

APPENDIX A1.A. EQUATIONS FOR THE CALCULATION OF MAXIMUM PERMITTED NOISE LEVELS AS A FUNCTION OF TAKE-OFF MASS

1. CONDITIONS DESCRIBED IN Subpart 1

M = Maximum take-off

mass in 1 000 kg

	0	34	272
Lateral noise level (EPNdB)	102	$91.83 + 6.64 \log M$	108
Approach noise level (EPNdB)	102	$91.83 + 6.64 \log M$	108
Flyover noise level (EPNdB)	93	$67.56 + 16.61 \log M$	108

2. CONDITIONS DESCRIBED IN Subpart 1

M = Maximum take-off

mass in 1 000 kg

mass in 1 000 kg	0	34	35	48.3	66.72	133.45	280	325	400
Lateral noise level (EPNdB) All aeroplanes		97	83.87 + 8.51 log M						106
Approach noise level (EPNdB) All aeroplanes	●	101	89.03 + 7.75 log M				108		
Flyover noise levels (EPNdB)	2 engines	93		70.62 + 13.29 log M				104	
	3 engines	93	67.56 + 16.61 log M			73.62 + 13.29 log M			107
	4 engines	93	67.56 + 16.61 log M				74.62 + 13.29 log M	108	

3. CONDITIONS DESCRIBED IN Subpart 2

M = Maximum take-off mass in 1 000 kg		0	20.2	28.6	35	48.1	280	385	400
Lateral full-power noise level (EPNdB) All aeroplanes		94		$80.87 + 8.51 \log M$				103	
Approach noise level (EPNdB) All aeroplanes		98		$86.03 + 7.75 \log M$				105	
Flyover noise levels (EPNdB)	2 engines or less	89		$66.65 + 13.29 \log M$				101	
	3 engines	89		$69.65 + 13.29 \log M$				104	
	4 engines or more	89		$71.65 + 13.29 \log M$				106	

4. CONDITIONS DESCRIBED IN Subpart 3

Each of the following conditions shall apply:

$$EPNL_L \leq LIMIT_L; EPNL_A \leq LIMIT_A; \text{ and } EPNL_F \leq LIMIT_F;$$

$$[(LIMIT_L - EPNL_L) + (LIMIT_A - EPNL_A) + (LIMIT_F - EPNL_F)] \geq 10$$

$$[(LIMIT_L - EPNL_L) + (LIMIT_A - EPNL_A)] \geq 2; [(LIMIT_L - EPNL_L) + (LIMIT_F - EPNL_F)] \geq 2;$$

and

$$[(LIMIT_A - LIMIT_L) + (LIMIT_F - EPNL_F)] \geq 2$$

Where

$EPNL_L$, $EPNL_A$ and $EPNL_F$ are, respectively, the noise levels at the lateral, approach and flyover reference noise measurement points when determined, to one decimal place, in accordance with the noise evaluation method of Appendix 2; and

$LIMIT_L$, $LIMIT_A$ and $LIMIT_F$ are, respectively, the maximum permitted noise levels at the lateral, approach and flyover reference noise measurement points determined, to one decimal place, in accordance with the equations for the conditions described in Chapter 3, 3.4.1 (Condition 3).

5. CONDITIONS DESCRIBED IN Subpart 4

M = Maximum take-off

mass in 1 000 kg 5.7 34.0 358.9 384.7

Lateral noise level (EPNdB)	96	$85.83 + 6.64 \log M$	103
Approach noise level (EPNdB)	98	$87.83 + 6.64 \log M$	105
Flyover noise level (EPNdB)	89	$63.56 + 16.61 \log M$	106

6. CONDITIONS DESCRIBED IN Subpart 5

M = Maximum take-off

mass in 1 000 kg 0 0.6 1.5 8.618

Noise level in dB(A)	68	$60 + 13.33 M$	80
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7. CONDITIONS DESCRIBED IN Subpart 7 36.07.4(1), AND Subpart 12

M = Maximum take-off

mass in 1 000 kg 0 0.788 80.0

Take-off noise level (EPNdB)	89	$90.03 + 9.97 \log M$	109
Approach noise level (EPNdB)	90	$91.03 + 9.97 \log M$	110
Overflight noise level (EPNdB)	88	$89.03 + 9.97 \log M$	108

8. CONDITIONS DESCRIBED IN Subpart 7

M = Maximum take-off

mass in 1 000 kg 0 0.788 80.0

Take-off noise level (EPNdB)	86	$87.03 + 9.97 \log M$	106
Approach noise level (EPNdB)	89	$90.03 + 9.97 \log M$	109
Overflight noise level (EPNdB)	84	$85.03 + 9.97 \log M$	104

