



# AEROSPACE RECOMMENDED PRACTICE

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### STANDARD INDOOR METHOD OF COLLECTION AND PRESENTATION OF THE BARE TURBOSHAFT ENGINE NOISE DATA FOR USE IN HELICOPTER INSTALLATIONS

#### 1. SCOPE

This Aerospace Recommended Practice (ARP) outlines a recommended test procedure, data collection and preparation method for indoor noise tests of a bare turboshaft engine suitable for helicopter installations. It should be recognized that free field measurements are preferable.

#### 2. RECOMMENDATIONS FOR ACOUSTIC MEASUREMENTS

- 2.1 Test Environment: The bare engine noise data may be obtained in a free field or in an environment approaching a reverberant field, such as that which would exist in a converted test cell. This ARP deals specifically with the latter method. References 1 and 5 provide additional information on pertinent test requirements.

A calibrated reference broadband acoustic source is used as a means of separating room effects and to relate measured sound pressure to the sound power radiated by the engine.

In the case where the open field measurement method is preferred, other applicable ARP's or specifications should be followed (see section 4).

It is recommended that the inlet and exhaust noise sources on the bare engine be measured separately. Other sources such as casing, gearbox, pumps, etc. should be isolated if they are judged to be significant. It is suggested that ducts and enclosures having adequate acoustic separation effectiveness be used to separate the sources.

The volume of the cell should be not less than 3,000 ft<sup>3</sup> and its internal dimensions should be adequate to accommodate the microphone locations as defined in 2.4.

- 2.2 Engine Location: The engine should be mounted at least 4 ft (1.2 m) from any reflecting surface (floor, walls and ceiling) and preferably some distance away from the geometric center of the cell.
- 2.3 Reference Sound Source Position: It is recommended that the reference source be positioned as close to the engine as practicable and remain in position during the complete engine test.
- 2.4 Microphone Positions: It is recommended that at least 5 microphones be positioned, to the extent feasible in the reverberant field, at least 4 ft (1.2 m) away from the source and from the reflecting surfaces; see recommendations in Reference 1.
- 2.5 Sound Pressure Level Readings: Twenty-four 1/3 octaves (Ref. 4) and the overall sound pressure level should be measured. If the compressor or turbine computed blade passing frequency is outside this limit but is still less than 20 kHz an effort should be made to take measurements at higher frequencies. The data should be recorded after due engine stabilization at required condition and should represent an average value for a period of at least one-half a minute. The data should be collected for the following conditions:
- 2.5.1 Room ambient, with all auxiliary systems operational at rated conditions.
- 2.5.2 The reference source only.

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