CAAM Civil Aviation Authority of Malaysia	**Civil Aviation Authority of Malaysia** **CIVIL AVIATION CIRCULAR (CAC)**	Date: 10/06/22 CAC Ref: 02/2022

CAC REFERENCE NUMBER:	CAC 02/2022
APPLICABILITY:	AIRWORTHINESS AIR NAVIGATION SERVICES FLIGHT OPERATIONS
EFFECTIVE DATE:	10/06/2022
DOCUMENT EFFECTED:	CAD 16 VOL I – ENVIRONMENTAL PROTECTION AIRCRAFT NOISE CAD 16 VOL II – ENVIRONMENTAL PROTECTION AIRCRAFT ENGINE EMISSIONS CAD 16 VOL III – ENVIRONMENTAL PROTECTION AIRCRAFT CO_2 EMISSIONS CAD 1011 – APPROVED TRAINING ORGANISATION CAD 1102 – AERODROME FLIGHT INFORMATION SERVICE CAD 1201 – ATC LICENSING CAD 6011 PART V – UNMANNED AIRCRAFT SYSTEM - SPECIAL UAS PROJECT

Revised CADs Requirements and Guidance

1 Introduction

1.1 This Civil Aviation Circular (CAC) is issued by the Chief Executive Officer (CEO) of the Civil Aviation Authority of Malaysia, as CAC 02/2022, in exercise of the powers conferred by section 24O of the Civil Aviation Act 1969 [*Act 3*].

1.2 This CAC, including the attachments is a legally binding document that supersedes current published standards, requirements, procedures, or guidelines in the CADs.

1.3 The standards, requirements, procedures, or guidelines stated in this CAC will be incorporated into the relevant CADs in the next planned revision cycle.

1.4 Without prejudice, any revision(s) in this CAC is only applicable to the aforementioned chapter or paragraph of the CADs herewith thereto.

2 Revision(s)

2.1 The revision(s) of the CADs can be found in attachments as below.

No.	Attachment	CAD applicable
1	Attachment 1	CAD 16 Vol I – Environmental Protection Aircraft Noise
2	Attachment 2	CAD 16 Vol II – Environmental Protection Aircraft Engine Emissions

3	Attachment 3	CAD 16 Vol III – Environmental Protection Aircraft CO_2 Emissions
4	Attachment 4	CAD 1011 – Approved Training Organisation
5	Attachment 5	CAD 1102 – Aerodrome Flight Information Service
6	Attachment 6	CAD 1201 – ATC Licensing
7	Attachment 7	CAD 6011 Part V – Unmanned Aircraft System - Special UAS Project

3 Incorporating Changes Into CADs

3.1 The changes stated in this CAC will be incorporated into the next revision of the applicable CADs.

(Datuk Captain Chester Voo Chee Soon)
Chief Executive Officer
Civil Aviation Authority of Malaysia

ATTACHMENT 1 TO CAC 02/2022: CAD 16 VOLUME I – ENVIRONMENTAL PROTECTION, AIRCRAFT NOISE

1 Revision(s)

1.1 **Part I, Chapter 1, Paragraph 1.5.1**

1.1.1 Nomenclature for velocity shall read as follows:

Symbol	*Unit*	*Meaning*
c_R	m/s	*Reference speed of sound*. Speed of sound at a reference temperature condition (25^{O}C).
c_{HR}	m/s	*Reference speed of sound at the altitude of the aeroplane*. The reference speed of sound corresponding to the ambient temperature – assuming a lapse rate of 0.65°C per 100 m – for a standard day at the aeroplane reference height above mean sea level.
M_{ATR}	—	*Helicopter rotor reference advancing blade tip Mach number*. The sum of the reference rotor rotational tip speed and the reference speed of the helicopter, divided by the reference speed of sound.
M_H	—	*Propeller helical tip Mach number*. 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 aeroplane, divided by the test speed of sound.
M_{HR}	—	*Propeller reference helical tip Mach number*. 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 aeroplane, divided by the reference speed of sound.
Best R/C	m/s	*Best rate of climb*. The certificated maximum take-off rate of climb at the maximum power setting and engine speed.
V_{AR}	m/s	*Adjusted reference speed*. 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_{CON}	m/s	*Maximum airspeed in conversion mode*. The never-exceed airspeed of a tilt-rotor when in conversion mode.
V_G	m/s	*Ground speed*. The aircraft velocity relative to the ground.
V_{GR}	m/s	*Reference ground speed*. The aircraft true velocity relative to the ground in the direction of the ground track under reference conditions. V_{GR} is the horizontal component of the reference aircraft speed V_R.

V_H	m/s	*Maximum airspeed in level flight*. The maximum airspeed of a helicopter in level flight when operating at maximum continuous power.
V_{MCP}	m/s	*Maximum airspeed in level flight*. The maximum airspeed of a tilt-rotor in level flight when operating in aeroplane mode at maximum continuous power.
V_{MO}	m/s	*Maximum operating airspeed*. The maximum operating limit airspeed of a tilt- rotor that may not be deliberately exceeded.
V_{NE}	m/s	*Never-exceed airspeed*. The maximum operating limit airspeed that may not be deliberately exceeded.
V_R	m/s	*Reference speed*. The aircraft true velocity at reference conditions in the direction of the reference flight path. *Note. – This symbol should not be confused with the symbol commonly used for aeroplane take-off rotation speed.*
V_{REF}	m/s	*Reference landing airspeed*. The speed of the aeroplane, 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.
V_S	m/s	*Stalling airspeed*. The minimum steady airspeed in the landing configuration.
V_{tip}	m/s	*Tip speed*. The rotational speed of a rotor or propeller tip at test conditions, excluding the aircraft velocity component.
V_{tipR}	m/s	*Reference tip speed.* The rotational speed of a rotor or propeller tip at reference conditions, excluding the aircraft velocity component.
V_Y	m/s	*Speed for best rate of climb*. The test airspeed for best take-off rate of climb.
V_2	m/s	*Take-off safety speed*. The minimum airspeed for a safe take-off.

1.1.2 **Reason for change:** Changes to units.

1.2 **Part I, Chapter 1, Paragraph 1.5.4**

1.2.1 Nomenclature for noise metrics shall read as follows:

Symbol	*Unit*	*Meaning*

EPNL	EPNdB	*Effective perceived noise level.* 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 ICAO Annex 16 Volume I Appendix 2, Section 4.1 for specifications.)
$EPNL_A$	EPNdB	*Approach EPNL.* Effective perceived noise level at the aeroplane approach reference measurement points.
$EPNL_F$	EPNdB	*Flyover EPNL.* Effective perceived noise level at the aeroplane flyover reference measurement points.
$EPNL_L$	EPNdB	*Lateral EPNL.* Effective perceived noise level at the aeroplane lateral reference measurement points.
L_{AE}	dB(A)	*Sound exposure level (SEL)*. 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 ICAO Annex 16 Volume I Appendix 4, Section 3 for specifications.)
L_{AS}	dB(A)	*Slow A-weighted sound level*. Sound level with frequency weighting A and time weighting S for a specified instance in time.
L_{ASmax}	dB(A)	*Maximum slow A-weighted sound level*. The maximum value of L_{AS} over a specified time interval.
L_{ASmaxR}	dB(A)	*Reference maximum slow A-weighted sound level.* The maximum value of L_{AS} over a specified time interval corrected to reference conditions.
$LIMIT_A$	EPNdB	*Approach EPNL limit*. The maximum permitted noise level at the aeroplane approach reference measurement points.
$LIMIT_F$	EPNdB	*Flyover EPNL limit*. The maximum permitted noise level at the aeroplane flyover reference measurement points.
$LIMIT_L$	EPNdB	*Lateral EPNL limit*. The maximum permitted noise level at the aeroplane lateral reference measurement points.
n	noy	*Perceived noisiness.* The perceived noisiness of a one-third octave band sound pressure level in a given spectrum.
N	noy	*Total perceived noisiness.* The total perceived noisiness of a given spectrum calculated from the 24 values of *n*.
PNL	PNdB	*Perceived noise level.* 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 ICAO Annex 16 Volume I Appendix 2, Section 4.2 for specifications.)

PNLT	TPNdB	*Tone-corrected perceived noise level.* The value of the PNL of a given spectrum adjusted for spectral irregularities.
$PNLT_R$	TPNdB	*Reference tone-corrected perceived noise level.* The value of PNLT adjusted to reference conditions.
PNLTM	TPNdB	*Maximum tone-corrected perceived noise level.* The maximum value of $PNLT_R$ in a specified time history, adjusted for the bandsharing adjustment Δ_B.
$PNLTM_R$	TPNdB	*Reference maximum tone-corrected perceived noise level.* The maximum value of $PNLT_R$ in a specified time history, adjusted for the bandsharing adjustment Δ_B in the simplified method and Δ_{BR} in the integrated method.
SPL	dB	*Sound pressure level.* The level of sound, relative to the reference level of 20 µPa 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 µPa. *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*
SPL_R	dB	*Reference sound pressure level*. The one-third octave band sound pressure levels adjusted to reference conditions.
SPL_S	dB	*Slow weighted sound pressure level*. The value of one-third octave band sound pressure levels with time weighting S applied.
Δ_1	TPNdB	*PNLTM adjustment.* Under ICAO Annex 16 Volume I Appendix 2 or Attachment F. 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.
	dB(A)	Under ICAO Annex 16 Volume I Appendix 4. The adjustments to be added to the measured L_{AE} to account for noise level changes for spherical spreading and duration due to the difference between test and reference helicopter height.
	dB(A)	Under ICAO Annex 16 Volume I Appendix 6. For propeller-driven aeroplanes 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 aeroplane heights.

