track.
α	dB/100 m	<i>Test atmospheric absorption coefficient.</i> The sound attenuation rate, due to atmospheric absorption, that occurs in a specified one-third octave band for the measured ambient temperature and relative humidity.
α <sub>R</sub>	dB/100 m	<i>Reference atmospheric absorption coefficient.</i> The sound attenuation rate, due to atmospheric absorption, that occurs in a specified one-third octave band for a reference ambient temperature and relative humidity.
μ	—	<i>Engine noise performance parameter.</i> For jet aircraft, typically the normalized low pressure fan speed, normalized engine thrust, or engine pressure ratio used in the calculation of the source noise adjustment.

**PART A – AIRCRAFT NOISE CERTIFICATION****16.1.2 APPLICABILITY**

- (1) The provisions under this subpart shall apply to all aircraft included in the classifications defined for noise Certification purposes of this Part where such aircraft are engaged in international air navigation.

**16.1.3 VALIDATION OF NOISE CERTIFICATION**

- (1) Noise certification shall be validated by the Authority on the basis of satisfactory evidence that the aircraft complies with requirements which are at least equal to the applicable requirements specified in these directives.
- (2) If noise re-certification of an aircraft is requested, it shall be validated by the Authority on the basis of satisfactory evidence that such aircraft complies with requirements which are at least equal to the applicable requirements specified in these directives. The date used to determine the re-certification basis shall be the date of acceptance of the first application for recertification.
- (3) The documents attesting noise certification shall be approved by the Authority and shall be carried on the aircraft.
- (4) The documents attesting noise certification for an aircraft shall provide at least the following information:
  - (a) Name: The Republic of Ghana
  - (b) Title of the noise document.
  - (c) Number of Document
  - (d) Nationality or common mark and registration marks (9G-)
  - (e) Manufacturer and manufacturer's designation of aircraft
  - (f) Aircraft serial number
  - (g) Engine manufacturer, type and model
  - (h) Propeller type and model for propeller-driven aircraft
  - (i) Maximum take-off weight (mass) in kilograms
  - (j) Maximum landing mass, in kilograms
  - (k) The chapter and section of these directives under which the aircraft was certified
  - (l) Additional modification incorporated for the purpose of compliance with the appropriate certification requirements
  - (m) The lateral/full-power noise level in the corresponding unit for documents issued under the appropriate chapters of Annex 16 Volume 1
  - (n) The approach noise level in the corresponding unit for documents issued under the appropriate chapters of Annex 16 Volume 1
  - (o) The flyover noise in the corresponding unit for documents issued under the appropriate chapters of Annex 16 Volume 1
  - (p) The over flight noise level in the corresponding unit for documents issued under



the appropriate chapters of Annex 16 Volume 1

- (q) The take-off noise level in the corresponding unit for documents issued under the appropriate chapters of Annex 16 Volume 1
  - (r) Statement of compliance, including a reference to Annex 16 Volume 1
  - (s) Date of issuance of the noise certification document
  - (t) Signature of the officer issuing it.
- (5) Item headings on the noise certification documents shall be uniformly numbered in Arabic numerals as indicated in (4), so that on any noise certification document the number shall, under any arrangement, refer to the same item heading except where the information in Items 1 through 6 and Items 18 through 20 is given in the certificate of airworthiness, in which case the numbering system of the certificate of airworthiness according to Part 5 of these Directives shall prevail.
- (6) The administrative system for implementation of noise certification documentation shall be applied under this Part.

*Note: See IS: 16.1.3 for the format and structure of noise certification documentation*

- (7) The information required under this subpart shall be included in the flight manual. A note shall be added stating that the thrust/power cutback height relates to the noise certification demonstration procedure and is not intended for use in normal operations.
- (8) The Authority shall recognize as valid a noise certification granted by another Contracting State provided that the requirements under which such certification was granted are at least equal to the applicable Standards specified in Annex 16 Volume 1.
- (9) The Authority shall suspend or revoke the noise certification of an aircraft on its Register if the aircraft ceases to comply with the applicable noise Standards. The Authority shall not remove the suspension of a noise certification or validate a new noise certification unless the aircraft is found, on reassessment, to comply with the applicable noise Standards.
- (10) The amendment of Volume 1 of Annex 16 to be used the Authority shall be that which is applicable on the date of submission to that Contracting State for:
  - (a) Type Certificate in the case of a new type; or
  - (b) approval of a change in type design in the case of a derived version; or
  - (c) in either case, under an equivalent application procedure prescribed by the certifying authority of that Contracting State.
- (11) The Authority will accept, unless otherwise specified and subject to the provisions in this subpart, the date to be used in determining the applicability of ICAO Standards shall be the date on which either the application for a Type Certificate was a submitted to the State of Design or the date for submission under an equivalent application procedure prescribed by the certifying authority of the State of Design. The application shall be effective for duration equal to the period applied in designation of airworthiness requirements appropriate to the aircraft type, except in special cases where the authority accepts an extension of this period.
- (12) For derived versions where the provisions governing the applicability of ICAO Standards refer to “the application for the certification of the change in type design”, the date to be accepted by the Authority in determining the applicability of the

Standards in Annex 16 Volume 1 shall be the date the application for the change in type design was submitted to the Contracting State that first certified the change in type design, or the date of submission under an equivalent application procedure prescribed by the certifying authority of the Contracting State that first certified the change in type design

- (13) The Authority shall only validate noise certification if the application was effective for the period specified in the designation of the airworthiness regulations appropriate to the aircraft type, except in special cases where the certifying authority accepted an extension of this period. When this period of effectivity is exceeded, the date to be used in determining the applicability of ICAO Standards shall be the date of issue of the Type Certificate or approval of the change in type design, or the date of issue of approval under an equivalent procedure prescribed by the State of Design, less the period of effectivity.

## **PART B – AERODROME NOISE MEASUREMENT**

### **16.1.4 SUBSONIC JET AIRCRAFT — APPLICATION FOR TYPE CERTIFICATE SUBMITTED BEFORE 6 OCTOBER 1977**

#### **16.1.4.1 APPLICABILITY**

- (1) The requirements of this subpart shall be applicable to all subsonic jet aircraft for which the application for a Type Certificate was submitted before 6 October 1977, except those aircraft:
- (a) requiring a runway length\* of 610 m or less at maximum certificated mass for airworthiness; or
  - (b) powered by engines with a by-pass ratio of 2 or more and for which a certificate of airworthiness for the individual aircraft was first issued before 1 March 1972; or
  - (c) powered by engines with a by-pass ratio of less than 2, and for which a Type Certificate was submitted before 1 January 1969, and for which a certificate of airworthiness for the individual aircraft was first issued before 1 January 1976.
- (2) The provisions of this subpart shall also be applicable to derived versions of all aircraft for which the application for certification of a change in type design was accepted, or another equivalent procedure was carried out by the certifying authority on or after 26 November 1981.
- (a) The Authority may accept that the following situations for jet aircraft and propeller-driven heavy aircraft on its registry do not require demonstration of compliance with the provisions of the requirements of this subpart:
- (i) gear down flight with one or more retractable landing gear down during the entire flight;
  - (ii) Spare engine and nacelle carriage external to the skin of the aircraft (and return of the pylon or other external mount); and
  - (iii) Time-limited engine and/or nacelle changes, where the change in type design specifies that the aircraft may not be operated for a period of more than 90 days unless compliance with the provisions of this subpart is shown for that change in type design. This applies only to changes resulting from a maintenance action.

#### 16.1.4.2 NOISE EVALUATION MEASURE

The noise evaluation measure shall be the effective perceived noise level in EPNdB as described in Attachment A.

#### 16.1.4.3 NOISE MEASUREMENT POINTS

An aircraft, when tested in accordance with the flight test procedures shall not exceed the noise levels specified in this subpart at the following points:

- (a) lateral noise measurement point: the point on a line parallel to and 650 m from the runway centre line, or extended runway centre line, where the noise level is a maximum during take-off;
- (b) fly over noise measurement point: the point on the extended centre line of the runway and at a distance of 6.5 km from the start of roll;
- (c) approach noise measurement point: the point on the ground, on the extended centre line of the runway, 120 m (395 ft) vertically below the 3° descent path originating from a point 300 m beyond the threshold. On level ground this corresponds to a position 2 000 m from the threshold.

#### 16.1.4.4 MAXIMUM NOISE LEVELS

- (1) The maximum noise levels of aircraft when determined in accordance with the noise evaluation method of Attachment A shall not exceed the following:
  - (a) at lateral and approach noise measurement points: 108 EPNdB for aircraft with maximum certificated take-off mass of 272 000 kg or over, decreasing linearly with the logarithm of the mass at the rate of 2 EPNdB per halving of the mass down to 102 EPNdB at 34 000 kg, after which the limit remains constant;
  - (b) at flyover noise measurement point: 108 EPNdB for aircraft with maximum certificated take-off mass of 272 000 kg or over, decreasing linearly with the logarithm of the mass at the rate of 5 EPNdB per halving of the mass down to 93 EPNdB at 34 000 kg, after which the limit remains constant.
- (2) The maximum noise levels of aircraft when determined in accordance with the noise evaluation method of Attachment A shall not exceed the following:

*Note- See Attachment A of ICAO Annex 16 Vol.1 for the calculation maximum permitted noise levels as a function of takeoff mass.*

##### 16.1.4.4.1 AT LATERAL NOISE MEASUREMENT POINT

106 EPNdB for aircraft with maximum certificated take-off mass of 400 000 kg or over, decreasing linearly with the logarithm of the mass down to 97 EPNdB at 35 000 kg, after which the limit remains constant.

##### 16.1.4.4.2 AT FLYOVER NOISE MEASUREMENT POINT

- (1) **Aircraft with two engines or less** - 104 EPNdB for aircraft with maximum certificated take-off mass of 325 000 kg or over, decreasing linearly with the logarithm of the mass at the rate of 4 EPNdB per halving of mass down to 93 EPNdB, after which

the limit remains constant.

- (2) **Aircraft with three engines** - but with 107 EPNdB for aircraft with maximum certificated take-off mass of 325 000 kg or Over or , whichever is the lower.
- (3) **Aircraft with four engines or more** - but with 108 EPNdB for aircraft with maximum certificated take-off mass of 325 000 kg or Over or , whichever is the lower.

#### 16.1.4.4.3 AT APPROACH NOISE MEASUREMENT POINT

108 EPNdB for aircraft with maximum certificated take-off mass of 280 000 kg or over, decreasing linearly with the logarithm of the mass down to 101 EPNdB at 35 000 kg, after which the limit remains constant.

#### 16.1.4.5 TRADE-OFFS

If the maximum noise levels are exceeded at one or two measurement points:

- (a) the sum of excesses shall not be greater than 4 EPNdB, except that in respect of four-engined aircraft powered by engines with by-pass ratio of 2 or more and for which the application for certificate of airworthiness for the prototype was accepted or another equivalent prescribed procedure was carried out by the certifying authority before 1 December 1969, the sum of any excesses shall not be greater than 5 EPNdB;
- (b) any excess at any single point shall not be greater than 3 EPNdB; and
- (c) any excesses shall be offset by corresponding reductions at the other point or points.

#### 16.1.4.6 TEST PROCEDURES

If the maximum noise levels are exceeded at one or two measurement points:

- (a) the sum of excesses shall not be greater than 4 EPNdB, except that in respect of four-engined aeroplanes powered by engines with by-pass ratio of 2 or more and for which the application for certificate of airworthiness for the prototype was accepted or another equivalent prescribed procedure was carried out by the certifying authority before 1 December 1969, the sum of any excesses shall not be greater than 5 EPNdB;
- (b) any excess at any single point shall not be greater than 3 EPNdB; and
- (c) any excesses shall be offset by corresponding reductions at the other point or points.

##### 16.1.4.6.1 TAKE-OFF TEST PROCEDURE

- (1) Average take-off thrust shall be used from the start of take-off to the point at which a height of at least 210 m (690 ft) above the runway is reached and the thrust thereafter shall not be reduced below that thrust which will maintain a climb gradient of at least 4 per cent.
- (2) A speed of at least  $V_2 + 19$  km/h ( $V_2 + 10$  kt) shall be attained as soon as practicable after lift-off and be maintained throughout the take-off noise certification test.
- (3) A constant take-off configuration selected by the applicant shall be maintained throughout the take-off noise certification demonstration test except that the landing gear may be retracted.

**16.1.4.6.2 APPROACH TEST PROCEDURE**

- (1) The aircraft shall be stabilized and following a  $3^{\circ} \pm 0.5^{\circ}$  glide path.
- (2) The approach shall be made at a stabilized airspeed of not less than  $1.3 VS + 19$  km/h ( $1.3 VS + 10$  kt) with thrust stabilized during approach and over the measuring point and continued to a normal touchdown.
- (3) The configuration of the aircraft shall be with maximum allowable landing flap setting.

**SUBPART C: SUBSONIC JET AIRCRAFT — APPLICATION FOR CERTIFICATE OF AIRWORTHINESS FOR THE PROTOTYPE ACCEPTED ON OR AFTER 6 OCTOBER 1977 AND BEFORE 1 JANUARY 2006**

- 1. PROPELLER-DRIVEN AIRCRAFT OVER 5 700 kg — Application for Certificate of Airworthiness for the Prototype accepted on or after 1 January 1985 and before 17 November 1988**
- 2. PROPELLER-DRIVEN AIRCRAFT OVER 8 618 kg — Application for Certificate of Airworthiness for the Prototype accepted on or after 17 November, 1988 and before 1 January 2006**

**16.1.5 APPLICABILITY**

- (1) The provisions of this section shall be applicable to:
  - (a) all subsonic jet aircraft, including their derived versions, other than aircraft which require a runway\* length of 610 m or less at maximum certificated mass for airworthiness, in respect of which either the application for certificate of airworthiness for the prototype was accepted or another equivalent prescribed procedure was carried out by the Authority, on or after 6 October 1977 and before 1 January 2006;
  - (b) all propeller-driven aircraft, including their derived versions, of over 5 700 kg maximum certificated take-off mass for which either the application for certificate of airworthiness for the prototype was accepted or another equivalent prescribed procedure was carried out by the certifying authority, on or after 1 January 1985 and before 17 November 1988; and
  - (c) all propeller-driven aircraft, including their derived versions, of over 8 618 kg maximum certificated takeoff mass, for which either the application for certificate of airworthiness for the prototype was accepted or another equivalent prescribed procedure was carried out by the certifying authority, on or after 17 November 1988 and before 1 January 2006.
- (2) The Authority may accept that the following situations for jet aircraft and propeller-driven heavy aircraft on the registry do not require demonstration of compliance with the provisions of the requirements of Section 1 of this subpart:
  - (a) gear down flight with one or more retractable landing gear down during the entire flight.
  - (b) spare engine and nacelle carriage external to the skin of the aircraft (and return of the pylon or other external mount); and
  - (c) time-limited engine and nacelle changes, or where the change in type design specifies that the aircraft may not be operated for a period of more than 90 days unless compliance with the provisions of Section I of this part is shown for that change resulting from a required maintenance action.

**16.1.5.1 NOISE MEASUREMENTS**

**Noise evaluation measure** - The noise evaluation measure shall be the effective perceived noise level in EPNdB as described in Attachment B.

**16.1.5.2 NOISE MEASUREMENT POINTS****16.1.5.2.1 REFERENCE NOISE EVALUATION MEASURE**

An aircraft, when tested in accordance with these Standards, shall not exceed the noise levels specified in this subpart at the following points:

- (a) **lateral full-power reference noise measurement point**
  - (i) for jet-powered aircraft: the point on a line parallel to and 450 m from the runway centre line, where the noise level is at a maximum during take-off;
  - (ii) for propeller-driven aircraft: the point on the extended centre line of the runway 650 m vertically below the climb-out flight path at full take-off power ;
- (b) **flyover reference noise measurement point:** the point on the extended centre line of the runway and at a distance of 6.5 km from the start of roll;
- (c) **approach reference noise measurement point:** the point on the ground, on the extended centre line of the runway 2 000 m from the threshold. On level ground this corresponds to a position 120 m (394 ft) vertically below the 3° descent path originating from a point 300 m beyond the threshold.

**16.1.5.2.2 TEST NOISE MEASUREMENT POINTS**

- (1) If the test noise measurement points are not located at the reference noise measurement points, any corrections for the difference in position shall be made in the same manner as the corrections for the differences between test and reference flight paths.
- (2) Sufficient lateral test noise measurement points shall be used to demonstrate to the Authority that the maximum noise level on the appropriate lateral line has been clearly determined. For jet-powered aircraft simultaneous measurements shall be made at one test noise measurement point at a symmetrical position on the other side of the runway. In the case of propeller-driven aircraft, because of their inherent asymmetry in lateral noise, simultaneous measurements shall be made at each and every test noise measurement point at a symmetrical position (within  $\pm 10$  m parallel with the axis of the runway) on the opposite side of the runway.

**16.1.5.3 MAXIMUM NOISE LEVELS**

The maximum noise levels, when determined in accordance with the noise evaluation method of Attachment B shall not exceed the following:

**(1) AT THE LATERAL FULL-POWER REFERENCE NOISE MEASUREMENT POINT**

103 EPNdB for aircraft with maximum certificated takeoff mass, at which the noise certification is requested, of 400 000 kg and over and decreasing linearly with the logarithm of the mass down to 94 EPNdB at 35 000 kg, after which the limit remains constant.



**(2) AT FLYOVER REFERENCE NOISE MEASUREMENT POINT**

- (a) **Aircraft with two engines or less** - 101 EPNdB for aircraft with maximum certificated take-off mass, at which the noise certification is requested, of 385 000 kg and over and decreasing linearly with the logarithm of the aircraft mass at the rate of 4 EPNdB per halving of mass down to 89 EPNdB, after which the limit is constant.
- (b) **Aircraft with three engines** – (a) but with 104 EPNdB for aircraft with maximum certificated take-off mass of 385 000 kg and over.
- (c) **Aircraft with four engines or more** – (a) but with 106 EPNdB for aircraft with maximum certificated take-off mass of 385 000 kg and over.

**(3) AT APPROACH REFERENCE NOISE MEASUREMENT POINT**

105 EPNdB for aircraft with maximum certificated take-off mass, at which the noise certification is requested, of 280 000 kg or over, and decreasing linearly with the logarithm of the mass down to 98 EPNdB at 35 000 kg, after which the limit remains constant.

**16.1.5.4 TRADE-OFFS**

If the maximum noise levels are exceeded at one or two measurement points:

- (a) the sum of excesses shall not be greater than 3 EPNdB;
- (b) any excess at any single point shall not be greater than 2 EPNdB; and
- (c) any excesses shall be offset by corresponding reductions at the other point or points.

**16.1.5.5 NOISE CERTIFICATION REFERENCE PROCEDURES****16.1.5.5.1 GENERAL CONDITIONS**

- (1) The reference procedures shall comply with the appropriate airworthiness requirements.
- (2) The calculations of reference procedures and flight paths shall be approved by the Authority.
- (3) The take-off and approach reference procedures shall be those defined.
- (4) When it is shown by the applicant that the design characteristics of the aircraft would prevent flight being conducted the reference procedures shall:
  - (a) be demanded by those design characteristics which make compliance with the procedures impossible; and
  - (b) be approved by the Authority.
- (5) The reference procedures shall be calculated under the following reference atmospheric conditions:
  - (a) sea level atmospheric pressure of 1 013.25 hPa;
  - (b) ambient air temperature of 25°C, i.e. ISA + 10°C;
  - (c) relative humidity of 70 per cent; and

- (d) zero wind; and
- (e) for the purpose of defining the reference take-off profiles for both take-off and lateral noise measurements, the runway gradient is zero.

#### 16.1.5.5.2 TAKE-OFF REFERENCE PROCEDURE

- (1) Take-off reference flight path shall be calculated as follows:
  - (a) average engine take-off thrust or power shall be used from the start of take-off to the point where at least the following height above runway level is reached:
    - (i) aircraft with two engines or less — 300 m (984 ft)
    - (ii) aircraft with three engines — 260 m (853 ft)
    - (iii) aircraft with four engines or more — 210 m (689 ft);
  - (b) upon reaching the height specified above, the thrust or power shall not be reduced below that required to maintain:
    - (i) a climb gradient of 4 per cent; and
    - (ii) in the case of multi-engined aircraft, level flight with one engine inoperative;whichever thrust or power is greater;
  - (c) for the purpose of determining the lateral full-power noise level, the reference flight path shall be calculated on the basis of using full take-off power throughout without a thrust or power reduction;
  - (d) the speed shall be the all-engines operating take-off climb speed selected by the applicant for use in normal operation, which shall be at least  $V_2 + 19$  km/h ( $V_2 + 10$  kt) but not greater than  $V_2 + 37$  km/h ( $V_2 + 20$  kt) and which shall be attained as soon as practicable after lift-off and maintained throughout the take-off noise certification test;
  - (e) a constant take-off configuration selected by the applicant shall be maintained throughout the take-off reference procedure except that the landing gear may be retracted. Configuration shall be interpreted as meaning the conditions of the systems and centre of gravity position and shall include the position of lift augmentation devices used, whether the APU is operating, and whether air bleeds and power off-takes are operating;
  - (f) the mass of the aircraft at the brake release shall be the maximum take-off mass at which the noise certification is requested; and
  - (g) the average engine shall be defined by the average of all the certification compliant engines used during the aircraft flight tests up to and during certification when operated to the limitations and procedures given in the flight manual. This will establish a technical standard including the relationship of thrust/power to control parameters (e.g. N1 or EPR). Noise measurements made during certification tests shall be corrected to this standard.



**16.1.5.5.3 APPROACH REFERENCE PROCEDURE**

The approach reference flight path shall be calculated as follows:

- (a) the aircraft shall be stabilized and following a 3° glide path;
- (b) a steady approach speed of  $V_{REF} + 19$  km/h ( $V_{REF} + 10$  kt), with thrust or power stabilized, shall be maintained over the measurement point;
- (c) the constant approach configuration as used in the airworthiness certification tests, but with the landing gear down, shall be maintained throughout the approach reference procedure;
- (d) the mass of the aircraft at the touchdown shall be the maximum landing mass permitted in the approach configuration at which noise certification is requested; and
- (e) the most critical (that which produces the highest noise level) configuration with normal deployment of aerodynamic control surfaces including lift and drag producing devices, at the mass at which certification is requested shall be used. This configuration includes all those items listed in Attachment B that will contribute to the noisiest continuous state at the maximum landing mass in normal operation.

**16.1.5.6 TEST PROCEDURES**

- (1) The test procedures shall be acceptable to the airworthiness and noise certifying authority of the State issuing the certificate.
- (2) The test procedures and noise measurements shall be conducted and processed in an approved manner to yield the noise evaluation measure designated as effective perceived noise level (EPNL), in units of EPNdB, as described in Attachment B.
- (3) Acoustic data shall be adjusted by the methods outlined in Attachment B to the reference conditions specified in this subpart. Adjustments for speed and thrust shall be made as described in Attachment B.
- (4) If the mass during the test is different from the mass at which the noise certification is requested, the necessary EPNL adjustment shall not exceed 2 EPNdB for takeoffs and 1 EPNdB for approaches. Data approved by the Authority shall be used to determine the variation of EPNL with mass for both take-off and approach test conditions. Similarly the necessary EPNL adjustment for variations in approach flight path from the reference flight path shall not exceed 2 EPNdB.
- (5) For the approach conditions the test procedures shall be accepted if the aircraft follows a steady glide path angle of  $3^\circ \pm 0.5^\circ$ .
- (6) If equivalent test procedures different from the reference procedures are used, the test procedures and all methods for adjusting the results to the reference procedures shall be approved by the Authority. The amounts of the adjustments shall not exceed 16 EPNdB on take-off and 8 EPNdB on approach, and if the adjustments are more than 8 EPNdB and 4 EPNdB respectively, the resulting numbers shall not be within 2 EPNdB of the limit noise levels.
- (7) For take-off, lateral, and approach conditions, the variation in instantaneous indicated airspeed of the aircraft must be maintained within  $\pm 3$  per cent of the average airspeed between the 10 dB-down points. This shall be determined by reference to the pilot's airspeed indicator. However, when the instantaneous indicated airspeed varies from

the average airspeed over the 10 dB-down points by more than  $\pm 5.5$  km/h ( $\pm 3$  kt), and this is judged by the certificating officer on the flight deck to be due to atmospheric turbulence, then the flight so affected shall be rejected for noise certification purposes.

**SUBPART D: — SUBSONIC JET AIRCRAFT — APPLICATION FOR CERTIFICATE OF AIRWORTHINESS FOR THE PROTOTYPE ACCEPTED ON OR AFTER 1 JANUARY 2006**

**PROPELLER-DRIVEN AIRCRAFT OVER 8 618 kg — APPLICATION FOR CERTIFICATE OF AIRWORTHINESS FOR THE PROTOTYPE ACCEPTED ON AFTER 1 JANUARY 2006**

**16.1.6 APPLICABILITY**

- (1) The provisions of this section shall be applicable to:
  - (a) all subsonic jet aircraft, including their derived versions, other than aircraft which require a runway length of 610 m or less (with no stop way or clearway) at maximum certificated mass for airworthiness, in respect of which either the application for certificate of airworthiness for the prototype was accepted or another equivalent prescribed procedure was carried out by the Authority, on or after 1 January 2006;
  - (b) all propeller-driven aircraft, including their derived versions, of over 8 618 kg maximum certificated takeoff mass, for which either the application for certificate of airworthiness for the prototype was accepted or another equivalent prescribed procedure was carried out by the Authority, on or after 1 January 2006; and
  - (c) all subsonic jet aircraft and all propeller-driven aircraft certificated originally as satisfying 2. Annex 16, Volume I, shall be re-certificated as requested.
- (2) Notwithstanding this subpart, The Authority may accept that the following situations for jet aircraft and propeller-driven heavy aircraft on the registry do not require demonstration of compliance with the provisions of the requirements of this subpart
  - (a) gear down flight with one or more retractable landing gear down during the entire flight.
  - (b) spare engine and nacelle carriage external to the skin of the aircraft ( and return of the pylon or other external mount); and
  - (c) time-limited engine and or nacelle changes, where the change in type design specifies that the aircraft may not be operated for a period of more than 90 days unless compliance with the provisions of Section 1 of this subpart is shown for that change resulting from a required maintenance action.

**16.1.6.1 NOISE MEASUREMENTS**

The noise evaluation measure shall be the effective perceived noise level in EPNdB as described in ICAO Annex 16, Appendix 2.

**16.1.6.2 REFERENCE NOISE MEASUREMENT POINTS**

An aircraft, when tested in accordance with these provisions, shall not exceed the maximum noise level of the noise measured.

**16.1.6.3 TEST NOISE MEASUREMENT POINTS**

Subsection 16.1.15.2 relating to test noise measurement points shall apply.

**16.1.6.4 MAXIMUM NOISE LEVELS**

- (1) The maximum permitted noise levels shall not be exceeded at any of the measurement points.
- (2) The sum of the differences at all three measurement points between the maximum noise levels and the maximum permitted noise levels shall not be less than 10 EPNdB.
- (3) The sum of the differences at any two measurement points between the maximum noise levels and the corresponding maximum permitted noise levels shall not be less than 2 EPNdB.

**16.1.6.5 NOISE CERTIFICATION REFERENCE PROCEDURES**

The noise certification reference procedures shall be as specified in this subpart.

**16.1.6.6 TEST PROCEDURES**

The test procedures shall be as specified in this subpart.

**16.1.6.7 RE-CERTIFICATION**

For aircraft re-certification shall be granted on the basis that the evidence used to determine compliance with this subpart is as satisfactory as the evidence associated with all aircraft.

**SUBPART E: PROPELLER-DRIVEN AIRCRAFT OVER 5 700 kg APPLICATION FOR CERTIFICATE OF AIRWORTHINESS FOR THE PROTOTYPE ACCEPTED BEFORE 1 JANUARY 1985****16.1.7 APPLICABILITY**

- (1) The provisions defined hereunder are not applicable to:
  - (a) aircraft requiring a runway\* length of 610 m or less at maximum certificated mass for airworthiness;
  - (b) aircraft specifically designed for fire-fighting;
  - (c) aircraft specifically designed for agricultural purposes;
  - (d) aircraft specifically designed for photography purposes; and
  - (e) aircraft specifically designed for aerial work.
- (2) The provisions of this subpart shall be applicable to all propeller-driven aircraft, including their derived versions, of over 5 700 kg maximum certificated take-off mass

for which either the application for a certificate of airworthiness for the prototype was accepted or another equivalent prescribed procedure was carried out by the Authority on or after 6 October 1977 and before 1 January 1985.

