SCHEDULE Article 8

Microlight noise standards

SECTION 1

MAXIMUM NOISE LEVELS

1. For microlight aeroplanes first registered in the United Kingdom or elsewhere before 1st April 1986 the maximum noise levels, when determined in accordance with the noise evaluation method specified in Section 2, must not exceed the following—

(a) single seat microlight aeroplanes – 80L_{AE} (dB(A));

(b) two seat microlight aeroplanes – 84L_{AE} (dB(A)).

2. For microlight aeroplanes first registered in the United Kingdom or elsewhere on or after 1st April 1986 and before 5 April 2002 the maximum noise levels, when determined in accordance with the noise evaluation method specified in Section 2, must not exceed the following—

(a) single seat microlight aeroplanes – 76L_{AE} (dB(A));

(b) two seat microlight aeroplanes – 80L_{AE} (dB(A)).

3. For microlight aeroplanes first registered in the United Kingdom or elsewhere on or after 5 April 2002 the maximum noise levels, when determined in accordance with the noise evaluation method specified in Section 2, must not exceed 80L_{AE} (dB(A)).

SECTION 2

NOISE EVALUATION METHOD FOR NOISE CERTIFICATION OF MICROLIGHT AEROPLANES

Introduction

1. This noise evaluation method includes—

(a) noise certification test and measurement conditions;

(b) computation of the noise evaluation measure, L_{AE};

(c) reporting of data to the CAA and correction of measured data.

Test procedures

2.—(1) All flight test procedures used in demonstrating compliance with the noise certification requirements must be consistent with the airworthiness certification basis of the aeroplane.

(2) The tests must be carried out under the following atmospheric conditions—

(a) no precipitation;

(b) ambient temperature not above 35°C and not below 2°C at 1.2m above ground;

(c) relative humidity not higher than 95 per cent and not below 20 per cent at 1.2m above the ground;

(d) on a diagram of relative humidity plotted against temperature, combinations of relative humidity and temperature which fall below a straight line between (60 per cent, 2°C) and (20 per cent, 35°C) are unacceptable;

(e) reported wind speed, when measured at 1.2m above the ground, must not exceed 19 km/hr (10 knots) and cross wind component must not exceed 9 km/hr (5 knots);

(f) no temperature inversion or anomalous weather conditions that would significantly affect the noise levels of the microlight aeroplane observed at the specified measurement position.

(3) Flights must be made in equal numbers with tail and head wind components.

(4) Subject to subparagraph (5) the microlight aeroplane must pass overhead the noise measurement position within ±10° of the vertical at a height of 150 (+10/-70) m (490 (+33/-230) ft).

(5) The CAA may, having regard to the poor definition, in some circumstances, of the noise field shape for microlight aeroplanes at 150m determine that the test be undertaken at a height of 100 (+60/-20) m (328 (+197/-60) ft).

(6) Overflights must be performed at stabilised speed in the cruise configuration, except that where the speed at take-off power would exceed the maximum speed authorised in level flight, climbing flight is acceptable.

(7) The maximum static propeller speed must be measured using a device accurate to within ±1 per cent.

(8) When requested in advance by the CAA, tape recordings of the noise tests must be provided. In such cases the instrumentation standards and procedures must be those described in paragraph 4.

Calculation of sound exposure level L_{AE} from measured noise data

3.—(1) The sound exposure level L_{AE} is defined as the level, in decibels, of the time integral of squared 'A'-weighted sound pressure (P_A) over a given time period or event, with reference to the square of the standard reference sound pressure (P_o) of 20 micropascals (P) and a reference duration of one second.

(2) This unit is defined by the expression—

$$L_{AE} = 10 \log \frac{1}{T_0} \int_{t1}^{t2} \left(\frac{P_A(t)}{P_0} \right)^2 dt$$

where T_o is the reference integration time of one second and $(t_2 - t_1)$ is the integration time interval.