$\Delta 2$	TPNdB	*Duration adjustment.* Under ICAO Annex 16 Volume I Appendix 2 or Attachment F. 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.
	dB(A)	Under ICAO Annex 16 Volume I Appendix 4. The adjustments to be added to the measured LAE to account for noise level changes due to the difference between reference and adjusted airspeed.
	dB(A)	Under ICAO Annex 16 Volume I Appendix 6. For propeller-driven aeroplanes not exceeding 8 618 kg, the adjustment to be added to L_{ASmax} to account for the noise level changes due to the difference between test and reference propeller helical tip Mach number.
Δ_3	TPNdB	*Source noise adjustment.* Under ICAO Annex 16 Volume I Appendix 2. 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)	Under ICAO Annex 16 Volume I Appendix 6. For propeller-driven aeroplanes not exceeding 8 618 kg, the adjustment to be added to the measured L_{ASmax} to account for noise level changes due to the difference between test and reference engine power.
Δ_4	dB(A)	*Atmospheric absorption adjustment*. Under ICAO Annex 16 Volume I Appendix 6. For propeller-driven aeroplanes 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 aeroplane heights.
Δ_B	TPNdB	*Bandsharing adjustment.* The adjustment to be added to the maximum PNLT to account for possible suppression of a tone due to one-third octave bandsharing of that tone. PNLTM is equal to the maximum PNLT plus Δ_B
Δ_{BR}	TPNdB	*Reference bandsharing adjustment*. The adjustment to be added to the maximum $PNLT_R$ in the integrated method to account for possible suppression of a tone due to one-third octave bandsharing of that tone. $PNLTM_R$ is equal to the maximum $PNLT_R$ plus Δ_{BR}.

Δ_{peak}	TPNdB	*Peak adjustment*. The adjustment to be added to the measured EPNL for when the PNLT for a secondary peak, identified in the calculation of EPNL from measured data and adjusted to reference conditions, is greater than the PNLT for the adjusted PNLTM spectrum.

1.2.2 **Reason for change:** Changes to units and meaning.

1.3 **Part I, Chapter 1, Paragraph 1.5.6**

1.3.1 Nomenclature for flight path geometry shall read as follows:

Symbol	*Unit*	*Meaning*
H	m	*Height.* The aircraft height at the point where the flight path intercepts the Vertical geometrical plane perpendicular to the reference ground track at the centre microphone.
H_R	m	*Reference height.* The reference aircraft height at the point where the reference flight path intercepts the vertical geometrical plane perpendicular to the reference ground track at the centre microphone
X	m	*Aircraft position along the ground track*. The position coordinate of the aircraft along the x-axis at a specific point in time.
Y	m	*Lateral aircraft position relative to the reference ground track*. The position coordinate of the aircraft along the y-axis at a specific point in time.
Z	m	*Vertical aircraft position relative to the reference ground track*. The position coordinate of the aircraft along the z-axis at a specific point in time.
θ	degrees	*Sound emission angle.* 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.
ψ	degrees	*Elevation angle.* 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.
ψ_R	degrees	*Reference elevation angle.* 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.

1.3.2 **Reason for change:** Changes to meaning.

1.4 **Part II, Chapter 1, Paragraph 1.1**

1.4.1 Para 1.1 shall read as follows:

The requirements of 1.2 to 1.4 shall apply to all aircraft included in the classifications defined for noise certification purposes in Chapters 2, 3, 4, 5, 6, 8, 10, 11, 12, 13 and 14 of this part where such aircraft are engaged in international air navigation.

1.4.2 **Reason for change:** Correction to referencing.

1.5 **Part II, Chapter 1, Paragraph 1.10**

1.5.1 Para 1.10 shall read as follows:

The amendment of this CAD to be used by the applicant shall be that which is applicable following the requirements in CAD 8102, CAD 8104, CAD 8105, CAD 8106, CAD 8107 or CAD 8108 as applicable.

1.5.2 **Reason for change:** Added reference to other applicable CAD.

1.6 **Part II, Chapter 3, Paragraph 3.7.7**

1.6.1 Para 3.7.7 shall read as follows:

For take-off, lateral, and approach conditions, the variation in instantaneous indicated airspeed of the aeroplane shall be maintained within ±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 ±5.5 km/h (±3 kt), and this is judged by CAAM representative on the flight deck to be due to atmospheric turbulence, then the flight so affected shall be rejected for noise certification purposes.

1.6.2 **Reason for change:** Standardise editorial practice.

1.7 **Part II, Chapter 7**

1.7.1 The following is added:

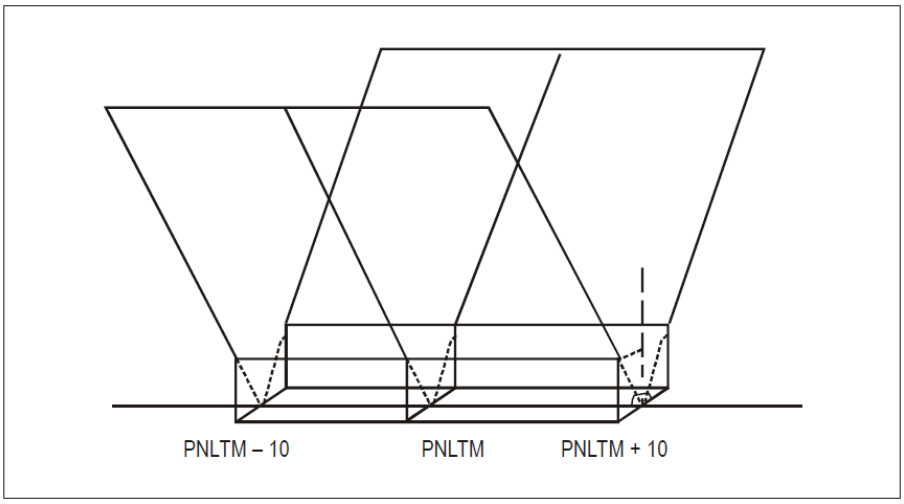
Note. – Standards for this chapter are not yet developed. In the meantime, guidelines provided in ICAO Annex 16 Volume I Attachment B may be used for noise certification of propeller-driven STOL aeroplanes for which a certificate of

airworthiness for the individual aeroplane was first issued on or after 1 January 1976.

1.7.2 **Reason for change:** To give provision for noise certification on propeller-driven STOL Aeroplanes.

1.8 **Part II, Chapter 8, Paragraph 8.7.8**

1.8.1 Figure 8-1 amended as follows:



1.8.2 **Reason for change:** Added missing reference track titles.

1.9 **Part II, Chapter 8, Paragraph 8.7.11**

1.9.1 Para 8.7.11 shall read as follows:

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 shall be completed at or above this maximum certificated mass.

1.9.2 **Reason for change:** Standardise editorial practice.

1.10 **Part II, Chapter 9**

1.10.1 The following is added:

Note. – Standards for this chapter are not yet developed. In the meantime, guidelines provided in ICAO Annex 16 Volume I Attachment C may be used for

noise certification of installed auxiliary power units (APU) and associated aircraft systems in:

a) all aircraft for which the application for a Type Certificate was submitted, or another equivalent prescribed procedure was carried out by the certificating authority, on or after 6 October 1977; and

b) aircraft of existing type design for which the application for a change of type design involving the basic APU installation was submitted, or another equivalent prescribed procedure was carried out by the certificating authority, on or after 6 October 1977.

1.10.2 **Reason for change:** To give provision for noise certification on Auxiliary Power Units (APU) and associated aircraft systems during ground operations.

1.11 **Part II, Chapter 11, Paragraph 11.2**

1.11.1 Para 11.2 shall read as follows:

The noise evaluation measure shall be the sound exposure level L_{AE} as described in ICAO Annex 16 Volume I Appendix 4.

1.11.2 **Reason for change:** To introduce symbol for sound exposure level.

1.12 **Part II, Chapter 11, Paragraph 11.4.1**

1.12.1 Para 11.4.1 shall read as follows:

For helicopters specified in 11.1.2 and 11.1.3, the maximum noise levels, when determined in accordance with the noise evaluation method of ICAO Annex 16 Volume I Appendix 4, shall not exceed 82 dB(A) 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.

1.12.2 **Reason for change:** To introduce unit for maximum noise level.

1.13 **Part II, Chapter 11, Paragraph 11.4.2**

1.13.1 Para 11.4.2 shall read as follows:

For helicopters specified in 11.1.4, the maximum noise levels, when determined in accordance with the noise evaluation method of ICAO Annex 16 Volume I Appendix 4, shall not exceed 82 dB(A) 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.

1.13.2 **Reason for change:** To introduce unit for maximum noise level.

1.14 **Part II, Chapter 11, Paragraph 11.6.2**

1.14.1 Para 11.6.2 shall read as follows:

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 (L_{AE}), in A-weighted decibels integrated over the duration time, as described in ICAO Annex 16 Volume I Appendix 4.

1.14.2 **Reason for change:** To introduce symbol for sound exposure level and requirement clarification.

1.15 **Part II, Chapter 12, Paragraph 12.2**

1.15.1 The following is added:

Note. – Standards for these aeroplanes have not been developed. However, the maximum noise levels of the Part that would be applicable to subsonic jet aeroplanes may be used as a guideline. Acceptable levels of sonic boom have not been established and compliance with subsonic noise Standards may not be presumed to permit supersonic flight.

1.15.2 **Reason for change:** To give provision for noise certification on supersonic aeroplanes which application for Type Certificate submitted on or after 1 January 1975.

1.16 **Part II, Chapter 13, Paragraph 13.7.11**

1.16.1 Para 13.7.11 shall read as follows:

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 shall be completed at or above this maximum certificated mass.

1.16.2 **Reason for change:** Standardise editorial practice.

1.17 **Part V, Paragraph 4 and 5**

1.17.1 The following paragraphs are added:

4. The factors to be taken into consideration in the development of appropriate aircraft operating procedures for noise abatement should include the following:

   a) the nature and extent of the noise problem including:

      1) the location of noise-sensitive areas; and

      2) critical hours;

   b) the types of aircraft affected, including aircraft mass, aerodrome elevation, temperature considerations;

   c) the types of procedures likely to be most effective;

   d) obstacle clearances (ICAO PANS-OPS (Doc 8168), Volumes I and II); and

   e) human performance in the application of the operating procedures.

5. *RESERVED*

1.17.2 **Reason for change:** Added noise abatement consideration factors.

ATTACHMENT 2 TO CAC 02/2022: CAD 16 VOLUME II – ENVIRONMENTAL PROTECTION, AIRCRAFT ENGINE EMISSIONS

1 Revision(s)

1.1 **Part I, Chapter 1**

1.1.1 Definition added as follows:

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

1.1.2 **Reason for change:** Added for clarity.