- (3) The provisions of this subpart shall be applicable to derived versions and individual aircraft of over 5700 kg maximum certificated take-off mass and to which do not apply and are of the type for which application for a certificate of airworthiness for the prototype was accepted or another equivalent prescribed procedure was carried out by the Authority before 6 October 1977 and for which a certificate of airworthiness for the individual aircraft was issued on or after 26 November 1981.
- (4) The provisions of this subpart shall be applicable to all propeller-driven aircraft, including their derived versions, of over 5 700 kg maximum take-off mass, for which either the application for a certificate of airworthiness for the prototype was accepted, or another equivalent prescribed procedure was carried out by the Authority on or after 1 January 1985.
- (5) Authority may accept that the following situations for jet aircraft and propeller-driven heavy aircraft on its registry do not require demonstration of compliance with the provisions of the Standards of this subpart;
  - (a) gear down flight with one or more retractable landing gear down during the entire flight;
  - (b) spare engine and nacelle carriage external to the skin of the aircraft (and return of the pylon or other external mount); and
  - (c) time-limited engine and nacelle changes, where the change in type design specifies that the aircraft may not be operated for a period of more than 90 days unless compliance with the provisions of this subpart is shown for that change in type design. This applies only to changes resulting from a required maintenance action.

#### 16.1.7.1 NOISE MEASUREMENTS

The noise evaluation measure shall be the effective perceived noise level in EPNdB as described in Annex 16, Appendix 2.

#### 16.1.7.2 REFERENCE NOISE MEASUREMENT POINTS

An aircraft, when tested in accordance with these Standards, shall not exceed the noise levels specified in this subpart at the following points:

- (a) **lateral reference noise measurement point:** the point on a line parallel to and 450 m from the runway centre line or extended runway centre line, where the noise level is at a maximum during take-off;
- (b) **flyover reference noise measurement point:** the point on the extended centre line of the runway and at a distance of 6.5 km from the start of roll;
- (c) **approach reference noise measurement point:** the point on the ground, on the extended centre line of the runway 2 000 m from the threshold. On level ground this corresponds to a position 120 m (395 ft) vertically below the 3° descent path originating from a point 300 m beyond the threshold.

#### 16.1.7.3 TEST NOISE MEASUREMENT POINTS

- (1) If the test noise measurement points are not located at the reference noise measurement points, any corrections for the difference in position shall be made in

the same manner as the corrections for the differences between test and reference flight paths.

- (2) Sufficient lateral test noise measurement points shall be used to demonstrate to the Authority that the maximum noise level on the appropriate lateral line has been clearly determined. Simultaneous measurements shall be made at one test noise measurement point at a symmetrical position on the other side of the runway.
- (3) The applicant shall demonstrate to the Authority that during flight test, lateral and flyover noise levels were not separately optimized at the expense of each other.

#### 16.1.7.4 MAXIMUM NOISE LEVELS

The maximum noise levels, when determined in accordance with the noise evaluation method of Appendix 2, shall not exceed the following:

- (a) **at lateral reference noise measurement point:** 96 EPNdB constant limit for aircraft with maximum take-off mass, at which the noise certification is requested, up to 34 000 kg and increasing linearly with the logarithm of aircraft mass at the rate of 2 EPNdB per doubling of mass from that point until the limit of 103 EPNdB is reached, after which the limit is constant;
- (b) **at flyover reference noise measurement point:** 89 EPNdB constant limit for aircraft with maximum take-off mass, at which the noise certification is requested, up to 34 000 kg and increasing linearly with the logarithm of aircraft mass at the rate of 5 EPNdB per doubling of mass from that point until the limit of 106 EPNdB is reached, after which the limit is constant; and
- (c) **at approach reference noise measurement point:** 98 EPNdB constant limit for aircraft with maximum take-off mass, at which the noise certification is requested, up to 34 000 kg and increasing linearly with the logarithm of aircraft mass at the rate of 2 EPNdB per doubling of mass from that point until the limit of 105 EPNdB is reached, after which the limit is constant.

#### 16.1.7.5 TRADE-OFFS

If the maximum noise levels are exceeded at one or two measurement points:

- (a) the sum of excesses shall not be greater than 3 EPNdB;
- (b) any excess at any single point shall not be greater than 2 EPNdB; and
- (c) any excesses shall be offset by corresponding reductions at the other point or points.

#### 16.1.7.6 NOISE CERTIFICATION REFERENCE PROCEDURES

- (1) The reference procedures shall comply with the appropriate airworthiness requirements.
- (2) The calculations of reference procedures and flight paths shall be approved by the Authority.
- (3) The take-off and approach reference procedures shall be those defined.
- (4) When it is shown by the applicant that the design characteristics of the aircraft would prevent flight being conducted the reference procedures shall:

- (a) Be demanded by those design characteristics which make compliance with the procedures impossible; and
  - (b) be approved by the Authority.
- (5) The reference procedures shall be calculated under the following reference atmospheric conditions:
- (a) sea level atmospheric pressure of 1 013.25 hPa;
  - (b) ambient air temperature of 25°C, i.e. ISA + 10°C except that at the discretion of the authority, an alternative reference ambient air temperature of 15°C, i.e. ISA may be used;
  - (c) relative humidity of 70 per cent; and
  - (d) zero wind.

#### 16.1.7.6.1 TAKE-OFF REFERENCE PROCEDURE

The take-off flight path shall be calculated as follows:

- (a) average take-off power shall be used from the start of take-off to the point where at least the height above runway level shown below is reached. The take-off power used shall be the maximum available for normal operations as scheduled in the performance section of the aircraft flight manual for the reference atmospheric;
  - (i) aircraft with two engines or less — 300 m (985 ft)
  - (ii) aircraft with three engines — 260 m (855 ft)
  - (iii) aircraft with four engines or more — 210 m (690 ft);
- (b) upon reaching the height specified above, the power shall not be reduced below that required to maintain:
  - (i) climb gradient of 4 per cent; or
  - (ii) in the case of multi-engined aircraft, level flight with one engine inoperative;whichever power is the greater;
- (c) the speed shall be the all-engines operating take-off climb speed selected by the applicant for use in normal operation, which shall be at least  $V_2 + 19$  km/h ( $V_2 + 10$  kt) and which shall be attained as soon as practicable after lift-off and be maintained throughout the take-off noise certification test;
- (d) a constant take-off configuration selected by the applicant shall be maintained throughout the take-off reference procedure except that the landing gear may be retracted; and
- (e) the mass of the aircraft at the brake-release shall be the maximum take-off mass at which the noise certification is requested.



**16.1.7.6.2 APPROACH REFERENCE PROCEDURE**

The approach reference flight path shall be calculated as follows

- (a) the aircraft shall be stabilized and following a 3° glide path;
- (b) the approach shall be made at a stabilized airspeed of not less than 1.3 VS + 19 km/h (1.3 VS + 10 kt) with power stabilized during approach and over the measuring point, and continued to a normal touchdown;
- (c) the constant approach configuration used in the airworthiness certification test, but with the landing gear down, shall be maintained throughout the approach reference procedure;
- (d) the mass of the aircraft at the touchdown shall be the maximum landing mass permitted in the approach configuration at which noise certification is requested; and
- (e) the most critical (that which produces the highest noise levels) configuration at the mass at which certification is requested, shall be used.

**16.1.7.7 TEST PROCEDURES**

- (1) The test procedures shall be acceptable to the Authority.
- (2) The test procedures and noise measurements shall be conducted and processed in an approved manner to yield the noise evaluation measure designated as effective perceived noise level, EPNL, in units of EPNdB, as described in Annex 16 Appendix 2.
- (3) Acoustic data shall be adjusted by the methods outlined in Appendix 2 of Annex 16 Vol.1 to the reference conditions specified in this chapter. Adjustments for speed and thrust shall be made as described in Annex 16, Appendix 2.
- (4) If the mass during the test is different from the mass at which the noise certification is requested, the necessary EPNL adjustment shall not exceed 2 EPNdB for take-offs and 1 EPNdB for approaches. Data approved by the certifying authority shall be used to determine the variation of EPNL with mass for both take-off and approach test conditions. Similarly, the necessary EPNL adjustment for variations in approach flight path from the reference flight path shall not exceed 2 EPNdB.
- (5) For the approach conditions the test procedures shall be accepted if the aircraft follows a steady glide path angle of  $3^{\circ} \pm 0.5^{\circ}$ .
- (6) If equivalent test procedures different from the reference procedures are used, the test procedures and all methods for adjusting the results to the reference procedures shall be approved by the Authority. The amounts of the adjustments shall not exceed 16 EPNdB on take-off and 8 EPNdB on approach, and if the adjustments are more than 8 EPNdB and 4 EPNdB respectively, the resulting numbers shall not be within 2 EPNdB of the limit noise levels.

**16.1.8 PROPELLER-DRIVEN AIRCRAFT NOT EXCEEDING 8 618 kg — APPLICATION FOR CERTIFICATE OF AIRWORTHINESS FOR THE PROTOTYPE ACCEPTED BEFORE 17 NOVEMBER 1988****16.1.8.1 APPLICABILITY**

The Standards of this chapter shall be applicable to all propeller-driven aircraft, except those aircraft specifically designed for aerobatic purposes or agricultural or fire fighting uses, of a maximum certificated take-off mass not exceeding 8 618 kg for which:

- (a) application for the certificate of airworthiness for the prototype was accepted, or another equivalent prescribed procedure was carried out by the Authority, on or after 1 January 1975 and before 17 November 1988, except for derived versions for which an application for a certificate of airworthiness was accepted or another equivalent procedure was carried out by the certifying authority on or after 17 November 1988 ; or
- (b) a certificate of airworthiness for the individual aircraft was first issued on or after 1 January 1980.

**16.1.8.2 NOISE EVALUATION MEASURE**

The noise evaluation measure shall be a weighted overall sound pressure level as defined in International Electrotechnical Commission (IEC) Publication 179. The weighting applied to each sinusoidal component of the sound pressure shall be given as a function of frequency by the standard reference curve called “A”.

**16.1.8.3 MAXIMUM NOISE LEVELS**

The maximum noise levels when determined in accordance with the noise evaluation method of Appendix 3 of this subpart shall not exceed the following: — a 68 dB (A) constant limit up to an aircraft mass of 600 kg, varying linearly with mass from that point to 1 500 kg, after which the limit is constant at 80 dB (A) up to 8 618 kg.

**16.1.8.4 NOISE CERTIFICATION REFERENCE PROCEDURES**

The reference procedure shall be calculated under the following reference atmospheric conditions:

- (a) sea level atmospheric pressure of 1 013.25 hPa;
- (b) ambient air temperature of 25°C, i.e. ISA + 10°C.

**16.1.8.5 TEST PROCEDURES**

- (1) Equivalent test procedures approved by the Authority shall be used.
- (2) Tests to demonstrate compliance with the maximum noise levels shall consist of a series of level flights overhead the measuring station at a height of the aircraft shall pass over the measuring point within  $\pm 10^\circ$  from the vertical.
- (3) Over flight shall be performed at the highest power in the normal operating range, stabilized airspeed and with the aircraft in the cruise configuration.



### 16.1.9 PROPELLER-DRIVEN STOL AIRCRAFT

The provisions specified in Attachment B shall may apply to noise certification of propeller-driven STOL aircraft for which a certificate of airworthiness for the individual aircraft was first issued on or after 1 January 1976.

### 16.1.10 HELICOPTERS

#### 16.1.10.1 APPLICABILITY

- (1) The Standards of this subpart shall be applicable to all helicopters, except those designed exclusively for agricultural, fire fighting or external load carrying purposes.
- (2) For a helicopter for which application for the certificate of airworthiness for the prototype was accepted, or another equivalent prescribed procedure was carried out by the Authority, on or after 1 January 1985.
- (3) For a derived version of a helicopter for which application for a change of type design was accepted, or other equivalent prescribed procedure was carried out by the Authority, on or after 17 November 1988.
- (4) For all helicopters, including their derived versions, for which application for the Certificate of Airworthiness for the prototype was accepted, or another equivalent prescribed procedure was carried out by the Authority, on or after 21 March 2002.
- (5) Certification of helicopters, which are capable of carrying external loads or external equipment, shall be made without such loads or equipment fitted.
- (6) An applicant may alternatively elect to show compliance if the helicopter has a maximum certificated take-off mass of 3 175 kg or less.

#### 16.1.10.2 NOISE EVALUATION MEASURE

The noise evaluation measure shall be the effective perceived noise level in EPNdB as described in Appendix 2.

#### 16.1.10.3 REFERENCE NOISE MEASUREMENT POINTS

A helicopter, when tested in accordance with these requirements, shall not the following points:

(a) **Take-off reference noise measurement points:**

- (i) a flight path reference point located on the ground vertically below the flight path defined in the take-off reference procedure and 500 m horizontally in the direction of flight from the point at which transition to climbing flight is initiated .
- (ii) two other points on the ground symmetrically disposed at 150 m on both sides of the flight path defined in the take-off reference procedure and lying on a line through the flight path reference point.

(b) **Over flight reference noise measurement points:**

- (i) A flight path reference point located on the ground 150 m (490 ft) vertically below the flight path.

- (ii) two other points on the ground symmetrically disposed at 150 m on both sides of the flight path defined in the over flight reference procedure and lying on a line through the flight path reference point.

(c) **Approach reference noise measurement points**

- (i) a flight path reference point located on the ground 120 m (395 ft) vertically below the flight path. On level ground, this corresponds to a position 1 140 m from the intersection of the 6.0° approach path with the ground plane;
- (ii) two other points on the ground symmetrically disposed at 150 m on both sides of the flight path defined in the approach reference procedure and lying on a line through the flight path reference point.

#### 16.1.10.4 MAXIMUM NOISE LEVELS

- (1) The maximum noise levels when determined in accordance with the noise evaluation method of Appendix 2 shall not exceed the following:
  - (a) **FOR TAKE-OFF:** 109 EPNdB for helicopters with maximum certificated takeoff mass at which the noise certification is requested, of 80 000 kg and over and decreasing linearly with the logarithm of the helicopter mass at a rate of 3 EPNdB per halving of mass down to 89 EPNdB after which the limit is constant.
  - (b) **FOR OVER FLIGHT:** 108 EPNdB for helicopters with maximum certificated takeoff mass at which the noise certification is requested, of 80 000 kg and over and decreasing linearly with the logarithm of the helicopter mass at a rate of 3 EPNdB per halving of mass down to 88 EPNdB after which the limit is constant.
  - (c) **FOR APPROACH FLIGHT:** 110 EPNdB for helicopters with maximum certificated takeoff mass at which the noise certification is requested, of 80 000 kg and over and decreasing linearly with the logarithm of the helicopter mass at a rate of 3 EPNdB per halving of mass down to 90 EPNdB after which the limit is constant.
- (2) For helicopters specified in 16.1.8.1(4) the maximum noise levels, when determined in accordance with the noise evaluation method of Appendix 2 of Annex 16 Vol.1, shall not exceed the following:
  - (a) **For take-off flight:** 106 EPNdB for helicopters with maximum certificated take-off mass at which the noise certification is requested, of 80 000 kg and over and decreasing linearly with the logarithm of the helicopter mass at a rate of 3 EPNdB per halving of mass down to 86 EPNdB after which the limit is constant.
  - (b) **FOR OVER FLIGHT:** 104 EPNdB for helicopters with maximum certificated take-off mass at which the Noise Certification is requested, of 80 000 kg and over and decreasing linearly with the logarithm of the helicopter mass at a rate of 3 EPNdB per halving of mass down to 84 EPNdB after which the limit is constant.
  - (c) **FOR APPROACH:** 109 EPNdB for helicopters with maximum certificated take-off mass at which the noise certification is requested, of 80 000 kg and over and decreasing linearly with the logarithm of the helicopter mass at a rate of 3 EPNdB per halving of mass down to 89 EPNdB after which the limit is constant.

**16.1.10.5 TRADE-OFFS**

If the noise level limits are exceeded at one or two measurement points:

- (a) the sum of excesses shall not be greater than 4 EPNdB;
- (b) any excess at any single point shall not be greater than 3 EPNdB; and
- (c) any excess shall be offset by corresponding reductions at the other point or points.

**16.1.10.6 NOISE CERTIFICATION REFERENCE PROCEDURES****16.1.10.6.1 GENERAL CONDITIONS**

- (1) The reference procedures shall comply with the appropriate airworthiness Requirement.
- (2) The reference procedures and flight paths shall be approved by the Authority.
- (3) When it is shown by the applicant that the design characteristics of the helicopter would prevent flight being conducted the reference procedures shall:
  - (a) only be demanded by those design characteristics which make compliance with the reference procedures impossible; and
  - (b) be approved by the certificating Authority.
- (4) The reference procedures shall be established for the following reference atmospheric condition;
  - (a) sea level atmospheric pressure of 1 013.25 hPa;
  - (b) ambient air temperature of 25°C, i.e. ISA + 10°C;
  - (c) relative humidity of 70 per cent; and
  - (d) zero wind.
- (5) The maximum normal operating rpm shall be taken as the highest rotor speed for each reference procedure corresponding to the airworthiness limit imposed by the manufacturer and approved by the Authority. Where a tolerance on the highest rotor speed is specified, the maximum normal operating rotor speed shall be taken as the highest rotor speed about which that tolerance is given. If the rotor speed is automatically linked with flight condition, the maximum normal operating rotor speed corresponding with that flight condition shall be used during the noise certification procedure. If rotor speed can be changed by pilot action, the highest normal operating rotor speed specified in the flight manual limitation section for power-on conditions shall be used during the noise certification procedure.

**16.1.10.6.2 TAKE-OFF REFERENCE PROCEDURE**

The take-off reference flight procedure shall be established as follows:

- (a) the helicopter shall be stabilized at the maximum take-off power corresponding to

- minimum installed engine(s) specification power available for the reference ambient conditions or gearbox torque limit, whichever is lower, and along a path starting from a point located 500 m prior to the flight path reference point, at 20 m (65 ft) above the ground;
- (b) the best rate of climb speed  $V_y$ , or the lowest approved speed for the climb after take-off, whichever is the greater, shall be maintained throughout the take-off reference procedure;
  - (c) the steady climb shall be made with the rotor speed stabilized at the maximum normal operating rpm certificated for take-off;
  - (d) a constant take-off configuration selected by the applicant shall be maintained throughout the take-off reference procedure with the landing gear position consistent with the airworthiness certification tests for establishing the best rate of climb speed  $V_y$ ; e) the mass of the helicopter shall be the maximum takeoff mass at which noise certification is requested; and
  - (e) the reference take-off path is defined as a straight line segment inclined from the starting point (500 m prior to the centre microphone location and 20 m (65 ft) above ground level) at an angle defined by Best Rate of Climb (BRC) and  $V_y$  for minimum specification engine performance.

#### 16.1.10.6.3 OVER FLIGHT REFERENCE PROCEDURE

- (1) The over flight reference procedure shall be established as follows:
  - (a) the helicopter shall be stabilized in level flight overhead the flight path reference point at a height of 150 m (492 ft);
  - (b) a speed of  $0.9 V_H$  or  $0.9 V_{NE}$ , or  $0.45 V_H + 120 \text{ km/h}$  ( $0.45 V_H + 65 \text{ kt}$ ) or  $0.45 V_{NE} + 120 \text{ km/h}$  ( $0.45 V_{NE} + 65 \text{ kt}$ ), whichever is the least, shall be maintained throughout the over flight reference procedure;
  - (c) the over flight shall be made with the rotor speed stabilized at the maximum normal operating rpm certificated for level flight;
  - (d) the helicopter shall be in the cruise configuration; and
  - (e) the mass of the helicopter shall be the maximum take-off mass at which noise certification is requested.
- (2) The value of  $V_H$  and  $V_{NE}$  used for noise certification shall be quoted in the Approved flight manual.

#### 16.1.10.6.4 APPROACH REFERENCE PROCEDURE

The approach reference procedure shall be established as follows:

- (a) the helicopter shall be stabilized and following a  $6.0^\circ$  approach path;
- (b) the approach shall be made at a stabilized airspeed equal to the best rate of climb

speed  $V_y$ , or the lowest approved speed for the approach, whichever is the greater, with power stabilized during the approach and over the flight path reference point, and continued to a normal touchdown;

- (c) the approach shall be made with the rotor speed stabilized at the maximum normal operating rpm certificated for approach;
- (d) the constant approach configuration used in airworthiness certification tests, with the landing gear extended, shall be maintained throughout the approach reference procedure; and
- (e) the mass of the helicopter at touchdown shall be the maximum landing mass at which noise certification is requested.

#### 16.1.10.7 TEST PROCEDURES

- (1) The test procedures shall be acceptable to the Authority.
- (2) The test procedures and noise measurements shall be conducted and processed in an approved manner to yield the noise evaluation measure designated as effective perceived noise level, EPNL, in units of EPNdB, as described in Annex 16, Appendix 2.
- (3) Test conditions and procedures shall be closely similar to reference conditions and procedures or the acoustic data shall be adjusted, by the methods outlined in Annex 16, Appendix 2 to the reference conditions and procedures specified in this subpart.
- (4) Adjustments for differences between test and reference flight procedures shall not exceed:
  - (a) for take-off 4.0 EPNdB, of which the arithmetic sum of D1 and the term  $-7.5 \log(QK/QrKr)$  from D2 shall not in total exceed 2.0 EPNdB;
  - (b) for over flight or approach 2.0 EPNdB.
- (5) During the test the average rotor rpm shall not vary from the normal maximum operating rpm by more than  $\pm 1.0$  per cent during the 10 dB-down time period.
- (6) The helicopter airspeed shall not vary from the reference airspeed appropriate to the flight demonstration by more than  $\pm 9$  km/h (5 kt) throughout the 10 dB-down time period.
- (7) The number of level over flights made with a head wind component shall be equal to the number of level over flights made with a tailwind component.
- (8) The helicopter shall fly within  $\pm 10^\circ$  or  $\pm 20$  m, whichever is greater, from the vertical above the reference track throughout the 10 dB-down time period.
- (9) The helicopter height shall not vary during over flight from the reference height at the overhead point by more than  $\pm 9$  m (30 ft).
- (10) During the approach noise demonstration the helicopter shall be established on a stabilized constant speed approach within the airspace contained between approach angles of  $5.5^\circ$  and  $6.5^\circ$ .
- (11) Tests shall be conducted at a helicopter mass not less than 90 per cent of the relevant maximum certificated mass and may be conducted at a mass not exceeding 105 per cent of the relevant maximum certificated mass. For each of the three flight conditions, at least

one test must be completed at or above this maximum certificated mass.

#### **16.1.11 ASSOCIATED AIRCRAFT**

The provisions of Attachment C of Vol. 1 in the Annex 16, shall apply to noise certification of installed auxiliary power units (APU) and associated aircraft systems in:

- (a) all aircraft for which application for a certificate of airworthiness for the prototype was accepted or another equivalent prescribed procedure was carried out by the Authority, on or after 6 October 1977; and
- (b) aircraft of existing type design for which application for a change of type design involving the basic APU installation was accepted or another equivalent prescribed procedure was carried out by the certifying authority.

#### **16.1.12 PROPELLER-DRIVEN AIRCRAFT NOT EXCEEDING 8 618 kg APPLICATION FOR CERTIFICATE OF AIRWORTHINESS FOR THE PROTOTYPE OR DERIVED VERSION ACCEPTED ON OR AFTER 17 NOVEMBER 1988**

##### **16.1.12.1 APPLICABILITY**

- (1) The Standards of this chapter shall be applicable to all propeller-driven aircraft and their derived versions, with a certificated take-off mass not exceeding 8 618 kg, except those aircraft specifically designed for aerobatic purposes and agricultural or fire fighting uses and self-sustaining powered sailplanes.
- (2) For an aircraft for which application for the certificate of airworthiness for the prototype or for all derived versions was accepted, or another equivalent prescribed procedure was carried out by the authority, on or after 17 November 1988.
- (3) For aircraft which fail to comply with the Standards of this chapter and where the application for the certificate of airworthiness for the prototype or all derived versions was accepted, or another equivalent prescribed procedure was carried out by the authority, before 17 November 1993, the Standards shall apply.
- (4) For single-engined aircraft, except those aircraft specifically designed for aerobatic purposes and agricultural or fire fighting uses, self-sustaining powered sailplanes, float planes and amphibians, for which:
  - (a) the application for the certificate of airworthiness for the prototype or their derived versions was accepted, or another equivalent procedure was carried out by the authority, on or after 4 November 1999.
  - (b) an application for the certificate of airworthiness for the derived version was accepted, or other procedure was carried out, on or after 4 November 1999, but for which the application for the certificate of airworthiness for the prototype, or another equivalent procedure was carried out by the authority, before 4 November 1999.
  - (c) the requirements of (b) above apply, but which fail to meet the noise limits of the noise



limits of (a) shall apply provided that the application for the derived version was made before 4 November 2004.

#### **16.1.12.2 NOISE EVALUATION MEASURE**

The noise evaluation measure shall be the maximum A-weighted noise level as defined in Annex 16, Appendix 6.

#### **16.1.12.3 REFERENCE NOISE MEASUREMENT POINTS**

- (1) An aircraft, when tested in accordance with these Directives, shall not exceed the noise level specified in this subpart at the take-off reference noise measurement point.
- (2) The take-off reference noise measurement point is the point on the extended centre line of the runway at distance of 2 500 m from the start of take-off roll.

#### **16.1.12.4 MAXIMUM NOISE LEVELS**

The maximum noise levels determined in accordance with the noise evaluation method of Appendix 6 shall not exceed the following:

- (a) for aircraft specified in 16.155 a 76 dB(A) constant limit up to an aircraft mass of 600 kg varying linearly from that point with the logarithm of aircraft mass until at 1 400 kg the limit of 88 dB(A) is reached after which the limit is constant up to 8 618 kg; and
- (b) for aircraft specified in this subpart, a 70 dB(A) constant limit up to an aircraft mass of 570 kg increasing linearly from that point with the logarithm of aircraft mass until at 1500 kg the limit of 85 dB(A) is reached after which the limit is constant up to 8 618 kg.

#### **16.1.12.5 NOISE CERTIFICATION REFERENCE PROCEDURES**

##### **16.1.12.5.1 GENERAL CONDITIONS**

- (1) The calculations of reference procedures and flight paths shall be approved by the Authority.
- (2) Except in conditions specified in this (3), the take-off reference procedure shall be that defined in 16.1.10.5.2.
- (3) When it is shown by the applicant that the design characteristics of the aircraft would prevent flights being conducted the reference procedures shall:
  - (a) depart from the reference procedures defined only to the extent demanded by those design characteristics which make compliance with the procedures impossible; and
  - (b) be approved by the Authority.
- (4) The reference procedures shall be calculated under the following atmospheric conditions:

- (a) sea level atmospheric pressure of 1 013.25 hPa;
  - (b) ambient air temperature of 15°C, i.e. ISA;
  - (c) relative humidity of 70 per cent; and
  - (d) zero wind.
- (5) The acoustic reference atmospheric conditions shall be the same as the reference atmospheric conditions for flight.

#### **16.1.12.5.2 TAKE-OFF REFERENCE PROCEDURE**

The take-off flight path shall be calculated taking into account the following two phases.

(a) **First phase**

- (i) Take-off power shall be used from the brake release point to the point at which the height of 15 m (50 ft) above the runway is reached.
- (ii) A constant take-off configuration selected by the applicant shall be maintained throughout this first phase.
- (iii) The mass of the aircraft at the brake-release shall be the maximum take-off mass at which the noise certification is requested.
- (iv) The length of this first phase shall correspond to the length given in the airworthiness data for a take-off on a level paved runway.

(b) **Second phase**

- (i) The beginning of the second phase corresponds to the end of the first phase.
- (ii) The aircraft shall be in the climb configuration with landing gear up, if retractable, and flap setting corresponding to normal climb throughout this second phase.
- (iii) The speed shall be the best rate of climb speed  $V_y$ .
- (iv) Take-off power and, for aircraft equipped with variable pitch or constant speed propellers, rpm shall be maintained throughout the second phase. If airworthiness limitations do not permit the application of take-off power and rpm up to the reference point, then take-off power and rpm shall be maintained for as long as is permitted by such limitations and thereafter at maximum continuous power and rpm. Limiting of time for which take-off power and rpm shall be used in order to comply with this sub-section shall not be permitted. The reference height shall be calculated assuming climb gradients appropriate to each power setting used.