9. CONDITIONS DESCRIBED IN Subpart 9

10.4 a):

M = Maximum take-off

mass in 1 000 kg 0 0.6 1.4 8.618

Noise level in dB(A)	76	$83.23 + 32.67 \log M$	88
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10.4 b):

M = Maximum take-off

mass in 1 000 kg 0 0.57 1.5 8.618

Noise level in dB(A)	70	$78.71 + 35.70 \log M$	85
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10. CONDITIONS DESCRIBED IN Subpart 10

M = Maximum take-off

mass in 1 000 kg 0 0.788 3.175

Noise level in dB SEL	82	$83.03 + 9.97 \log M$
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11. CONDITIONS DESCRIBED IN Subpart 10

M = Maximum take-off mass in 1 000 kg	0	1.417	3.175
Noise level in dB SEL	82	$80.49 + 9.97 \log M$	

12. CONDITIONS DESCRIBED IN Subpart 13

M = Maximum take-off mass in 1 000 kg	0	2	8.618	20.234	28.615	35	48.125	280	385	400
Lateral full-power noise level (EPNdB) All aeroplanes	88.6	$86.03754 + 8.512295 \log M$		94		$80.86511 + 8.50668 \log M$			103	
Approach noise level (EPNdB) All aeroplanes	93.1	$90.77481 + 7.72412 \log M$		98		$86.03167 + 7.75117 \log M$			105	
Flyover noise levels (EPNdB)	2 engines or less	80.6	$76.57059 + 13.28771 \log M$	89		$66.64514 + 13.28771 \log M$			101	
	3 engines			89		$69.64514 + 13.28771 \log M$			104	
	4 engines or more			89		$71.64514 + 13.28771 \log M$			106	

Note.— The slope of the limit lines in the lower and higher weight regions are essentially the same. The observed minor differences between the coefficients of the equations defining the slopes of the lateral and approach lines are a consequence of the limits in **Subpart 13** 36.13.4(1)(a) and 36.13.4(1)(c), being defined with fixed end-points. For all practical purposes the minor differences between the coefficients are considered to be insignificant.

Each of the following conditions shall apply:

$$EPNL_L \leq LIMIT_L; EPNL_A \leq LIMIT_A; \text{ and } EPNL_F \leq LIMIT_F$$

$$(LIMIT_L - EPNL_L) \geq 1; (LIMIT_A - EPNL_A) \geq 1; \text{ and } (LIMIT_F - EPNL_F) \geq 1;$$

$$[(LIMIT_L - EPNL_L) + (LIMIT_A - EPNL_A) + (LIMIT_F - EPNL_F)] \geq 17$$

where

$EPNL_L$, $EPNL_A$ and $EPNL_F$ are respectively the noise levels at the lateral, approach and flyover reference noise measurement points when determined, to one decimal place, in accordance with the noise evaluation method of Appendix 2; and

$LIMIT_L$, $LIMIT_A$, and $LIMIT_F$ are respectively the maximum permitted noise levels at the lateral, approach and flyover reference noise measurement points determined, to one decimal place, in accordance with the equations for the conditions described in **Subpart 13**

APPENDIX A1 B. GUIDELINES FOR NOISE CERTIFICATION OF PROPELLER-DRIVEN STOL AEROPLANES

Note.— See Subpart 6.

Note 1.— For the purpose of these guidelines, STOL aeroplanes are those which, when operating in the short take-off and landing mode, consistent with the relevant airworthiness requirements, require a runway length (with no stopway or clearway) of not more than 610 m at maximum certificated mass for airworthiness.

Note 2.— These guidelines are not applicable to aircraft with vertical take-off and landing capabilities.

1. APPLICABILITY

The following guidelines should be applied to all propeller-driven aeroplanes of over 5 700 kg maximum certificated take-off mass intended for operation in the short take-off and landing (STOL) mode, requiring a runway¹ length, compatible with the relevant take-off and landing distance requirements, of less than 610 m at maximum

certificated mass for airworthiness, and for which a certificate of airworthiness for the individual aeroplane was first issued on or after 1 January 1976.

2. NOISE EVALUATION MEASURE

The noise evaluation measure should be the effective perceived noise level in EPNdB as described in Appendix 2 to this Part 36.