1.2 **Part III, Chapter 1, Paragraph 1.1**

1.2.1 Para 1.1 shall read as follows:

> The provisions of 1.2 and 1.4 shall apply to all engines and their derivative versions included in the classifications defined for emission certification purposes in Chapters 2, 3 and 4 where such engines are fitted to aircraft engaged in international air navigation.

1.2.2 **Reason for change:** Correction to referencing.

1.3 **Part III, Chapter 1, Paragraph 1.6**

1.3.1 Para 1.6 added as follows:

> Unless otherwise specified in this CAD, the date to be used by the applicant in determining the applicability of the Standards in this CAD shall be the date when the application for a Type Certificate for engines of a type or model was submitted to the CAAM, or the date of submission under an equivalent application procedure prescribed by the CAAM.

1.3.2 **Reason for change:** Added certification administration requirements.

1.4 **Part III, Chapter 1, Paragraph 1.7**

1.4.1 Para 1.7 added as follows:

> An application for a Type Certificate for engines of a type or model shall be effective for the period specified in the designation of the airworthiness regulations appropriate to the engine of a type or model, except in special cases where the CAAM accepts an extension of this period. When this period of effectivity is exceeded and an extension is approved, the date to be used in determining the

applicability of the Standards in this CAD shall be the date of issue of the Type Certificate or approval of the change in the type design, or the date of issue of approval under an equivalent procedure prescribed by the CAAM, less the period of effectivity.

1.4.2 **Reason for change:** Added certification administration requirements.

1.5 **Part III, Chapter 2, Paragraph 2.1.1.1**

1.5.1 Para 2.1.1.1 shall read as follows:

The provisions of this chapter shall apply to all turbojet and turbofan engines, as further specified in 2.2 and 2.3, intended for propulsion only at subsonic speeds, except when the certificating authority or the competent authority having jurisdiction over the organization responsible for production of the engine grants exemptions for:

a) specific engine types and derivative versions of such engines for which the type certificate of the first basic type was issued or other equivalent prescribed procedure was carried out before 1 January 1965; and

b) a limited number of engines over a specific period of time beyond the dates of applicability specified in 2.2 and 2.3 for the manufacture of the individual engine.

1.5.2 **Reason for change:** Added clarification on certificating authority.

1.6 **Part III, Chapter 2, Paragraph 2.1.1.3**

1.6.1 Para 2.1.1.3 shall read as follows:

The provisions of this chapter shall also apply to engines designed for applications that otherwise would have been fulfilled by turbojet and turbofan engines and which are designed as an integrated propulsive power plant and certified with a rated thrust.

Note. – Guidance material is provided in the ICAO Environmental Technical Manual (Doc 9501), Volume II — Procedures for the Emissions Certification of Aircraft Engines.

1.6.2 **Reason for change:** Added requirement clarification and note.

1.7 **Part III, Chapter 2, Paragraph 2.2.1**

1.7.1 Para 2.2.1, under applicability shall read as follows:

The provisions of 2.2.2 shall apply:

a) to engines whose date of manufacture is on or after 1 January 1983 and before 1 January 2023; and

b) to engines with a maximum rated thrust of less than or equal to 26.7 kN whose date of manufacture is on or after 1 January 2023.

1.7.2 **Reason for change:** Revised applicability.

1.8 **Part III, Chapter 2, Paragraph 2.3.2**

1.8.1 Para 2.3.2 e) and f) shall read as follows:

e) for engines of a type or model for which the date of manufacture of the first individual production model was on or after 1 January 2014 and for which an application for a Type Certificate was submitted before 1 January 2023:

1) for engines with a pressure ratio of 30 or less:

i) for engines with a maximum rated thrust of more than 89.0 kN:

$$D_p / F_{oo} = 7.88 + 1.4080\pi_{oo}$$

ii) for engines with a maximum rated thrust of more than 26.7 kN but not more than 89.0 kN:

$$D_p / F_{oo} = 40.052 + 1.5681\pi_{oo} - 0.3615F_{oo} - 0.0018\pi_{oo}F_{oo}$$

2) for engines with a pressure ratio of more than 30 but less than 104.7:

i) for engines with a maximum rated thrust of more than 89.0 kN:

$$D_p / F_{oo} = -9.88 + 2.0\pi_{oo}$$

ii) for engines with a maximum rated thrust of more than 26.7 kN but not more than 89.0 kN:

$$D_p / F_{oo} = 41.9435 + 1.505\pi_{oo} - 0.5823F_{oo} + 0.005562\pi_{oo}F_{oo}$$

3) for engines with a pressure ratio of 104.7 or more:

$$D_p / F_{oo} = 32 + 1.6\pi_{oo}$$

f) for engines of a type or model for which an application for a Type Certificate was submitted on or after 1 January 2023:

1) for engines with a pressure ratio of 30 or less:

i) for engines with a maximum rated thrust of more than 89.0 kN:

$D_p / F_{oo} = 7.88 + 1.4080\pi_{oo}$

ii) for engines with a maximum rated thrust of more than 26.7 kN but not more than 89.0 kN:

$D_p / F_{oo} = 40.052 + 1.5681\pi_{oo} – 0.3615F_{oo} – 0.0018\pi_{oo}F_{oo}$

2) for engines with a pressure ratio of more than 30 but less than 104.7:

i) for engines with a maximum rated thrust of more than 89.0 kN:

$D_p / F_{oo} = –9.88 + 2.0\pi_{oo}$

ii) for engines with a maximum rated thrust of more than 26.7 kN but not more than 89.0 kN:

$D_p / F_{oo} = 41.9435 + 1.505\pi_{oo} – 0.5823F_{oo} + 0.005562\pi_{oo} F_{oo}$

3) for engines with a pressure ratio of 104.7 or more:

$D_p / F_{oo} = 32 + 1.6\pi_{oo}$

1.8.2 **Reason for change:** Revised applicability for e) and addition for f).

1.9 **Part III, Chapter 4, Paragraph 4.1.1**

1.9.1 Para 4.1.1, under applicability is replaced by the following paragraphs:

4.1.1.1 The provisions of this chapter shall apply to all aircraft engines, as further specified in 4.2, intended for propulsion only at subsonic speeds.

4.1.1.2 Specific provisions for the relevant engine categories shall apply as detailed in section 4.2, except when the certificating authority or the competent authority having jurisdiction over the organization responsible for production of the engines grants exemptions for a limited number of engines over a specific period of time beyond the dates of applicability specified in 4.2 for the manufacture of the individual engine.

4.1.1.3 (Reserved).

1.9.2 **Reason for change:** Revised applicability.

1.10 **Part III, Chapter 4, Paragraph 4.1.2**

1.10.1 Para 4.1.2 shall read as follows:

The purpose of this section is to control non-volatile particulate matter mass (nvPM) emissions.

1.10.2 **Reason for change:** Revised nomenclature.

1.11 **Part III, Chapter 4, Paragraph 4.1.3**

1.11.1 Para 4.1.3, under units of measurement is replaced by the following paragraphs:

4.1.3.1 The concentration of nvPM mass shall be measured and reported in micrograms/m3.

4.1.3.2 The nvPM mass emitted during the reference emissions landing and take-off (LTO) cycle, defined in 4.1.4.2 (LTO_{mass}), shall be measured and reported in milligrams.

4.1.3.3 The nvPM number emitted during the reference emissions landing and take-off (LTO) cycle, defined in 4.1.4.2 (LTO_{num}), shall be measured and reported in number of particles.

1.11.2 **Reason for change:** Revised Units of measurement.

1.12 **Part III, Chapter 4, Paragraph 4.1.4.2**

1.12.1 Para 4.1.4.2 shall read as follows:

The engine shall be tested at sufficient thrust settings to define the nvPM emissions of the engine so that nvPM mass emission indices (EI_{mass}) and nvPM number emission indices (EI_{num}) can be determined at the following specific percentages of rated thrust and at thrusts producing maximum $nvPM_{mass}$ concentration, maximum EI_{mass} and maximum EI_{num} as agreed by the certificating authority.

For the calculation and reporting of nvPM emissions, the reference emissions LTO cycle shall be represented by the following thrust setting and time in each following operating mode:

LTO operating mode	*Thrust setting* *Per cent F_{oo}*	*Time in operating mode* *Minutes*
Take-off	100	0.7
Climb	85	2.2
Approach	30	4.0
Taxi/ground idle	7	26.0

1.12.2 **Reason for change:** Revised reference emissions LTO cycle.

1.13 **Part III, Chapter 4, Paragraph 4.1.5.4**

1.13.1 Para 4.1.5.4 shall read as follows:

The maximum nvPM mass concentration shall be corrected for dilution and thermophoretic losses in the Collection Part of the sampling system in accordance with the procedures of ICAO Annex 16 Volume II Appendix 7. The EI_{mass} and EI_{num} shall be corrected for thermophoretic losses in the Collection Part of the sampling system and fuel composition in accordance with the procedures of ICAO Annex 16 Volume II Appendix 7.

1.13.2 **Reason for change:** Revised maximum nvPM concentration requirement.

1.14 **Part III, Chapter 4, Paragraph 4.2.1**

1.14.1 Para 4.2.1, under applicability is replaced by the following paragraphs:

4.2.1.1 The provisions further specified in 4.2.2 and 4.2.3 shall apply to all turbofan and turbojet engines of a type or model with a rated thrust greater than 26.7 kN.

4.2.1.2 The provisions of this chapter shall also apply to engines designed for applications that otherwise would have been fulfilled by turbojet and turbofan engines and which are designed as an integrated propulsive powerplant and certified with a rated thrust.

1.14.2 **Reason for change:** Revised applicability.

1.15 **Part III, Chapter 4, Paragraph 4.2.2**

1.15.1 Para 4.2.2, under regulatory levels is replaced by the following paragraphs:

4.2.2.1 *Maximum nvPM mass concentration*

For an engine whose date of manufacture of the individual engine is on or after 1 January 2020, the maximum nvPM mass concentration obtained from measurement at sufficient thrust settings, in such a way that the emission maximum can be determined, and computed in accordance with the procedures of ICAO Annex 16 Volume II Appendix 7 and converted to characteristic levels by the procedures of ICAO Annex 16 Volume II Appendix 6, or equivalent procedures as agreed by the certificating authority, shall not exceed the regulatory level determined from the following formula:

$$\text{Regulatory limit concentration of nvPM}_{mass} = 10^{(3 + 2.9\, F_{oo}^{-0.274})}$$

Note. – Since there is a correlation between nvPM mass concentration and Smoke Number, the regulatory level in 4.2.2.1 was derived from the Smoke Number regulatory level. Further information is provided in the ICAO Environmental Technical Manual (Doc 9501), Volume II − Procedures for the Emissions Certification of Aircraft Engines.