#### **16.1.12.6 TEST PROCEDURES**

- (1) The test procedures shall be acceptable to the Authority.
- (2) The test procedures and noise measurements shall be conducted and processed in an



approved manner to yield the noise evaluation measure in units of L<sub>Amax</sub> as described in Appendix 6.

- (3) Acoustic data shall be adjusted by the methods outlined in Annex 16, Appendix 6 to the reference conditions specified in this chapter.
- (4) If equivalent test procedures are used, the test procedures and all methods for correcting the results to the reference procedures shall be approved by the Authority.

### **16.1.13 HELICOPTERS NOT EXCEEDING 3 175 kg MAXIMUM CERTIFICATED TAKE-OFF MASS**

#### **16.1.13.1 APPLICABILITY**

- (1) The requirements of this section shall be applicable to all helicopters having a maximum certificated take-off mass not exceeding 3 175 kg except those designed exclusively for agricultural, fire fighting or external load carrying purposes.
- (2) For a helicopter for which application for the certificate of airworthiness for the prototype was issued, or another equivalent prescribed procedure was carried out by the Authority, on or after 11 November 1993.
- (3) For a derived version of a helicopter for which application for the certificate of airworthiness for a change of type design was issued, or another equivalent prescribed procedure was carried out by the Authority, on or after 11 November 1993.
- (4) For all helicopters, including their derived versions, for which application for the certificate of airworthiness for the prototype was accepted, or another equivalent prescribed procedure was carried out by the Authority, on or after 21 March 2002.
- (5) Certification of helicopters which are capable of carrying external loads or external equipment shall be made without such loads or equipment fitted.
- (6) An applicant may alternatively show compliance with this subpart by providing evidence to the Authority.

#### **16.1.13.2 NOISE EVALUATION MEASURE**

The noise evaluation measure shall be the sound exposure level (SEL) as described in Appendix 4.

#### **16.1.13.3 REFERENCE NOISE MEASUREMENT POINT**

A helicopter, when tested in accordance with these Directives, shall not exceed the noise levels specified in this subpart at a flight path reference point located on the ground 150 m (492 ft) vertically below the flight path .

#### **16.1.13.4 MAXIMUM NOISE LEVEL**

- (1) The maximum noise levels when determined in accordance with the noise evaluation method of Appendix 4 shall not exceed 82 decibels SEL for helicopters with maximum

certificated take-off mass at which the noise certification is requested, of up to 788 kg and increasing linearly with the logarithm of the helicopter mass at a rate of 3 decibels per doubling of mass thereafter.

- (2) The maximum noise levels when determined in accordance with the noise evaluation method of Appendix 4 shall not exceed 82 decibels SEL for helicopters with maximum certificated take-off mass at which the noise certification is requested, of up to 1 417 kg and increasing linearly with the logarithm of the helicopter mass at a rate of 3 decibels per doubling of mass thereafter.

### **16.1.13.5 NOISE CERTIFICATION REFERENCE PROCEDURE**

#### **16.1.13.5.1 GENERAL CONDITIONS**

- (1) The reference procedure shall comply with the appropriate airworthiness requirements and shall be approved by the Authority
- (2) Except as otherwise approved, the over flight reference procedure shall be as defined in this subpart.
- (3) When it is shown by the applicant that the design characteristics of the helicopter would prevent flight being conducted the reference procedure shall be permitted to depart from the specified reference procedure, with the approval of the Authority, but only to the extent demanded by those design characteristics which make compliance with the reference procedures impossible.
- (4) The reference procedure shall be established for the following reference atmospheric conditions:
  - (a) sea level atmospheric pressure of 1 013.25 hPa;
  - (b) ambient air temperature of 25°C;
  - (c) relative humidity of 70 per cent; and
  - (d) zero wind.
- (5) The maximum normal operating rpm shall be taken as the highest rotor speed corresponding to the airworthiness limit imposed by the manufacturer and approved by the Authority for over flight. Where a tolerance on the highest rotor speed is specified, the maximum normal operating rotor speed shall be taken as the highest rotor speed about which that tolerance is given. If rotor speed is automatically linked with flight condition, the maximum normal operating rotor speed corresponding with that flight condition shall be used during the noise certification procedure. If rotor speed can be changed by pilot action, the highest normal operating rotor speed specified in the flight manual limitation section for power-on conditions shall be used during the noise certification procedure.

#### **16.1.13.5.2 REFERENCE PROCEDURE**

- (1) The reference procedure shall be established as follows:
  - (a) the helicopter shall be stabilized in level flight overhead the flight path reference point at a height of 150 m (492 ft)  $\pm$ 15 m (50 ft);

- (b) a speed of 0.9 V<sub>H</sub> or 0.9 V<sub>NE</sub> or 0.45 V<sub>H</sub> + 120 km/h (65 kt) or 0.45 V<sub>NE</sub> + 120 km/h (65 kt), whichever is the least, shall be maintained throughout the over flight procedure. For noise certification purposes, V<sub>H</sub> is defined as the airspeed in level flight obtained using the torque corresponding to minimum engine installed, maximum continuous power available for sea level pressure (1 013.25 hPa), 25°C ambient conditions at the relevant maximum certificated mass. V<sub>NE</sub> is defined as the not-to-exceed airworthiness airspeed imposed by the manufacturer and approved by the certifying authority;
  - (c) the over flight shall be made with the rotor speed stabilized at the maximum normal operating rpm certificated for level flight;
  - (d) the helicopter shall be in the cruise configuration; and
  - (e) the mass of the helicopter shall be the maximum take-off mass at which noise certification is requested.
- (2) The value of V<sub>H</sub> and/or V<sub>NE</sub> used for noise certification shall be quoted in the approved flight manual.

#### 16.1.13.6 TEST PROCEDURES

- (1) The test procedure shall be acceptable to the Authority.
- (2) The test procedure and noise measurements shall be conducted and processed in an approved manner to yield the noise evaluation measure designated as sound exposure level (SEL) in A-weighted decibels, as described in Annex 16, Appendix 4.
- (3) Test conditions and procedures shall be closely similar to reference conditions and procedures or the acoustic data shall be adjusted, by the methods outlined in Annex 16, Appendix 4 to the reference conditions and procedures specified in this subpart.
- (4) During the test, flights shall be made in equal numbers with tailwind and headwind components.
- (5) Adjustments for differences between test and reference flight procedures shall not exceed 2.0 dB(A).
- (6) During the test, the average rotor rpm shall not vary from the normal maximum operating rpm by more than ±1.0 per cent during the 10 dB-down time period.
- (7) The helicopter airspeed shall not vary from the reference airspeed appropriate to the flight demonstration as described in Appendix 4 by more than ±5 km/h (±3 kt) throughout the 10 dB-down time period.
- (8) The helicopter shall fly within ±10° from the vertical above the reference track through the reference noise measurement position.
- (9) Tests shall be conducted at a helicopter mass not less than 90 per cent of the relevant maximum certificated mass and may be conducted at a mass not exceeding 105 percent of the relevant maximum certificated mass.

**16.1.14 SUPERSONIC AIRCRAFT****16.1.14.1 SUPERSONIC AIRCRAFT — APPLICATION FOR CERTIFICATE OF AIRWORTHINESS FOR THE PROTOTYPE ACCEPTED BEFORE JANUARY 1975**

- (1) The provisions of this subpart, with the exception of maximum noise levels shall be applicable to all supersonic aircraft, including their derived versions, in respect of which either the application for the certificate of airworthiness for the prototype was accepted or another equivalent prescribed procedure was carried out by the Authority before 1 January 1975 and for which a certificate of airworthiness for the individual aircraft was first issued after 26 November 1981.
- (2) The maximum noise levels of those aircraft when determined in accordance with the noise evaluation method of Annex 16, Appendix 1, shall not exceed the measured noise levels of the first certificated aircraft of the type.

**16.1.14.2 SUPERSONIC AIRCRAFT — APPLICATION FOR CERTIFICATE OF AIRWORTHINESS FOR THE PROTOTYPE ACCEPTED ON OR AFTER 1 JANUARY 1975.**

- (1) The Standards of this subpart, with the exception of maximum noise levels shall be applicable to all supersonic aeroplanes, including their derived versions, in respect of which either the application for the certificate of airworthiness for the prototype was accepted or another equivalent prescribed procedure was carried out by the Authority before 1 January 1975 and for which a certificate of airworthiness for the individual aeroplane was first issued after 26 November 1981.
- (2) The maximum noise levels of those aeroplanes when determined in accordance with the noise evaluation method of Annex 16, Appendix 1, shall not exceed the measured noise levels of the first certificated aeroplane of the type.

**16.1.15 TILT-ROTOR AIRCRAFT****16.1.15.1 APPLICABILITY**

- (1) The Standards of this subpart shall be applicable to all tilt-rotors, including their derived versions, for which the application for a Type Certificate was submitted on or after 1 January 2018.
- (2) Noise certification of tilt-rotors which are capable of carrying external loads or external equipment shall be made without such loads or equipment fitted.

**16.1.15.2 NOISE EVALUATION MEASURE**

The noise evaluation measure shall be the effective perceived noise level in EPNdB as described in Appendix 2 of this directive. The correction for spectral irregularities shall start at 50 Hz (see 4.3.1 of Appendix 2).

*Note.— Additional data in SEL and LASmax as defined in Appendix 4, and one-third octave SPLs as defined in Appendix 2 corresponding to LASmax should be made available to the Authority for land-use planning purposes.*

**16.1.15.3 NOISE MEASUREMENT REFERENCE POINTS**

- (1) A tilt-rotor, when tested in accordance with the reference procedures of 16.1.15.6 and the test procedures of 16.1.15.7, shall not exceed the noise levels specified in 16.1.15.4 at the following reference points:
  - (a) Take-off reference noise measurement points:
    - (i) a flight path reference point located on the ground vertically below the flight path defined in the take-off reference procedure (see 13.6.2) and 500 m (1 640 ft) horizontally in the direction of flight from the point at which transition to climbing flight is initiated in the reference procedure;
    - (ii) two other points on the ground symmetrically disposed at 150 m (492 ft) on both sides of the flight path defined in the take-off reference procedure and lying on a line through the flight path reference point.
  - (b) Overflight reference noise measurement points:
    - (i) a flight path reference point located on the ground 150 m (492 ft) vertically below the flight path defined in the overflight reference procedure (see 13.6.3)
      - A. two other points on the ground symmetrically disposed at 150 m (492 ft) on both sides of the flight path defined in the overflight reference procedure and lying on a line through the flight path reference point.
  - (c) *Approach reference noise measurement points:*
    - 1) a flight path reference point located on the ground 120 m (394 ft) vertically below the flight path defined in the approach reference procedure (see 13.6.4). On level ground, this corresponds to a position 1 140 m (3 740 ft) from the intersection of the 6.0° approach path with the ground plane;
    - 2) two other points on the ground symmetrically disposed at 150 m (492 ft) on both sides of the flight path defined in the approach reference procedure and lying on a line through the flight path reference point.

**16.1.15.4 MAXIMUM NOISE LEVELS**

- (1) For tilt-rotors specified in 16.1.15.1, the maximum noise levels, when determined in accordance with the noise evaluation method of Appendix 2 for helicopters, shall not exceed the following:
  - (a) *For take-off:* 109 EPNdB for tilt-rotors in VTOL/conversion mode with maximum certificated take-off mass, at which the noise certification is requested, of 80 000 kg and over and decreasing linearly with the logarithm of the tilt-rotor mass at a rate of 3 EPNdB per halving of mass down to 89 EPNdB after which the limit is constant.
  - (b) *For overflight:* 108 EPNdB for tilt-rotors in VTOL/conversion mode with maximum certificated take-off mass, at which the noise certification is requested, of 80 000 kg and over and decreasing linearly with the logarithm of the tilt-rotor mass at a rate of 3 EPNdB per halving of mass down to 88 EPNdB after which the limit is constant.

*Note 1.— For the tilt-rotor in aeroplane mode, there is no maximum noise level.*

*Note 2.— VTOL/conversion mode is all approved configurations and flight modes where the design operating rotor speed is that used for hover operations.*

- (c) *For approach:* 110 EPNdB for tilt-rotors in VTOL/conversion mode with maximum

certificated take-off mass, at which the noise certification is requested, of 80 000 kg and over and decreasing linearly with the logarithm of the tilt-rotor mass at a rate of 3 EPNdB per halving of mass down to 90 EPNdB after which the limit is constant.

*Note.— The equations for the calculation of noise levels as a function of take-off mass presented in Section 7 of Attachment A, for conditions described in Chapter 8, 8.4.1, are consistent with the maximum noise levels defined in 16.1.15.4.*

#### **16.1.15.5 TRADE-OFFS**

If the maximum noise levels are exceeded at one or two measurement points:

- (a) the sum of excesses shall not be greater than 4 EPNdB;
- (b) any excess at any single point shall not be greater than 3 EPNdB; and
- (c) any excess shall be offset by corresponding reductions at the other point or points.

#### **16.1.15.6 NOISE CERTIFICATION REFERENCE PROCEDURES**

##### **16.1.15.6.1 GENERAL CONDITIONS**

- (1) The reference procedures shall comply with the appropriate airworthiness requirements.
- (2) The reference procedures and flight paths shall be approved by the certifying authority.
- (3) Except in conditions specified in (4), the take-off, overflight and approach reference procedures shall be those defined in 16.1.15.6.2, 16.1.15.6.3 and 16.1.15.6.4, respectively.
- (4) When it is shown by the applicant that the design characteristics of the tilt-rotor would prevent a flight from being conducted in accordance with 16.1.15.6.2, 16.1.15.6.3 or 16.1.15.6.4, the reference procedures shall:
  - (a) depart from the reference procedures defined in 16.1.15.6.2, 16.1.15.6.3 or 16.1.15.6.4 only to the extent demanded by those design characteristics which make compliance with the reference procedures impossible; and
  - (b) be approved by the Authority.
- (5) The reference procedures shall be calculated under the following reference atmospheric conditions:
  - (a) constant atmospheric pressure of 1 013.25 hPa;
  - (b) constant ambient air temperature of 25°C, i.e. ISA + 10°C;
  - (c) constant relative humidity of 70 per cent; and
  - (d) zero wind.
- (6) In 16.1.15.6.2(d), 16.1.15.6.3(1)(d) and 16.1.15.6.4(c), the maximum normal operating rpm shall be taken as the highest rotor speed for each reference procedure corresponding to the airworthiness limit imposed by the manufacturer and approved by the certifying authority. Where a tolerance on the highest rotor speed is specified, the maximum normal



operating rotor speed shall be taken as the highest rotor speed about which that tolerance is given. If the rotor speed is automatically linked with the flight condition, the maximum normal operating rotor speed corresponding with the reference flight condition shall be used during the noise certification procedure. If the rotor speed can be changed by pilot action, the maximum normal operating rotor speed specified in the flight manual limitation section for the reference conditions shall be used during the noise certification procedure.

#### **16.1.15.6.2 TAKE-OFF REFERENCE PROCEDURE**

The take-off reference flight procedure shall be established as follows:

- a) a constant take-off configuration, including nacelle angle, selected by the applicant shall be maintained throughout the take-off reference procedure;
- b) the tilt-rotor shall be stabilized at the maximum take-off power corresponding to minimum installed engine(s) specification power available for the reference ambient conditions or gearbox torque limit, whichever is lower, and along a path starting from a point located 500 m (1 640 ft) prior to the flight path reference point, at 20 m (65 ft) above the ground;
- c) the nacelle angle and the corresponding best rate of climb speed, or the lowest approved speed for the climb after take-off, whichever is the greater, shall be maintained throughout the take-off reference procedure;
- d) the steady climb shall be made with the rotor speed stabilized at the maximum normal operating rpm certificated for take-off;
- e) the mass of the tilt-rotor shall be the maximum take-off mass at which noise certification is requested; and
- f) the reference take-off path is defined as a straight line segment inclined from the starting point (500 m (1 640 ft) prior to the centre noise measurement point and 20 m (65 ft) above ground level) at an angle defined by best rate of climb and the best rate of climb speed corresponding to the selected nacelle angle and for minimum specification engine performance.

#### **16.1.15.6.3 Overflight reference procedure**

- (1) The overflight reference procedure shall be established as follows:
  - (a) the tilt-rotor shall be stabilized in level flight overhead the flight path reference point at a height of 150 m (492 ft);
  - (b) a constant configuration selected by the applicant shall be maintained throughout the overflight reference procedures;
  - (c) the mass of the tilt-rotor shall be the maximum take-off mass at which noise certification is requested;
  - (d) in the VTOL/conversion mode, the nacelle angle at the authorized fixed operation point that is closest to the lowest nacelle angle certificated for zero airspeed, a speed of  $0.9 V_{CON}$  and a rotor speed stabilized at the maximum normal operating rpm certificated for level flight shall be maintained throughout the overflight reference

procedure;

*Note.— For noise certification purposes,  $V_{CON}$  is defined as the maximum authorized speed for VTOL/conversion mode at a specific nacelle angle.*

- (e) in the aeroplane mode, the nacelles shall be maintained on the down-stop throughout the overflight reference procedure, with:
  - (i) rotor speed stabilized at the rpm associated with the VTOL/conversion mode and a speed of  $0.9 V_{CON}$ ; and
  - (ii) rotor speed stabilized at the normal cruise rpm associated with the aeroplane mode and at the corresponding  $0.9 V_{MCP}$  or  $0.9 V_{MO}$ , whichever is lesser, certificated for level flight.

*Note.— For noise certification purposes,  $V_{MCP}$  is defined as the maximum operating limit airspeed for aeroplane mode corresponding to minimum engine installed, maximum continuous power (MCP) available for sea level pressure (1 013.25 hPa), 25°C ambient conditions at the relevant maximum certificated mass; and  $V_{MO}$  is the maximum operating (MO) limit airspeed that may not be deliberately exceeded.*

- (2) The values of  $V_{CON}$  and  $V_{MCP}$  or  $V_{MO}$  used for noise certification shall be quoted in the approved flight manual.

#### **16.1.15.6.4 APPROACH REFERENCE PROCEDURE**

The approach reference procedure shall be established as follows:

- (a) the tilt-rotor shall be stabilized and follow a  $6.0^\circ$  approach path;
- (b) the approach shall be in an airworthiness approved configuration in which maximum noise occurs, at a stabilized airspeed equal to the best rate of climb speed corresponding to the nacelle angle, or the lowest approved airspeed for the approach, whichever is the greater, and with power stabilized during the approach and over the flight path reference point, and continued to a normal touchdown;
- (c) the approach shall be made with the rotor speed stabilized at the maximum normal operating rpm certificated for approach;
- (d) the constant approach configuration used in airworthiness certification tests, with the landing gear extended, shall be maintained throughout the approach reference procedure; and
- (e) the mass of the tilt-rotor at touchdown shall be the maximum landing mass at which noise certification is requested.

#### **16.1.15.6.5 TEST PROCEDURES**

- (1) The test procedures shall be acceptable to the Authority.
- (2) The test procedures and noise measurements shall be conducted and processed in an approved manner to yield the noise evaluation measure designated in 16.1.15.2.
- (3) Test conditions and procedures shall be similar to reference conditions and procedures



or the acoustic data shall be adjusted, by the methods outlined in Appendix 2 for helicopters, to the reference conditions and procedures specified in this subpart.

- (4) Adjustments for differences between test and reference flight procedures shall not exceed:
- (a) *for take-off*: 4.0 EPNdB, of which the arithmetic sum of  $\Delta_1$  and the term  $-7.5 \log QK/Q_rK_r$  from  $\Delta_2$  shall not in total exceed 2.0 EPNdB; and
  - (b) *for overflight or approach*: 2.0 EPNdB.
- (5) During the test the average rotor rpm shall not vary from the normal maximum operating rpm by more than  $\pm 1.0$  per cent throughout the 10 dB-down period.

The airspeed of the tilt-rotor shall not vary from the reference airspeed appropriate to the flight demonstration by more than  $\pm 9$  km/h ( $\pm 5$  kt) throughout the 10 dB-down period.

The number of level overflights made with a headwind component shall be equal to the number of level overflights made with a tailwind component.

The tilt-rotor shall fly within  $\pm 10^\circ$  or  $\pm 20$  m ( $\pm 65$  ft), whichever is greater, from the vertical above the reference track throughout the 10 dB-down period (see Figure 8-1).

The height of the tilt-rotor shall not vary during overflight from the reference height throughout the 10 dB-down period by more than  $\pm 9$  m ( $\pm 30$  ft).

During the approach noise demonstration the tilt-rotor shall be established on a stabilized constant speed approach within the airspace contained between approach angles of  $5.5^\circ$  and  $6.5^\circ$  throughout the 10 dB-down period.

Tests shall be conducted at a tilt-rotor mass not less than 90 per cent of the relevant maximum certificated mass and may be conducted at a mass not exceeding 105 per cent of the relevant maximum certificated mass. For each of the flight conditions, at least one test must be completed at or above this maximum certificated mass.

## **PART C**

### **16.1.15.7 NOISE MEASUREMENT FOR MONITORING PURPOSES**

Where the measurement of aircraft noise is made for monitoring purposes, the method outlined in Annex 16, Appendix 5 shall be used. These purposes are described as including: monitoring compliance with and checking the effectiveness of such noise abatement requirements as may have been established for aircraft in flight or on the ground. An indication of the degree of correlation between values obtained by the method used for measuring noise for aircraft design purposes and the method(s) used for monitoring purposes would be necessary.

### **16.1.15.8 ASSESSMENT OF AERODROME NOISE**

Where international comparison of noise assessment around Aerodromes is undertaken, the methodology described in Recommended Method for Computing Noise Contours around Aerodromes (Circ. 205) shall be applied. The methodology described in Recommended Method for Computing Noise Contours around Aerodromes (Circ. 205) shall be applied in National noise assessment procedures and Directives.

**16.1.15.9 BALANCED APPROACH TO NOISE MANAGEMENT**

- (1) The balanced approach to noise management consists of identifying the noise problem at an Aerodrome and then analyzing the various measures available to reduce noise through the exploration of four principle elements, namely reduction of source land-use planning and management noise abatement operational procedures and operating restrictions, with the goal of addressing the noise problem in the most cost- effective manner. All the elements of the balanced approach are addressed in the ICAO guidance on the balanced approach to aircraft noise management (Doc 9829)
- (2) Aircraft operating procedures for noise abatement shall not be introduced unless the Authority, based on appropriate studies and consultation, determines that a noise problem exists.
- (3) Aircraft operating procedures for noise abatement should be developed in consultation with the operators which use the aerodrome concerned.
  - (a) the factors to be taken into operating procedures for noise abatement shall include the following:
    - (i) the nature and extent of the noise problem including:
      - A. the location of noise sensitive areas; and
      - B. critical hours.
    - (ii) the types of aircraft affected, including aircraft mass aerodrome elevation, temperature considerations;
    - (iii) the types of procedures likely to be most effective;
    - (iv) obstacle clearances (PANS-OPS (Doc 8168), Volume I and II); and
    - (v) human performance in the application of the operating Procedures.

**PART 16 VOLUME I – IMPLEMENTING STANDARDS**

GCAA

**IS: 16.1.3 SAMPLE NOISE CERTIFICATION DOCUMENTATION**



CERTIFICATE NUMBER

REPUBLIC OF GHANA

**GHANA CIVIL AVIATION AUTHORITY**

**NOISE CERTIFICATE**

4. Nationality and Registration Mark  9G -	5. Constructor and Constructor's Designation of Aircraft	6. Aircraft Serial No:
7. Engine Model:		
8. Propeller type and model for propeller driven aircraft		
9. Maximum take-off weight: <hr style="border-top: 1px dotted black;"/>		
10. Maximum landing weight: <hr style="border-top: 1px dotted black;"/>		
11. This aircraft has been certified in accordance with the requirements specified in ANNEX 16 to the Conventions on International Civil Aviation Volume (1) Aircraft Noise and Ghana Civil Aviation (Flight Standards) Directives Part 16 Volume I.		
12. Modifications incorporated:		
13. The lateral/ full - power noise level: <hr style="border-top: 1px dotted black;"/>		
14. The approach noise level: <hr style="border-top: 1px dotted black;"/>		
15. The flyover noise level: <hr style="border-top: 1px dotted black;"/>		
16. The overflight noise level: <hr style="border-top: 1px dotted black;"/>		
17. The take-off noise level: <hr style="border-top: 1px dotted black;"/>		
18. Statement of compliance: This certificate is issued pursuant to Volume I of Annex 16 to the Convention on International Civil Aviation and Ghana Civil Aviation (Flight Standards) Directives Part 16 Volume I in respect of the above-mentioned aircraft, which is considered to comply with the indicated noise Standard when maintained and operated in accordance with the relevant requirements and operating limitations.		

19. Date of issue:

.....

.....  
By authority of the Director General  
Ghana Civil Aviation Authority

This Certificate unless suspended, varied or revoked shall continue to be valid.

GCAA

**16.2 - VOLUME II – EMISSIONS**

GCAA

## **INTRODUCTION**

**Part A** of Volume II deals with the protection of the environment from the effect of aircraft engine emissions where such engines are fitted to aircraft engaged in international civil aviation.

Part B of this Volume deals with the protection of the Aerodrome from the effect of aircraft noise and also addresses general aviation's impact on the environment.

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## 16.2.1 DEFINITIONS AND SYMBOLS

## Part 16 – Environmental Protection

## 16.2.1.1 DEFINITIONS

Where the following expressions are used in this subpart, they shall have the following meanings:

**Afterburning.** A mode of engine operation wherein a combustion system fed (in whole or part) by vitiated air is used.

**Aircraft operator** means the natural or juridical person operating and directing an aircraft, and putting it to use either personally or through his employees, agents or subsidiaries, and its crew members shall be under his instructions and commands, whether he is an owner, lessee or in possession thereof”.

**Aerodrome operator** means the party responsible to operate the Aerodrome and holds an Aerodrome Operating Certificate.

**Approach phase.** The operating phase defined by the time during which the engine is operated in the approach operating mode.

**Authority** means the Ghana Civil Aviation Authority.

**Carbon sink** means a natural or man-made feature that achieves a net reduction in atmospheric carbon dioxide.

**Climb phase.** The operating phase defined by the time during which the engine is operated in the climb operating mode.

**Date of manufacture.** The date of issue of the document attesting that the individual aircraft or engine as appropriate conforms to the requirements of the type or the date of an analogous document.

**Derivative version.** An aircraft gas turbine engine of the same generic family as an originally type- certificated engine and having features which retain the basic core engine and combustor design of the original model and for which other factors, as judged by the Authority, have not changed.

**Emissions** means gases and particles emitted as a result of fossil fuel combustion.

**Environment** means the surroundings which include the living and nonliving beings, the materials contained, and what surrounds it, such as air, water, soil, and interactions of any of them, as well as the establishments built by the human being.

**Exhaust nozzle.** In the exhaust emissions sampling of gas turbine engines where the jet effluxes are not mixed (as in some turbofan engines, for example) the nozzle considered is that for the gas generator (core) flow only. Where, however, the jet efflux is mixed the nozzle considered is the total exit nozzle.

**Hazardous Waste** means management, Transportation and Handling of Harmful and Hazardous Substances.

**Non-volatile particulate matter (nvPM).** Emitted particles that exist at a gas turbine engine exhaust nozzle exit plane that do not volatilize when heated to a temperature of

350°C.

**Movement** means an aircraft take off and related taxiing or other motion, or an aircraft landing and related taxiing or other motion.

**Multiple departure** applies only to flying training organizations and means either an agreed number of take-offs or “touch-and-goes” by an individual aircraft during a notified flight, (such agreement being between the Aerodrome operator and the aircraft operator), or the actual number of recorded departures during the notified flight.

**Oxides of nitrogen.** The sum of the amounts of the nitric oxide and nitrogen dioxide contained in a gas sample calculated as if the nitric oxide were in the form of nitrogen dioxide.

**Quarantine waste** means organic waste generated on a flight arriving in Ghana from another country, and includes vegetable, fruit, meat, food, beverage and similar wastes and any materials that may be in contact with these wastes such as cutlery.

**Rated thrust.** For engine emissions purposes, the maximum take-off thrust approved by the certificating authority for use under normal operating conditions at ISA sea level static conditions, and without the use of water injection. Thrust is expressed in kilonewtons.

**Reference pressure ratio.** The ratio of the mean total pressure at the last compressor discharge plane of the compressor to the mean total pressure at the compressor entry plane when the engine is developing take-off thrust rating in ISA sea level static conditions.