3. NOISE MEASUREMENT REFERENCE POINTS

The aeroplane, when tested in accordance with the flight test procedure of Section 6, should not exceed the noise levels specified in Section 4 at the following reference points:

- a) *lateral noise reference point*: the point on a line parallel to and 300 m from the runway centre line, or extended runway centre line, where the noise level is a maximum during take-off or landing, with the aeroplane operating in the STOL mode;
- b) *flyover noise reference point*: the point on the extended centre line of the runway 500 m from the start of the takeoff roll; and
- c) *approach noise reference point*: the point on the extended centre line of the runway 900 m from the runway threshold.

4. MAXIMUM NOISE LEVELS

The maximum noise level at any of the reference points, when determined in accordance with the noise evaluation method of Appendix 2, should not exceed 96 EPNdB in the case of aeroplanes with maximum certificated mass of 17 000 kg or less, this limit increasing linearly with the logarithm of mass at a rate of 2 EPNdB per doubling of mass in the case of aeroplanes having maximum certificated mass in excess of 17 000 kg.

5. TRADE-OFFS

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

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

6. TEST PROCEDURES

6.1 The take-off reference procedure should be as follows:

- a) the aeroplane should be at the maximum take-off mass for which noise certification is requested;
- b) the propeller and/or engine speed (rpm) and engine power setting scheduled for STOL take-off should be used; and
- c) throughout the take-off noise certification demonstration test, the airspeed, climb gradient, aeroplane attitude and aeroplane configuration should be those specified in the flight manual for take-off in the STOL mode.

6.2 The approach reference procedure should be as follows:

- a) the aeroplane should be at the maximum landing mass for which the noise certification is requested;
- b) throughout the approach noise certification demonstration test, the propeller and/or engine speed (rpm), engine power setting, airspeed, descent gradient, aeroplane attitude and aeroplane configuration should be those specified in the flight manual for STOL landing; and

c) the use of reverse thrust after landing should be the maximum specified in the flight manual.

7. ADDITIONAL NOISE DATA

Where so specified by the certifying authority, data permitting measured noise levels to be evaluated in terms of the A-weighted overall sound pressure level (dB(A)) should be provided.

APPENDIX A1 C. GUIDELINES FOR EVALUATING AN ALTERNATIVE METHOD OF MEASURING HELICOPTER NOISE DURING APPROACH

Note. — The approach reference procedure of Subpart 7, specifies a single approach path angle. This can coincide with the impulsive noise regime for some helicopters and not for others. In order that alternative methods of establishing compliance may be evaluated, States are encouraged to undertake additional measurements as described below.

1. INTRODUCTION

The following guidance material has been prepared for the use of States when obtaining additional information on which a future revision of the approach test procedures of Subpart 7 may be based.

2. APPROACH NOISE EVALUATION PROCEDURE

When conducting such tests the provisions of Subpart 7 shall be observed except as follows.

2.1 Approach reference noise measurement points

A flight path reference point located on the ground 120 m (394 ft) vertically below the flight paths defined in the approach reference procedure. On level ground this corresponds to the following positions:

- a) 2 290 m from the intersection of the 3° approach path with the ground plane;
- b) 1 140 m from the intersection of the 6° approach path with the ground plane;
- c) 760 m from the intersection of the 9° approach path with the ground plane.

2.2 Maximum noise levels

At the approach flight path reference point: the noise level to be calculated by taking the arithmetical average of the corrected levels for 3°, 6° and 9° approaches.

2.3 Approach reference procedure

The approach reference procedure shall be established as follows:

- a) the helicopter shall be stabilized and following approach paths of 3°, 6° and 9°;
- b) the approach shall be made at a stabilized airspeed equal to the best rate of climb speed, VY, 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.

Maximum take-off mass exceeding 8 618 kg

NO YES

Application for Type Certificate submitted on or after 1 January 1975

NO YES

Certificate of Airworthiness for individual aeroplane issued on or after 1 January 1980

NO YES

No rule 6.3

Application for Type Certificate or, in the case of a derived version, application for certification of change in type design submitted on or after 17 November 1988

NO YES

6.3 10.4 a)² or 6.3

Application for Type Certificate or, in the case of a derived version, application for certification of change in type design submitted on or after 17 November 1993

NO YES

10.4 a)² or 6.3

Multi-engine or float plane or amphibian

NO

Derived version

YES NO

Application for certification of change in type design submitted on or after 4 November 1999

NO

Application for Type Certificate submitted on or after 4 November 1999

YES NO

10.4 a)² 10.4 a)³

Application for Type Certificate submitted on or after 6 October 1977

NO YES

Certificate of Airworthiness for individual aeroplane issued on or after 26 November 1981 or, in the case of a derived version, application for certification of change in type design submitted on or after 6 October 1977

NO YES

No rule 2.4.1

Application for Type Certificate submitted on or after 1 January 1985

NO YES

5.4 3.4

Application for Type Certificate submitted on or after 1 January 2006

NO YES

3.4

Maximum take-off mass less than 55 000 kg

NO YES

14.4

Application for Type Certificate submitted on or after 31 December 2020

YES NO

4.4

Application for Type Certificate submitted on or after 31 December 2017

NO

4.4

Application for Type Certificate submitted on or after 4 November 1999

NO YES

10.4 b)³ or 10.4 a)¹³ 10.4 b)³

10.4 a)³ 10.4 b)³

1. These Standards do not apply to aeroplanes specifically designed and used for aerobatic, agricultural or firefighting purposes.