4.2.2.2 *nvPM mass and nvPM number emitted during the reference LTO cycle*

The nvPM mass and nvPM number emission levels when measured and computed in accordance with the procedures of ICAO Annex 16 Volume II Appendix 7 and converted to characteristic levels by the procedures of ICAO Annex 16 Volume II Appendix 6, or equivalent procedures as agreed by the certificating authority, shall not exceed the regulatory levels determined from the following formulas:

a) LTO_{mass}:

1) for engines of a type or model for which the date of manufacture of the individual engine was on or after 1 January 2023:

i) for engines with a maximum rated thrust of more than 200 kN:

$$LTO_{mass}/F_{oo} = 347.5$$

ii) for engines with a maximum rated thrust of more than 26.7 kN but not more than 200 kN:

$$LTO_{mass}/F_{oo} = 4646.9 - 21.497F_{oo}$$

2) for engines of a type or model for which an application for a Type Certificate was submitted on or after 1 January 2023:

i) for engines with a maximum rated thrust of more than 150 kN:

$$LTO_{mass}/F_{oo} = 214.0$$

ii) for engines with a maximum rated thrust of more than 26.7 kN but not more than 150 kN:

$$LTO_{mass}/F_{oo} = 1251.1 - 6.914F_{oo}$$

b) LTO_{num}:

1) for engines of a type or model for which the date of manufacture of the individual engine was on or after 1 January 2023:

i) for engines with a maximum rated thrust of more than 200 kN:

$$LTO_{num}/F_{oo} = 4.170 \times 10^{15}$$

ii) for engines with a maximum rated thrust of more than 26.7 kN but not more than 200 kN:

$$LTO_{num}/F_{oo} = 2.669 \times 10^{16} - 1.126 \times 10^{14}F_{oo}$$

2) for engines of a type or model for which an application for a Type Certificate was submitted on or after 1 January 2023:

i) for engines with a maximum rated thrust of more than 150 kN:
$LTO_{num}/F_{oo} = 2.780 \times 10^{15}$

ii) for engines with a maximum rated thrust of more than 26.7 kN but not more than 150 kN:
$LTO_{num}/F_{oo} = 1.490 \times 10^{16} - 8.080 \times 10^{13} F_{oo}$

1.15.2 **Reason for change:** Revised regulatory levels.

1.16 **Part III, Chapter 4, Paragraph 4.2.3**

1.16.1 Para 4.2.3, under reporting requirement shall read as follows:

The manufacturer shall report the following values of nvPM emissions measured and computed in accordance with the procedures of ICAO Annex 16 Volume II Appendix 7, or any equivalent procedures as agreed by CAAM:

a) maximum EI_{mass} (milligrams/kg of fuel); and

b) maximum EI_{num} (particles/kg of fuel).

1.16.2 **Reason for change:** Revised maximum nvPM concentration requirement.

1.17 **Part III, Chapter 4, Paragraph 4.3**

1.17.1 Para 4.3, under information required shall read as follows:

Note. – The information required is divided into three groups: 1) general information to identify the engine characteristics, the fuel used and the method of data analysis; and 2) the data obtained from the engine test(s); and 3) derived information.

4.3.1 General information

The following information shall be provided for each engine type for which emissions certification is sought:

a) engine identification;

b) rated thrust (kN);

c) reference pressure ratio;

d) fuel specification reference;

e) fuel hydrogen/carbon ratio;

f) the methods of data acquisition; and

g) the method of data analysis.

4.3.2 Test information

4.3.2.1 The following information shall be provided for each engine tested for certification purposes:

a) fuel net heat of combustion (MJ/kg);

b) fuel hydrogen content (mass %);

c) fuel total aromatics content (volume %);

d) fuel naphthalenes content (volume %); and

e) fuel sulphur content (ppm by mass).

4.3.2.2 The following information, as measured and computed in accordance with the procedures of ICAO Annex 16 Volume II Appendix 7, or any equivalent procedures as agreed by the certificating authority, shall be provided for each engine tested for certification purposes:

a) fuel flow (kg/s) at each thrust setting of the LTO cycle;

b) EI_{mass} (milligrams/kg of fuel) at each thrust setting of the LTO cycle;

c) EI_{num} (particles/kg of fuel) at each thrust setting of the LTO cycle.

4.3.3 Derived information

4.3.3.1 The following derived information shall be provided for each engine tested for certification purposes:

a) emission rate, i.e. EI_{mass} × fuel flow, (milligrams/s) for nvPM mass;

b) emissions rate, i.e. EI_{num} × fuel flow, (particles/s) for nvPM number;

c) total gross emission of nvPM mass measured over the LTO cycle (milligrams);

d) total gross emission of nvPM number measured over the LTO cycle (particles);

e) values of LTO_{mass}/F_{oo} (milligrams/kN);

f) values of LTO_{num}/F_{oo} (particles/kN); and

g) maximum nvPM mass concentration (micrograms/m^3).

4.3.3.2 The characteristic levels shall be provided for the maximum nvPM mass concentration, the LTOmass/Foo and the LTOnum/Foo for each engine type for which emissions certification is sought.

1.17.2 **Reason for change:** Revised test information and added derived information.

1.18 **Part IV**

1.18.1 Part IV shall read as follows:

For engines of a type or model subject to Part III, Chapter 4, and for which the date of manufacture of the individual engine was on or after 1 January 2023, the nvPM mass and nvPM number system loss correction factors (k_{SL_mass} and k_{SL_num}), and EI_{mass} and EI_{num} corrected for system losses shall be reported to the certificating or competent authority as designated by the State in accordance with the procedures of ICAO Annex 16 Volume II Appendix 8, or equivalent procedures as agreed by the certificating authority.

1.18.2 **Reason for change:** Added requirements on assessment for inventory and modelling purposes.

ATTACHMENT 3 TO CAC 02/2022: CAD 16 VOLUME III – ENVIRONMENTAL PROTECTION, AEROPLANE CO_2 EMISSIONS

1 Revision(s)

1.1 **Part I, Chapter 1**

1.1.1 Definition added as follows:

Type Design means the set of data and information necessary to define an aircraft, engine or propeller type for the purpose of airworthiness determination.

1.1.2 **Reason for change:** Added for clarity.

1.2 **Part I, Chapter 2**

1.2.1 The symbol δ and its meaning is deleted.

1.2.2 **Reason for change:** Not used.

1.3 **Part II, Chapter 1, Paragraph 1.3 and 1.4**

1.3.1 Paragraph 1.3 and 1.4 shall read as follows:

1.3 CAAM may recognize as valid a CO_2 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 this CAD or ICAO Annex 16 Volume III.

1.4 The amendment of this CAD to be used by the applicant shall be that which is applicable following the requirements in CAD 8102, CAD 8104, CAD 8105, CAD 8106, CAD 8107 or CAD 8108 as applicable.

1.3.2 **Reason for change:** Revised administrative requirements.

1.4 **Part II, Chapter 2, Paragraph 2.1.1**

1.4.1 Paragraph 2.1.1 d) and e) shall read as follows:

d) derived versions of non-CO_2-certified subsonic jet aeroplanes, including their subsequent CO_2-certified derived versions, of greater than 5 700 kg maximum certificated take-off mass, for which the application for certification of the change in type design was submitted on or after 1 January 2023;

e) derived versions of non-CO_2 certified propeller-driven aeroplanes, including their subsequent CO_2-certified derived versions, of greater than 8618 kg

maximum certificated take-off mass, for which the application for certification of the change in type design was submitted on or after 1 January 2023;

1.4.2 **Reason for change:** Revised applicability.

1.5 **Part II, Chapter 2, Paragraph 2.5.1**

1.5.1 Paragraph 2.5.1 b) shall read as follows:

b) a combination of altitude and airspeed selected by the applicant;

1.5.2 **Reason for change:** Revised for clarity.

1.6 **Part II, Chapter 3, Appendix 1, Paragraph 3.1**

1.6.1 Paragraph 3.1 Note shall read as follows:

Note. – An application for certification of a CO_2 emissions metric value may involve only a minor change to the aeroplane type design. The resultant changes in the CO_2 emissions metric value can often be established reliably by way of equivalent procedures without the necessity of resorting to a complete test.

1.6.2 **Reason for change:** Revised for clarity.

1.7 **Part II, Chapter 3, Appendix 1, Paragraph 3.2.1**

1.7.1 Paragraph 3.2.1 a) shall read as follows:

a) ***Aeroplane conformity***. The test aeroplane shall be confirmed to be in conformance with the type design for which certification is sought.

1.7.2 **Reason for change:** Revised for clarity.

1.8 **Part II, Chapter 3, Appendix 1, Paragraph 5.2.1**

1.8.1 Definition of ***Mass/δ*** is deleted.

1.8.2 **Reason for change:** Not used.

1.9 **Part II, Chapter 3, Appendix 1, Paragraph 5.2.1**

1.9.1 Reynolds number definition shall read as follows:

Reynolds number. The Reynolds number affects aeroplane drag. For a given test condition the Reynolds number is a function of the density and viscosity of air at the test altitude and temperature. The reference Reynolds number is derived from the

density and viscosity of air from the ICAO standard atmosphere at the reference altitude.

1.9.2 **Reason for change:** Revised for clarity.

1.10 **Part II, Chapter 3, Appendix 1, Paragraph 6.4**

1.10.1 Paragraph 6.4 Note shall read as follows:

Note. – Methods for calculating the 90 per cent confidence interval are given in the ICAO Environmental Technical Manual (Doc 9501), Volume III — Procedures for the CO_2 Emissions Certification of Aeroplanes.

1.10.2 **Reason for change**: Revised for clarity.

ATTACHMENT 4 TO CAC 02/2022: CAD 1011 – APPROVED TRAINING ORGANISATION (ATO)

1 Revision(s)

1.1 **Paragraph 1.5 Duration and continued validity**

1.1.1 The following paragraphs has been added:

1.5.3 Any COA which is lapsed for more than one year will be revoked.

1.5.4 CAAM will not reinstate revoked COAs, hence it will require to undergo full certification cycle.

1.5.5 A COA application process which is inactive or not progressing for 90 days will be terminated.

1.1.2 **Reason for change:**

Addition to the requirements.