**Smoke.** The carbonaceous materials in exhaust emissions which obscure the transmission of light.

**Smoke Number.** The dimensionless term quantifying smoke emissions.

**Solid Waste** means management of Solid Waste Regulations.

**Take-off phase.** The operating phase defined by the time during which the engine is operated at the rated output.

**Taxi/ground idle.** The operating phases involving taxi and idle between the initial starting of the propulsion engine(s) and the initiation of the take-off roll and between the time of runway turn-off and final shutdown of all propulsion engine(s).

**Tenant** means any organization – other than the relevant Aerodrome operator – who carries out any form of activities at the Aerodrome under a contract with the Aerodrome operator.

**Type certificate.** A document issued by a Contracting State to define the design of an aircraft, engine or propeller type and to certify that this design meets the appropriate airworthiness requirements of that State.

**Unburned hydrocarbons.** The total of hydrocarbon compounds of all classes and molecular weights contained in a gas sample, calculated as if they were in the form of methane.

**16.2.1.2 SYMBOLS**

The following symbols as used in this Section, shall have the meanings ascribed to them below:

- CO:** Carbon monoxide
- D<sub>p</sub>:** The mass of any gaseous pollutant emitted during the reference emissions landing and take-off cycle
- F<sub>n</sub>:** Thrust in International Standard Atmosphere (ISA), sea level conditions, for the given operating mode
- F<sub>oo</sub>:** Rated thrust (see definition)
- F\*<sub>oo</sub>:** Rated thrust with afterburning applied
- HC:** Unburned hydrocarbons.
- NO:** Nitric oxide
- NO<sub>2</sub>:** Nitrogen dioxide
- NO<sub>x</sub>:** Oxides of nitrogen
- nvPM:** Non-volatile particulate matter (see definition)
- SN:** Smoke Number
- π<sub>oo</sub>:** Reference pressure ratio (see definition)

**PART A – AIRCRAFT FUEL EMISSIONS****16.2.2 VENTED FUEL**

- (1) The provision of this Part shall apply to all turbine engine powered aircraft intended for operation in international air navigation manufactured after 18 February 1982.
- (2) Certification related to the prevention of intentional fuel venting shall be validated by the Authority on the basis of satisfactory evidence that either the aircraft or the aircraft engines comply with the requirements of Annex 16 Volume II.
- (3) The Authority may recognize as valid a certification relating to fuel venting granted by the certifying authority of another Contracting State provided the requirements under which such certification was granted are not less stringent than the provisions of Annex 16 Volume II.

**16.2.3 PREVENTION OF INTENTIONAL FUEL VENTING**

Aircraft shall be so designed and constructed as to prevent the intentional discharge into the atmosphere of liquid fuel from the fuel nozzle manifolds resulting from the process of engine shutdown following normal flight or ground operations.

**16.2.4 EMISSIONS CERTIFICATION**

**Part 16 – Environmental Protection**

- (1) The provisions of this subpart shall apply to all engines and their derivative versions included in the classifications defined for emission certification purposes where such engines are fitted to aircraft engaged in international air navigation.
- (2) Emissions certification shall be validated by the Authority on the basis of satisfactory evidence that the engine complies with requirements which are at least equal to the stringency of the provisions of Annex 16 Volume II.
- (3) The document attesting emissions certification for each individual engine shall include at least the following information which is applicable to the engine type:
  - (a) name of certifying authority;
  - (b) manufacturer's type and model designation;
  - (c) statement of any additional modifications incorporated for the purpose of compliance with the applicable emissions certification requirements;
  - (d) rated thrust;
  - (e) reference pressure ratio;
  - (f) a statement indicating compliance with Smoke Number requirements;
  - (g) a statement indicating compliance with gaseous pollutant requirements.
- (4) The Authority shall recognize as valid emissions certification granted by the certifying authority of another Contracting State provided that the requirements under which such certification was granted are not less stringent than the provisions of Annex 16 Volume II.
- (5) The Authority shall recognize as valid engine exemptions for an engine production cut-off requirement granted by a certifying authority of another Contracting State provided that the exemptions are granted in accordance with the process and criteria defined in the Environmental Technical Manual (Doc 9501), Volume II — Procedures for the Emissions Certification of Aircraft Engines.

**PART B – CERTIFICATION STANDARD FOR AIRCRAFT CO<sub>2</sub> EMISSIONS BASED ON THE CONSUMPTION OF FUEL****16.2.5 APPLICABILITY**

The provisions of this part shall apply to all aircraft included in the classifications defined for CO<sub>2</sub> emissions certification purposes in Annex 16 Volume III Chapter 2 where such aircraft are engaged in international air navigation.

**16.2.6 VALIDATION OF AIRCRAFT ENGINE CO<sub>2</sub> CERTIFICATION**

- (1) CO<sub>2</sub> emissions certification shall be validated by the Authority on the basis of satisfactory evidence that the aircraft complies with requirements that are at least equal to the applicable Standards specified in Annex 16 Volume III.

*Note: See Part 16 Volume (II) IS:16.2.6 for the format and structure of engines*

- (2) The Authority shall recognize as valid a CO<sub>2</sub> emissions certification granted by another Contracting State provided that the requirements under which such certification was granted are at least equal to the applicable Standards specified in Annex 16 Volume III.
- (3) The amendment of Annex 16 Volume III to be used by the Authority shall be that which is applicable on the date of submission to a Contracting State for either a Type Certificate in the case of a new type, approval of a change in type design in the case of a derived version, or under equivalent application procedures prescribed by the certifying authority of that Contracting State.
- (4) Unless otherwise specified in this volume of Part 16, the date to be used by the Authority in determining the applicability of ICAO Standards shall be the date the application for a Type Certificate was submitted to the State of Design, or the date of submission under an equivalent application procedure prescribed by the certifying authority of the State of Design.
- (5) The Authority shall only validate CO<sub>2</sub> emissions certification if the application was effective for the period specified in the airworthiness regulations appropriate to the aircraft type, except in special cases where the certifying authority granted an extension. When the period of effectivity is extended, the date to be used in determining the applicability of ICAO Standards in this Annex shall be the date of issue of the Type Certificate, or approval of the change in type design, or the date of issue of approval under an equivalent procedure prescribed by the State of Design, less the period of effectivity.
- (6) For derived versions of non-CO<sub>2</sub>-certified aircraft and derived versions of CO<sub>2</sub>-certified aircraft, the applicability provisions concerning ICAO Standards refer to the date on which “the application for the certification of the change in type design” was made. The date to be used by the Authority in determining the applicability of ICAO Standards shall be the date on which the application for the change in type design was submitted to the Contracting State that first certified the change in type design.
- (7) Where the provisions governing the applicability of the Standards of this Annex refer to the date on which the certificate of airworthiness was first issued to an individual aircraft, the date to be used by the Authority in determining the applicability of ICAO Standards shall be the date on which the first certificate of airworthiness was issued by any Contracting State.
- (8) The certifying authority shall publish the certified CO<sub>2</sub> emissions evaluation metric value granted or validated by that authority.
- (9) The use of equivalent procedures in lieu of the procedures specified in the appendices of Annex 16 Volume III shall be approved by the certifying authority.
- (10) The Authority shall recognize valid aircraft exemptions granted by an authority of another Contracting State responsible for production of the aircraft provided that an acceptable process was used.

**PART C      AIRCRAFT ENGINE EMISSIONS.****16.2.7 OPERATION OF AIRCRAFT.**

For the purpose of this Section, all civil aviation aircraft using Ghana Aerodromes shall meet the requirements of these Directives.

#### **16.2.8 OPERATIONAL PROCEDURES TO MINIMIZE AIRCRAFT ENGINE EMISSIONS.**

- (1) Within 6 months of the implementation of this Part, the Aerodrome operator shall submit to the Authority's operational procedures to reduce aircraft engine emissions at Aerodromes. The following procedures shall be considered in addition to others that the Aerodrome operator may specify:
  - (a) Delayed engine start up.
  - (b) Use of ground power units in place of auxiliary power units.
  - (c) Use of low power/low drag procedure.
  - (d) Taxiing with minimum engines running.
  - (e) Shutting down of engines immediately upon arrival at the ramp or apron.
- (2) The Authority shall give its determination on the specified operational procedures within 30 working days of receipt of the measures.
- (3) The Aerodrome operator shall require aircraft operators to implement the operational procedures to reduce aircraft emissions at the Aerodrome within 14 working days of the date of issuance of an approval by the Authority.

#### **16.2.9 SUPPLEMENTAL VOLUNTARY MEASURES.**

The Aerodrome operator shall negotiate supplemental agreements with airline operators to provide for the achievement of further reductions in aircraft engine emissions by the airline companies. These agreements shall be implemented voluntarily by airline operator(s) and shall achieve reduced aircraft takeoff weight, reduced fuel use and/or greater fuel efficiency among other measures that might also be achieved to reduce emissions. Commitments shall be documented using formats provided by the International Civil Aviation Organization (ICAO).

#### **16.2.10 EMISSIONS MONITORING**

The Aerodrome Operator shall install emissions monitoring equipment to monitor emissions at the Aerodrome to determine non-compliance with operational measure set to reduce emissions as prescribed the Authority.

#### **16.3.1 NOISE MONITORING**

The Aerodrome operator shall install noise-monitoring equipment to monitor noise levels at the Aerodrome to determine non-compliance with operational measure set to reduce noise.



**NOVEMBER 2018**

**GHANA CIVIL AVIATION (AERODROMES) DIRECTIVES**

*Part 16 – Environmental Protection*

**PART 16 VOLUME II – IMPLEMENTING  
STANDARDS**

IS: 16.2.6 SAMPLE ENGINE EMISSIONS CERTIFICATION DOCUMENTATION



CERTIFICATE NUMBER

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REPUBLIC OF GHANA  
**GHANA CIVIL AVIATION  
AUTHORITY**

**ENGINE EMISSIONS  
CERTIFICATE**

2. Manufacturer's Type and Model Designation

Certification Standard: ANNEX 16 to the Conventions on International Civil Aviation Volume (II) & (III) and Ghana Civil Aviation (Flight Standards) Directives Part 16 Volume (II) & (III).

- 3. Modifications incorporated: .....
- 4. Rated thrust .....
- 5. Reference pressure ration: .....
- 6. Compliance with Smoke Number: .....
- 7. Compliance with gaseous pollutant: .....
- 8. Exemptions for engine production cut-off: .....
- 9. CO<sub>2</sub> Certification: .....

This certificate is issued pursuant to Volume II of Annex 16 to the Convention on International Civil Aviation and Ghana Civil Aviation (Flight Standards) Directives Part 16 Volume (II) & (III) in respect of the above-mentioned engine, which is considered to comply with the indicated emissions Standard when maintained and operated in accordance with the relevant requirements and operating limitations.

19. Date of issue:.....

.....  
By authority of the Director General  
Ghana Civil Aviation Authority

This Certificate unless suspended, varied or revoked shall continue to be valid.

GCAA

**VOLUME III – AERODROME  
ENVIRONMENTAL STANDARDS**

GHANA

**PART A - AERODROME ENVIRONMENTAL STANDARDS****16.3.1 APPLICABILITY**

- (1) The Authority shall supervise all aspects of this Part related to aviation environmental issues and its implementation. Relevant Government Authorities shall supervise also non-aviation environmental issues.
- (2) Aerodrome operators shall ensure that appropriate staff with environmental management expertise exists to coordinate the implementation of this Part and shall promptly communicate the name(s) of the individual responsible for environmental management to the Authority.
- (3) Where Aerodrome operator does not have environmental office, within 6 months of the enactment of this Part, each Aerodrome operator shall identify and, as necessary, train appropriate staff to ensure sufficient environmental management capacity to coordinate the implementation of this Part at the Aerodrome operator level and shall promptly communicate the name of the individual responsible for environmental management to the Authority.
- (4) Aerodrome operators shall adhere to the requirements of this Part. Aerodrome operators shall also ensure that all entities and individuals who undertake operations or other activities on their behalf meet the environmental standards, procedures and requirements set out in this Part. Where more than one entity has a responsibility for Aerodrome operations, each such entity shall meet the requirements set out in this Part.
- (5) Aircraft operators shall meet aircraft performance standards set out in this Part, or referred to by this Part.
- (6) Entities and individuals that undertake activities on Aerodrome property shall undertake the actions necessary to comply with the requirements of this Part. Tenants shall be responsible for ensuring that any of their sub-contractors or other employees comply with the requirements of this Part.
- (7) All reports, charts, maps and other documents required to be provided to the Authority by this Part, shall be in both electronic and hard copy formats.
- (8) Nothing in this Part shall be understood or construed to prevent the application of any other requirement that may be required by any other government entity according to applicable laws.

**PART B - AERODROME NOISE.****16.3.2 PREPARATION OF NOISE CONTOURS**

- (1) Aerodrome operators shall prepare noise contour maps for the Aerodromes for which they are responsible in accordance with this Part within 6 months of the effective date of this Part. Aerodrome operators shall submit noise contour maps to the Authority within 40 working days of their completion.

**Part 16 – Environmental Protection**

- (2) Aerodrome operators shall submit to the Authority, noise contour maps assessment report once every two years for review.
- (3) Validation of the noise contour maps shall be through:
- (a) A revision of the aircraft fleet mix that was used to construct noise contours; or
  - (b) A new run of the noise model if the aircraft fleet mix does not fall within the criteria established for the previous noise contour development; or
  - (c) On-site measurement of noise levels.
- (4) The Authority shall review noise contour maps submitted to it and shall approve them within 30 working days provided they meet the requirements for preparation of noise contour maps set out in Volume I of this Part.

**16.3.3 NOISE REDUCTION AND MANAGEMENT MEASURES.**

Where a noise contour map referred to in 16.1 of this Part, identifies a non-compatible land use with respect to 16.1 of this Part, the Authority shall immediately order the Aerodrome operator to:

- (a) Specify and implement operational procedures to reduce noise levels in specific areas to become compatible with the existing land use as specified in Volume I of this Part, and
- (b) Prepare, in consultation with the appropriate authorities, a Noise Reduction and Management Plan to be implemented in the case where the operational procedures to reduce noise were ineffective in reaching compatible noise levels as specified by the Authority.

**16.3.4 OPERATIONAL PROCEDURES TO REDUCE NOISE.**

Where the Aerodrome operator receives an order from the Authority to specify and implement operational procedures to reduce noise at the aerodrome, the Aerodrome operator shall consider the following, in consultation with the concerned parties, among other things that may be specified by the Authority:

- (a) Selection of runways to reduce noise in adjacent communities.
- (b) Delayed engine start up.
- (c) Use of ground power units in place of auxiliary power units.
- (d) Application of continuous descent approach procedures.
- (e) Use of low power/low drag procedure.
- (f) Minimizing flap angles.
- (g) Reduced use of reverse thrust.
- (h) Taxiing with fewer engines running.

- (i) Joining the instrument landing slope from a higher angle.
- (j) Enforced shut down of engines while on the apron/ramp.
- (k) Requirements for aircraft to maintain airspace allotted for take-off and landing.
- (l) Imposing curfews.
- (m) The Aerodrome operator shall specify, and forward to the Authority, operational measures within 30 working days of an order being issued by the Authority under this Section after consulting with all relevant Aerodrome operational units.
- (n) The Authority shall give its determination on the specified operational measures within 30 working days of receipt of the measures.
- (o) The Aerodrome operator shall implement operational procedures to reduce noise at the Aerodrome within 60 working days of the date of issuance of an approval by the Authority.

#### 16.3.5 NOISE REDUCTIONS AND MANAGEMENT PLAN.

- (1) Where the Aerodrome operator receives an order to prepare a Noise Reduction and Management Plan under this Section, and/or where operational conditions prescribed by the Authority exist, the Aerodrome operator shall develop a Noise Reduction and Management Plan to reduce noise levels in the non-compatible area to levels that fall within the criteria of the Environmental Protection Agency (EPA).
- (2) The Noise Reduction and Management Plan shall include the following:
  - (a) Operational measures in accordance with those approved by the Authority or, if these have not been approved at the time the Noise Reduction and Management Plan are submitted to the Authority they shall be added as soon as they have been approved.
  - (b) Identification of properties and buildings in the area(s) of non-compatible land use identified by the noise contour maps together with specification of measures to be undertaken by the Aerodrome operator to reduce Aerodrome noise in buildings in these areas. The measures to be specified shall include, as appropriate and among other measures that may be considered appropriate:
    - (i) installation of windows and doors designed to reduce noise.
    - (ii) installation of noise insulation.
    - (iii) construction of berms on Aerodrome property.
    - (iv) installation of noise barriers.
  - (c) Identification of the sites that will be used for aircraft noise monitoring.
  - (d) The identification of a schedule of noise charges that shall be paid by aircraft operators for each aircraft movement at the Aerodrome.

- (e) A schedule for terminating within 3 years following commencement of the implementation of the Noise Reduction and Management Plan, the use of the Aerodrome by aircraft that do not meet Stage 3 noise certification standards as specified by this Part, or subsequent noise certification standards for quieter aircraft that may be adopted by the Authority.
  - (f) Specified restrictions in the use of the Aerodrome by aircraft in the event that other measures to reduce noise in communities adjacent to the Aerodrome do not reduce noise levels to within the thresholds.
  - (g) An implementation and financing plan in accordance with this Part shall achieve implementation of all measures in this part within 3 years of approval of the plan by the Authority, which shall be implemented as necessary after the third year following approval of the Noise Reduction and Management Plan to achieve noise levels to within the thresholds.
- (3) The Aerodrome operator shall submit the Noise Reduction and Management Plan to the Authority within 12 months of receiving an order under this Section.
- (4) The Authority shall give its determination on the specified operational measures within 30 working days of receipt of the Noise Reduction and Management Plan.
- (5) Where an updated noise contour map prepared after the implementation of operational procedures identified in this Section identifies a continuing level of noise that exceeds the levels as determined under this Part, the Authority shall within 60 working days of receipt of the updated noise contour map, orders the Aerodrome operator to implement the measures of the Noise Reduction and Management Plan.
- (6) The Authority shall monitor the implementation of the Noise Reduction and Monitoring Plan and may order the Aerodrome operator to take additional measures to reduce noise.

### **16.3.6 AERODROME OPERATIONS.**

#### **16.3.6.1 GENERAL**

The Aerodrome Operator shall undertake Aerodrome operations in compliance with the requirements of this Part and in compliance with the environmental and planning requirements of relevant government authorities.

#### **16.3.6.2 NON-HAZARDOUS SOLID WASTE MANAGEMENT**

The Aerodrome operator and all parties operating at the Aerodrome:

- (a) Shall manage their non-hazardous solid waste in accordance with the requirements of the Environmental Protection Agency (EPA) “Solid Waste Management”, or the requirements of relevant authorities, as applicable, through an established Non-Hazardous Solid Waste Management Plan.
- (b) Shall not dispose of solid waste except in containers that are designed for solid waste management and for which the Aerodrome operator, service provider or commercial entity, as appropriate, has made waste collection and disposal



arrangements and which comply with international or national requirements which relate to recycling of non-hazardous solid waste.

- (c) Shall not discard solid waste into a solid waste container that is too small for the waste or which is too full to properly accommodate the waste.
- (d) Shall not place liquids in a container designed or intended for solid waste.

#### **16.3.6.3 HAZARDOUS WASTES.**

The Aerodrome operator and all parties operating at the Aerodrome shall prepare a Management Plan that identifies actions to address hazardous waste at the Aerodrome. The plan shall be in accordance with the requirements of EPA on Hazardous Waste Management and Handling (Storage of Hazardous Substances), or the requirements of relevant authorities, as applicable.

#### **16.3.6.4 DANGEROUS GOODS.**

Aerodrome operator and all parties operating at the Aerodrome shall manage their Dangerous Goods in accordance with the requirements of Part 18 of the Ghana Civil Aviation (Flight Standards) Directives and ICAO Document 9284. Airline operators who are International Air Transport Association (IATA) members shall also be required to comply with the requirements of the IATA Technical Instructions.

#### **16.3.7 SPILLS MANAGEMENT.**

##### **16.3.7.1 PLANNING**

- (1) The Aerodrome operator and all parties operating at the Aerodrome and who store, transport or use dangerous goods, hazardous materials or who generate any hazardous waste shall prepare a Hazardous Materials Spills Management Plan that identifies actions to address spills of hazardous goods or hazardous waste in accordance with the Ministry of the Environment, Science and Technology on Environmental Protection from Pollution in Emergency Cases, Regulation on Hazardous Waste Management and Handling – General Requirements for Storage of Hazardous Substances, issued by Ghana Institution for Standards and Meteorology, Ghana Atomic Energy Commission, as well as ICAO Document 9284 requirements.
- (2) The Hazardous Materials Spills Management Plan for each service provider and commercial entity operating at the Aerodrome shall specify actions to be taken at their own facilities as well as at notification of appropriate officials and Aerodrome operations.
- (3) The Hazardous Materials Spills Management Plan of the Aerodrome operator shall address the actions at facilities it operates itself, as well as the range of requirements in this Part.
- (4) The Hazardous Materials Spills Management Plan shall include the minimum quantities of spills that must be reported to the Authority.

- (5) The Aerodrome operator and all parties operating at the Aerodrome shall submit their Hazardous Materials Spills Management Plans to the Authority, within 3 months of establishment of the party that uses or generates the hazardous waste for Aerodrome operators and parties already established on the Aerodrome, and prior to the establishment of the party for new entities. The Authority shall approve them when it is satisfied that the Hazardous Materials Spills Management Plan will provide an effective response to a hazardous materials spill, and shall advise the concerned party of its decision within 30 working days of receipt of the Hazardous Material Spills Management Plans.
- (6) The Aerodrome operator shall ensure that the approved Hazardous Material Spills Management Plans are distributed to all relevant parties.
- (7) The Aerodrome operator shall designate staff members contactable 24 hours per day who shall have responsibility for taking action in respect to spills of hazardous goods or hazardous waste, and shall communicate details regarding contacting these staff members to all parties operating at the Aerodrome.

#### **16.3.7.2 IMPLEMENTATION.**

- (1) The operator of the facility in which the spill occurred shall be responsible for the containment and clean-up of the spill and for actions to address the spill and its consequences within the facility it operates.
- (2) The operator of the facility in which a spill has occurred shall immediately contact the Aerodrome operator or the relevant authority, as appropriate, and to report the spill.
- (3) The Aerodrome operator, in consultation with the appropriate government authority, shall be responsible for determining whether the spill poses a threat to other facilities, to people outside the facility in which the spill occurred, or to the environment, and shall undertake all communication and coordination measures necessary to protect people, property and the environment from the consequences of the spill.
- (4) The Aerodrome operator and all parties operating at the Aerodrome shall immediately implement their Hazardous Materials Spills Management Plan in the event of a spill of a hazardous good or a hazardous waste.
- (5) All parties operating at the Aerodrome must immediately contact the Aerodrome operations department in the event of a spill of a hazardous good or a hazardous waste for which they are responsible.

#### **16.3.7.3 ENFORCEMENT.**

The Aerodrome Operator may order the Aerodrome operator or the responsible party, as may be appropriate, for causing the spill to take additional actions to address spills or the clean-up of spills. The additional actions required shall be at the expense of the party found to have caused the spill.

**16.3.7.4 SURFACE WATER AND WASTEWATER.**

- (1) The Aerodrome Operator shall ensure that surface waters are separately collected and stored on Aerodrome for non-potable usage. Surplus shall, in any case, be discharged separately from sewage and other wastewater.
- (2) The Aerodrome operator shall ensure that wastewater generated on the Aerodrome property is managed through a system that ensures it is treated prior to discharge in accordance with standards prepared by relevant Institution for responsible for applicable regulatory standards.
- (3) The Aerodrome operator and all parties operating at the Aerodrome shall ensure that no hazardous goods or hazardous waste, including oil, fuel or chemical substance, is discarded into the surface water management system or into the wastewater management system.

**16.3.8 ATMOSPHERIC EMISSIONS.**

The Aerodrome operator and all parties operating at the Aerodrome shall not discharge gases or vapors to the atmosphere except in accordance with the standards and provisions of EPA or relevant authorities as applicable on Ambient Air Quality,

**16.3.9 WILDLIFE MANAGEMENT.**

Wildlife at the Aerodrome shall be managed in accordance with the provisions of the appropriate regulatory agency in Ghana.

**16.3.10 LAND USE WITHIN AERODROMES.**

Land use within the Aerodrome shall be managed by the Aerodrome operator in accordance with the rules and procedures established by the Aerodrome operator.

**16.3.11 LAND USE PLANNING AROUND AERODROMES.**

- (1) In accordance with the Ghana Civil Aviation Act, Act 678, the approval of land use planning around the Aerodrome is the responsibility of the Authority and shall be determined in cooperation with the concerned Ministries, Municipalities, District and Assemblies (MMDAs).
- (2) In the case of land around the Aerodrome, the Aerodrome operator shall comply with approved land use plans.
- (3) In the case of any actual or suspected infringement, such infringement shall be reported by the relevant Aerodrome operator to the appropriate land authority and to the Authority for redress accordingly.

**16.3.12 ENVIRONMENTAL MANAGEMENT SYSTEM**

Aerodrome Operators shall develop an Environmental Management System to be submitted to the Authority for approval. The Environmental Management System shall

address the environmental compliance requirements of this Part by both the Aerodrome operator and by the services and commercial entities operating at the Aerodrome under agreement with the Aerodrome operator.

**Part 16 – Environmental Protection**

**16.3.12.1 Content of an Environmental Management System**

- (1) The Environmental Management System document to be submitted to the Authority shall satisfy the following criteria:
  - (a) The Environmental Policy statement for the Aerodrome operator that provides the Aerodromes' commitment to environmental quality.
  - (b) The Environmental Management Plan to be implemented by the Aerodrome operator, including:
    - i. environmental priorities of the Aerodrome operator during the period during the Aerodrome certification period to ensure compliance with applicable environmental requirements.
    - ii. How the priorities shall be achieved.
    - iii. General timing of key actions to achieve the priorities.
    - iv. financial resources necessary to achieve the priorities and how they shall be raised.
  - (c) The Environmental Monitoring and Enforcement Plan to be implemented by the Aerodrome operator, including:
    - i. Mechanisms for monitoring the proper environmental performance of all parties operating at the Aerodrome.
    - ii. Mechanisms for enforcing the environmental management obligations of all parties operating at the Aerodrome.
    - iii. Provision to the Authority of a report annually that verifies the compliance of the Aerodrome operator and all parties operating at the Aerodrome with the environmental requirements set out in this Part as well as including non-compliance and corrective actions.
- (2) The Authority shall give its determination on the specified operational measures within 20 working days of receipt of the measures.

**16.3.13 ENVIRONMENTAL IMPACT ASSESSMENT.**

- (1) The Aerodrome operator shall notify the Authority of any construction or other development they propose to undertake and shall conduct an Environmental Impact Assessment, in accordance with the regulations of the Environmental Protection Agency (EPA), as applicable and a copies of reports submitted to the Authority for acceptance.
- (2) The Environmental Impact Assessment reports shall be presented to the Authority prior to submission to the EPA for comment.

**16.3.14 ENVIRONMENTAL BASELINE.***Part 16 – Environmental Protection***16.3.14.1 ENVIRONMENTAL BASELINE REPORT**

- (1) The Aerodrome Operator shall prepare an Environmental Baseline Report in accordance with the requirements of the EPA, as applicable, or in accordance with this Part.
- (2) The Environmental Baseline Reports shall be submitted as follows:
  - (a) Existing Aerodromes under the same management. Within 6 months of the coming into force of this Part, the Aerodrome operator shall submit to the Authority an Environmental Baseline Report prepared according to Terms of Reference drafted by the operator and approved by the Authority. The report shall contain all the findings and recommendations, and be independently prepared by duly qualified individuals experienced in preparation of such reports without hindrance or influence from the Aerodrome operator, the Authority or any service or commercial enterprise operating currently or in the past at the Aerodrome or other parties except that the Aerodrome operator shall undertake the administrative functions to hire the necessary expertise and to ensure the proper delivery of the report.
  - (b) New Aerodromes applicants shall comply with the relative requirements of the EPA.