(3) The above integral can also be expressed as—

$$L_{AE} = 10 \log \frac{1}{T_0} \int_{t1}^{t2} 10^{L_A(t)/10} dt$$

where $L_A(t)$ is the time varying 'A'-weighted sound level.

(4) The integration time (t2 - t1) in practice must not be less than the time interval during which LA(t) first rises to within 10dB(A) of its maximum value (LAmax) and last falls below a level of 10dB(A) less than its maximum value.

(5) The L_{AE} may be approximated by the following expression for L_{Amax}—

$$L_{\mathrm{AE}} = L_{\mathrm{Amax}} + \Delta A$$

where ΔA is the duration allowance given by $\Delta A = 10 \log \tau$ where $\tau = (t_2 - t_1)/2$.

Measurement system

4.—(1) The measurement system must consist of equipment equivalent to the following—

(a) A microphone, amplifier and indicating instrument having frequency response characteristics compatible with the measurement and analysis system accuracy required by sub-paragraph (2).

(b) Tripods or similar microphone mountings that minimise interference with the sound being measured.

(c) (i) Subject to sub-paragraph (ii), recording and reproducing equipment (when used) having frequency response and dynamic range characteristics compatible with the measurement and analysis system accuracy required by sub-paragraph (2).

(ii) The CAA may require that the sound produced by the microlight aeroplane must be recorded in such a way that complete information, including time history, is retained.

(d) (i) Acoustic calibrators using sine wave or broadband noise of known sound pressure level.

(ii) If broadband noise is used, the signal must be described in terms of its average and maximum root-mean-square (rms) value for non-overload signal level.

(e) A graphic level recorder or tape recorder may be used to record the noise time history.

Sensing, Recording and Reproducing Equipment for Aeroplanes

(a) (2) (a) The sound level produced by the aeroplane must be recorded, for which purpose a magnetic tape recorder, graphic level recorder or sound level meter may be used at the option of the CAA.

(b) When a tape recorder is used it must form part of the complete system complying with International Electrotechnical Commission (IEC) Publication No. 1265 [M1] or an equivalent standard.

(c) The response of the complete system to a sensibly plane progressive sinusoidal wave of constant amplitude must lie within the tolerance limits specified in Table IV and Table V for Type 1 instruments in IEC Publication No. 60651 or an equivalent standard for weighting curve 'A' over the frequency range 40 to 12 500 Hz.

(d) (i) The recorded noise signal must be read, over the frequency range 40 to 12 500 Hz through an 'A' weighting network as defined in IEC Publication No. 60651 or an equivalent standard with time weighting designated 'S' (SLOW) [M2].

(ii) With the agreement of the CAA, during tests with high flight speeds, the 'F' (FAST) time weighting may be applied to obtain the true level.

(e) (i) A windshield must be employed with the microphone during all measurements of microlight aeroplane noise.

(ii) Its characteristics must be such that, when it is used, the complete system, including the windshield, will meet the specifications of sub-paragraph (**c**).

(iii) Its insertion loss at the frequency of the acoustic calibrator must also be known and included in the provision of an acoustic reference level for the analysis of the measurements.

(f) (i) The overall sensitivity of the measuring system must be checked before and after the measurement of the noise level for a sequence of tests, using an acoustic calibrator generating a known sound pressure level at a known frequency.

(ii) The output of the acoustic calibrator must have been certified by a standardising laboratory [M3] within 6 months of the test series.

(iii) Tolerable deviation in output from the manufacturer's stated level must be not more than 0.2dB.

Marginal Citations

M1 International Electrotechnical Commission Publications are available at www.iec.ch/.