ATTACHMENT 5 TO CAC 02/2022: CAD 1102 – AERODROME FLIGHT INFORMATION SERVICE (AFIS)

1 Revision(s)

1.1 **Paragraph 2.1.5**

1.1.1 Para 2.1.5 shall read as follows:

Pursuant to the Civil Aviation Regulations 2016 Regulation 204, an AFIS station shall be subjected to safety regulatory oversight conducted by CAAM for the purpose of determining compliance with this CAD and relevant regulations of the Civil Aviation Regulations 2016.

1.1.2 **Reason for change:**

Addition to emphasise the compliance to the CAD and relevant regulations of CAR 2016 by an AFIS station.

1.2 **Paragraph 6**

1.2.1 Para 6 has been revised as follows:

Qualifications and Training of AFIS

1.2.2 **Reason for change:**

The revision is made to rephrase the statement of the topic.

1.3 **Paragraph 6.1.3**

1.3.1 Para 6.1.3 shall read as follows:

In the event of AFIS personnel does not performed AFIS duty for more than six (6) months, he/she shall be required to undergo refresher training for four (4) days.

1.3.2 **Reason for change:**

The revision is made to ensure AFIS personnel's competency is well maintained and up-to-date.

1.4 **Paragraph 6.4**

1.4.1 Para 6.4 has been revised as follows:

Training and Experience

1.4.2 **Reason for change:**

The revision is made to rephrase the statement of the topic.

1.5 **Paragraph 6.4.1**

1.5.1 Para 6.4.1 shall read as follows:

For newly established AFIS station, a training proposal shall be submitted to CAAM for approval.

1.5.2 **Reason for change:**

Reposition the paragraph from para 6.4.2.

1.6 **Paragraph 6.4.2**

1.6.1 Para 6.4.2 shall read as follows:

AFIS personnel who does not hold any valid Air Traffic Controller Licence shall have satisfactory experience required by fulfilling the following:

a) completion of an approved basic ATC and aerodrome control course; and

b) On-The-Job Training (OJT) under a qualified AFIS officer for not less than two months.

1.6.2 **Reason for change:**

The revision is made to rephrase the statement of the paragraph to focus on the requirements of training for AFIS personnel who does not hold any valid ATC licence.

1.7 **Paragraph 6.4.3**

1.7.1 Para 6.4.3 shall read as follows:

AFIS personnel who holds a valid Air Traffic Controller licence shall have satisfactory experience required by fulfilling the following:

a) Hold or have held a rating / validation in Aerodrome Control for a period of at least two (2) months; and

b) On-The-Job Training (OJT) under a qualified AFIS officer for not less than two weeks.

1.7.2 **Reason for change:**

The revision is made to complement the qualification and training requirements for AFIS personnel who holds a valid ATC Licence. The current requirements stipulated in the CAD 1102 adopts ICAO Circular 211-AN/128 which provides guidance on AFIS personnel in general (non-ATC).

1.8 **Paragraph 6.7**

1.8.1 Para 6.7 shall read as follows:

Training Report

1.8.2 **Reason for change:**

Additional topic to cover training report submission requirements.

1.9 **Paragraph 6.7.1**

1.9.1 Para 6.7.1 shall read as follows:

The training log shall be forwarded to the ANSSD every two (2) weeks until the completion of the training.

1.9.2 **Reason for change:**

Additional topic to cover training report submission requirements.

1.10 **Paragraph 6.7.2**

1.10.1 Para 6.7.2 shall read as follows:

The training log shall be recorded in the record-keeping system to ensure all requirements of the training have been met.

1.10.2 **Reason for change:**

Additional topic to cover training report submission requirements.

ATTACHMENT 6 TO CAC 02/2022: CAD 1201 – ATC LICENSING

1 Revision(s)

1.1 **Paragraph 3.1.7**

1.1.1 Para 3.1.7 shall read as follows:

Training requirements for Aerodrome Flight Information Service (AFIS) shall be referred to CAD 1102 AFIS.

1.2 **Paragraph 3.3.3.4**

1.2.1 The table in Para 3.3.3.4 has been removed, and the para has been revised as follows:

The OJT period prior to Flight Information Service (FIS) competency examination shall be two (2) weeks.

1.3 **Paragraph 4.3.1**

1.3.1 Para 4.3.1 shall read as follows:

Examination are conducted on completion of training at OJT centres to assess trainee achievement for the following:

a) Aerodrome Control;

b) Approach Control Procedural;

c) Approach Control Surveillance;

d) Area Control Procedural;

e) Area Control Surveillance; and

f) Flight Information Service.

1.4 **Paragraph 4.4.3.1**

1.4.1 Para 4.4.3.1 shall read as follows:

A controller shall pass a competency examination before performing FIS function.

1.5 **Paragraph 4.4.3.4**

1.5.1 Para 4.4.3.4 shall read as follows:

A controller who fails his first Flight Information Service (FIS) competency examination shall be required to undergo a second OJT for a period of two (2) weeks before being allowed to re-sit.

1.6 **Paragraph 4.7.8**

1.6.1 Para 4.7.8 shall read as follows:

The duration for conducting practical and oral examinations are detailed in the table below:

	Work Position	Duration
a.	Area Control Procedural	3 sector or less: afternoon & morning or night shift (2 days) 4 sector or more: afternoon, morning and night shift (3 days)
b.	Area Control Surveillance	afternoon & morning shift (2 days)
c.	Approach Control Procedural	afternoon & morning shift (2 days)
d.	Approach Control Procedural (radar environment)	Simulator (1 day)
e.	Approach Control Surveillance	afternoon & morning shift (2 days)
f.	Aerodrome & Approach Control Procedural (combine)	afternoon & morning shift (2 days)
g.	Aerodrome Control	afternoon & morning shift (2 days)
h.	Flight Information Service	afternoon & morning shift (2 days)
i.	Flow Control	afternoon & morning shift (2 days)

Note. – The ATSU may conduct the examination with a minimum of 3 sectors for the purpose of acquiring a Rating / Validation, taking into account these factors:
i. Traffic pattern and airspace structure;
ii. Overall workload;
iii. Operational advantage for the ATSU's human resource management; and
iv. Career advancement for surveillance training.

2 Reason of the change

The revision is made to avoid contradiction with the requirements for AFIS personnel stipulated in the CAD 1102 *Aerodrome Flight Information Service*

ATTACHMENT 7 TO CAC 02/2022: CAD 6011 Part V – UNMANNED AIRCRAFT SYSTEM - SPECIAL UAS PROJECT

1 Revision(s)

1.1 **Paragraph 3.1.1**

1.1.1 Para 3.1.1 has been amended as follows:

3.1.1 This Chapter describes the process of applying for a Special UAS Project Approval in order to conduct a Special UAS Project. The CAAM has established a methodological approach for evaluating and determining an applicant's ability to comply with the Regulations. Depending on the operational risk the applicant presents, the applicants must successfully satisfy some or all of the phases in the evaluation process to receive the Special UAS Project Operations approval:

1.1.2 **Reason for change:** To cater for a more swift approval; the lower intrinsic valued risk may not be required to undergo the five (5) phases evaluation process.

1.2 **Paragraph 3.1.1.1**

1.2.1 Para 3.1.1.1 has been added as follows:

3.1.1.1 With reference to 3.1.1, the applicants that will be required to satisfy in full all five (5) phases will be as following:

a) Operational risk with Safety Assurance Integrity Level (SAIL) amounting to three (3) onwards will be required

b) As stated by the Civil Aviation Authority of Malaysia (CAAM).

1.2.2 **Reason for change:** To cater for a more swift approval; the lower intrinsic valued risk may not be required to undergo the five (5) phases evaluation process.

1.3 **Paragraph 3.1.1.2**

1.3.1 Para 3.1.1.2 has been added as follow:

3.1.1.2 The applicants that are exempted from the full five phases certification process will still be subjected to:

a) a pre-application phase,

b) formal application phase,

c) documents evaluation phase (as applicable) and

d) certification phase.

1.3.2 Reason for change: To cater for a more swift approval; the lower intrinsic valued risk may not be required to undergo the five (5) phases evaluation process.

1.4 **Paragraph 3.2.2**

1.4.1 Para 3.2.2 has been amended as follows:

3.2.2 In addition to understanding the MCAR 2016, this CAD and its related documents, the CAAM strongly advices initial new applicants to book a pre-application meeting before preparing an application. To book a meeting, send an email to **drone.specific@caam.gov.my** in the subject field, put a **"request for Special UAS Project Approval pre-application meeting".** Within the body of the e-mail, indicate your preference for face-to-face or teleconference, and include your contact details.

1.4.2 **Reason for change:** SUP approval application has been allocated a specific email address.

1.5 **Paragraph 3.2.5**

1.5.1 Para 3.2.5 has been amended as follows:

3.2.5 Depending on applicability, Jawatankuasa UAS (JAKUAS) may be called to join during the pre-application phase. JAKUAS may comprise of:

a) CAAM UAS Unit;

b) SIRIM;

c) MCMC;

d) JUPEM; and

e) CGSO.

Note: A representative of CAAM UAS Unit will act as chairman of JAKUAS.

1.5.2 **Reason for change:** JAKUAS has been established to function as the previously called "The Committee".

1.6 **Paragraph 3.2.6**

1.6.1 Para 3.2.6 has been amended as follows:

3.2.6 The establishment of JAKUAS is required for the applicant to determine the applicability and compliance with all other UAS regulations set by other agencies; and if required, for the certification/approval process to work parallel.

1.6.2 **Reason for change:** JAKUAS has been established to function as the previously called "The Committee".

1.7 **Paragraph 9.3.4**

1.7.1 Para 9.3.4 embedded link has been amended as follows:

9.3.4 Application for approval to carry dangerous goods:

a) UAS operators must refer to the CAAM dangerous goods approvals webpage for the most up-to-date information and to ensure all application requirements are met and then:

1) Complete the form in the National Transport of Dangerous Goods Programme (NTDGP) in this link.
2) Submit the appropriate fee
3) Details of cost can be found in the MCAR Fees and Charges which can be found on the CAAM website here.