**16.3.14.2 SCOPE OF ENVIRONMENTAL BASELINE REPORT.**

The Environmental Baseline Report shall address at least the following environmental liabilities, as they existed at the time that the Aerodrome operator assumes operational control of the Aerodrome; as well as any other requirements imposed by the EPA, as applicable, as well as the requirements of the Authority:

- (a) Pollution of soil.
- (b) Pollution of groundwater.
- (c) Air emissions.
- (d) Noise levels.
- (e) Extent of uncontrolled solid waste and litter.
- (f) Aircraft that are not airworthy or other aircraft or parts of aircraft or support equipment or other related aviation materials that are on the Aerodrome site and for which an owner cannot be identified.
- (g) Other conditions at the Aerodrome that impact negatively on the ambient environment and which pose an inherited environmental liability for the operator of the Aerodrome as a consequence of previous actions or absence of actions.
- (h) Recommended approaches for correcting the identified environmental liabilities.
- (i) Costs for correcting the identified environmental liabilities.
- (j) Environmental criteria and standards used in the report shall be the most recent standards, as applicable.

**16.3.14.3 AGREEMENT ON ENVIRONMENTAL BASELINE STUDY.**

- (1) Appropriate international standards and benchmarks shall be used where environmental liabilities are found for which no Ghanaian standard or criterion exists, having regard for both environmental quality and Aerodrome safety.
- (2) The Authority shall advise its acceptance of the report within 2 months of its receipt.

**16.3.14.4 RESPONSIBILITY OF AERODROME OPERATOR FOR ENVIRONMENTAL LIABILITIES.**

- (1) The Aerodrome operator or intending Aerodrome operator shall be financially responsible for environmental liabilities determined by the Environmental Baseline Study to have existed at the time that the operator's report was first submitted to the Authority.
- (2) Within 6 months of notification of acceptance of the Environmental Baseline Report for established Aerodrome operators, or within 6 months of receiving the authorization to operate the Aerodrome in the case of new Aerodrome operators or new Aerodromes, the Aerodrome operator shall undertake the work necessary to correct the environmental liabilities.

**16.3.15 AVAILABILITY AND INSPECTION OF DOCUMENTS****16.3.15.1 AVAILABILITY OF DOCUMENTS.**

The Aerodrome operator shall retain all documents related to the scope of this Part for a minimum of 5 years following the end of the calendar year to which they pertain. The Aerodrome operator shall include the following clause into all contracts and agreements with service deliverers and commercial entities at the Aerodrome:

*“[NAME OF ENTITY] shall retain all documents relating to environmental management for a minimum of 5 years following the end of the calendar year to which they pertain and shall make them available for inspection by the Aerodrome operator and/or the Authority upon demand.”*

**16.3.15.2 Inspection of Documents.**

The Authority shall have the right to inspect at any time and without prior notice any documents of the Aerodrome operator that may be related to the implementation of the requirements of this Part.

**16.3.16 COMMUNICATIONS**

- (1) The Authority shall respond in writing to the Aerodrome operator within 14 working days to confirm receipt of any report, application, proposal or amendment it receives from the Aerodrome operator.
- (2) The Authority shall approve, and, unless otherwise specified in this Part, shall notify the Aerodrome operator in writing of its approval, within 30 working days of receipt of the report, application, proposal or amendment, or within the same timeframe it shall

notify the Aerodrome operator in writing of deficiencies or requirements that it must address and the date by which the deficiencies or requirements must be addressed.

**16.3.17 AERODROME ENVIRONMENTAL COMMITTEE**

- (1) The Aerodrome operator shall establish an Aerodrome Environment Committee to advise and facilitate the application of this Part generally, including the noise reduction and management measures as well as carbon management at the Aerodrome to minimize the adverse effect of carbon emissions.
- (2) The committee shall comprise an odd number of full members drawn from relevant government and municipal entities, a representative of the airlines, other entities that the Aerodrome operator considers relevant.
- (3) The Authority may attend meetings of the committee as an observer. All full members of the Committee shall have equal voting rights.
- (4) The Aerodrome Operator shall:
  - (a) Chair the meetings of the Committee.
  - (b) Set the agenda of meetings of the committee and distribute this to members of the committee and to the Authority at least 5 working days before each meeting of the committee.
  - (c) Prepare Minutes of each meeting of the committee and distribute the minutes to each member of the committee and to the Authority within 5 working days following each meeting.
- (5) The Committee shall meet at least once every three (3) months.
- (6) Unless it can show just cause the Aerodrome operator shall comply with the resolutions of the Committee.

**VOLUME IV**

**16.4 - CARBON OFFSETTING AND REDUCTION  
SCHEME FOR INTERNATIONAL AVIATION  
(CORSA)**



## INTRODUCTION

This Volume IV to Part 16 sets out the Standards necessary for the implementation of a global MBM scheme in the form of the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA).

This Volume contains requirements and guidelines for monitoring, reporting and verification of an aeroplane operator's CO<sub>2</sub> emissions. This Volume also contains requirements and guidelines on an aeroplane operator's CO<sub>2</sub> offsetting requirements that can be reconciled using Emissions Units generated by eligible programmes.

GHANA

### 16.4.1 APPLICABILITY

This Subpart shall be applicable to an air operator engaged in international air navigation.

### 16.4.2 DEFINITIONS, ABBREVIATIONS AND UNITS

#### 16.4.2.1 DEFINITIONS

**Administrative partnership.** Delegation of administering tasks in this Volume from one State to another State(s).

**Aerodrome.** A defined area on land or water (including any buildings, installations and equipment) intended to be used either wholly or in part for the arrival, departure and surface movement of aircraft.

**Aerodrome pair.** A group of two aerodromes composed of a departing aerodrome and an arrival aerodrome.

**Aeroplane.** A power-driven heavier-than-air aircraft, deriving its lift in flight chiefly from aerodynamic reactions on surfaces which remain fixed under given conditions of flight.

**Aeroplane owner.** Person(s), organization(s) or enterprise(s) identified via Item 4 (Name of owner) and Item 5 (Address of owner) on the certificate of registration of an aeroplane.

**Air operator certificate (AOC).** A certificate authorizing an operator to carry out specified commercial air transport operations.

**Conversion process.** A type of technology used to convert a feedstock into aviation fuel.

**CORSIA eligible fuel.** A CORSIA sustainable aviation fuel or a CORSIA lower carbon aviation fuel, which an operator may use to reduce their offsetting requirements.

**CORSIA lower carbon aviation fuel.** A fossil-based aviation fuel that meets the CORSIA Sustainability Criteria under this Volume.

**CORSIA sustainable aviation fuel.** A renewable or waste-derived aviation fuel that meets the CORSIA Sustainability Criteria under this Volume.

**Feedstock.** A type of unprocessed raw material used for the production of aviation fuel.

**Flight plan.** Specified information provided to air traffic services units, relative to an intended flight or portion of a flight of an aircraft.

**Fuel uplift.** Measurement of fuel provided by the fuel supplier, as documented in the fuel delivery notes or invoices for each flight (in litre).

**Great Circle Distance.** The shortest distance, rounded to the nearest kilometre, between the origin and the destination aerodromes, measured over the earth's surface modelled according to the World Geodetic System 1984 (WGS84).

*Note.* – Latitude and longitude coordinates of aerodromes can be obtained from the ICAO Location Indicators database.

**National accreditation body.** A body authorized by a State which attests that a verification body is competent to provide specific verification services.

**New entrant.** Any aeroplane operator that commences an aviation activity falling within the scope of this Volume on or after its entry into force and whose activity is not in whole or in part a continuation of an aviation activity previously performed by another aeroplane operator.

**Notifying State.** The State that has submitted to ICAO the request for the registration of or change in the three-letter designator of an aeroplane operator over which it has jurisdiction.

**Operator.** The person, organization or enterprise engaged in or offering to engage in an aircraft operation.

**Pathway.** A specific combination of feedstock and conversion process used for the production of aviation fuel.

**Reporting period.** A period which commences on 1 January and finishes on 31 December in a given year for which an aeroplane operator or State reports required information. The flight departure time (UTC) determines which reporting period a flight belongs to.

**State pair.** A group of two States composed of a departing State or its territories and an arrival State or its territories.

**Verification of report.** An independent, systematic and sufficiently documented evaluation process of an emissions report and, when required, a cancellation of eligible emissions units report.

**Verification body.** A legal entity that performs the verification of an Emissions Report and, when required, an Emissions Unit Cancellation Report, as an accredited independent third party.

**Verification team.** A group of verifiers, or a single verifier that also qualifies as a team leader, belonging to a verification body conducting the verification of an Emissions Report and, when required, an Emissions Unit Cancellation Report. The team can be supported by technical experts.

**Verification report.** A document, drafted by the verification body, containing the verification statement and required supporting information.

#### 16.4.2.2 ABBREVIATIONS AND UNITS

Where the following abbreviations are used in Volume IV of this Annex, they have the meanings ascribed to them below:

- (a) Abbreviations:
- |                  |   |
|------------------|---|
| ACARS            | Aircraft Communications Addressing and Reporting System |
| AOC              | Air Operator Certificate                                |
| CERT             | CO <sub>2</sub> Estimation and Reporting Tool           |
| CO <sub>2</sub>  | Carbon dioxide  |
| CO <sub>2e</sub> | Carbon dioxide equivalent                               |

CORSIA	Carbon Offsetting and Reduction Scheme for International Aviation
GHG	Greenhouse gases
IAF	International Accreditation Forum
IEC	International Electrotechnical Commission
ISO	International Organisation for Standardisation
MRV	Monitoring, Reporting and Verification
MJ	Megajoule
RTK	Revenue Tonne Kilometres

(b) *Non-SI units*

The non-SI units listed in below shall be used either in lieu of, or in addition to, SI units as primary units of measurement under this Subpart.

**Table 2-1 Non-SI units for use with SI**

<i>Specific quantity</i>	<i>Unit</i>	<i>Symbol</i>	<i>Definition</i> <i>(in terms of SI units)</i>
mass	tonne	t	1 t = 10 <sup>3</sup> kg
time	hour	h	1 h = 60 min = 3600 s
volume	litre	L	1 L = 1 dm <sup>3</sup> = 10 <sup>-3</sup> m <sup>3</sup>

**16.4.3 CARBON OFFSETTING AND REDUCTION SCHEME FOR INTERNATIONAL AVIATION (CORSA)****16.4.3.1 ADMINISTRATION**

The following provisions shall apply to the classifications defined in this Subpart.<sup>1</sup>

**16.4.3.1.1 ATTRIBUTION OF INTERNATIONAL FLIGHTS TO AN AIR OPERATOR**

- (1) The Air Operator shall identify international flights, as defined in (2) and 16.4.4.1, that are attributed to it according to the approach in (2) and (3).

*Note.* – Two or more consecutive flights operated under the same flight number are considered as separate flights for the purposes of this Volume.

- (2) For the purpose of this Sub Part, an international flight shall be defined as the operation of an aircraft from take-off at an aerodrome of a State or its territories, and landing at an aerodrome of another State or its territories. A domestic flight shall also be defined as the operation of an aircraft from take-off at an aerodrome of a State or its territories, and landing at an aerodrome of the same State or its territories.
- (3) The attribution of a specific international flight to an Air Operator shall be determined as follows:

- (a) **ICAO Designator:** When Item 7 (aircraft identification) of the flight plan contains the ICAO Designator, that flight shall be attributed to the Air Operator that has been assigned this Designator;

*Note 1.* – ICAO Designators are contained in Doc 8585 — Designators for Aircraft Operating Agencies, Aeronautical Authorities and Services.

*Note 2.* – The reference to Item 7 is based on the ICAO model flight plan form contained in Appendix 2 of Doc 4444 — Procedures for Air Navigation Services - Air Traffic Management.

- (b) **Registration marks:** When Item 7 (aircraft identification) of the flight plan contains the nationality or common mark, and registration mark of an aeroplane that is explicitly listed in an AOC (or equivalent) issued by a State, that flight shall be attributed to the Air Operator that holds the AOC (or equivalent); and

- (c) **Others:** When the Air Operator of a flight has not been identified via (a) or (b), that flight shall be attributed to the aeroplane owner who shall then be considered the aeroplane operator.

*Note.* – See Attachment A Figure A-1 for an illustration on the process for attributing a flight to an aeroplane operator.

<sup>1</sup> Note 1. – See also Appendix 1 for further information on administration procedures.

*Note 2.* – The ICAO documents referred to in this Volume of Annex 16 and listed below are material approved by the Council for publication by ICAO to support this Volume and are essential to the implementation of the CORSIA. These ICAO documents are available on the ICAO CORSIA website and may only be amended by the Council: CORSIA States for Chapter 3 State Pairs; ICAO CORSIA CO2 Estimation and Reporting Tool; CORSIA Eligibility Framework and Requirements for Sustainability Certification Schemes; CORSIA Approved Sustainability Certification Schemes; CORSIA Sustainability Criteria for CORSIA Eligible Fuels; CORSIA Default Life Cycle Emissions Values for CORSIA Eligible Fuels; CORSIA Methodology for Calculating Actual Life Cycle Emissions Values; CORSIA Eligible Emissions Units; CORSIA Emissions Unit Eligibility Criteria; CORSIA Central Registry (CCR): Information and Data for the Implementation of CORSIA; CORSIA Aeroplane Operator to State Attributions; CORSIA 2020 Emissions; CORSIA Annual Sector's Growth Factor (SGF); and CORSIA Central Registry (CCR): Information and Data for Transparency.

- (4) Where requested by the Authority, the owners of Ghana registered aircraft identified via (3)(c) shall provide all information necessary to identify the actual Air Operator of a flight.
- (5) Subject to prior approval by the Authority, the Air Operator may, by contract, delegate the administrative requirements of this Volume to a third party, as long as the delegation is not to the same entity as the verification body. Liability for compliance shall not be delegated.

#### 16.4.3.1.2 ATTRIBUTION OF AN AIR OPERATOR TO A STATE

- (1) The air operator with international flights, as defined in 16.3.1.1(1) and 16.4.4.1, attributed to it shall identify the State to which it is attributed according to the approach in (3).
- (2) The Authority shall ensure the correct attribution of an Air Operator to it according to the approach in sub-paragraph (3) below.
- (3) The attribution of an Air Operator to a State shall be determined as follows:
  - (a) **ICAO Designator:** Where the Air Operator has an ICAO Designator, the State to which the Air Operator fulfils its requirements under this Volume shall be the Notifying State;  
*Note. – ICAO Designators and Notifying States are contained in Doc 8585 — Designators for Aircraft Operating Agencies, Aeronautical Authorities and Services.*
  - (b) **Air operator certificate:** Where the Air Operator does not possess an ICAO Designator, but has a valid air operator certificate (or equivalent), the State to which the Air Operator fulfils its requirements under this Volume shall be the State that issued the air operator certificate (or equivalent); and
  - (c) **Place of juridical registration:** Where the Air Operator does not possess an ICAO Designator or air operator certificate, the State where the Air Operator is registered as juridical person shall be the State to which the Air Operator fulfils its requirements under this Volume. Where the Air Operator is a natural person, the State of residence and registration of this person shall be the State to which the Air Operator fulfils its requirements under this Volume.
- (4) If the Air Operator changes its ICAO Designator, AOC (or equivalent) or place of juridical registration, and is subsequently attributed to a new State, but it is not establishing a new entity or a subsidiary, then this State shall become the State to which the Air Operator fulfils its requirements under this subpart.
- (5) The Authority may permit the Air Operator with a wholly owned subsidiary Air Operator that is legally registered in the same State to be treated as a single consolidated Air Operator liable for compliance with the requirements of this Volume, subject to the prior approval of the Authority. Evidence shall be provided in the aeroplane operator's Emissions Monitoring Plan to demonstrate that the subsidiary Air Operator is wholly owned.

#### 16.4.3.1.3 STATE

The Authority shall approve the Air Operator compliance on the basis of satisfactory evidence that the Air Operator meets requirements that are at least equal to the applicable requirements of this subpart.

**16.4.3.1.4 RECORD KEEPING**

- (1) The Air Operator shall keep the necessary records relevant to demonstrating compliance with the requirements of this Part for a period of ten (10) years.
- (2) The Authority shall keep records relevant to the Air Operators CO<sub>2</sub> emissions in order to calculate the Air Operator's offsetting requirements during the 2030-2035 compliance periods.

**16.4.3.1.5 COMPLIANCE PERIODS AND TIMELINE**

Air operators shall comply with the requirements of this subpart in accordance with the timeline as defined in Appendix 1(Implementing Standards).

**16.4.3.1.6 EQUIVALENT PROCEDURES - EXEMPTIONS**

- (1) The Authority may approve the use of equivalent procedures in lieu of specific procedures required in this Volume which shall initially be approved by the State to which the Air Operator has been attributed in 16.4.3.1.2.
- (2) An Air Operator requesting the use of equivalent procedures shall demonstrate to the Authority that the proposed equivalent procedures meet the requirements of this Volume.

*Note. — Guidance material, including the use of equivalent procedures, is provided in the Environmental Technical Manual (Doc 9501), Volume IV – Procedures for demonstrating compliance with the Carbon Offsetting and Reduction Scheme for International Aviation (CORSA).*

**16.4.4 MONITORING, REPORTING AND VERIFICATION (MRV) OF AIR OPERATOR ANNUAL CO<sub>2</sub> EMISSIONS****16.4.4.1 APPLICABILITY OF MRV REQUIREMENTS**

- (1) The provisions of this subpart shall be applicable to an Air Operator that produces annual CO<sub>2</sub> emissions greater than 10 000 tonnes from the use of an aeroplane(s) with a maximum certificated take-off mass greater than 5 700 kg conducting international flights, as defined in 16.4.3.1.2, on or after 1 January 2019, with the exception of humanitarian, medical and firefighting flights.
- (2) When considering whether a flight is international or domestic, an Air Operator and a State should use, for the purpose of this Volume, Doc 7910 — Location Indicators, which contains a list of aerodromes and the State they are attributed to.

*Note- Further guidance material is also provided in the Environmental Technical Manual (Doc 9501), Volume IV – Procedures for demonstrating compliance with the Carbon Offsetting and Reduction Scheme for International Aviation (CORSA).*

- (3) The provisions of this Volume shall not be applicable to international flights, as defined in 16.4.3.1.2, preceding or following a humanitarian, medical or firefighting flight provided such flights were conducted with the same aeroplane, and were required to accomplish the related humanitarian, medical or firefighting activities or to reposition thereafter the aeroplane for its next activity. The Air



Operator shall provide supporting evidence of such activities to the verification body or, upon request, to the Authority.

- (4) The provisions of this Volume shall be applicable to a new entrant Air Operator from the year after it meets the requirements in (1) and (3).
- (5) If the Air Operator is close to the threshold of annual CO<sub>2</sub> emissions, as defined in (1) and (3), from international flights, as defined in 16.4.3.1.2, it should consider engaging with the State to which it is attributed for guidance. Likewise, the State should carry out oversight of the aeroplane operators attributed to it, and engage with any that it considers may be close to or above the threshold. The Air Operator with annual CO<sub>2</sub> emissions below the threshold may choose to voluntarily engage with the State to which it is attributed.

*Note. – See Attachment B Figure B-1 for a process flowchart on the determination of the applicability of Chapter 2 to international flights, as defined in 16.4.3.1.2.*

#### **16.4.4.2 MONITORING OF CO<sub>2</sub> EMISSIONS**

##### **16.4.4.2.1 ELIGIBILITY OF MONITORING METHODS**

The Air Operator shall monitor and record its fuel use from international flights, as defined in 16.4.3.1.2 and 16.4.4.1, in accordance with an eligible monitoring method as defined in 16.4.4.2.2 and 16.4.4.2.3, and approved by the State to which it is attributed. Following approval of the Emissions Monitoring Plan, the Air Operator shall use the same eligible monitoring method for the entire compliance period.

*Note. – Further guidance material on eligibility of monitoring methods, as well as on associated thresholds and related metrics, is provided in the Environmental Technical Manual (Doc 9501), Volume IV – Procedures for demonstrating compliance with the Carbon Offsetting and Reduction Scheme for International Aviation (CORSA).*

##### **16.4.4.2.2 2019-2020 PERIOD**

- (1) The Air Operator with annual CO<sub>2</sub> emissions from international flights, as defined in 16.4.3.1.2 and 16.4.4.1, greater than or equal to 500 000 tonnes shall use a Fuel Use Monitoring Method as described in Appendix 2.
- (2) The Air Operator with annual CO<sub>2</sub> emissions from international flights, as defined in 16.4.3.1.2 and 16.4.4.1 of less than 500 000 tonnes shall use either a Fuel Use Monitoring Method or the ICAO CORSIA CO<sub>2</sub> Estimation and Reporting Tool (CERT), as described in Appendices 2 and 3 respectively.
- (3) If the aeroplane operator's annual CO<sub>2</sub> emissions from international flights, as defined in 16.4.3.1.2 and 16.4.4.1, increases above the threshold of 500 000 tonnes in 2019, the State shall permit, at its discretion, the Air Operator to continue to use the monitoring method chosen in accordance with (2) during 2020.
- (4) The Air Operator should use the same monitoring method during the 2019-2020 period that it expects to use during the 2021-2023 period, taking into account its expected annual CO<sub>2</sub> emissions during the 2021-2023 period. If the Air Operator needs to change monitoring method, it will submit a revised Emissions Monitoring Plan by 30 September 2020 in order to implement the new monitoring method from 1 January 2021.
- (5) Where the Air Operator does not have an approved Emissions Monitoring Plan as of 1 January 2019, it shall monitor and record its CO<sub>2</sub> emissions in accordance with the eligible monitoring method outlined in the Emissions Monitoring Plan that it will submit, or has submitted, to the State to which it is attributed.



- (6) If the aeroplane operator's Emissions Monitoring Plan, as defined in 16.4.4.3 is determined to be incomplete and/or inconsistent with the eligible Fuel Use Monitoring Method in Appendix 2 and the Air Operator is attributed to Ghana, the Authority shall at its discretion, approve a different eligible Fuel Use Monitoring Method within the Emissions Monitoring Plan for a period lasting no later than 30 June 2019.
- (7) Where the Air Operator does not have sufficient information to use a Fuel Use Monitoring Method, as defined in Appendix 2, the State to which the Air Operator is attributed shall, at its discretion, approve the use of the ICAO CORSIA CO<sub>2</sub> Estimation and Reporting Tool (CERT) for a period lasting no later than 30 June 2019.

*Note.* – See Attachment B Figure B-2 for a process flowchart on the eligibility of Fuel Use Monitoring Methods during the 2019-2020 period.

#### **16.4.4.2.3 2021-2035 period**

- (1) The aeroplane operator, with annual CO<sub>2</sub> emissions from international flights subject to offsetting requirements, of greater than or equal to 50 000 tonnes, shall use a Fuel Use Monitoring Method as described in Appendix 2 for these flights. For international flights, not subject to offsetting requirements, the Air Operator shall use either a Fuel Use Monitoring Method, as described in Appendix 2, or the ICAO CORSIA CO<sub>2</sub> Estimation and Reporting Tool (CERT), as described in Appendix 3.
- (2) The aeroplane operator, with annual CO<sub>2</sub> emissions from international flights subject to offsetting requirements, of less than 50 000 tonnes, shall use either a Fuel Use Monitoring Method or the ICAO CORSIA CO<sub>2</sub> Estimation and Reporting Tool (CERT) as described in Appendices 2 and 3 respectively.
- (3) Where the aeroplane operator's annual CO<sub>2</sub> emissions from international flights subject to offsetting requirements, increases above the threshold of 50 000 tonnes in a given year (y), and also in year (y+1), the Air Operator shall submit an updated Emissions Monitoring Plan by 30 September of year (y + 2). The Air Operator shall change to a Fuel Use Monitoring Method, as described in Appendix 2, on 1 January of year (y+3).
- (4) Where the air operator's annual CO<sub>2</sub> emissions from international flights subject to offsetting requirements, decreases below the threshold of 50 000 tonnes in a given year (y), and also in year (y+1), the air operator may change monitoring method on 1 January of year (y+3). If the air operator chooses to change its monitoring method, it shall submit an updated Emissions Monitoring Plan by 30 September of year (y + 2) to the Authority for review.

*Note.* – See Attachment B Figure B-3 for a process flowchart on the eligibility of Fuel Use Monitoring Methods during the 2021-2035 compliance periods.

#### **16.4.4.3 EMISSIONS MONITORING PLAN**

- (1) Where the Air Operator is attributed to Ghana, it shall submit an Emissions Monitoring Plan to the Authority for approval by the Authority in accordance with the timeline as defined in Appendix 1. The Emissions Monitoring Plan shall contain the information as defined in Appendix 4.
- (2) A new entrant Air Operator shall submit an Emissions Monitoring Plan, where it is attributed to Ghana, to the Authority within three months of falling within the scope of applicability as defined in 16.4.4.1.
- (3) Where the air operator is attributed to Ghana, it shall resubmit the Emissions Monitoring Plan to the Authority for approval if a material change is made to the information contained within the Emissions Monitoring Plan (i.e., a change to the information presented in the plan that would affect

the status or eligibility of the air operator for an option under the emissions monitoring requirements, or that would otherwise affect the decision by Ghana with regard to whether the air operator's approach to monitoring conforms with the requirements).

- (4) Where the air operator is attributed to Ghana, the air operator shall ensure that it informs the Authority of any changes that would affect the Authority's oversight (e.g., change in corporate name or address), even if the changes do not fall within the definition of a material change.
- (5) Where the air operator's Emissions Monitoring Plan is determined to be incomplete and or inconsistent with the Emissions Monitoring Plan requirements in Appendix 4, the Authority shall engage with the air operator to resolve outstanding issues. The Authority may either return the Emissions Monitoring Plan to the air operator along with an explanation as to why the plan was found deficient, or a request for further information.

*Note.* – Further guidance material on the Emissions Monitoring Plan and material changes is provided in the Environmental Technical Manual (Doc 9501), Volume IV – Procedures for demonstrating compliance with the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA).

#### 16.4.4.3.1 CALCULATION OF CO<sub>2</sub> EMISSIONS FROM AEROPLANE FUEL USE

- (1) The air operator shall apply a fuel density value to calculate fuel mass where the amount of fuel uplift is determined in units of volume.
- (2) The air operator shall record the fuel density (which may be an actual or a standard value of 0.8 kg per litre) that is used for operational and safety reasons (e.g., in an operational, flight or technical log). The procedure for informing the use of actual or standard density shall be detailed in the Emissions Monitoring Plan along with a reference to the relevant air operator documentation.

*Note.* – Further guidance material on fuel density is provided in the Environmental Technical Manual (Doc 9501), Volume IV – Procedures for demonstrating compliance with the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA).

- (3) The air operator using a Fuel Use Monitoring Method, as defined in Appendix 2, shall determine the CO<sub>2</sub> emissions from international flights, using the following equation:

$$E_{CO_2} = \sum M_f * FCF_f$$

where

:

CO<sub>2</sub> = CO<sub>2</sub> emissions (in tonnes);

M<sub>f</sub> = Mass of fuel f used (in tonnes); and

FCF<sub>f</sub> = Fuel conversion factor of given fuel f, equal to 3.16 (in kg CO<sub>2</sub>/kg fuel)

for Jet-A fuel /

FCF<sub>f</sub>

Jet-A1 fuel and 3.10 (in kg CO<sub>2</sub>/kg fuel) for AvGas or Jet-B fuel.

*Note.* – For the purpose of calculating CO<sub>2</sub> emissions the mass of fuel used includes all aviation fuels.

**16.4.4.3.2 MONITORING OF CORSIA ELIGIBLE FUELS CLAIMS**

- (1) Where an air operator intends to claim for emissions reductions from the use of CORSIA eligible fuels, that air operator shall use a CORSIA eligible fuel that meets the CORSIA Sustainability Criteria as defined within the ICAO document entitled “CORSIA Sustainability Criteria for CORSIA Eligible Fuels”.
- (2) Where an air operator intends to claim for emissions reductions from the use of CORSIA eligible fuels, that air operator shall only use CORSIA eligible fuels from fuel producers that are certified by an approved Sustainability Certification Scheme included in the ICAO document entitled “CORSIA Approved Sustainability Certification Schemes”, that is available on the ICAO CORSIA website. Such certification schemes shall meet the requirements included in the ICAO document entitled “CORSIA Eligibility Framework and Requirements for Sustainability Certification Schemes”.

*Note- CORSIA Sustainability Criteria for CORSIA Eligible Fuels and CORSIA Eligibility Framework and Requirements for Sustainability Certification Schemes documents are available on the ICAO CORSIA website.*

- (3) Where the air operator cannot demonstrate the compliance of the CORSIA eligible fuel with the CORSIA Sustainability Criteria, then it shall not be accounted for as CORSIA eligible fuel.