M2 F(FAST) time weighting refers to the simulated linear response of the sound level analysers to an actual change in Sound Pressure Level (SPL) readings.{d1}{t1}The normal procedure, designated S(SLOW), takes four half second SPL readings and uses 13% from the initial half second interval, 21% from the second, 27% from the third and 39% from the fourth to calculate an equivalent SPL for a point in time at 1.25 seconds. This method is used in modern day analysis to simulate the performance of the old analogue analysers and maintain a constant data processing methodology.{d1}{t1}The F(FAST) time weighting response uses the same procedure as S(SLOW) but is performed over a short duration and is equivalent to the performance of a digital analyser. This method is sometimes used in tests with high flight speeds in order to obtain a clearer and more accurate noise profile.

M3 A “standardising laboratory” refers to a technical laboratory which has acoustic equipment calibrated against a “gold” national standard and which is licensed to calibrate other external acoustic equipment against this “gold” standard. This is a well known and documented technical term quoted in ICAO Annex 16, Volume 1, Appendix 2, Paragraph 3.5.5.

Noise measurement procedures for microlight aeroplanes

5.—(1) For demonstrating compliance with this Section the microphone must be oriented in a known direction so that the maximum sound received arrives as nearly as possible in the direction for which the microphones are calibrated.

(2) The microphones must be placed so that their sensing elements are approximately 1.2m (4ft) above the ground.

(3) Immediately prior to and after each test, a recorded acoustic calibration of the system must be made in the field with an acoustic calibrator for the purposes of checking system sensitivity and providing an acoustic reference level for the analysis of the sound level data.

(4) The ambient noise, including both acoustical background and electrical noise of the measurement systems, must be recorded and determined in the test area with the system gain set at levels which will be used for aeroplane noise measurements.

(5) If aeroplane sound pressure levels do not exceed the background sound pressure levels by at least 10dB(A), approved corrections for the contribution of background sound pressure level to the observed sound pressure level must be applied.

Adjustment of flight test results

6.—(1) Differences between test conditions and reference conditions must require that adjustments be made to the measured L_{AE} figures for two different effects—

(a) variations in propeller tip Mach number and hence source noise;

(b) variations in microlight aeroplane height over the noise measurement position and hence in noise path length.

(2) The adjustments must be made in accordance with sub-paragraphs (3), (4), (5) and (6).

Adjustment for Propeller Tip Mach Number

(3) An adjustment for propeller source noise Δm must be added to the measured sound exposure level $L_{AE\text{meas}}$ where—

$$\Delta m = 85\log((T - 0.0065H)/298)$$

and T is the absolute temperature in degrees Kelvin at the height of the microphone on the test day, and H is the height in metres of the microlight aeroplane over the microphone.

(4) For microlight aeroplanes described in paragraph 1 of Section 1, if the propeller tip Mach number measured statically is less than 0.7, the adjustment Δm must be taken to be zero.

Adjustment for Noise Path Difference

(5) Noise measurements made for microlight aeroplane heights over the noise measurement position different from 150m (492 ft) must be adjusted to 150m (492 ft) by adding a correction ΔH1 to the measured sound exposure level $L_{AE}$where—

$$\Delta H1 = 14\log(H/150)$$

and H is the height in metres of the microlight aeroplane over the microphone.

(6) Reference day sound exposure level (L_{AEref}) must be obtained from—

$$L_{\mathrm{AEref}} = L_{\mathrm{AEmeas}} + \Delta m + \Delta H1$$

where L_{AEmeas} is the measured value of L_{AE}.

Noise evaluation measure

7. The noise evaluation measure must be the sound exposure level L_{AE} as defined in this Section.

Noise certification reference procedures

8.—(1) The reference procedure must be calculated under the following atmospheric conditions—

(a) sea level atmospheric pressure of 1013.25 hPa;

(b) ambient temperature of 25°C at 1.2m above ground.

(2) The reference flight procedure must comprise a series of level flights overhead the noise measurement position at a height of 150m (492 ft) and at maximum take-off power.

Changes to legislation:
There are currently no known outstanding effects for the The Air Navigation (Environmental Standards For Non-Part 21 Aircraft) Order 2008.