1.7.2 **Reason for change:**

a) Embedded link for Item 9.3.4.a).1) has been updated to https://www.caam.gov.my/wp-content/uploads/2021/05/1-National-Transport-of-Dangerous-Goods-Programme-NTDGP.pdf

b) Embedded link for Item 9.3.4.a).3) has been updated to https://www.caam.gov.my/legislation-regulations/general/regulations/?std

1.8 **Appendix 1 Paragraph 1.5**

1.8.1 Appendix 1 Paragraph 1.5 has been amended as follows:

f) CAAM — The CAAM is the recognised national authority for assess the safety case of UAS operations, according to Chapter 6 of this CAD. The CAAM may accept an applicant's SORA submission in whole or in part. Through the SORA process, the applicant may need to consult with the CAAM to ensure the consistent application or interpretation of individual steps.

The CAAM is the competent authority in Malaysia to verify compliance of the UAS design and its components and to verify compliance with the operational requirements and compliance of the personnel's competency with the applicable rules. The following elements are related to the UAS design:

- OSOs #02, #04, #05, #06, #10, #12, #18, #19 (limited to criterion #3), #20, and #24;

- M1 mitigation (tethered operations): criterion #1 and M2 mitigation: criterion #1;

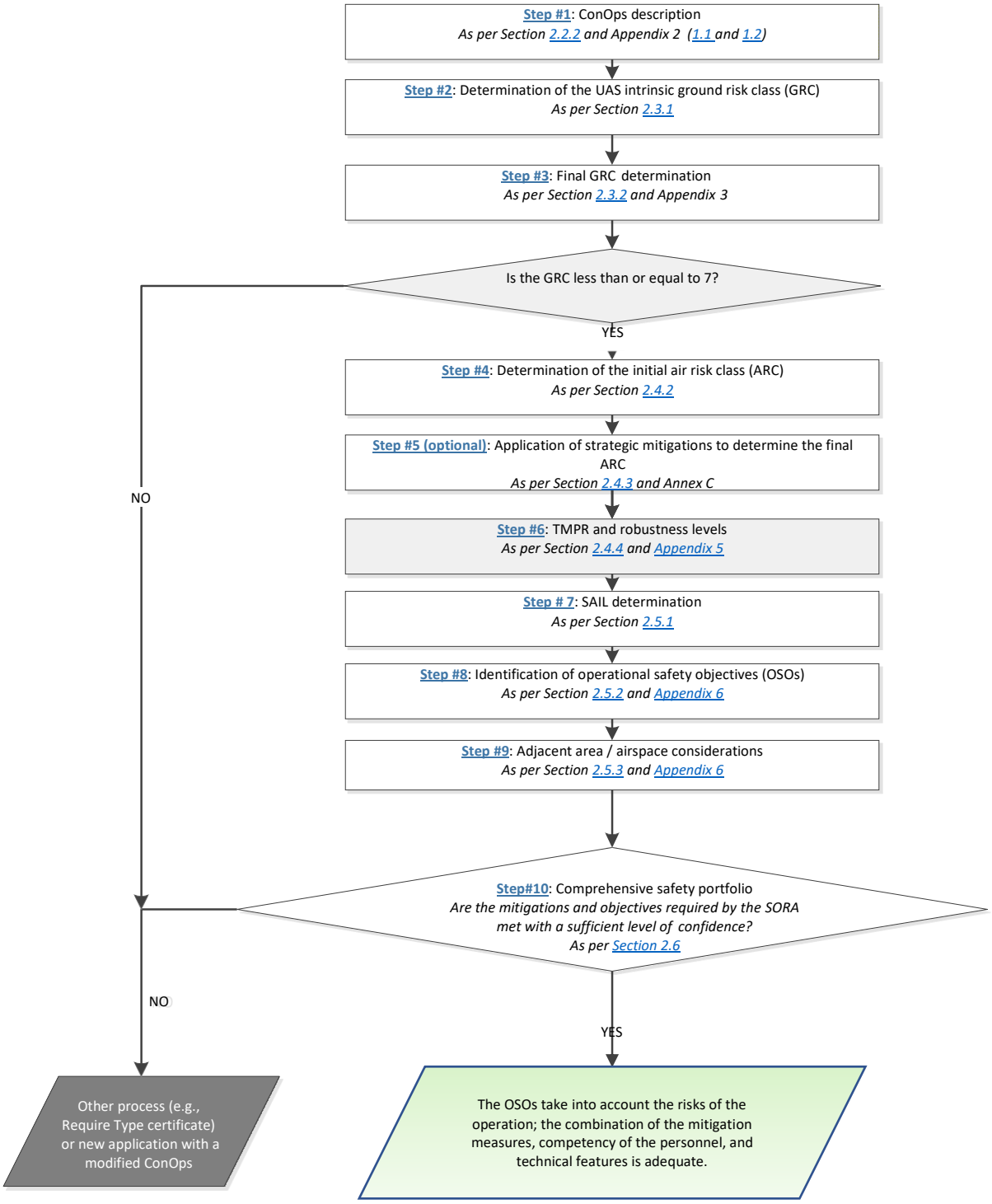
- verification of the system to contain the UAS within the operational volume in accordance with Step #9 of the SORA process.

When according to the SAIL or to the claimed mitigation means, the level of assurance of the above OSOs and or mitigation means is 'high' (i.e. SAIL V and VI), the CAAM will take the validation approach in accordance to CAD 8107- Validation to a Type Certificate. For the other OSOs and mitigation means, the CAAM shall be the competent authority to verify the compliance with the UAS operator.

1.8.2 **Reason for change:** In consistent with the EASA AMC & GM to Commission Implementing Regulation (EU) 2019-947 – Issue 1, Amendment 1.

1.9 Appendix 1 Figure 3

1.9.1 Appendix 1 Figure 3 has been amended as follows:



1.9.2 **Reason for change:** In consistent with the EASA AMC & GM to Commission Implementing Regulation (EU) 2019-947 – Issue 1, Amendment 1.

1.10 **Appendix 1 Paragraph 2.3.1**

1.10.1 Appendix 1 Para 2.3.1 has been amended as follows:

c) The applicant needs to have defined the area at risk when conducting the operation (also called the 'area of operation') including:

1) the operational volume, which is composed of the flight geography and the contingency volume. To determine the operational volume, the applicant should consider the position-keeping capabilities of the UAS in 4D space (latitude, longitude, height and time). In particular, the accuracy of the navigation solution, the flight technical error of the UAS and the path definition error (e.g., map errors), and latencies should be considered and addressed in this determination;
2) whether or not the area is a controlled ground area; and
3) the associated ground risk buffer with at least a 1:1 rule, or for rotary wing UA, defined using a ballistic methodology approach acceptable to the CAAM.

d) Table 2 illustrates how to determine the intrinsic ground risk class (GRC). The intrinsic GRC is found at the intersection of the applicable operational scenario and the maximum UA characteristic dimension that drives the UAS lethal area. If there is a mismatch between the maximum UAS characteristic dimension and the typical kinetic energy expected, the applicant should provide substantiation for the chosen column.

e) The operational scenarios describe an attempt to provide discrete categorisations of operations with increasing numbers of people at risk. In principle, it is possible to use either qualitative criteria (please refer to the next point (f) or quantitative criteria, or consider both criteria, to assess if an operation takes place over sparsely populated areas, populated areas or assemblies of people.

f) Qualitative assessment: the volume to be used by the operator to classify the operation includes the operational volume and the ground risk buffer (as defined by a semantic model), which determine the intrinsic GRC.

Section 2.1 Definition 'assemblies of people' provides guidance on when an operation is classified as taking place over assemblies of people.

An operation should be classified as taking place over a populated area if the volume that is used to determine the intrinsic GRC:

- does not include assemblies of people; and

- includes areas that are substantially used for residential, commercial or recreational purposes.

g) EVLOS[4] operations are to be considered to be BVLOS for the intrinsic GRC determination.

h) Controlled ground areas are a way to strategically mitigate the risk on ground (similar to flying in segregated airspace); the UAS operator should ensure, through appropriate procedures, that no uninvolved person is in the area of operation, as defined in Section 2.3.1(c).

1.10.2 **Reason for change:**

a) In consistent with the EASA AMC & GM to Commission Implementing Regulation (EU) 2019-947 – Issue 1, Amendment 1.

b) Footnotes number has been amended.

1.11 **Appendix 1 Table 2**

1.11.1 Appendix 1 Table 2 has been amended as follows:

Intrinsic UAS ground risk class				
Max UAS characteristics dimension	1 m / approx. 3 ft	3 m / approx. 10 ft	8 m / approx. 25 ft	>8 m / approx. 25 ft
Typical kinetic energy expected	< 700 J (approx. 529 ft lb)	< 34 kJ (approx. 25 000 ft lb)	< 1 084 kJ (approx. 800 000 ft lb)	> 1 084 kJ (approx. 800 000 ft lb)
Operational scenarios				
VLOS/BVLOS over a controlled ground area	1	2	3	4
VLOS over a sparsely populated area	2	3	4	5
BVLOS over a sparsely populated area	3	4	5	6
VLOS over a populated area	4	5	6	8
BVLOS over a populated area	5	6	8	10
VLOS over an assembly of people	7			
BVLOS over an assembly of people	8			

1.11.2 **Reason for change:** In consistent with the EASA AMC & GM to Commission Implementing Regulation (EU) 2019-947 – Issue 1, Amendment 1. Footnotes number has been removed.

1.12 **Appendix 1 Paragraph 2.3.2**

1.12.1 Appendix 1 Para 2.3.2 has been amended as follows:

c) The final GRC determination (step #three) is based on the availability of these mitigations to the operation. Table 3 provides a list of potential mitigations and the associated relative correction factor. A positive number denotes an increase in the GRC, while a negative number results in a decrease in the GRC. All the mitigations should be applied in numeric sequence to perform the assessment. Appendix 3 provides additional details on how to estimate the robustness of each mitigation. Competent authorities may define additional mitigations and the relative correction factors.

g) In general, a quantitative approach to mitigation means allows to reduce the intrinsic GRC by 1 point if the mitigation means reduce the risk of operation by a factor of approximately 10 (90% reduction) compared to the risk that is assessed before the mitigation means are applied. Such quantitative criteria should be used to validate the risk reduction that is claimed when applying Appendix 3 of this CAD.