*Note 1. – The provisions of this Chapter consider that aviation fuel supply chains are not segregated at aerodromes, and that CORSIA eligible fuels will be typically co-mingled at various points in the fuel supply infrastructure (e.g., pipelines, storage terminals, aerodrome fuel storage systems). The CORSIA eligible fuels purchased by a particular Air Operator may not be physically used in its aeroplane, and it will not be feasible to determine the specific CORSIA eligible fuel content at the point of uplift in an aeroplane. Claims of emissions reductions from the use of CORSIA eligible fuels by an Air Operator are based on mass of CORSIA eligible fuels according to purchasing and blending records.*

*Note 2. – The emissions reductions from the use of a CORSIA eligible fuel are calculated as indicated in Part II, Chapter 3, 3.3 in the context of the calculation of the CO<sub>2</sub> offsetting requirements in Chapter 3. These calculations use the approved life cycle emissions value (L<sub>Sf</sub>) for the CORSIA eligible fuel. Information on emissions reductions from using CORSIA eligible fuel is included in the aeroplane operator’s Emissions Report (Field 12 of Table A5-1 in Appendix 5), in accordance with Part II, Chapter 2, 2.3.1 and 2.3.3.*

**16.4.4.4 REPORTING OF CO<sub>2</sub> EMISSIONS****16.4.4.4.1 AIR OPERATOR REPORTING**

- (1) Where the air operator is attributed to Ghana, it shall submit a copy of the verified Emissions Report for approval by the Authority and a copy of the associated Verification Report in accordance with the timeline as defined in Appendix 1.
- (2) The Authority shall decide on the level of aggregation (i.e., State pair or aerodrome pair) for which an air operator attributed to Ghana shall report the number of international flights, as defined in 16.4.3.1.2 (i.e., Table A5-1 Field 7) and CO<sub>2</sub> emissions (i.e., Table A5-1 Field 8). The Authority shall inform an air operator attributed to it whether Field 7 and 8 in the Emissions Report shall be reported at the level of State pair or aerodrome pair during the approval process for the Emissions Monitoring Plan.
- (3) The Emissions Report shall contain the information as defined in Appendix 5 Table A5-1. An Air Operator that uses the ICAO CORSIA CO<sub>2</sub> Estimation and Reporting Tool (CERT) shall not be required to report Field 5.
- (4) The Air Operator shall use the standardised Emissions Report template provided in Appendix 1 of the Environmental Technical Manual (Doc 9501), Volume IV – Procedures to demonstrate compliance with the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA), or a template approved by the State to which it is attributed, for submission of information to the State to which it is attributed.

- (5) When the air operator reports its consolidated CO<sub>2</sub> emissions from international flights, during the 2019-2020 period, including subsidiary air operators, disaggregated data relating to each subsidiary air operator shall be appended to the main Emissions Report.
- (6) In specific circumstances where the air operator attributed to Ghana operates a very limited number of State pairs that are subject to offsetting requirements, and/or a very limited number of State pairs that are not subject to offsetting requirements, it may request in writing to the Authority that such data not be published at the air operator level, as defined in Appendix 5, 3.2, explaining the reasons why disclosure would harm its commercial interests. Based on this request, the Authority shall determine whether this data is confidential.  
*Note. – In the application of (6) and/or (7), the annual CO<sub>2</sub> emissions of an Air Operator on a given State pair are considered as commercially sensitive if they are determined using a Fuel Use Monitoring Method as described in Appendix 2.*
- (7) In specific circumstances where aggregated State pair data may be attributed to an identified air operator as a result of a very limited number of air operators conducting flights on a State pair, that air operator may request in writing to the Authority that such data not be published at State pair level, explaining the reasons why disclosure would harm their commercial interests. Based on this request, the Authority shall determine whether this data is confidential.

#### 16.4.4.4.2 STATE REPORTING

- (1) The Authority shall calculate and inform each of the air operators that are attributed to Ghana of their average total annual CO<sub>2</sub> emissions during the 2019 and 2020 period, in accordance with the timeline as defined in Appendix 1.
- (2) The Authority shall submit a report to ICAO in accordance with the timeline as defined in Appendix 1. This report shall contain the information as defined in Appendix 5, Tables A5-4, A5-5 and A5-6, when applicable.
- (3) The Authority shall inform ICAO of any reported data deemed confidential in accordance with 16.4.4.4.1(6) and 16.4.4.4.1(7).
- (4) All air operator data which is deemed confidential in accordance with 16.4.4.4.1(6) and 16.4.4.4.1(7) shall be aggregated without attribution to the specific air operator, and included within the ICAO document entitled “CORSIA Central Registry (CCR): Information and Data for Transparency”.

*Note - CORSIA Central Registry (CCR): Information and Data for Transparency document can be accessed on the ICAO CORSIA website.*

#### 16.4.4.4.3 REPORTING OF CORSIA ELIGIBLE FUELS

- (1) The air operator shall subtract CORSIA eligible fuels traded or sold to a third party from its total reported quantity of CORSIA eligible fuels.
- (2) The air operator shall provide a declaration of all other GHG schemes it participates in where the emissions reductions from the use of CORSIA eligible fuels may be claimed, and a declaration that it has not made claims for the same batches of CORSIA eligible fuel under these other schemes.
- (3) To claim emissions reductions from the use of CORSIA eligible fuels in the Emissions Report, the air operator shall provide the information as described in Appendix 5 Table A5-2 within a given compliance period for all CORSIA eligible fuel received by a blender by the end of that compliance period. The information provided is through to the blend point, and includes information received from both the neat (unblended) fuel producer and the fuel blender.

- (4) The Air Operator may make CORSIA eligible fuel claims on an annual basis in order to ensure all documentation is dealt with in a timely manner. However, the Air Operator has the option to decide when to make a CORSIA eligible fuel claim within a given compliance period for all CORSIA eligible fuel received by a blender within that compliance period. For blending that occurs in the second half of the final year of a compliance period, the Air Operator and the Authority should determine what, if any, flexibility is needed in terms of submitting reports.
- (5) If the Air Operator purchases fuel from a supplier downstream from the fuel blender (e.g., from a distributor, another aeroplane operator, or an aerodrome-based fuel distributor), this fuel supplier shall provide all of the requisite documentation in order for the emissions reductions from the use of CORSIA eligible fuels to be claimed by the Air Operator in accordance with Chapter 3.

#### **16.4.4.5 VERIFICATION OF CO<sub>2</sub> EMISSIONS**

##### **16.4.4.5.1 ANNUAL VERIFICATION OF AN AEROPLANE OPERATOR'S EMISSIONS REPORT**

- (1) The Air Operator shall engage a verification body for the verification of its annual Emissions Report.

*Note. – The verification body is one of the verification bodies included in the list of verification bodies accredited in States, included within the ICAO document entitled “CORSIA Central Registry (CCR): Information and Data for Transparency”(available on the ICAO CORSIA website).*

- (2) The Air Operator shall perform an internal pre-verification of its Emissions Report prior to the verification by a verification body.

*Note. – Further guidance material on internal pre-verification is provided in the Environmental Technical Manual (Doc 9501), Volume IV – Procedures for demonstrating compliance with the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA).*

- (3) A verification body shall conduct the verification according to ISO 14064-3:2006<sup>1</sup>, and the relevant requirements in Appendix 6 Section 3.
- (4) Following the verification of the Emissions Report by the verification body, the air operator and the verification body shall both independently submit, upon authorization by the air operator, a copy of the Emissions Report and associated Verification Report to the Authority, in accordance with the timeline as defined in Appendix 1.
- (5) The Authority shall perform an order of magnitude check of the Emissions Report in accordance with the timeline, as defined in Appendix 1.

*Note. – Further guidance material on the order of magnitude check is provided in the Environmental Technical Manual (Doc 9501), Volume IV – Procedures for demonstrating compliance with the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA).*

- (6) To facilitate order of magnitude checks and ensure the completeness of reported data, and where necessary to support the implementation of the requirements in this Volume, the Authority shall share, upon agreement with another State, specific data and information contained in the aeroplane operator's Emissions Report for aeroplane operators performing flights to and from the requesting State.

*Note. – Such data and information could include aeroplane operator's name, reporting year, number of international flights, as defined in 16.4.3.1.2, per aerodrome pair or State pair and aeroplane and emissions data.*

- (7) The Authority shall inform concerned air operators on the requests for data sharing. In the absence of an express written agreement between the two States, this information shall not be disclosed to third parties.



- (8) The Authority may share, upon a justified request from another State, data on air operators which are attributed to Ghana, where the request relates to the correct attribution of flights to air operators. This includes leased aircraft where there is a risk of incorrect attribution of flights due to the complexity of leasing and Parent/Subsidiary arrangements between air operators. In addition, the Authority may support another State by providing flight information (e.g., from ATM systems), especially in cases where the flight is between two States which does not include the State to which the Air Operator is attributed. Such data includes origin and destination aerodromes, flight date and time, aircraft type.

*Note. – As an example of leasing complexities, Operator A may lease its aeroplane to Operator B, with both operators using the same aeroplane during the year but Operator B not operating to the State making the request for information. The State regulating Operator A may want to confirm that the leased aeroplane is identified in the Emissions Report from Operator B to be confident that Operator A has not under reported.*

- (9) The Authority shall provide the name of the verification body used to verify each Emissions Report upon a request for information disclosure.
- (10) The Authority may inform concerned air operators of any request for information disclosure.

#### 16.4.4.6 VERIFICATION BODY AND NATIONAL ACCREDITATION BODY

- (1) A verification body shall be accredited to ISO 14065:2013<sup>2</sup> and the relevant requirements in Appendix 6 Section 2 by a national accreditation body, in order to be eligible to verify the Emissions Report of the air operator.

*Note. – An air operator may engage a verification body accredited in another State, subject to rules and regulations affecting the provision of verification services in Ghana.*

- (2) A national accreditation body shall be working in accordance with ISO/IEC 17011<sup>2</sup>.

#### 16.4.4.7 VERIFICATION OF CORSIA ELIGIBLE FUELS

- (1) Fuel purchases, transaction reports, fuel blending records and sustainability credentials shall constitute the documentary proof for the purpose of verification and approval of emissions reductions from the use of CORSIA eligible fuels.
- (2) The air operator shall ensure that it, or its designated representative, has audit rights of the production records for the CORSIA eligible fuels that it purchases.
- (3) *When an audit provision is triggered, and an audit of the fuel producer is undertaken, the air operator may share the results of the audit with the fuel producer so that the producer may then make it available to other aeroplane operators seeking assurance on the fuel producer's internal processes for the purpose of this Volume.*

*Note. – The quality control assurances of CORSIA eligible fuel producers include declarations and/or process certifications, with periodic audits by verifiers, purchasers, or trusted entities. The process certifications, including the sustainability credentials, provide assurance that the CORSIA eligible fuel producer has established business processes to prevent double counting, and the periodic audits verify that the producer is following their established procedures. Purchasers and States may elect to independently audit the production records of the CORSIA eligible fuel producer in order to provide further assurance.*

- (4) In order to ensure this capability exists, CORSIA eligible fuel procurement controls may seek to enable audit rights for fuel purchasers, aeroplane operators, or their designated representatives.

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<sup>2</sup> ISO 14065:2013 entitled "Greenhouse gases – Requirements for greenhouse gas validation and verification bodies for use in accreditation or other forms of recognition, Document published on: 2013-04." ISO/IEC 17011:2004 entitled "Conformity assessment – General requirements for accreditation bodies accrediting conformity assessment bodies".

**16.4.4.8 DATA GAPS<sup>3</sup>****16.4.4.8.1 AEROPLANE OPERATOR**

- (1) The Air Operator using a Fuel Use Monitoring Method, as described in Appendix 2, shall fill data gaps using the ICAO CORSIA CO<sub>2</sub> Estimation and Reporting Tool (CERT), as described in Appendix 3, provided that the data gaps during a compliance period do not exceed the following thresholds:
  - (a) 2019-2020 period: 5 per cent of international flights, as defined in 16.4.3.1.2 and 16.4.4.1;
  - (b) 2021-2035 period: 5 per cent of international flights subject to offsetting requirements, as defined in 16.4.3.1.2 and 3.1.
- (2) The Air Operator shall correct issues identified with the data and information management system in a timely manner to mitigate ongoing data gaps and system weaknesses.
- (3) If the Air Operator realizes it has data gaps and system weaknesses that exceed the threshold in 2.5.1.1, then it shall engage with the Authority to take remedial action to address this.
- (4) When the threshold is exceeded, the Air Operator shall state the percentage of international flights, as defined in 16.4.3.1.2 and 16.4.4.1 for the 2019-2020 period, or flights subject to offsetting requirements, as defined in 3.1 for the 2021-2035 period, that had data gaps, and provide an explanation to the State to which it is attributed in their annual Emissions Report.
- (5) The Air Operator shall fill all data gaps and correct systematic errors and misstatements prior to the submission of the Emissions Report.

**16.4.4.8.2 STATE**

- (1) If the Air Operator does not provide its annual Emissions Report in accordance with the timeline as defined in Appendix 1, then the State to which it is attributed shall engage with the Air Operator to obtain the necessary information. If this proves unsuccessful, then the Authority shall estimate the aeroplane operator's annual emissions using the best available information and tools, such as the ICAO CORSIA CO<sub>2</sub> Estimation and Reporting Tool (CERT) as described in Appendix 3.

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<sup>3</sup> Note 1. – Data gaps occur when an Air Operator is missing data relevant for the determination of its fuel use for one or more international flights in accordance with 2.2.1.1. Gaps in emissions-related data can occur due to various reasons, including irregular operations, data feed issues or critical system failures. Procedures to prevent data gaps are to be detailed in the Emissions Monitoring Plan of the Air Operator in accordance with Appendix 4, 2.4.1. When data gaps are identified by the verification body, it may be unable to obtain sufficient evidence to determine compliance with the requirements, which for severe data gaps, could result in the verification body concluding that the Emissions Report is unsatisfactory. A data gap could also be identified by the State in its review of the verified Emissions Report.

Note 2. – Guidance material on data gaps is provided in the Environmental Technical Manual (Doc 9501), Volume IV – Procedures for demonstrating compliance with the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA).

- (2) If the Authority does not provide its annual aggregated Emissions Report to ICAO in accordance with the timeline as defined in Appendix 1, then the data provided by ICAO shall be used to fill these gaps and calculate the total sectoral CO<sub>2</sub> emissions in a given year and the Sectoral Growth Factor.

#### 16.4.4.9 ERROR CORRECTION TO EMISSIONS REPORTS

- (1) If an error in the aeroplane operator's reported emissions is identified by the State, the verification body, or the Air Operator after the reported CO<sub>2</sub> emissions have been submitted to ICAO in accordance with the timeline as defined in Appendix 1, the State shall update the reported CO<sub>2</sub> emissions to address the error. The State shall assess any implications with respect to the aeroplane operator's offsetting requirements in previous years and, if necessary, make an adjustment to compensate for the error during the compliance period in which the error has been identified.
- (2) The Authority shall report an error in the aeroplane operator's CO<sub>2</sub> emissions and the follow-up result of the related adjustment to ICAO.

*Note. – No adjustments will be made to the total sectoral CO<sub>2</sub> emissions or the Sector's Growth Factor (SGF), as defined in Chapter 3, as a result of error correction to Emissions Reports.*



**PART 16 VOLUME IV – IMPLEMENTING STANDARDS**

GCAA

**APPENDIX 1: CONTENT OF AN EMISSIONS MONITORING PLAN****1. INTRODUCTION**

The Emissions Monitoring Plan of an aeroplane operator shall contain the information listed in Section 2 of this Appendix.

**2. CONTENT OF EMISSIONS MONITORING PLANS**

*Note. – The template of an Emissions Monitoring Plan (from aeroplane operator to GCAA) is provided in Appendix 1 of the Environmental Technical Manual (Doc 9501), Volume IV – Procedures for demonstrating compliance with the Carbon Offsetting and Reduction Scheme for International Aviation (CORSA).*

**2.1 Aeroplane operator identification**

2.1.1 Name and address of the aeroplane operator with legal responsibility.

2.1.2 Information for attributing the aeroplane operator to a State:

a) **ICAO Designator:** ICAO Designator(s) used for air traffic control purposes, as listed in Doc 8585 — *Designators for Aircraft Operating Agencies, Aeronautical Authorities and Services*.

b) **Air operator certificate:** If the aeroplane operator does not have an ICAO Designator, then a copy of the air operator certificate.

c) **Place of juridical registration:** If the aeroplane operator does not have an ICAO Designator or an air operator certificate, then the aeroplane operator's place of juridical registration.

2.1.3 Details of ownership structure relative to any other aeroplane operators with international flights, including identification of whether the aeroplane operator is a parent company to other aeroplane operators with international flights, a subsidiary of another aeroplane operator(s) with international flights, and/or has a parent and or subsidiaries that are aeroplane operators with international flights.

2.1.4 If the aeroplane operator in a parent-subsidary relationship seeks to be considered a single aeroplane operator for purposes of this Regulation, then confirmation shall be provided that the parent and subsidiary(ies) are attributed to the Ghana and that the subsidiary(ies) are wholly-owned by the parent.

2.1.5 Contact information for the person within the aeroplane operator's company who is responsible for the Emissions Monitoring Plan.

2.1.6 Description of the aeroplane operator's activities (e.g. scheduled/non-scheduled, passenger/cargo/executive, and geographic scope of operations).

## 2.2 Fleet and operations data

2.2.1 List of the aeroplane types and type of fuel (e.g. Jet-A, Jet-A1, Jet-B, AvGas) used in aeroplanes operated for international flights at the time of submission of the Emissions Monitoring Plan, recognizing that there may be changes over time. The list shall include:

- a) Aeroplane types with a maximum certificated take-off mass of 5 700 kg or greater and the number of aeroplane per type, including owned and leased aeroplanes; and

*Note 1. — Aeroplane types are contained in Doc 8643 — Aircraft Type Designators.*

*Note 2. — The aeroplane operator using the ICAO CORSIA CO<sub>2</sub> Estimation and Reporting Tool (CERT) could use the functionality of the CERT to identify applicable aeroplane types.*

- b) Type of fuel(s) used by the aeroplanes (e.g., Jet-A, Jet-A1, Jet-B, AvGas).

*Note. — The aeroplane operator using the ICAO CORSIA CO<sub>2</sub> Estimation and Reporting Tool (CERT) does not need to specify the type of fuel used by aeroplanes.*

2.2.2 Information used for attributing international flights to the aeroplane operator:

- a) **ICAO Designator:** List of the ICAO Designator(s) used in Item 7 of the aeroplane operator's flight plans.
- b) **Registration marks:** If the aeroplane operator does not have an ICAO Designator, then a list of the nationality or common mark, and registration mark of aeroplanes that are explicitly stated in the air operator certificate (or equivalent) and used in Item 7 of the aeroplane operator's flight plans.

2.2.3 Procedures on how changes in the aeroplane fleet and fuel used will be tracked, and subsequently integrated in the Emissions Monitoring Plan.

2.2.4 Procedures on how the specific flights of an aeroplane will be tracked to ensure completeness of monitoring.

2.2.5 Procedures for determining which aeroplane flights are subject to the Chapter 2, Chapter 3, or Chapter 4 requirements.

*Note. — The aeroplane operator using the ICAO CORSIA CO<sub>2</sub> Estimation and Reporting Tool (CERT) could use the functionality of the CERT to identify international flights, as long as all flights (i.e., domestic and international) conducted during the reporting year are entered as input into the tool.*

2.2.6 List of States to where the aeroplane operator operates international flights at the time of initial submission of the Emissions Monitoring Plan.

*Note. — The aeroplane operator using the estimation functionality of the ICAO CORSIA CO<sub>2</sub> Estimation and Reporting Tool (CERT) to assess its eligibility to use the CERT could use the output of the tool (i.e., list of States) as input to the Emissions Monitoring Plan submission.*

2.2.7 Procedures for determining which international aeroplane flights are subject to CORSIA offsetting requirements.

*Note.* — The aeroplane operator using the ICAO CORSIA CO<sub>2</sub> Estimation and Reporting Tool (CERT) could use the functionality of the CERT to identify flights subject to offsetting requirements in a given year of compliance as long as the aeroplane operator uses the correct version (i.e., year of compliance) of the CERT.

2.2.8 Procedures for identifying domestic flights and/or humanitarian, medical or firefighting international flights that would not be subject to Chapter 2, Chapter 3, or Chapter 4 requirements.

### **2.3 Methods and means of calculating emissions from international flights**

#### 2.3.1 Methods and means for establishing the average emissions during the 2019-2020 period

2.3.1.1 If the aeroplane operator meets the eligibility criteria in §2.16 and chooses to use the ICAO CORSIA CO<sub>2</sub> Estimation and Reporting Tool (CERT), then the following information shall be provided:

- a) An estimate of CO<sub>2</sub> emissions for all international flights within the applicability of Chapter 2, Chapter 3, or Chapter 4 requirements for 2019 with supporting information on how the estimation was calculated.
- b) The type of input method used in the ICAO CORSIA CO<sub>2</sub> Estimation and Reporting Tool (CERT):
  - Great Circle Distance input method; or
  - Block Time input method.

*Note.* – Guidance on estimating CO<sub>2</sub> emissions for 2019 is provided in the Environmental Technical Manual (Doc 9501), Volume IV – Procedures for demonstrating compliance with the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA).

2.3.1.2 If the aeroplane operator meets the eligibility criteria in §2.15 or chooses to use a Fuel Use Monitoring method as described in Appendix 2, then the following information shall be provided:

- a) The Fuel Use Monitoring Method that will be used:
  - Method A;
  - Method B;
  - Block-off / Block-on;
  - Fuel Uplift; or
  - Fuel Allocation with Block Hour.
- b) If different Fuel Use Monitoring Methods are to be used for different aeroplane types, then the aeroplane operator shall specify which method applies to which aeroplane type;
- c) Information on the procedures for determining and recording fuel density values (standard or actual) as used for operational and safety reasons and a reference to the relevant aeroplane operator documentation; and
- d) The systems and procedures to monitor fuel consumption in both owned and leased aeroplane. If the aeroplane operator has chosen the Fuel Allocation with Block Hour

method, information shall be provided on the systems and procedures used to establish the average fuel burn ratios as described in Appendix 2.

2.3.1.3 If the aeroplane operator is in a parent-subsidary relationship and seeks to be considered as a single aeroplane operator for purposes of this Regulation, then it shall provide the procedures that will be used for maintaining records of fuel used and emissions monitored during the 2019-2020 period of the various corporate entities. This shall be used to establish individual average emissions during the 2019- 2020 period for the parent and subsidiary (or subsidiaries).

### 2.3.2 Methods and means for emissions monitoring and compliance on or after 1 January 2021

2.3.2.1 If the aeroplane operator has international flights, but these are not subject to offsetting requirements, then it shall confirm whether it plans to use the ICAO CORSIA CO<sub>2</sub> Estimation and Reporting Tool (CERT) or the Fuel Use Monitoring Methods as described in Appendix 2.

2.3.2.2. If the aeroplane operator meets the eligibility criteria in §2.22, and it chooses to use the ICAO CORSIA CO<sub>2</sub> Estimation and Reporting Tool (CERT), then the following information shall be provided:

- a) An estimate of CO<sub>2</sub> emissions for all international flights subject to offsetting requirements for the year before the emissions monitoring is to occur (for example, an estimate of such emissions for 2020 for monitoring in 2021), as well as information on how the fuel use and CO<sub>2</sub> estimation was calculated.
- b) The type of input method used in the ICAO CORSIA CO<sub>2</sub> Estimation and Reporting Tool (CERT):
  - Great Circle Distance input method; or
  - Block Time input method.

2.3.2.3 If the aeroplane operator meets the eligibility criteria in §2.21, or chooses to use a Fuel Use Monitoring method as described in Appendix 2, then the following information shall be provided:

- a) The Fuel Use Monitoring Method that will be used:
  - Method A;
  - Method B;
  - Block-off / Block-on;
  - Fuel Uplift; or
  - Fuel Allocation with Block Hour.
- b) If different Fuel Use Monitoring Methods are to be used for different aeroplane types, then the aeroplane operator shall specify which method applies to which aeroplane type;
- c) Information on the procedures for determining and recording fuel density values (standard or actual) as used for operational and safety reasons and a reference to the relevant aeroplane operator documentation; and
- d) The systems and procedures to monitor fuel consumption in both owned and leased aeroplane. If the aeroplane operator has chosen the Fuel Allocation with Block Hour method, information shall be provided on the systems and procedures used to establish the average fuel burn ratios as described in Appendix 2.

2.3.2.4 If the aeroplane operator is using a Fuel Use Monitoring Method, as defined in Appendix 2, it shall state whether it plans to use the ICAO CORSIA CERT for international flights that are subject to emissions monitoring but not offsetting requirements. If so, the aeroplane operators shall also state which input method into the ICAO CORSIA CERT is being used (i.e., Great Circle Distance input method, or Block Time input method).

## **2.4 Data management, data flow and control**

2.4.1 The aeroplane operator shall provide the following information:

- a) roles, responsibilities and procedures on data management;
- b) procedures to handle data gaps and erroneous data values, including:
  - i. Secondary data reference sources which would be used as an alternative;
  - ii. Alternative method in case the secondary data reference source is not available; and
  - iii. For those aeroplane operators using a Fuel Use Monitoring Method, information on systems and procedures for identifying data gaps and for assessing whether the 5 per cent threshold for significant data gaps has been reached.
- c) documentation and record keeping plan;
- d) assessment of the risks associated with the data management processes and means for addressing significant risks;
- e) procedures for making revisions to the Emissions Monitoring Plan and resubmitting relevant portions to the Authority when there are material changes;
- f) procedures for providing notice in the Emissions Report of non-material changes that require the attention of the Authority; and
- g) a data flow diagram summarizing the systems used to record and store data associated with the monitoring and reporting of CO<sub>2</sub> emissions.

**APPENDIX 2: FUEL USE MONITORING METHODS****1. INTRODUCTION**

*Note.* — The procedures specified in this Appendix are concerned with the monitoring of fuel use by aeroplane operators. The methods proposed are representative of the most accurate established practices.

Any equivalent procedures to those contained in this Appendix shall only be allowed after prior application to and approval by the Authority.

**2. FUEL USE MONITORING METHODS**

2.1 The aeroplane operator, with the exception of an aeroplane operator eligible to use the ICAO CORSIA CO<sub>2</sub> Estimation and Reporting Tool (CERT), shall choose from the following fuel use monitoring methods:

- a) Method A;
- b) Method B;
- c) Block-off / Block-on;
- d) Fuel Uplift; or
- e) Fuel Allocation with Block Hour.

**2.2 Method A**

2.2.1 The aeroplane operator shall use the following formula to compute fuel use according to Method A:

$$F_N = T_N - T_{N+1} + U_{N+1}$$

where:

- $F_N$  = Fuel used for the flight under consideration (=flight  $N$ ) determined using Method A (in tonnes);
- $T_N$  = Amount of fuel contained in aeroplane tanks once fuel uplifts for the flight under consideration (i.e., flight  $N$ ) are complete (in tonnes);
- $T_{N+1}$  = Amount of fuel contained in aeroplane tanks once fuel uplifts for the subsequent flight (i.e., flight  $N+1$ ) are complete (in tonnes); and
- $U_{N+1}$  = Sum of fuel uplifts for the subsequent flight (i.e., flight  $N+1$ ) measured in volume and multiplied with a density value (in tonnes).

*Note 1.* — See §2.23 and §2.24 for requirements on fuel density values.

*Note 2.* — Fuel uplift  $U_{N+1}$  is determined by the measurement by the fuel supplier, as documented in the fuel delivery notes or invoices for each flight.



*Note 3. — For ensuring completeness of the data, it is important to note that not only data generated during the flight under consideration (i.e., flight  $N$ ) is needed, but also data generated from the subsequent flight (i.e., flight  $N+1$ ). This is of particular importance when a domestic flight is followed by an international flight, or vice versa. In order to avoid data gaps it is therefore recommended that the Block-off on fuel or the amount of fuel in the tank after all fuel uplifts for a flight is always recorded on flights of aeroplanes which are used for international flights. For the same reasons, fuel uplift data for all flights of those aeroplanes should be collected, before deciding which flights are international.*

2.2.2 The aeroplane operator performing on an ad-hoc basis flights attributed to another aeroplane operator shall provide to the latter the fuel measurement values according to the Block-off / Block-on method.