2. The option to apply the Standards of 10.4 a) does not apply to derived versions for which the application for certification of change in type design was submitted on or after 4 November 2004.

3. These Standards do not apply to self-sustaining powered sailplanes.

APPENDIX A1 E. GUIDELINES FOR NOISE CERTIFICATION OF TILT-ROTORS

Note. — See Subpart 12.

Note.— These guidelines are not intended to be used for tilt-rotors that have one or more configurations that are certificated for airworthiness for STOL only. In such cases, different or additional guidelines would likely be needed.

1. APPLICABILITY

The following guidelines should be applied to all tilt-rotors, including their derived versions, for which the application for a Type Certificate was submitted on or after 13 May 1998 and before 1 January 2018.

Note.— Certification of tilt-rotors which are capable of carrying external loads or external equipment should be made without such loads or equipment fitted.

2. NOISE EVALUATION MEASURE

The noise evaluation measure should be the effective perceived noise level in EPNdB as described in 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 certificating authority for land-use planning purposes.

3. NOISE MEASUREMENT REFERENCE POINTS

A tilt-rotor, when tested in accordance with the reference procedures of Section 6 and the test procedures of Section 7, should not exceed the noise levels specified in Section 4 at the following reference points:

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

1) a flight path reference point located on the ground vertically below the flight path defined in the take-off reference procedure (see 6.2) and 500 m horizontally in the direction of flight from the point at which transition to climbing flight is initiated in the reference procedure;

2) 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) Overflight reference noise measurement points:

1) 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 6.3);

2) two other points on the ground symmetrically disposed at 150 m 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 6.4). On level ground, this corresponds to a position 1 140 m 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 on both sides of the flight path defined in the approach reference procedure and lying on a line through the flight path reference point.

4. MAXIMUM NOISE LEVELS

For tilt-rotors specified in Subpart O, the maximum noise levels, when determined in accordance with the noise evaluation method of Appendix 2 for helicopters, should 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 Subpart 7,36.07.4(1), are consistent with the maximum noise levels defined in these guidelines.

5. TRADE-OFFS

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

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

6. NOISE CERTIFICATION REFERENCE PROCEDURES

6.1 General conditions

6.1.1 The reference procedures should comply with the appropriate airworthiness requirements.

6.1.2 The reference procedures and flight paths should be approved by the certifying authority.

6.1.3 Except in conditions specified in 6.1.4, the take-off, overflight and approach reference procedures should be those defined in 6.2, 6.3 and 6.4, respectively.

6.1.4 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 6.2, 6.3 or 6.4, the reference procedures should:

- a) depart from the reference procedures defined in 6.2, 6.3 or 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 certifying authority.

6.1.5 The reference procedures should 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;
- c) constant relative humidity of 70 per cent; and
- d) zero wind.

6.1.6 In 6.2 d), 6.3 d) and 6.4 c), the maximum normal operating rpm should 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 should 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 should 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 should be used during the noise certification procedure.

6.2 Take-off reference procedure

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

- a) a constant take-off configuration, including nacelle angle, selected by the applicant should be maintained throughout the take-off reference procedure;
- b) the tilt-rotor should 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;

- 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, should be maintained throughout the take-off reference procedure;
- d) the steady climb should be made with the rotor speed stabilized at the maximum normal operating rpm certificated for take-off;
- e) the mass of the tilt-rotor should 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 prior to the centre noise measurement point and 20 m (65 ft) above ground level) at an angle defined by best rate of climb (BRC) and the best rate of climb speed corresponding to the selected nacelle angle and for minimum specification engine performance.