1.12.2 **Reason for change:** Editorial – reference typo for Appendix 3 at item 2.3.2.c) and adding item 2.3.2.g)

1.13 **Appendix 1 Table 3**

1.13.1 Appendix 1 Table 3 has been amended as follows:

		Robustness		
Mitigation Sequence	**Mitigations for ground risk**	**Low/None**	**Medium**	**High**
1	M1 — Strategic mitigations for ground risk[5]	0: None -1: Low	-2	-4
2	M2 — Effects of ground impact are reduced[6]	0	-1	-2
3	M3 — An emergency response plan (ERP) is in place, the UAS operator is validated and effective	1	0	-1

1.13.2 **Reason for change:** Editorial – footnotes number has been amended.

1.14 **Appendix 1 Paragraph 2.5.2**

1.14.1 Appendix 1 Para 2.5.2 has been amended as follows:

b) Table 6 is a consolidated list of the common OSOs that historically have been used to ensure safe UAS operations. It represents the collected experience of many experts, and is therefore a solid starting point to determine the required safety objectives for a specific operation. The CAAM that issue the operational

authorisation may define additional OSOs for a given SAIL and the associated level of robustness.

1.14.2 **Reason for change:** In consistent with the EASA AMC & GM to Commission Implementing Regulation (EU) 2019-947 – Issue 1, Amendment 1.

1.15 **Appendix 1 Table 6**

1.15.1 Appendix 1 Table 6 has been amended as follows:

OSO number (in line with Appendix 6)		SAIL					
		I	II	III	IV	V	VI
	Technical issue with the UAS						
OSO#04	UAS developed to authority recognised design standards[7]	O	O	L	L	M	H

1.15.2 **Reason for change:** In consistent with the EASA AMC & GM to Commission Implementing Regulation (EU) 2019-947 – Issue 1, Amendment 1. Footnotes number has been amended.

1.16 **Paragraph 2.5.3**

1.16.1 Para 2.5.3.b) has been amended as follows:

b) Safety requirements for containment are:

1) No probable[8] failure[9] of the UAS or any external system supporting the operation should lead to operation outside the operational volume.
2) Compliance with the requirement above shall be substantiated by a design and installation appraisal and shall include at least:
   i) the design and installation features (independence, separation and redundancy);
   ii) any relevant particular risk (e.g., hail, ice, snow, electro-magnetic interference, etc.) associated with the ConOps

1.16.2 **Reason for change:** Editorial – footnotes number has been amended.

1.16.3 Para 2.5.3.c) has been amended as follows:

c) The enhanced containment, which consists in the following three safety requirements, applies to operations conducted:

2) Or where the operational volume is in a populated area where:
   i) M1 mitigation has been applied to lower the GRC; or
   ii) operating in a controlled ground area.

a) The UAS is designed to standards that are considered adequate by the competent authority and/or in accordance with a means of compliance that is acceptable to that authority such that:

1) The probability of the UA leaving the operational volume should be less than 10^{-4}/FH; and
2) No single failure of the UAS or any external system supporting the operation should lead to its operation outside the ground risk buffer.

Compliance with the requirements above should be substantiated by analysis and/or test data with supporting evidence.

b) Software (SW) and airborne electronic hardware (AEH) whose development error(s) could directly (refer to Note 2) lead to operations outside the ground risk buffer should be developed to an industry standard or methodology that is recognised as being adequate by the CAAM.

1.16.4 **Reason for change:** In consistent with the EASA AMC & GM to Commission Implementing Regulation (EU) 2019-947 – Issue 1, Amendment 1.

1.17 **Appendix 1 Footnotes**

1.17.1 Appendix 1 Footnote 4 has been removed.

4 The intrinsic ground risk class for BVLOS operations in populated environment or over gathering of people will be developed in a future edition of the SORA.

1.17.2 Appendix 1 Footnotes 4,5,6,7,8 & 9 has been amended.

4 EVLOS — A UAS operation whereby the remote pilot maintains uninterrupted situational awareness of the airspace in which the UAS operation is being conducted via visual airspace surveillance through one or more human VOs, possibly aided by technological means. The remote pilot has direct control of the UAS at all times.

5 This mitigation is meant as a means to reduce the number of people at risk.

6 This mitigation is meant as a means to reduce the energy absorbed by the people on the ground upon impact.

7 In case of experimental flight that investigate new technical solutions, the CAAM may accept that recognised standard are not met.

8 The term ‘probable’ needs to be understood in its qualitative interpretation, i.e., ‘Anticipated to occur one or more times during the entire system/operational life of an item’.

9 The term ‘failure’ needs to be understood as an occurrence that affects the operation of a competent, part, or elements such that it can no longer function as intended. Errors may cause failures, but are not considered to be failures. Some

structural or mechanical failures may be excluded from the criterion if it can be shown that these mechanical parts were designed according to aviation industry best practices.

1.17.3 **Reason for change:** Editorial – footnotes numbering has been changed.

1.18 **Appendix 6 Paragraph 1.2**

1.18.1 Appendix 6 Para 1.2 OSO #2 has been amended as follows:

OSO #02 — UAS manufactured by a competent and/or proven entity

TECHNICAL ISSUE WITH THE UAS		**Level of integrity**		
		Low	**Medium**	**High**
OSO #02 UAS manufactured by competent and/or proven entity	Criteria	As a minimum, manufacturing procedures cover: (a) the specification of materials; (b) the suitability and durability of materials used; and (c) the processes necessary to allow for repeatability in manufacturing, and conformity within acceptable tolerances.	Same as low. In addition, manufacturing procedures also cover: (a) configuration control; (b) the verification of incoming products, parts, materials, and equipment; (c) identification and traceability; (d) in-process and final inspections & testing; (e) the control and calibration of tools; (f) handling and storage; and (g) the control of non-conforming items.	The manufacturer complies with the organisational requirements defined in CAAM Part 21.
	Comments	*N/A*	*N/A*	*N/A*

TECHNICAL ISSUE WITH THE UAS		Level of assurance		
		Low	Medium	High
OSO #02 UAS manufactured by competent and/or proven entity	Criteria	The declared manufacturing procedures are developed to a standard considered adequate by the CAAM and/or in accordance with a means of compliance acceptable to that authority. CAAM validates the claimed level of integrity.	Same as low. In addition, evidence is available that the UAS has been manufactured in conformance to its design. CAAM validates the claimed level of integrity.	Same as medium, In addition: CAAM validates compliance with the organisational requirements that are defined in CAAM Part 21.
	Comments	*N/A*	*N/A*	*N/A*

1.18.2 **Reason for change:** In consistent with the EASA AMC & GM to Commission Implementing Regulation (EU) 2019-947 – Issue 1, Amendment 1.

1.18.3 Appendix 6 Para 1.2 OSO #4 has been amended as follows:

OSO #04 — UAS developed to authority recognised design standards

TECHNICAL ISSUE WITH THE UAS		Level of integrity		
		Low	Medium	High
OSO #04 UAS developed to authority recognised design standards	Criteria	The UAS is designed to standards considered adequate by the competent authority and/or in accordance with a means of compliance acceptable to that authority. The standards and/or the means of compliance should be applicable to a low level of integrity and the intended operation.	The UAS is designed to standards considered adequate by the competent authority and/or in accordance with a means of compliance acceptable to that authority. The standards and/or the means of compliance should be applicable to a medium level of integrity and the intended operation.	The UAS is designed to standards considered adequate by the CAAM and/or in accordance with a means of compliance acceptable to that authority. The standards and/or the means of compliance should be applicable to a high level of integrity and the intended operation.
	Comments	*In case of experimental flights that investigate new technical solutions, the competent authority may accept that recognised standards are not met.*		

TECHNICAL ISSUE WITH THE UAS		Level of assurance		
		Low	Medium	High
OSO #04 UAS developed to authority recognised design standards	Criteria	Consider the criteria defined in section 1.0 of Appendix 6.		
	Comments	CAAM validates the claimed level of integrity.	CAAM validates the claimed level of integrity.	*N/A*

1.18.4 **Reason for change:** In consistent with the EASA AMC & GM to Commission Implementing Regulation (EU) 2019-947 – Issue 1, Amendment 1.

1.18.5 Appendix 6 Para 1.2 OSO #5 has been amended as follows:

TECHNICAL ISSUE WITH THE UAS		Level of assurance		
		Low	Medium	High
OSO #05 UAS is designed considering system safety and reliability	Criteria	A functional hazard assessment[1] and a design and installation appraisal that shows hazards are minimised, are available. CAAM validates the claimed level of integrity.	Same as low. In addition: (a) Safety analyses are conducted in line with standards considered adequate by the CAAM and/or in accordance with a means of compliance acceptable to that authority. (b) A strategy for the detection of single failures of concern include pre-flight checks. CAAM validates the claimed level of integrity.	Same as medium. In addition, safety analyses and development assurance activities are validated by CAAM.
	Comments	*[1] The severity of failure conditions (no safety effect, minor, major, hazardous and catastrophic) should be determined according to the definitions provided in JARUS AMC RPAS.1309 Issue 2.*	*N/A*	*N/A*

1.18.6 **Reason for change:** In consistent with the EASA AMC & GM to Commission Implementing Regulation (EU) 2019-947 – Issue 1, Amendment 1.

1.18.7 Appendix 6 Para 1.2 OSO #6 has been amended as follows

TECHNICAL ISSUE WITH THE UAS		Level of assurance		
		Low	Medium	High
OSO #06 C3 link characteristics (e.g., performance, spectrum use) are appropriate for the operation	Criteria	Consider the assurance criteria defined in section 1.0 of Appendix 6. (low level of assurance) CAAM validates the claimed level of integrity.	Demonstration of the C3 link performance is in accordance with standards considered adequate by the CAAM and/or in accordance with means of compliance acceptable to that authority. CAAM validates the claimed level of integrity.	Same as medium. In addition, evidence is validated by CAAM.
	Comments	*N/A*	*N/A*	*N/A*

1.18.8 **Reason for change:** In consistent with the EASA AMC & GM to Commission Implementing Regulation (EU) 2019-947 – Issue 1, Amendment 1.