2.2.3 Where no fuel uplift for the flight or subsequent flight takes place, the amount of fuel contained in aeroplane tanks ( $T_N$  or  $T_{N+1}$ ) shall be determined at block-off for the flight or subsequent flight. In exceptional cases the variable  $T_{N+1}$  cannot be determined. This is the case when an aeroplane performs activities other than a flight, including undergoing major maintenance involving the emptying of the tanks, after the flight to be monitored. In such case the aeroplane operator may substitute the quantity “ $T_{N+1} + U_{N+1}$ ” with the amount of fuel remaining in tanks at the start of the subsequent activity of the aeroplane or fuel in tanks at Block-on, as recorded by technical logs.

### 2.3 Method B

2.3.1 The aeroplane operator shall use the following formula to compute fuel use according to Method B:

$$F_N = R_{N-1} - R_N + U_N$$

where:

$F_N$  = Fuel used for the flight under consideration (i.e., flight  $N$ ) determined using Method B (in tonnes);

$R_{N-1}$  = Amount of fuel remaining in aeroplane tanks at the end of the previous flight (i.e., flight  $N-1$ ) at Block-on before the flight under consideration, (in tonnes);

$R_N$  = Amount of fuel remaining in aeroplane tanks at the end of the flight under consideration (i.e., flight  $N$ ) at Block-on after the flight, (in tonnes); and

$U_N$  = Fuel uplift for the flight considered measured in volume and multiplied with a density value (in tonnes).

*Note 1. — See §2.25 and §2.26 for requirements on fuel density values.*

*Note 2. — Fuel uplift is determined by the measurement by the fuel supplier, as documented in the fuel delivery notes or invoices for each flight.*

*Note 3. — For ensuring completeness of the data, it is important to note that not only data generated during the flight under consideration (i.e., flight  $N$ ) is needed, but also data generated from the previous flight (i.e., flight  $N-1$ ). This is in particular important when a domestic flight is followed by an international, or vice versa. For avoiding data gaps it is therefore recommended that, the amount of fuel remaining in the tank after the flight or the amount of fuel in the tank after fuel uplift is always recorded on flights of aeroplane which are used for international flights. For the same reasons, fuel uplift data for all flights of those aeroplane should be collected, before deciding which flights are international.*



2.3.2 The aeroplane operator performing on an ad-hoc basis flights attributed to another aeroplane operator shall provide to the latter the fuel measurement values according to the Block-off / Block-on method.

2.3.3 Where an aeroplane does not perform a flight previous to the flight for which fuel consumption is being monitored (e.g., if the flight follows a major revision or maintenance), the aeroplane operator may substitute the quantity  $R_{N-1}$  with the amount of fuel remaining in aeroplane tanks at the end of the previous activity of the aeroplane, as recorded by technical logs.

#### 2.4 Block-off / Block-on

2.4.1 The aeroplane operator shall use the following formula to compute fuel use according to the Block-off / Block-on Method:

$$F_N = T_N - R_N$$

where:

$F_N$  = Fuel used for the flight under consideration (=flight  $N$ ) determined using Block-off / Block-on Method (in tonnes);

$T_N$  = Amount of fuel contained in aeroplane tanks at Block-off for the flight under consideration i.e., flight  $N$  (in tonnes); and

$R_N$  = Amount of fuel remaining in aeroplane tanks at Block-on of the flight under consideration i.e., flight  $N$  (in tonnes).

#### 2.5 Fuel Uplift

2.5.1 For flights with a fuel uplift unless the subsequent flight has no uplift, the aeroplane operator shall use the following formula to compute fuel use according to the Fuel Uplift Method:

$$F_N = U_N$$

where:

$F_N$  = Fuel used for the flight under consideration (i.e., flight  $N$ ) determined using fuel uplift (in tonnes); and

$U_N$  = Fuel uplift for the flight considered, measured in volume and multiplied with a density value (in tonnes).

*Note 1. — See §2.25 and §2.26 for requirements on fuel density values.*

2.5.2 For flight(s) without a fuel uplift (i.e., flight  $N+1$ , ..., flight  $N+n$ ), the aeroplane operator shall use the following formula to allocate fuel use from the prior fuel uplift (i.e., from flight  $N$ ) proportionally to block hour:

$$F_N = U_N * \left[ \frac{BH_N}{BH_N + BH_{N+1} + \dots + BH_{N+n}} \right]$$

$$F_{N+1} = U_N * \left[ \frac{BH_{N+1}}{BH_N + BH_{N+1} + \dots + BH_{N+n}} \right]$$

...

$$F_{N+n} = U_N * \frac{BH_{N+n}}{BH_N + BH_{N+1} + \dots + BH_{N+n}}$$

where:

$F_N$  = Fuel used for the flight under consideration (i.e., flight  $N$ ) determined using fuel uplift (in tonnes);

$F_{N+1}$  = Fuel used for the subsequent flight (i.e., flight  $N+1$ ) determined using fuel uplift (in tonnes);

...

$F_{N+n}$  = Fuel used for the follow-on flight (i.e., flight  $N+n$ ) determined using fuel uplift (in tonnes);  $U_N$  = Fuel uplift for the flight under consideration (i.e., flight  $N$ ) (in tonnes);

$BH_N$  = Block hour for the flight under consideration (i.e., flight  $N$ ) (in hours);  $BH_{N+1}$  = Block hour for the subsequent flight (i.e., flight  $N+1$ ) (in hours); and

...

$BH_{N+n}$  = Block hour for the follow-on flight (i.e., flight  $N+n$ ) (in hours).

*Note.* — Fuel uplift is determined by the measurement by the fuel supplier, as documented in the fuel delivery notes or invoices for each flight.

## 2.6 Fuel Allocation with Block Hour

### 2.6.1 Computation of average fuel burn ratios

2.6.1.1 For an aeroplane operator which can clearly distinguish between international and domestic fuel uplifts, the aeroplane operator shall compute, for each aeroplane type, the average fuel burn ratios by summing up all actual fuel uplifts from international flights, divided by the sum of all actual block hours from international flights for a given year, according to the following formula:

$$AFBR_{AO,AT} = \frac{I_{,N} U_{AO,AT,N}}{I_{,N} BH_{AO,AT,N}}$$

where:

$AFBR_{AO,AT}$  = Average fuel burn ratios for aeroplane operator (AO) and aeroplane type (AT) (in tonnes per hour);

$U_{AO,AT,N}$  = Fuel uplifted for the international flight  $N$  for aeroplane operator (AO) and aeroplane type (AT) determined using monitoring method Fuel Uplift (in tonnes); and

$BH_{AO,AT,N}$  = Block hour for the international flight  $N$  for aeroplane operator (AO) and aeroplane type (AT) (in hours).

2.6.1.2 For an aeroplane operator which cannot clearly distinguish between international and domestic fuel uplifts, the aeroplane operator shall compute, for each aeroplane type, the average fuel burn ratios by summing up all actual fuel uplifts from international and domestic flights divided by the sum of all actual block hours from these flights for a given year, according to the following formula:

$$= \frac{U_{AO,AT,N} \cdot I_{,N}}{BH_{AO,AT,N}}$$

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where:

- AFBR<sub>AO, AT</sub> = Average fuel burn ratios for aeroplane operator (AO) and aeroplane type (AT) (in tonnes per hour);
- U<sub>AO, AT, N</sub> = Fuel uplifted for the international or a domestic flight<sub>N</sub> for aeroplane operator (AO) and aeroplane type (AT) measured in volume and multiplied with a specific density value (in tonnes); and
- BH<sub>AO, AT, N</sub> = Block hour for the international and domestic flight<sub>N</sub> for aeroplane operator (AO) and aeroplane type (AT) (in hours).

2.6.1.3 An aeroplane operator specific average fuel burn ratios shall be calculated on a yearly basis by using the yearly data from the actual reporting year. The average fuel burn ratios shall be reported, for each aeroplane type, in the aeroplane operator's Emissions Report.

*Note 1. — See §2.25 and §2.26 for requirements on fuel density values.*

*Note 2. — Aeroplane types are contained in Doc 8643 — Aircraft Type Designators.*

## 2.6.2 Computation of fuel use for individual flights

2.6.2.1 The aeroplane operator shall compute the fuel consumption for each international flight by multiplying the aeroplane operator specific average fuel burn ratios with the flight's block hour according to the following formula:

$$F_N = AFBR_{AO, AT} * BH_{AO, AT, N}$$

where:

- F<sub>N</sub> = Fuel allocated to the international flight under consideration (i.e., flight<sub>N</sub>) using the Fuel Allocation Block Hour method (in tonnes);
- AFBR<sub>AO, AT</sub> = Average fuel burn ratios for aeroplane operator (AO) and aeroplane type (AT) (in tonnes per hour); and
- BH<sub>AO, AT, N</sub> = Block hour for the international flight under consideration (=flight<sub>N</sub>) for aeroplane operator (AO) and aeroplane type (AT) (in hours).

*Note 1. — Fuel uplift is determined by the measurement by the fuel supplier, as documented in the fuel delivery notes or invoices for each flight.*

*Note 2. — The Verification Report of the external verification body includes an assessment of the aeroplane operator specific average fuel burn ratio per ICAO aircraft type designator used.*

*Note 3. — Average fuel burn ratio (AFBR) based on all flights for a reporting year and rounded to at least three decimal places.*

2.6.2.2 A verification body shall cross-check whether the emissions reported are reasonable in comparison to other fuel related data of the aeroplane operator.

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**APPENDIX 3: CONTENT OF AN EMISSIONS REPORT FROM AEROPLANE OPERATOR TO STATE**

Field #	Data Field	Details
Field 1	Aeroplane operator information	<p>1.a Name of aeroplane operator</p> <p>1.b Detailed contact information of aeroplane operator</p> <p>1.c Name of a point of contact</p> <p>1.d Method and identifier used to attribute an aeroplane operator to the Authority in accordance with §1.2.</p> <p>1.e State</p>
Field 2	Reference details of aeroplane operator Emissions Monitoring Plan	<p>2 Reference to the Emissions Monitoring Plan that is the basis for emissions monitoring that year</p> <p><i>Note. - GCAA may require providing reference to updated Emissions Monitoring Plan, if applicable.</i></p>
Field 3	Information to identify the verification body and Verification Report	<p>3.a Name and contact information of the verification body</p> <p>3.b Verification Report to be a separate report from aeroplane operator's Emissions Report</p>
Field 4	Reporting year	4. Year during which emissions were monitored
Field 5	Type and mass of fuel(s) used	<p>5.a Total fuel mass per type of fuel:</p> <ul style="list-style-type: none"> <li>• Jet-A (in tonnes)</li> <li>• Jet-A1 (in tonnes)</li> <li>• Jet-B (in tonnes)</li> <li>• AvGas (in tonnes)</li> </ul> <p><i>Note 1. – Above totals to include CORSIA eligible fuels.</i></p> <p><i>Note 2.- The aeroplane operator using the ICAO CORSIA CERT, does not need to report Field 5.</i></p>
Field 6	Total number of international flights during the reporting period	<p>6.a Total number of international flights, subject to Chapter 2, Chapter 3, and Chapter 4 requirements, during the reporting period.</p> <p><i>Note. - Total (sum of values from Field 7)</i></p>
Field 7	Number of international flights per State pair or aerodrome pair	<p>7.a Number of international flights, subject to Chapter 2, Chapter 3, and Chapter 4 requirements, per State pair (no rounding); or</p> <p>7.b Number of international flights per aerodrome pair (no rounding).</p>

Field 8	CO <sub>2</sub> emissions per aerodrome pair or State pair	8.a CO <sub>2</sub> emissions from international flights, subject to Chapter 2, Chapter 3, and Chapter 4 requirements, per State pair (in tonnes); or  8.b CO <sub>2</sub> emissions from international flights, subject to Chapter 2, Chapter 3, or Chapter 4 requirements, per aerodrome pair (in tonnes).
Field 9	Scale of data gaps	9.a Per cent of data gaps (according to criteria defined in Part §4.17 and rounded to the nearest 0.1%)  9.b Reason for data gaps if per cent of data gaps exceeds the threshold defined in §4.17
Field 10	Aeroplane information	10.a List of aeroplane types  10.b Aeroplane identifiers used in flight plans' Item 7 during the year for all international flights. Where the identifier is based on an ICAO Designator, only the ICAO Designator is to be reported  10.c Information on leased aeroplanes  10.d Average fuel burn ratio (AFBR) for each aeroplane type under 10.a in line with Doc 8643 — <i>Aircraft Type Designator</i> (in tonnes per hour to 3 decimal places)  <i>Note: - 10.d is only required if the aeroplane operator is using the Fuel Allocation with Block Hour method, as defined in Appendix 2.</i>
Field 11	Eligibility for and use of the ICAO CORSIA CO <sub>2</sub> Estimation and Reporting Tool (CERT) as per Chapter 2	11.a Version of the ICAO CORSIA CERT used  11.b Scope of use of the ICAO CORSIA CERT i.e., on all flights or only on the international flights not subject to offsetting requirements
Field 12	CORSIA eligible fuel claimed	12.a Fuel type (i.e., type of fuel, feedstock and conversion process)  12.b Total mass of the neat CORSIA eligible fuel claimed (in tonnes) per fuel type
Note.- If emissions reductions from the use of CORSIA eligible fuel are claimed, see Appendix 4 for supplementary information that is to be provided with the aeroplane operator's	Emissions information (per fuel type)	12.c Approved Life Cycle Emissions values  12.d Emissions reductions claimed from a CORSIA eligible fuel
	Emissions reductions (total)	12.e Total emissions reductions claimed from the use of all CORSIA eligible fuels (in tonnes)  <i>Note. – During the 2019-2020 period, fields 12.a to 12.e are not required as the applicability of CORSIA offsetting requirements starts on 1 January 2021 i.e., there are no</i>

<i>Emissions Report.</i>		<i>offsetting requirements and no emissions reductions from the use of CORSIA eligible fuels during the 2019-2020 period.</i>
Field 13	Total CO <sub>2</sub> emissions	<p>13.a Total CO<sub>2</sub> emissions (based on total mass of fuel in tonnes from Field 5 and reported in tonnes)</p> <p>13.b Total CO<sub>2</sub> emissions from flights subject to offsetting requirements (in tonnes)</p> <p>13.c Total CO<sub>2</sub> emissions from international flights, subject to Chapter 2, Chapter 3, and Chapter 4 requirements. and that are not subject to offsetting requirements (in tonnes)</p> <p><i>Note. – During the 2019-2020 period, only fields 13.a is required as the applicability of CORSIA offsetting requirements starts on 1 January 2021 i.e., there are no State pairs subject to offsetting requirements during the 2019-2020 period.</i></p>



**APPENDIX 4: SUPPLEMENTARY INFORMATION TO AN AEROPLANE OPERATOR'S EMISSIONS REPORT IF EMISSIONS REDUCTIONS FROM THE USE OF EACH CORSIA ELIGIBLE FUEL BEING CLAIMED**

<i>Field #</i>	<i>Data Field</i>	<i>Details</i>
Field 1	Purchase date of the neat CORSIA eligible fuel	
Field 2	Identification of the producer of the neat CORSIA eligible fuel	2.a Name of producer of the neat CORSIA eligible fuel 2.b Contact information of the producer of the neat CORSIA eligible fuel
Field 3	Fuel Production	3.a Production date of the neat CORSIA eligible fuel 3.b Production location of the neat CORSIA eligible fuel 3.c Batch number of each batch of neat CORSIA eligible fuel 3.d Mass of each batch of neat CORSIA eligible fuel produced
Field 4	Fuel type	4.a Type of fuel (i.e., Jet-A, Jet-A1, Jet-B, AvGas) 4.b Feedstock used to create the neat CORSIA eligible fuel 4.c Conversion process used to create the neat CORSIA eligible fuel
Field 5	Fuel Purchased	5.a Proportion of neat CORSIA eligible fuel batch purchased (rounded to the nearest %)  <i>Note. - If less than an entire batch of CORSIA eligible fuel is purchased.</i>  5.b Total mass of each batch of neat CORSIA eligible fuel purchased (in tonnes)  5.c Mass of neat CORSIA eligible fuel purchased (in tonnes)  <i>Note. — Field 5.c is equal to the total for all batches of CORSIA eligible fuels reported in Field 5.b.</i>
Field 6	Evidence that fuel satisfies the CORSIA Sustainability Criteria	i.e., valid sustainability certification document
Field 7	Life cycle emissions values of the CORSIA eligible fuel	7.a Default or Actual Life Cycle Emissions Value ( $LS_f$ ) for given CORSIA eligible fuel $f$ , which is equal to the sum of 7.b and 7.c (in $gCO_2e/MJ$ rounded to the nearest whole number)

		<p>7.b Default or Actual Core Life Cycle Assessment (LCA) value for given CORSIA eligible fuel f (in gCO<sub>2</sub>e/MJ rounded to the nearest whole number)</p> <p>7.c Default Induced Land Use Change (ILUC) value for given CORSIA eligible fuel f (in gCO<sub>2</sub>e/MJ rounded to the nearest whole number)</p>
Field 8	Intermediate purchaser	<p>8.a Name of the intermediate purchaser</p> <p>8.b Contact information of the intermediate purchaser</p> <p><i>Note. — This information would be included in the event that the aeroplane operator claiming emissions reductions from the use of CORSIA eligible fuels was not the original purchaser of the fuel from the producer (e.g., the aeroplane operator purchased fuel from a broker or a distributor). In those cases, this information is needed to demonstrate the complete chain of custody from production to blend point.</i></p>
Field 9	Party responsible for shipping of the neat CORSIA eligible fuel to the fuel blender	<p>9.a Name of party responsible for shipping of the neat CORSIA eligible fuel to the fuel blender</p> <p>9.b Contact information of party responsible for shipping of the neat CORSIA eligible fuel to the fuel blender</p>
Field 10	Fuel Blender	<p>10.a Name of the party responsible for blending neat CORSIA eligible fuel with aviation fuel</p> <p>10.b Contact information of the party responsible for blending neat CORSIA eligible fuel with aviation fuel</p>
Field 11	Location where neat CORSIA eligible fuel is blended with aviation fuel	
Field 12	Date the neat CORSIA eligible fuel was received by blender	
Field 13	Mass of neat CORSIA eligible fuel received (in tonnes)	<i>Note. - This number may differ from the number in Field 5.c in cases where only a portion of a batch or batches are received by the blender (i.e. due to sale to intermediate purchaser).</i>
Field 14	Blend ratio of neat CORSIA eligible fuel and aviation fuel (rounded to the nearest %)	
Field 15	Documentation demonstrating that the batch or batches of neat CORSIA eligible fuel were blended into aviation fuel (e.g., the subsequent	

	Certificate of	
	Analysis of the blended fuel)	
Field 16	Mass of neat CORSIA eligible fuel claimed (in tonnes)	<i>Note. - This number may differ from the number in Field 5.c in cases where only a portion of a batch or batches are claimed by the aeroplane operator.</i>

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**APPENDIX 5: EMISSIONS REPORT FROM A STATE TO ICAO FOR 2019 AND 2020**

<i>Field #</i>	<i>Data Field</i>	<i>Details</i>
Field 1	Total annual CO <sub>2</sub> emissions per State pair aggregated for all aeroplane operators attributed to the State (in tonnes)	<i>Note. – Include emissions from CORSIA eligible fuels, calculated using fuel conversion factor(s) from corresponding aviation fuels, in accordance with §2.27.</i>

**APPENDIX 6: EMISSIONS REPORT FROM A STATE TO ICAO ANNUALLY AFTER 2021**

<i>Field #</i>	<i>Data Field</i>	<i>Details</i>
Field 1	Total annual CO <sub>2</sub> emissions on each State pair aggregated for all aeroplane operators attributed to the State	1.a Total annual CO <sub>2</sub> emissions on each State pair subject to offsetting requirements aggregated for all aeroplane operators attributed to the State (in tonnes) 1.b Total annual CO <sub>2</sub> emissions on each State pair not subject to offsetting requirements, aggregated for all aeroplane operators attributed to the State (in tonnes)
Field 2	Total annual CO <sub>2</sub> emissions for each aeroplane operator attributed to the State	2.a Total annual CO <sub>2</sub> emissions for each aeroplane operator attributed to the State (in tonnes) 2.b Indicate whether the ICAO CORSIA CO <sub>2</sub> Estimation and Reporting Tool (CERT) is used
Field 3	Total aggregated annual CO <sub>2</sub> emissions for all State pairs subject to offsetting requirements for each aeroplane operator attributed to the State (in tonnes)	
Field 4	Total aggregated annual CO <sub>2</sub> emissions for all State pairs not subject to offsetting requirements for each aeroplane operator attributed to the State (in tonnes)	

**Appendix 7: CORSIA Eligible Fuels Supplementary Information to the Emissions Report from a State to ICAO**

<i>Field#</i>	<i>Data Field</i>	<i>Details</i>	<i>Notes</i>
Field 1	Production	1.a Production year of CORSIA eligible fuel claimed  1.b Producer of CORSIA eligible fuel	
Field 2	Batch of CORSIA eligible fuel	2.a Batch number(s) of each CORSIA eligible fuel claimed  2.b Total mass of each batch of CORSIA eligible fuel claimed (in tonnes)	
Field 3	CORSIA eligible fuel claimed	3.a Fuel types (i.e., type of fuel, feedstock and conversion process)  3.b Total mass of the neat CORSIA eligible fuel (in tonnes) per fuel type being claimed by all the aeroplane operators attributed to the State	<i>This would provide a total mass for each fuel type being claimed by all aeroplane operators attributed to the State.</i>
Field 4	Emissions information (per fuel type)	4. Total emissions reductions claimed from the use of a CORSIA eligible fuel (in tonnes)	
Field 5	Emissions reductions (total)	5. Total emissions reductions claimed by all aeroplane operators attributed to the State from the use of all CORSIA eligible fuel use (in tonnes)	

**APPENDIX 8: REQUIREMENTS FOR CONDUCTING THE VERIFICATION**

The verification team shall conduct the verification according to ISO 14064-3:2006, and the following additional requirements.

**3.1 Level of assurance (ISO 14064-3:2006 section 4.3.1)**

A reasonable level of assurance shall be required for all verifications under this Regulation.

**3.2 Objectives (ISO 14064-3:2006 section 4.3.2)**

3.2.1 When conducting the verification of an Emissions Report, the verification body shall perform sufficient procedures to conclude whether:

- a) the greenhouse gas assertion is materially fair and an accurate representation of emissions over the period of the Emissions Report and is supported by sufficient and appropriate evidence;
- b) the aeroplane operator has monitored, quantified and reported its emissions over the period of the Emissions Report in accordance with this Regulation and the approved Emissions Monitoring Plan;
- c) the aeroplane operator has correctly applied the method of flight attribution documented in the approved Emissions Monitoring Plan and in accordance with §1.8, to ensure a correct attribution of leased aeroplane and international flights operated by other aeroplane operators under the same corporate structure;
- d) the stated amount of emissions reductions from the use of CORSIA eligible fuels is materially fair and an accurate representation of emissions reductions over the reporting period, and is supported by sufficient and appropriate internal and external evidence;
- e) the claimed batches of CORSIA eligible fuels have not also been claimed by the aeroplane operator under any other voluntary or mandatory schemes it has participated in (where the emissions reductions from CORSIA eligible fuels may be claimed), during the current compliance period, as well as the compliance period immediately preceding it; and
- f) the aeroplane operator has monitored, calculated and reported its emissions reductions associated from the use of CORSIA eligible fuels over the period of the reporting period in accordance with this Regulation.

3.2.2 When conducting the verification of an Emissions Unit Cancellation Report, the verification body shall perform sufficient procedures to conclude whether:

- a) the aeroplane operator has accurately reported cancellations of its CORSIA Eligible Emissions Units in accordance with this Regulation;

- b) the stated number of cancelled CORSIA Eligible Emissions Units is sufficient for meeting the aeroplane operator's total final offsetting requirements associated with the relevant compliance period, after accounting for any claimed emissions reductions from the use of CORSIA eligible fuels, and the aeroplane operator can demonstrate sole right of use to such cancelled CORSIA Eligible Emissions Units; and
- c) the eligible emissions units cancelled by the aeroplane operator to meet its offsetting requirements under this Regulation have not been used by the aeroplane operator to offset any other emissions.

### **3.3 Scope (ISO 14064-3:2006 section 4.3.4)**

3.3.1 When conducting the verification of an Emissions Report, the scope of the verification shall reflect the period of time and information covered by the report and the CORSIA eligible fuels claim(s) where applicable. This includes:

- a) CO<sub>2</sub> emissions from aeroplane fuel monitoring methods, calculated in accordance with Chapter 2; and
- b) Emissions reductions from the use of CORSIA eligible fuel(s).

3.3.2 The scope of the verification of the CORSIA eligible fuel claim(s) in the Emissions Report shall include the following:

- a) Any internal aeroplane operator procedures for CORSIA eligible fuels, including aeroplane operator controls to ensure the claimed CORSIA eligible fuels satisfies the CORSIA Sustainability Criteria;
- b) Checks for double claiming are limited to the specific aeroplane operator. Any findings outside of this scope are not relevant for the verification statement, however they should still be included in the Verification Report for further consideration by the State;
- c) Assessment of verification risk with appropriate changes to the verification plan; and
- d) Assessment of whether there is sufficient access to relevant internal and external information to obtain sufficient confidence in each CORSIA eligible fuel claim. Where evidence of the sustainability or the size of the CORSIA eligible fuels claim is considered either inappropriate or insufficient, further information should be sought directly from the fuel producer with direct access facilitated through the aeroplane operator.

3.3.3 When conducting the verification of an Emissions Unit Cancellation Report, the scope of the verification shall reflect the period of time and information covered by the report and the verification body shall confirm that the cancelled eligible emissions units used to meet the aeroplane operator's offsetting requirements under this Regulation have not been used to offset any other emissions.

### **3.4 Materiality (ISO 14064-3:2006 section 4.3.5)**

3.4.1 When conducting the verification of an Emissions Report, the verification body shall apply the following materiality thresholds:



- a) of 2 per cent for aeroplane operators with annual emissions on international flights subject to Chapter 2, Chapter 3, and Chapter 4 requirements above 500 000 tonnes; and
- b) of 5 per cent for aeroplane operators with annual emissions on international flights subject to Chapter 2, Chapter 3, or Chapter 4 requirements equal or less than 500 000 tonnes of CO<sub>2</sub>.

3.4.2 When conducting the verification of an Emissions Report, the over and understatement in 3.4.1 shall be allowed to balance out in both cases.

### **3.5 General (ISO 14064-3:2006 section 4.4.1)**

Prior to the development of the verification approach, the verification body shall assess the risk of misstatements and non-conformities and their likelihood of a material effect on the basis of a strategic analysis of the aeroplane operator's greenhouse gas emissions information <sup>1</sup>. Depending on the information obtained during the verification, the verification body shall revise the risk assessment and modify or repeat the verification activities to be performed.

### **3.6 Validation or verification plan (ISO 14064-3:2006 section 4.4.2)**

3.6.1 The verification team shall prepare the verification plan on the basis of the strategic analysis and assessment of risks. The verification plan shall include a description of the verification activities for each variable that has a potential impact on the reported emissions. The verification team shall consider the assessment of risk, and the requirement to deliver a verification opinion with reasonable assurance, when determining sample size.

3.6.2 The verification plan shall include the following:

- a) verification team members, roles, responsibilities and qualifications;
- b) any external resources required;
- c) schedule of verification activities; and
- d) sampling plan, including the processes, controls and information to be verified and details of the risk assessment conducted to identify these.

### **3.7 Sampling plan (ISO 14064-3:2006 section 4.4.3)**

3.7.1 The Emissions Report sampling plan shall include the following:

- a) number and type of records and evidence to be examined;
- b) methodology used to determine a representative sample; and
- c) justification for the selected methodology.

3.7.2 When conducting the verification of an Emissions Unit Cancellation Report, the verification body shall not rely on sampling.

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<sup>1</sup> Definitions of strategic analysis and the assessment of risks are contained in the IAF Mandatory Document for the Application of ISO 14065: 2013, Issue 2 (IAF MD 6:2014).

**3.8 Assessment of GHG data and information (ISO 14064-3:2006 section 4.6)**

3.8.1 The verification team shall confirm that the Emissions Report data has been collected in accordance with the approved Emissions Monitoring Plan and monitoring requirements specified in this Regulation.

3.8.2 In accordance with the Emissions Report sampling plan, the verification body shall carry out substantive data testing consisting of analytical procedures and data verification to assess the plausibility and completeness of data. The verification team shall, as a minimum, assess the plausibility of fluctuations and trends over time or between comparable data items as well as identify and assess immediate outliers, unexpected data, anomalies, and data gaps.

3.8.3 Depending on the outcome of Emissions Report data testing and assessment, the assessment of risk, verification and sampling plans shall be amended, where necessary.