6.3 Overflight reference procedure

6.3.1 The overflight reference procedure should be established as follows:

- a) the tilt-rotor should 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 should be maintained throughout the overflight reference procedures;
- c) the mass of the tilt-rotor should 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 VCON and a rotor speed stabilized at the maximum normal operating rpm certificated for level flight should be maintained throughout the overflight reference procedure;

Note.— For noise certification purposes, VCON is defined as the maximum authorized speed for VTOL/conversion mode at a specific nacelle angle.

e) in the aeroplane mode, the nacelles should be maintained on the down-stop throughout the overflight reference procedure, with:

1) rotor speed stabilized at the rpm associated with the VTOL/conversion mode and a speed of 0.9 VCON; and

2) rotor speed stabilized at the normal cruise rpm associated with the aeroplane mode and at the corresponding 0.9 VMCP or 0.9 VMO, whichever is lesser, certificated for level flight.

Note.— For noise certification purposes, VMCP 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 VMO is the maximum operating (MO) limit airspeed that may not be deliberately exceeded.

6.3.2 The values of VCON and VMCP or VMO used for noise certification should be quoted in the approved flight manual.

6.4 Approach reference procedure

The approach reference procedure should be established as follows:

a) the tilt-rotor should be stabilized and follow a 6.0° approach path;

b) the approach should 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 should 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, should be maintained throughout the approach reference procedure; and
- e) the mass of the tilt-rotor at touchdown should be the maximum landing mass at which noise certification is requested.

7. TEST PROCEDURES

7.1 The test procedures should be acceptable to the airworthiness and noise certifying authority of the State issuing the certificate.

7.2 The test procedures and noise measurements should be conducted and processed in an approved manner to yield the noise evaluation measure designated in Section 2.

7.3 Test conditions and procedures should be similar to reference conditions and procedures or the acoustic data should be adjusted, by the methods outlined in Appendix 2 for helicopters, to the reference conditions and procedures specified in this attachment.

7.4 Adjustments for differences between test and reference flight procedures should not exceed:

a) *for take-off*: 4.0 EPNdB, of which the arithmetic sum of $\Delta 1$ and the term $-7.5 \log (QK/QrKr)$ from $\Delta 2$ should not in total exceed 2.0 EPNdB; and

b) *for overflight or approach*: 2.0 EPNdB.

7.5 During the test the average rotor rpm should not vary from the normal maximum operating rpm by more than ± 1.0 per cent throughout the 10 dB-down time period.

7.6 The tilt-rotor airspeed should not vary from the reference airspeed appropriate to the flight demonstration by more than ± 9 km/h (± 5 kt) throughout the 10 dB-down time period.

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

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

7.9 The tilt-rotor height should not vary during overflight from the reference height throughout the 10 dB-down period by more than ± 9 m (30 ft).

7.10 During the approach noise demonstration the tilt-rotor should be established on a stabilized constant speed approach within the airspace contained between approach angles of 5.5° and 6.5° throughout the 10 dB-down period.

7.11 Tests should 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.

APPENDIX A1.F. GUIDELINES FOR THE ADMINISTRATION OF NOISE CERTIFICATION DOCUMENTATION

Note. — See Subpart 0.

1. INTRODUCTION

The following information is provided for the benefit of States that wish to have further guidance on the administration of noise certification documentation. These guidelines are not intended to be applied retroactively, but if States wish to apply the proposed formats retroactively they are free to do so.

2. NOISE CERTIFICATION DOCUMENTATION

2.1 Information to be provided

2.1.1 Subpart 0, 36.00.5 , specifies which information shall, as a minimum, be included in the noise certification documentation. The following provides further guidance on these items. Note that all items must be numbered in accordance with subpart 0 36.00.5, using Arabic numbers. This is to facilitate access to the information when the noise certification documentation is issued in a language foreign to the user of the information. Some items are relevant to certain subparts only. In these cases the relevant subparts are indicated in the item.

2.1.2 Item 1. Name of State

The name of the State issuing the noise certification documentation. This item should correspond with the information on the certificate of registration and the certificate of airworthiness.

2.1.3 Item 2. Title of the noise document

As explained in Section 2.3, several different kinds of documents can be issued depending on the administrative system for implementation of the noise certification documentation. The system chosen will determine the name of the document or documents, for instance “noise certificate”, “noise certification document” or any other title that the State of Registry uses in its administrative system.

2.1.4 Item 3. Number of the document

A unique number, issued by the State of Registry, that identifies this particular document in its administration. Such a number will facilitate any enquiries with respect to the document.

2.1.5 Item 4. Nationality or common mark and registration marks

The nationality or common mark and registration marks issued by the State of Registry in accordance with CAR Part 47. This item should correspond with the information on the certificate of registration and the certificate of airworthiness.

2.1.6 Item 5. Manufacturer and manufacturer's designation of aircraft

The type and model of the subject aircraft. This item should correspond with the information on the certificate of registration and the certificate of airworthiness.