1.19 **Appendix 6 Paragraph 1.5**

1.19.1 Appendix 6 Para 1.5 OSO #10 & OSO #12 has been amended as follows:

		LEVEL of ASSURANCE		
		Low	Medium	High
OSO #10 & OSO #12	Criteria	A design and installation appraisal is available. In particular, this appraisal shows that: (a) the design and installation features (independence, separation and redundancy) satisfy the low integrity criterion; and (b) particular risks relevant to the ConOps (e.g., heavy rain, monsoon season, haze, electromagnetic interference, etc.) do not violate the independence claims, if any.	Same as low. In addition, the level of integrity claimed is substantiated by analysis and/or test data with supporting evidence. CAAM validates the claimed level of integrity.	Same as medium. In addition, CAAM validates the level of integrity claimed.
	Comments	*N/A*	*N/A*	*N/A*

1.19.2 **Reason for change:** In consistent with the EASA AMC & GM to Commission Implementing Regulation (EU) 2019-947 – Issue 1, Amendment 1.

1.20 **Appendix 6 Paragraph 1.7**

1.20.1 Appendix 6 Para 1.7 OSO #18 has been amended as follows:

HUMAN ERROR		**LEVEL of ASSURANCE**		
		Low	**Medium**	**High**
OSO #18 Automatic protection of the flight envelope from human errors	Criteria	The automatic protection of the flight envelope has been developed in-house or out of the box (e.g., using commercial off-the-shelf elements), without following specific standards. CAAM validates the claimed level of integrity.	The automatic protection of the flight envelope has been developed to standards considered adequate by the CAAM and/or in accordance with a means of compliance acceptable to that authority. CAAM validates the claimed level of integrity.	Same as Medium. In addition, evidence is validated by CAAM.
	Comments	*N/A*	*N/A*	*N/A*

1.20.2 **Reason for change:** In consistent with the EASA AMC & GM to Commission Implementing Regulation (EU) 2019-947 – Issue 1, Amendment 1.

1.20.3 Appendix 6 Para 1.7 OSO #19 has been amended as follows:

HUMAN ERROR		LEVEL of ASSURANCE		
		Low	**Medium**	**High**
OSO #19 Safe recovery from Human Error	Criterion #1 (Procedures and checklists)	— Procedures and checklists do not require validation against either a standard or a means of compliance considered adequate by the CAAM. — The adequacy of the procedures and checklists is declared.	— Procedures and checklists are validated against standards considered adequate by the CAAM and/or in accordance with a means of compliance acceptable to that authority. — Adequacy of the procedures and checklists is proven through:	Same as Medium. In addition: — Flight tests performed to validate the procedures and checklists cover the complete flight envelope or are proven to be conservative.
			— Dedicated flight tests, or — Simulation, provided the simulation is proven valid for the intended purpose with positive results.	— The procedures, checklists, flight tests and simulations are validated by a competent third party.
	Comments	*N/A*	*N/A*	*N/A*
	Criterion #2 (Training)	Consider the criteria defined for the level of assurance of the generic remote crew training OSO (i.e., OSO #09, OSO #15 and OSO #22) corresponding to the SAIL of the operation		
	Comments	*N/A*	*N/A*	*N/A*
	Criterion #3 (UAS design)	The applicant declares that the required level of integrity has been achieved[1]. CAAM validates the claimed level of integrity.	The applicant has supporting evidence that the required level of integrity is achieved. That evidence is provided through testing, analysis, simulation[2], inspection, design review or operational experience. CAAM validates the claimed level of integrity.	CAAM validates the claimed level of integrity
	Comments	*[1]Supporting evidence may or may not be available.*	*[2]When simulation is performed, the validity of the targeted environments that is used in the simulation needs to be justified.*	*N/A*

1.20.4 **Reason for change:** In consistent with the EASA AMC & GM to Commission Implementing Regulation (EU) 2019-947 – Issue 1, Amendment 1.

1.20.5 Appendix 6 Para 1.7 OSO #20 has been amended as follows:

HUMAN ERROR		LEVEL of ASSURANCE		
		Low	**Medium**	**High**
OSO #20 A Human Factors evaluation has been performed and the HMI found appropriate for the mission	Criteria	The applicant conducts a human factors evaluation of the UAS to determine whether the HMI is appropriate for the mission. The HMI evaluation is based on inspection or analyses. CAAM witnesses the HMI evaluation of the UAS	Same as Low but the HMI evaluation is based on demonstrations or simulations.[1] CAAM witnesses the HMI evaluation of the UAS	Same as Medium. In addition, EASA witnesses the HMI evaluation of the UAS and a competent third party witnesses the HMI evaluation of the possible electronic means used by the VO.
	Comments	N/A	[1] When simulation is performed, the validity of the targeted environment that is used in the simulation needs to be justified.	N/A

1.20.6 **Reason for change:** In consistent with the EASA AMC & GM to Commission Implementing Regulation (EU) 2019-947 – Issue 1, Amendment 1.

1.21 Appendix 6 Paragraph 1.8

1.21.1 Appendix 6 Para 1.8 OSO #23 has been amended as follows:

ADVERSE OPERATING CONDITIONS		LEVEL of ASSURANCE		
		Low	Medium	High
OSO #23 Environmental conditions for safe operations defined, measurable and adhered to	Criterion #1 (Definition)	Consider the criteria defined in Section 1.9 of Appendix 6		
	Comments	*N/A*		
	Criterion #2 (Procedures)	— Procedures do not require validation against either a standard or a means of compliance considered adequate by the CAAM.	— Procedures are validated against standards considered adequate by the CAAM and/or in accordance with a means of compliance acceptable to that authority.	Same as Medium. In addition: — Flight tests performed to validate the procedures cover the complete flight envelope or are proven to be conservative.
		— The adequacy of the procedures and checklists is declared.	— The adequacy of the procedures is proved through: — Dedicated flight tests, or — Simulation, provided the simulation is proven valid for the intended purpose with positive results.	— The procedures, flight tests and simulations are validated by a competent third party.
	Comments	*N/A*	*N/A*	*N/A*
	Criterion #3 (Training)	Training is self-declared (with evidence available).	— Training syllabus is available. — The UAS operator provides competency-based, theoretical and practical training.	A competent third party: — Validates the training syllabus. — Verifies the remote crew competencies.
	Comments	*N/A*	*N/A*	*N/A*

1.21.2 **Reason for change:** In consistent with the EASA AMC & GM to Commission Implementing Regulation (EU) 2019-947 – Issue 1, Amendment 1.

1.21.3 Appendix 6 Para 1.8 OSO #24 has been amended as follows:

b) The lowest integrity level should be considered for those cases where a UAS equipment has only a partial environmental qualification and/or a partial demonstration by similarity and/or parts with no qualification at all.

ADVERSE OPERATING CONDITIONS		LEVEL of INTEGRITY		
		N/A	Medium	High
OSO #24 UAS is designed and qualified for adverse environmental conditions	Criteria	N/A	The UAS is designed to limit the effect of environmental conditions.	The UAS is designed using environmental standards considered adequate by the competent authority and/or in accordance with a means of compliance acceptable to that authority.
	Comments	*N/A*	*N/A*	*N/A*

ADVERSE OPERATING CONDITIONS		LEVEL of ASSURANCE		
		N/A	Medium	High
OSO #24 UAS is designed and qualified for adverse environmental conditions	Criteria	N/A	Consider the criteria defined in Section 1.9 of Appendix 6	
	Comments	*N/A*	*N/A*	

1.21.4 **Reason for change:** In consistent with the EASA AMC & GM to Commission Implementing Regulation (EU) 2019-947 – Issue 1, Amendment 1.

1.22 **Appendix 6 Paragraph 1.9**

1.22.1 Appendix 6 Para 1.9 has been amended as follows:

		LEVEL of ASSURANCE		
		Low	**Medium**	**High**
TECHNICAL OSO	Criteria	The applicant declares that the required level of integrity has been achieved[1].	The applicant has supporting evidence that the required level of integrity is achieved. This is typically done by testing, analysis, simulation[2], inspection, design review or through operational experience. CAAM validates the claimed level of integrity.	CAAM validates the claimed level of integrity.
	Comments	*[1] Supporting evidence may or may not be available.*	*[2] When simulation is performed, the validity of the targeted environment that is used in the simulation needs to be justified.*	*N/A*

1.22.2 **Reason for change:** In consistent with the EASA AMC & GM to Commission Implementing Regulation (EU) 2019-947 – Issue 1, Amendment 1.

1.23 **Appendix 7 Paragraph 1.3**

1.23.1 Appendix 7 Para 1.3 reference of MOR has been changed to CAD1900:

1.3.1 The regulations:

b) The means of reporting is via the Mandatory Occurrence Reporting (MOR) Scheme which can be found in CAD 1900 in the CAAM's website.

1.23.2 **Reason for change:** MOR has been changed to CAD1900.

1.24 **Appendix 7 Paragraph 1.3.3.1**

1.24.1 Appendix 7 Para 1.3.3.1 embedded link has been amended as follows:

1.3.3.1 How to report a UAS accident or serious incident to the AAIB?

a) Aircraft accidents or serious incidents should be reported by using the 'AAIB (Malaysia) Accident/Incident Notification Form' to the AAIB via email to yahaya@mot.gov.my or fax to 03-888 0163.

1.24.2 **Reason for change:** Embedded link for item 1.3.3.1.a) has been updated to https://www.mot.gov.my/en/Documents/Public%20AAIB%20Accident%20Notification%20fillable.pdf

1.25 **Appendix 7 Paragraph 1.3.3.2**

1.25.1 Appendix 7 Para 1.3.3.2 embedded link has been amended as follows:

1.3.3.2 Any questions?

a) Contact the AAIB if you have any questions about reporting occurrences to the AAIB.

1.25.2 **Reason for change:**

a) Editorial – re-numbering item 1.3.4.2.b) to 1.3.4.2.a)

b) Embedded link for item 1.3.3.1.a) has been updated to https://www.mot.gov.my/en/about/division-unit/AAIB

1.26 **Appendix 7 Paragraph 1.3.4**

1.26.1 Appendix 7 Para 1.3.4 embedded link has been changed to CAD 1900 as follows:

1.3.4 Reporting a UAS occurrence to the CAAM

d) The MOR Scheme can be found in CAD1900 on the CAAM website.

1.26.2 **Reason for change:** Reference for MOR Scheme has been changed to CAD1900.