**3.9 Evaluation of the GHG assertion (ISO 14064-3:2006 section 4.8)**

3.9.1 The verification body shall use an independent reviewer not involved in the verification activities to assess the internal verification documentation, and the Verification Report, prior to its submission to the aeroplane operator and State.

3.9.2 The independent review, whose scope includes the complete verification process, shall be recorded in the internal verification documentation.

3.9.3 The independent review shall be performed to ensure that the verification process has been conducted in accordance with ISO 14065:2013, ISO 14064-3:2006 and this Regulation, and that the evidence gathered is appropriate and sufficient to enable the verification body to issue a Verification Report with reasonable assurance.

**3.10 Validation and verification statement (ISO 14064-3:2006 section 4.9)**

3.10.1 The verification body shall submit a copy of the Verification Report to the aeroplane operator. Upon authorization by the aeroplane operator, the verification body shall forward a copy of the Verification Report together with the Emissions Report, the Emissions Unit Cancellation Report, or both, to the State. The Verification Report shall include:

- a) names of the verification body and verification team members;
- b) time allocation (including any revisions and dates);
- c) scope of the verification;
- d) main results of impartiality and avoidance of conflict of interest assessment;
- e) criteria against which the Emissions Report was verified;
- f) aeroplane operator information and data used by the verification body to cross-check data and carry out other verification activities;
- g) main results of the strategic analysis and assessment of risk;

- h) description of verification activities undertaken, where each was undertaken (on-site vs off-site) and results of checks made on the CO<sub>2</sub> emissions information system and controls;
- i) description of data sampling and testing conducted, including records or evidence sampled, sample size, and sampling method(s) used;
- j) the results of all data sampling and testing, including cross-checks;
- k) compliance with the Emissions Monitoring Plan;
- l) any non-compliances of the Emissions Monitoring Plan with this Regulation;
- m) non-conformities and misstatements identified (including a description of how these have been resolved);
- n) conclusions on data quality and materiality;
- o) conclusions on the verification of the Emissions Report;
- p) conclusions on the verification of the Emissions Unit Cancellation Report;
- q) justifications for the verification opinion made by the verification body;
- r) results of the independent review and the name of the independent reviewer; and
- s) concluding verification statement.

3.10.2 When conducting the verification of an Emissions Unit Cancellation Report, only 3.10.1 (a), (b), (c), (d), (f), (g), (h), (m), (p), (q), (r) and (s) shall be applicable.

3.10.3 The verification body shall provide a conclusion on each of the verification objectives listed in 3.2, as applicable, in the concluding verification statement.

3.10.4 When conducting the verification of an Emissions Report or an Emissions Unit Cancellation Report, the verification body shall choose between two types of verification opinion statements, either 'verified as satisfactory' or 'verified as not satisfactory'. If the report includes non-material misstatements and / or non-material non-conformities, the report shall be 'verified as satisfactory with comments', specifying the misstatements and non-conformities. If the report contains material misstatements and / or material non-conformities, or if the scope of the verification is too limited or the verification body is not able to obtain sufficient confidence in the data, then the report shall be 'verified as not satisfactory'.

### **3.11 Validation or verification records (ISO 14064-3:2006 section 4.10)**

3.11.1 On request of Authority, the verification body shall disclose the internal verification documentation on a confidential basis to the Authority.

3.11.2 Where issues that may render a previously issued verification statement invalid or inaccurate are brought to the attention of the verification body, then it shall notify the Authority.

**APPENDIX 9: REQUIREMENTS FOR A VERIFICATION BODY****1. INTRODUCTION**

*Note — The procedures specified in this Appendix are concerned with the verification requirements in Chapter 4 of this Regulation.*

**2. VERIFICATION BODY**

2.1 The verification body shall be accredited to ISO 14065:2013, and meet the following additional requirements in order to be eligible to verify the Emissions Report, and the Emissions Unit Cancellation Report where applicable, of an aeroplane operator.

*Note — The following documents should be used as normative references that provide guidance for the application of this Regulation:*

- a) *Environmental Technical Manual (Doc 9501), Volume IV – Procedures for demonstrating compliance with the Carbon Offsetting and Reduction Scheme for International Aviation (CORSA);*
- b) *The International Accreditation Forum (IAF) document entitled, “IAF Mandatory Document for the Application of ISO 14065:2013 (IAF MD 6:2014)”;* and
- c) *The International Organization for Standardization (ISO) document entitled, “ISO 14066:2011 Greenhouse gases – Competence requirements for greenhouse gas validation team and verification teams”.*

**2.2 Avoidance of conflict of interest (ISO 14065:2013 section 5.4.2)**

2.2.1 If the leader of the verification team undertakes six annual verifications for one aeroplane operator, then the leader of the verification team shall take a three consecutive year break from providing verification services to that same aeroplane operator. The six year maximum period includes any greenhouse gas verifications performed for the aeroplane operator prior to it requiring verification services under this Regulation.

2.2.2 The verification body, and any part of the same legal entity, shall not be an aeroplane operator, the owner of an aeroplane operator or owned by an aeroplane operator.

2.2.3 The verification body, and any part of the same legal entity, shall not be a body that trades emissions units, the owner of a body that trades emissions units or owned by a body that trades emissions units.

2.2.4 The relationship between the verification body and the aeroplane operator shall not be based on common ownership, common governance, common management or personnel, shared resources, common finances and common contracts or marketing.

2.2.5 The verification body shall not take over any delegated activities from the aeroplane operator with regard to the preparation of the Emissions Monitoring Plan, the Emissions Report (including monitoring of fuel use and calculation of CO<sub>2</sub> emissions) and the Emissions Unit Cancellation Report.

2.2.6 To enable an assessment of impartiality and independence by the national accreditation body, the verification body shall document how it relates to other parts of the same legal entity.

### **2.3 Management and personnel (ISO 14065:2013 section 6.1)**

2.3.1 The verification body shall establish, implement and document a method for evaluating the competence of the verification team personnel against the competence requirements outlined in ISO 14065:2013, ISO 14066:2011 and paragraphs 2.4, 2.5 and 2.6 of this Appendix.

2.3.2 The verification body shall maintain records to demonstrate the competency of the verification team and personnel in accordance with paragraph 2.4 of this Appendix.

### **2.4 Competencies of personnel (ISO 14065:2013 section 6.2)**

The verification body shall:

- a) identify and select competent team personnel for each engagement;
- b) ensure appropriate verification team composition for the aviation engagement;
- c) ensure the verification team, at a minimum, includes a team leader who is responsible for the engagement planning and management of the team;
- d) ensure continued competence of all personnel conducting verification activities, including continual professional development and training for verifiers to maintain and/or develop competencies; and
- e) conduct regular evaluations of the competence assessment process to ensure that it continues to be relevant for this Regulation.

### **2.5 Validation or verification team knowledge (ISO 14065:2013 section 6.3.2)**

2.5.1 The verification team as a whole, and the independent reviewer, shall demonstrate knowledge of:

- a) the requirements as outlined in this Regulation, the Assembly Resolution A39-3, the *Environmental Technical Manual* (Doc 9501), Volume IV – *Procedures for demonstrating compliance with the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA)*, and any public ICAO explanatory material;
- b) the verification requirements as outlined in this Regulation, and *Environmental Technical Manual* (Doc 9501), Volume IV – *Procedures for demonstrating compliance with the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA)*, including materiality threshold, verification criteria, verification scope and objectives and the Verification Report preparation and submission requirements;
- c) the eligibility criteria for technical exemptions, scope of applicability, State pair phase-in rules, and State pair coverage as outlined in this Regulation and the Assembly Resolution A39-3;

- d) the monitoring requirements as outlined in this Directives; and
- e) the national requirements in addition to the provisions set out in this Regulation.

2.5.2 When conducting the verification of an Emissions Unit Cancellation Report, only 2.5.1

- (a),
- (b) and (e) shall be applicable.

### **2.6 Validation or verification team technical expertise (ISO 14065:2013 section 6.3.3)**

2.6.1 The verification team as a whole, and the independent reviewer, shall demonstrate knowledge in the following technical competencies:

- a) general technical processes in the field of civil aviation;
- b) aviation fuels and their characteristics, including CORSIA eligible fuel;
- c) fuel related processes including flight planning and fuel calculation;
- d) relevant aviation sector trends or situations that may impact the CO<sub>2</sub> emissions estimate;
- e) CO<sub>2</sub> emissions quantification methodologies as outlined in this Regulation, including assessment of Emissions Monitoring Plans;
- f) fuel use monitoring and measurement devices, and related procedures for monitoring of fuel use related to greenhouse gas emissions, including procedures and practices for operation, maintenance and calibration of such measurement devices;
- g) greenhouse gas information and data management systems and controls, including quality management systems and quality assurance / quality control techniques;
- h) aviation related IT systems such as flight planning software or operational management systems;
- i) knowledge of approved CORSIA Sustainability Certification Schemes relevant for CORSIA eligible fuels under this Regulation, including certification scopes; and
- j) basic knowledge of greenhouse gas markets and emissions units programme registries.

2.6.2 Evidence of the above competencies shall include proof of relevant professional experience, complemented by appropriate training and education credentials.

2.6.3 When conducting the verification of an Emissions Report, 2.6.1 (a) to (i) shall be applicable.

2.6.4 When conducting the verification of an Emissions Unit Cancellation Report, only 2.6.1 (g) and (j) shall be applicable.

### **2.7 Validation or verification team data and information auditing (ISO 14065:2013 section 6.3.4)**

2.7.1 The verification team as a whole shall demonstrate detailed knowledge of ISO 14064- 3:2006, including demonstrated ability to develop a risk-based verification approach, perform verification



procedures including assessing data and information systems and controls, collect sufficient and appropriate evidence and draw conclusions based on that evidence.

2.7.2 Evidence of data and information auditing expertise and competencies shall include previous professional experience in auditing and assurance activities, complemented by appropriate training and education credentials.

#### **2.8 Use of contracted validators and verifiers (ISO 14065:2013 section 6.4)**

The verification body shall document roles and responsibilities of the verification personnel, including contracted persons involved in the verification activity.

#### **2.9 Outsourcing (ISO 14065:2013 section 6.6)**

2.9.1 The verification body shall not outsource the final decision on the verification and the issuance of the verification statement.

2.9.2 The independent review shall only be outsourced as long as the outsourced service is appropriate, competent, and covered by the accreditation.

#### **2.10 Confidentiality (ISO 14065:2013 section 7.3)**

The verification body shall ensure it has the express consent of the aeroplane operator prior to submission of the verified Emissions Report, the Emissions Unit Cancellation Report where applicable, and the Verification Report to the Authority. The mechanism for authorizing this consent shall be specified in the contract between the verification body and aeroplane operator.

#### **2.11 Records (ISO 14065:2013 section 7.5)**

The verification body shall keep records on the verification process for a minimum of ten years, including:

- a) client's Emissions Monitoring Plan, Emissions Report and Emissions Unit Cancellation Report where applicable;
- b) Verification Report and related internal documentation;
- c) identification of team members and criteria for selection of team; and
- d) working papers with data and information reviewed by the team in order to allow for an independent party to assess the quality of the verification activities and conformance with verification requirements.

#### **2.12 Agreement (ISO 14065:2013 section 8.2.3)**

The contract between verification body and aeroplane operator shall specify the conditions for verification by stating:

- a) scope of verification, verification objectives, level of assurance, materiality threshold and relevant verification standards (ISO 14065, ISO 14064-3, this Regulation and the Environmental Technical Manual, Volume IV);



- b) amount of time allocated for verification;
- c) flexibility to change time allocation if this proves necessary because of findings during the verification;
- d) conditions which have to be fulfilled to conduct the verification such as access to all relevant documentation, personnel and premises;
- e) requirement of the aeroplane operator to accept the audit as a potential witness audit by national accreditation body's assessors;
- f) requirement of the aeroplane operator to authorize the release of the Emissions Report, the Emissions Unit Cancellation Report, where applicable, and the Verification Report by the verification body to the Authority; and
- g) liability coverage.

**CO<sub>2</sub> OFFSETTING REQUIREMENTS FROM INTERNATIONAL FLIGHTS AND EMISSIONS REDUCTIONS FROM THE USE OF CORSIA ELIGIBLE FUELS****16.4.4.10 APPLICABILITY OF CO<sub>2</sub> OFFSETTING REQUIREMENTS**

- (1) From 1 January 2021 to 31 December 2035, the offsetting requirements of this Chapter shall be applicable to an Air Operator with international flights, as defined in 16.4.3.1.2 and 2.1, between States as defined in the ICAO document entitled “CORSIA States for Chapter 3 State Pairs” that is available on the ICAO CORSIA website.
- (2) The provisions of this section shall not be applicable to a new entrant Air Operator for three years starting in the year when it meets the requirements in 2.1.1 and 2.1.3, or until its annual CO<sub>2</sub> emissions exceed 0.1 per cent of total CO<sub>2</sub> emissions from international flights, as defined in 16.4.3.1.2 and 2.1, in 2020, whichever occurs earlier. The Standards of this Chapter shall then be applicable in the subsequent year. The State shall use the information on the total CO<sub>2</sub> emissions in 2020 from the ICAO document entitled “CORSIA 2020 Emissions” that is available on the ICAO CORSIA website. This information will be produced in accordance with the timeline described in Appendix 1.
- (3) The Authority shall notify ICAO of their decision to voluntarily participate, or to discontinue the voluntary participation in CORSIA, for the purpose of the inclusion of the State in the ICAO document entitled “CORSIA States for Chapter 3 State Pairs”, according to the timeline described in Appendix 1.

*Note. – The ICAO document entitled “CORSIA States for Chapter 3 State Pairs” that is available on the ICAO CORSIA website includes:*

- a) *States that have volunteered to participate during the compliance periods from 1 January 2021 to 31 December 2026;*
  - b) *States, with the exception of Least Developed Countries (LDCs), Small Island Developing States (SIDS) and Landlocked Developing Countries (LLDCs), which meet the following criteria during the compliance periods from 1 January 2027 to 31 December 2035:*
    - (i) *an individual share of international aviation activities in RTKs in the year 2018 above 0.5 per cent of total RTKs; or*
    - (ii) *whose cumulative share in the list of States from the highest to the lowest amount of RTKs reaches 90 per cent of total RTKs in the year 2018.*
  - c) *States which are not within the applicability scope of (b), but which have volunteered to participate.*
- This document is updated on an annual basis according to the timeline as defined in Appendix 1.*

The State shall calculate the annual aeroplane operator's final CO<sub>2</sub> offsetting requirements based on the data reported in accordance with Chapter 2, the applicability requirements in 3.1, and the application of 3.2, 3.3 and 3.4 where applicable.

**16.4.4.11 CO<sub>2</sub> offsetting requirements**

The State shall calculate, for each of the aeroplane operators attributed to it, the amount of CO<sub>2</sub> emissions required to be offset in a given year from 1 January 2021 to 31 December 2023 prior to consideration of the CORSIA eligible fuels, as follows:

$$= *$$

where

OR<sub>y</sub> = Aeroplane operator's offsetting requirements in the given year *y*;

OE = Aeroplane operator's CO<sub>2</sub> emissions covered by 3.1 in the given year *y* or aeroplane operator's

CO<sub>2</sub> emissions covered by 3.1 in 2020, depending upon the option selected by the State which will

be applied to all aeroplane operators that have been attributed to it; and

SGF<sub>y</sub> = Sector's Growth Factor.

*Note 1. – The Sector's Growth Factor applicable for a given year (SGF<sub>y</sub>) is provided in the ICAO document entitled "CORSIA Annual Sector's Growth Factor (SGF)" that is available from the ICAO CORSIA website, and is calculated as  $(\frac{SE_y}{SE_{B,y}})^{1/y}$ , where SE<sub>y</sub> = Total sectoral CO<sub>2</sub> emissions covered by 3.1 in the given year *y* and SE<sub>B,y</sub> = Average total annual sectoral CO<sub>2</sub> emissions during 2019 and 2020 covered by 3.1 in the given year *y*.*

*Note 2. – Sectoral emissions in a given year (SE<sub>y</sub>) do not include the CO<sub>2</sub> emissions from new entrants during their exception period, as defined in 3.1.2.*

*Note 3. – As the States which form the "CORSIA States for Chapter 3 State Pairs", as defined by 3.1, change over time, the average total annual sectoral CO<sub>2</sub> emissions during 2019 and 2020 covered by these State pairs in the given year *y* (SE<sub>B,y</sub>) will be recalculated.*

The State shall calculate, for each of the aeroplane operators attributed to it, the amount of CO<sub>2</sub> emissions required to be offset in a given year from 1 January 2024 to 31 December 2035 prior to consideration of the CORSIA eligible fuels, every year as follows:

$$= \% * ( * ) + \% * ( * )$$

where:

OR<sub>y</sub> = Aeroplane operator's offsetting requirements in the given year *y*;

OE<sub>y</sub>

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= Aeroplane operator's CO<sub>2</sub> emissions covered by 3.1 in the given year *y*;

%S  
*y* = Per cent Sectoral in the given year *y*;

%O  
*y* = Per cent Individual in the given year *y* where %O<sub>*y*</sub> = (100% - %S<sub>*y*</sub>);

SGF  
*y* = Sector's Growth Factor; and

OGF  
*y* = Aeroplane operator's Growth Factor.



**Table 3.1 – Overview of CO<sub>2</sub> offsetting requirements on a sectoral and individual basis**

<i>Year of applicability</i>	<i>%S<sub>y</sub></i>	<i>%O<sub>y</sub></i>
1 January 2024 to 31 December 2029	100%	0%
1 January 2030 to 31 December 2032	(100% - %O <sub>y</sub> )	A specified percentage of at least 20%
1 January 2033 to 31 December 2035	(100% - %O <sub>y</sub> )	A specified percentage of at least 70%

*Note. – The specified percentage (i.e., %O<sub>y</sub>) will be determined by the ICAO Assembly in 2028.*

The State shall use the Sector Growth Factor applicable for a given year (SGF<sub>y</sub>) in the ICAO document entitled “CORSIA Annual Sector’s Growth Factor (SGF)” that is available from the ICAO CORSIA website. This information will be produced in accordance with the timeline as defined in Appendix 1.

The State shall calculate, when applicable, the aeroplane operator’s Growth Factor for a given year (OGF<sub>y</sub>) in accordance with the CO<sub>2</sub> emissions from the verified Emissions Reports submitted by aeroplane operators attributed to it, as follows:

$$OGF_y = \frac{OE_y - OE_{B,y}}{OE_{B,y}}$$

where:

OE<sub>y</sub> = Total aeroplane operator’s CO<sub>2</sub> emissions covered by 3.1 in the given year *y*;

and

OE<sub>B,y</sub> = Average total annual aeroplane operator’s CO<sub>2</sub> emissions during 2019 and 2020 covered by 3.1

in the given year *y*.

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The State shall, upon calculating the offsetting requirements in a given year (OR<sub>y</sub>) of each of the aeroplane operators attributed to it, inform the Air Operator of its offsetting requirements according to the timeline as defined in Appendix 1.

**3.3 Emissions reductions from the use of CORSIA eligible fuels**

The Air Operator that intends to claim for emissions reductions from the use of CORSIA eligible fuels in a given year shall compute emissions reductions as follows:

$$ER_y = MS_{f,y} \left[ \sum_{f \in F} FCF_f \left( 1 - \frac{LS_f}{LC} \right) \right]$$

where  
:

$ER_y$  = Emissions reductions from the use of CORSIA eligible fuels in the given year  $y$  (in tonnes);

$FCF$  = Fuel conversion factor, equal to 3.16 kg CO<sub>2</sub>/kg fuel for Jet-A fuel / Jet-A1 fuel and 3.10 kg CO<sub>2</sub>/kg fuel for AvGas or Jet-B fuel;

$MS_{f,y}$  = Total mass of a neat CORSIA eligible fuel claimed in the given year  $y$  (in tonnes), as described and reported in Field 12.b in Table A5-1 from Appendix 5;

$LS_f$  = Life cycle emissions value for a CORSIA eligible fuel (in gCO<sub>2</sub>e/MJ); and

$LC$  = Baseline life cycle emissions values for aviation fuel, equal to 89 gCO<sub>2</sub>e/MJ for jet fuel and equal to 95 gCO<sub>2</sub>e/MJ for AvGas.

Note 1. – The ratio  $(1 - )$  is also referred to as the emissions reduction factor (ERF<sub>f</sub>) of a CORSIA eligible fuel.

Note 2. – For each of the CORSIA eligible fuels claimed, the total mass of the neat CORSIA eligible fuel claimed in the given year  $y$  needs to be multiplied by its emissions reduction factor (ERF<sub>f</sub>). Then the quantities are summed for all CORSIA eligible fuels.

3.3.2 If a Default Life Cycle Emissions value is used, then the Air Operator shall use the ICAO document entitled “CORSIA Default Life Cycle Emissions Values for CORSIA Eligible Fuels” that is available on the ICAO CORSIA website for the calculation in 3.3.1.

3.3.3 If an Actual Life Cycle Emissions value is used, then an approved Sustainability Certification Scheme shall ensure that the methodology, as defined in the ICAO document entitled “CORSIA Methodology for Calculating Actual Life Cycle Emissions Values” that is available on the ICAO CORSIA website, has been applied correctly.

**3.4 Total final CO<sub>2</sub> offsetting requirements for a given compliance period with emissions reductions from the use of CORSIA eligible fuels**

The amount of CO<sub>2</sub> emissions required to be offset by the aeroplane operator, after taking into account emissions reductions from the use of CORSIA eligible fuels in a given compliance period from 1 January 2021 to 31 December 2035, shall be calculated by the State as follows:

$$= (1, + 2, + 3,) - (1, + 2, + 3,)$$

where:

FOR<sub>c</sub> = Aeroplane operator’s total final offsetting requirements in the given compliance period  $c$ ;

OR<sub>y,c</sub> = Aeroplane operator’s offsetting requirements in the given year  $y$  (where  $y = 1, 2$  or  $3$ ) of the compliance period  $c$ ; and

ER<sub>y,c</sub> = Emissions reductions from the use of CORSIA eligible fuels in the given year  $y$  (where  $y = 1, 2$



or 3) of the compliance period c.

3.4.2 If the aeroplane operator's total final offsetting requirements during a compliance period (i.e., FOR<sub>c</sub>) is negative, then the Air Operator has no offsetting requirements for the compliance period. These negative offsetting requirements shall not be carried forward to subsequent compliance periods.

3.4.3 The aeroplane operator's total final offsetting requirements during a compliance period (i.e., FOR<sub>c</sub>) shall be rounded up to the nearest tonne of CO<sub>2</sub>.

3.4.4 The State shall, upon calculating the total final offsetting requirements for a given compliance period of each of the aeroplane operators attributed to it, inform the Air Operator of its total final offsetting requirements according to the timeline as defined in Appendix 1.

*Note. – Information on CORSIA Eligible Emissions Units, which can be used to meet CO<sub>2</sub> offsetting requirements, are contained in Chapter 4.*

## EMISSIONS UNITS

*Note.— An emissions unit represents one metric tonne of carbon dioxide equivalent.*

### Applicability of emissions units

The Standards and Recommended Practices of this Chapter shall be applicable to an Air Operator who is subject to offsetting requirements in Chapter 3.

*Note.— See also Chapter 1 and Appendix 1 for administration procedures relevant to Chapter 4.*

### Cancelling CORSIA Eligible Emissions Units

The Air Operator shall meet its offsetting requirements according to 3.4.4, as calculated by the State to which it is attributed, by cancelling CORSIA Eligible Emissions Units in a quantity equal to its total final offsetting requirements for a given compliance period (i.e., FOR<sub>c</sub>). The CORSIA Eligible Emissions Units are only those units described in the ICAO document entitled "CORSIA Eligible Emissions Units", which meet the CORSIA Emissions Unit Eligibility Criteria contained in the ICAO document entitled "CORSIA Emissions Unit Eligibility Criteria". These ICAO documents are available on the ICAO CORSIA website.

*Note. — The CORSIA Eligible Emissions Units are determined by the Council, upon recommendation of a technical advisory body established by the Council, and meet the CORSIA Emissions Unit Eligibility Criteria. The CORSIA Emissions Unit Eligibility Criteria are approved and may only be amended by the Council, with the technical contribution of CAEP, taking into account relevant developments in the UNFCCC and the Paris Agreement. The emissions units generated from mechanisms established under the UNFCCC and the Paris Agreement are eligible for use in CORSIA, provided that they align with decisions by the Council with the technical contribution of CAEP, including on avoiding double counting and on eligible vintage and timeframe.*

To fulfil the provisions in 4.2.1, the Air Operator shall:

- a) cancel such CORSIA Eligible Emissions Units within a registry designated by a CORSIA Eligible Emissions Unit Programme in accordance with the timeline as defined in Appendix 1; and

- b) request each CORSIA Eligible Emissions Unit Programme registry to make visible on the registry’s public website, information on each of the aeroplane operator’s cancelled CORSIA Eligible Emissions Units for a given compliance period, as defined in Appendix 1. Such information for each cancelled CORSIA Eligible Emissions Unit shall include the consolidated identifying information in Field 5 of Table A5-7, except fields 5.j, 5.k and 5.m.

*Note.* — “Cancel” means the permanent removal and single use of a CORSIA Eligible Emissions Unit within a CORSIA Eligible Emissions Unit Programme designated registry such that the same emissions unit may not be used more than once. This is sometimes also referred to as “retirement”, “cancelled”, “cancelling” or “cancellation”.

### **Reporting emissions unit cancellation**

The Air Operator shall report to the State to which it is attributed, the cancellation of CORSIA Eligible Emissions Units carried out in accordance with 4.2 to meet its total final offsetting requirements for a given compliance period, by submitting to the State a copy of the verified Emissions Unit Cancellation Report for approval and a copy of the associated Verification Report. The Emissions Unit Cancellation Report shall contain information using the required fields defined in Appendix 5 Table A5-7 and shall be submitted to the State according to the timeline as defined in Appendix 1.

The State shall report to ICAO in accordance with the timeline as defined in Appendix 1. This report shall contain the information as defined in Appendix 5 Table A5-8, using an ICAO approved form.

The State should publish the following information, once submitted to ICAO, for a given compliance period:

- a) Total final offsetting requirements over the compliance period for each aeroplane operators attributed to the State; and
- b) Total quantity of emissions units cancelled over the compliance period by each Air Operator to reconcile the total final offsetting requirements, as reported by each Air Operator attributed to the State.

### **Verification of Emissions Unit Cancellation Report**

#### **Verification of an aeroplane operator’s Emissions Unit Cancellation Report**

1. The Air Operator shall engage a verification body for the verification of its Emissions Unit Cancellation Report.

*Note.* — The Air Operator may choose to use the same verification body engaged for the verification of its Emissions Report, although it is not obligated to do so.

2. A verification body shall conduct the verification according to ISO 14064-3:20064, and the relevant requirements in Appendix 6, Section 3.
3. If required by the verification body, the Air Operator shall provide access to relevant information on the cancellation of emissions units.
4. Following the verification of the Emissions Unit Cancellation Report by the verification body, the Air Operator and the verification body shall both independently submit, upon authorization by the aeroplane operator, a copy of the Emissions Unit Cancellation Report and associated Verification Report to the State to which the Air Operator is attributed in accordance with the timeline in Appendix 1.

5. The State shall perform an order of magnitude check of the Emissions Unit Cancellation Report in accordance with the timeline, as defined in Appendix 1.

*Note.* – Further guidance material on the verification of Emissions Unit Cancellation Report is provided in the Environmental Technical Manual (Doc 9501), Volume IV – Procedures for demonstrating compliance with the Carbon Offsetting and Reduction Scheme for International Aviation (CORSA).

#### **Verification body and national accreditation body**

1. A verification body shall be accredited to ISO 14065:2013<sup>4</sup> and the relevant requirements in Appendix 6, Section 2 by a national accreditation body, in order to be eligible to verify the Emissions Unit Cancellation Report of an aeroplane operator.

*Note.* – An Air Operator may engage a verification body accredited in another State, subject to rules and regulations affecting the provision of verification services in the State to which the Air Operator is attributed.

2. A national accreditation body shall be working in accordance with ISO/IEC 17011:2004<sup>6</sup>.

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<sup>4</sup>ISO 14065:2013 entitled "Greenhouse gases – Requirements for greenhouse gas validation and verification bodies for use in accreditation or other forms of recognition, Document published on: 2013-04." ISO 14064-3:2006 entitled "Greenhouse gases – Part 3: Specification with guidance for the validation and verification of greenhouse gas assertions."