2.1.7 Item 6. Aircraft serial number

The aircraft serial number as given by the manufacturer of the aircraft. This item should correspond with the information on the certificate of registration and the certificate of airworthiness.

2.1.8 Item 7. Engine manufacturer, type and model

The designation of the installed engine(s) for identification and verification of the aircraft configuration. It should contain the type and model of the subject engine(s). The designation should be in accordance with the type certificate or supplemental type certificate for the subject engine(s).

2.1.9 Item 8. Propeller type and model for propeller-driven aeroplanes

The designation of the installed propeller(s) for identification and verification of the aircraft configuration. It should contain the type and model of the subject propeller(s). The designation should be in accordance with the type certificate or supplemental type certificate for the subject propeller(s). This item is included only in the noise certification documentation for propeller-driven aeroplanes.

2.1.10 Item 9. Maximum take-off mass and unit

The maximum take-off mass, in kilograms, associated with the certificated noise levels of the aircraft. The unit (kg) should be specified explicitly in order to avoid misunderstanding. If the primary unit of mass of the State of Design of the aircraft is different from kilograms, the conversion factor used should be in accordance with relevant Units of Measurement.

2.1.11 Item 10. Maximum landing mass, in kilograms, for certificates issued under Subpart 1, 2, 3, 4, 11 and 13.

The maximum landing mass, in kilograms, associated with the certificated noise levels of the aircraft. The unit (kg) should be specified explicitly in order to avoid misunderstanding. If the primary unit of mass of the State of Design of the aircraft is different from kilograms, the conversion factor used should be in accordance with relevant Units of Measurement. This item is included only in the noise certification documentation for documents issued under Subpart 1, 2, 3, 4, 11 and 13.

2.1.12 Item 11. The subpart and section of Part 36, according to which the aircraft is certificated

The subpart of Part 36, to which the subject aircraft is noise certificated. For Subpart 1, 7, 9 and 10, the section specifying the noise limits should also be included.

2.1.13 Item 12. Additional modifications incorporated for the purpose of compliance with the applicable noise certification Standards

This item should contain, as a minimum, all additional modifications to the basic aircraft as defined by Items 5, 7 and 8 that are essential in order to meet the requirements of the chapter of Part 36, to which the aircraft is noise certificated as given under Item 11. Other modifications that are not essential to meet the stated subpart but are needed to attain the certificated noise levels as given may also be included at the discretion of the certificating authority. The additional modifications

should be given using unambiguous references, such as supplemental type certificate (STC) numbers, unique part numbers or type/model designators given by the manufacturer of the modification.

2.1.14 Item 13. The lateral/full-power noise level in the corresponding unit for documents issued under Subpart 1, 2, 3, 4, 11 and 13.

The lateral/full-power noise level as defined in the relevant chapter. It should specify the unit (e.g. EPNdB) of the noise level, and the noise level should be stated to the nearest tenth of a dB. This item is included only in the noise certification documentation for aircraft certificated to Subpart 1, 2, 3, 4, 11 and 13.

2.1.15 Item 14. The approach noise level in the corresponding unit for documents issued under Subpart 1, 2, 3, 4, 11, 12 and 13.

The approach noise level as defined in the relevant subpart. It should specify the unit (e.g. EPNdB) of the noise level, and the noise level should be stated to the nearest tenth of a dB. This item is included only in the noise certification documentation for aircraft certificated to Subpart 1, 2, 3, 4, 11, 12 and 13.

2.1.16 Item 15. The flyover noise level in the corresponding unit for documents issued under Subpart 1, 2, 3, 4, 11 and 13.

The flyover noise level as defined in the relevant subpart. It should specify the unit (e.g. EPNdB) of the noise level, and the noise level should be stated to the nearest tenth of a dB. This item is included only in the noise certification documentation for aircraft certificated to Subpart 1, 2, 3, 4, 11 and 13.

2.1.17 Item 16. The overflight noise level in the corresponding unit for documents issued under Subpart 5, 7, 10 and 12.

The overflight noise level as defined in the relevant subpart. It should specify the unit (e.g. EPNdB or dB(A)) of the noise level, and the noise level should be stated to the nearest tenth of a dB. This item is included only in the noise certification documentation for aircraft certificated to Subpart 5, 7, 10 and 12.

Note. — For tilt-rotors certificated according to Subpart 12 only the overflight noise level established in VTOL/conversion mode needs to be stated.

2.1.18 Item 17. The take-off noise level in the corresponding unit for documents issued under Subpart 7, 9 and 12

The take-off noise level as defined in the relevant subpart. It should specify the unit (e.g. EPNdB or dB(A)) of the noise level, and the noise level should be stated to the nearest tenth of a dB. This item is included only in the noise certification documentation for aircraft certificated to Subpart 7, 9 and 12.

2.1.19 Item 18. Statement of compliance, including reference to Part 36.

A statement that the subject aircraft complies with the applicable noise requirements. Reference should be made to Part 36. In addition to this, reference may be made to national noise requirements.

2.1.20 Item 19. Date of issuance of the noise certification document

The date on which the noise certification document was issued.

2.1.21 Item 20. Signature of the officer issuing it

The signature of the officer issuing the noise certification document. Other items may be added such as a seal or a stamp.

2.2 Additional information

2.2.1 States may decide to add additional information to the noise certification documentation at their own discretion. Caution should be exercised to ensure that the information provided will not be confused with the official noise certification levels. In particular, noise levels taken under conditions other than the noise certification conditions should be clearly marked as supplementary information. The additional

information should be placed in a “remarks” box or in separate boxes. These boxes should not be numbered in order to avoid non-standardized numbering and to allow for future modifications to the numbering system. The box or boxes should contain an adequate description of what additional information is provided. Examples of possible additional information are provided in 2.2.2 through 2.2.7.

2.2.2 Logo and name of the issuing authority In order to facilitate recognition, the logo or symbol and the name of the issuing authority may be added.

2.2.3 Noise limits

If added, noise limits should be given according to the subject noise requirements and should be quoted, to the nearest tenth of a decibel, in the appropriate unit. If national noise requirements use different limits (more or less stringent), this should be clearly marked, and in order to avoid confusion the SACAA limits should also be quoted.

2.2.4 Language

States issuing their noise certification documentation in a language other than English should provide an English translation in accordance with Operation of Aircraft.

2.2.5 References to national requirements

Reference to national requirements can be combined with Item 18 or can be added as a separate item.

2.2.6 Other aircraft modifications

Other modifications from the basic aircraft model as specified under Item 5 and Items 7 through 10 to aid further identification of the noise configuration can be provided at the discretion of the State of Registry. Note that any modifications required to meet the Standards to which any document is issued should be reported under Item 12.

2.2.7 Date of expiry

If the State of Registry limits the validity of the noise certification documentation, it should include the date of expiry.

2.3 Formats for noise certification documentation

2.3.1 In view of the wide variety of administrative needs for systems for noise certification documentation, three alternative standardized options are provided:

- 1) A stand-alone noise certificate in which the mandatory information requirements of Part 36, are contained in a single document.
- 2) Two complementary documents of which one may be the aeroplane flight manual (AFM) or the aircraft operating manual (AOM).
- 3) Three complementary documents.

2.3.2 Option 1. One document

The first option is an administrative system in which the document attesting noise certification takes the form of a separate noise certificate that contains all the items identified in Subpart 0, 36.00.5 A standard format is provided in Figure G-1. States using this format may deviate from this where needed to meet their national requirements and/or to include any additional items. It should however be generally similar to Figure G-1. Note that not all items will be mentioned on every noise certificate. For instance, not all Items 13 through 17 will be mentioned on one noise certificate since they are not all applicable to every subpart. Normally, only one certificate per aircraft serial number should be issued and be valid at the same time. If a noise certificate has lost its validity, it should be suspended or revoked to avoid the situation that more than one noise certificate is current for an aircraft. If multiple documents for this option have been issued, it should be easy to determine which document is applicable at any given time.

2.3.3 Option 2. Two complementary documents

2.3.3.1 The second option is an administrative system consisting of two documents in which the first official document attests noise certification, but is limited to identification of the aircraft, and the statement of compliance, containing only Items 1 through 6 and Items 18 through 20 of 2.1. This can be either in the form of a (limited) noise certificate or in the form of a certificate of airworthiness for those States that include noise requirements in their airworthiness requirements. In the latter case, there is no need for Item 18 (statement of compliance with reference to Part 36) since compliance is implicit. The numbering of the items in the certificate of airworthiness will be according to the convention in CAR Part 21, Subpart 8. In these cases the remaining items of 2.1 should be transferred to a complementary standardized noise certification document, normally as a page of the AFM or AOM certified by the State of Registry, the format of which can be very similar to that of the noise certificate described under 2.3.2. Therefore, the format given in Figure G-1 can equally serve as a standard format for the

complementary document, although some items may not be needed. 2.3.3.2 Normally only one set of the two documents should be issued for each aircraft. If a noise certification document has lost its validity, it should be suspended or revoked. If multiple documents have been issued under this option, it should be obvious from the documentation which document is applicable at any given time.

2.3.4 Option 3. Three complementary documents

2.3.4.1 The third option is an administrative system consisting of three documents in which the first official document is identical to the first document of Option 2, 2.3.3.1. It attests noise certification and is therefore also limited to identification of the aircraft, and the statement of compliance, containing only Items 1 through 6 and Items 18 through 20 of 2.1. This can be either in the form of a noise certificate or in the form of a certificate of airworthiness for those States that include noise requirements in their airworthiness requirements (with the same observation as in the second option). The remaining items of 2.1 should be transferred to the second and third complementary noise certification documents.

2.3.4.2 The second document, normally presented as a page (or set of following pages) in the AFM or AOM, certified by the State of Registry, list(s) all the configurations operated or forecast to be operated by the aircraft fleet from the date of issuance of the page(s). The fleet is composed of all aircraft that are operated with the same flight manual. The format of the information can be very similar to that of the noise certificate described under 2.3.2, all information corresponding to a given configuration comprising Item 5 and Items 7 through 17. Each list of parameters corresponding to a given configuration is identified by a “configuration number”, for example “x”. Therefore, the format given in Figure G-1 can equally serve for the items concerned, with the addition of the configuration number.

For use by State of Registry		1. <State of Registry>		3. Document number:	
2. NOISE CERTIFICATE					
4. Nationality and registration marks:		5. Manufacturer and manufacturer's designation of aircraft:		6. Aircraft serial number:	
7. Engine:		8. Propeller:*			
9. Maximum take-off mass: kg		10. Maximum landing mass: * kg		11. Noise certification Standard:	
12. Additional modifications incorporated for the purpose of compliance with the applicable noise certification Standards:					
13. Lateral/full-power noise level:*	14. Approach noise level:*	15. Flyover noise level:*	16. Overflight noise level:*	17. Take-off noise level:*	
Remarks:					
18. This noise certificate is issued pursuant to Volume I of Annex 16 to the Convention on International Civil Aviation, 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		20. Signature			

* These boxes may be omitted depending on the noise certification Standard.

Figure G-1. Noise certificate

2.3.4.3 The third document under this option is issued according to a national regulatory process. It states that an aircraft with a given serial number has operated in the configuration number “x” since the date of issuance of this third document. If multiple documents for this option have been issued, it should be obvious from the documentation which document is applicable at any given time.

APPENDIX A1.G. GUIDELINES FOR OBTAINING HELICOPTER NOISE DATA FOR LAND-USE PLANNING PURPOSES

1. INTRODUCTION

The following guidance material has been prepared for the use of States wishing to utilize noise certification data, or optional supplementary test data, for land-use planning purposes. The purpose of this guidance material is to assist in the provision of data suitable for the prediction of helicopter noise exposure contours and to support the development of heliport noise abatement operational procedures.

2. DATA COLLECTION PROCEDURES

2.1 Data suitable for land-use planning purposes may be derived directly from Chapter 8 noise certification data. Subpart 7 applicants may optionally elect to acquire data suitable for land-use planning purposes via alternative take-off, approach and/or flyover procedures defined by the applicant and approved by the certifying authority. Alternative flyover procedures should be performed overhead the flight path reference point at a height of 150 m (492 ft). In addition, an applicant may optionally elect to provide data at additional microphone locations.

2.2 Subpart 10 noise certification data may be provided for land-use planning purposes. Subpart 10 applicants may optionally elect to provide data acquired via alternative flyover procedures at 150 m (492 ft) above ground level. In acquiring data for land-use planning purposes, Subpart 10 applicants should give consideration to acquiring data from two additional microphones symmetrically disposed at 150 m (492

ft) on each side of the flight path and/or additional take-off and approach procedures defined by the applicant and approved by the certificating authority. In addition, an applicant may optionally elect to provide data at additional microphone locations.

2.3 All data provided for land-use planning purposes should be corrected to the appropriate reference conditions via the approved procedures of Subpart 7 and Subpart 10 or, for alternative flight procedures, by appropriate correction procedures approved by the certificating authority.

3. REPORTING OF DATA

3.1 All data provided for land-use planning purposes should be submitted to the certificating authority for approval. The approved data and the corresponding flight procedures should be presented as supplementary information in the helicopter flight manual.

3.2 It is recommended that all data provided for land-use planning purposes be presented in terms of average sound exposure level, LAE, as defined in Appendix 4 of this volume, for left sideline, centre line and right sideline measurement points defined relative to the direction of flight for each test run. Additional data in other noise metrics may also be provided and should be derived in a manner that is consistent with the prescribed noise certification analysis procedure.