SAE Aerospace
An SAE International Group

AEROSPACE RECOMMENDED PRACTICE

ARP1801

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Measurement of Exterior Sound Level of Specialized Aircraft Ground Support Equipment

RATIONALE

This document has been reaffirmed to comply with the SAE 5-year Review policy.

1. PURPOSE: The purpose of this recommended practice is to establish test procedures, environment and instrumentation for determining the exterior sound level of specialized aircraft ground support equipment. The measured sound levels will be useful to equipment manufacturers and airline ground equipment engineers in development of equipment, comparison of equipment and determining sound level exposures of those working with the equipment.

2. SCOPE: The scope of this recommended practice covers specialized internal combustion engine powered equipment used in the support of aircraft operations. The equipment may be self-propelled, truck mounted, trailer mounted, skid mounted or stationary. It does not include construction equipment or equipment designed primarily for operation on highways or within factories or building areas.

3. INSTRUMENTATION: The following instrumentation shall be used, where applicable, for the measurement required:

3.1 A sound level meter which meets the Type 1 or SIA requirements of American National Standard Specification for Sound Level Meters S1.4-1971.

3.1.1 As an alternative to making direct measurements using a sound level meter, a microphone or sound level meter may be used with a magnetic tape recorder and/or a graphic level recorder or indicating instrument, providing the system meets the requirements of SAE Recommended Practice J184, Qualifying A Sound Data Acquisition System.

3.2 A sound level calibrator with an accuracy of ± 0.5 dBA (see Para. 7.4).

3.3 A microphone windscreen may be used provided that its effect on the microphone response is not more than ± 1 dBA for frequencies of 20-4,000 Hz or ± 1 1/2 dBA for frequencies of 4,000-10,000 Hz.

3.4 An engine speed tachometer having an accuracy of ± 1.5% full scale.

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3.5 An anemometer having an accuracy within 10% at 12 mph (19 km/h).

4. TEST SITE: The following test site requirements shall be considered the minimum necessary to perform effective measurements:

4.1 A suitable test site shall consist of a level open space free of large reflecting surfaces such as parked vehicles, signboards, buildings, or hill sides, located within 100 ft (30m) of either the equipment or the microphone.

4.2 Where possible the measurement area shall be surfaced with concrete, asphalt or other hard material and shall be free of snow, grass, soil, ashes or other sound absorbing materials.

4.3 If the conditions of 4.2 are not possible the type of surface and surface condition of the measurement area shall be documented in the test report.

4.4 The ambient sound level (including wind effects) due to sources other than the equipment being measured shall be 10dBA or more lower than the level of the equipment being tested.

4.5 Measurements shall be made only when wind speed is below 12 mph (19 km/h).

5. TEST PROCEDURE: The microphone shall be located 4 ft (1.2m) above the ground plane and 15 ft. (4.6m) from the equipment surface at a minimum of eight positions at 45 degree (.8 rad.) radials (0°, 45°, 90°, 135°, 180°, 225°, 270°, 315°).

5.1 Tractors:

5.1.1 Operate tractor (baggage and/or aircraft towing) engine(s) at no load with the propulsion drive system in neutral position twice through the cycle "low idle - maximum governed speed - low idle" as rapidly as possible but allowing the engine to stabilize for at least 10 seconds at maximum governed speed before it is permitted to return to idle. Repeat this procedure for each of the 8 microphone positions established in Para. 5.

5.1.2 If the tractor is equipped with a separate 400 Hz generator set, repeat 5.1.1 with the generator set operating under full load conditions.

5.2 Self-Propelled Equipment With Auxiliary Equipment Powered by the Propulsion Engine:

5.2.1 Position the equipment at the test site with the propulsion drive system in the neutral or park position or, if applicable, in the position required for power takeoff (PTO) engagement.

5.2.2 Under no load conditions operate the auxiliary equipment through two complete cycles of operation with the microphone at each of the 8 positions determined in Para. 5.

5.2.3 Repeat Para. 5.2.2 with the auxiliary equipment operating under full load conditions.

5.3 Self-Propelled Equipment with Auxiliary Engine(s) for Powering Auxiliary Equipment and Trailer Mounted, Skid Mounted or Stationary Equipment:

5.3.1 Position the equipment at the test site and shut down the propulsion engine (if applicable).

5.3.2 Under no load conditions operate the equipment through two complete cycles of operation with the microphone at each of the 8 positions established in Para. 5.

5.3.3 Repeat Para. 5.3.2 with the equipment operating under full load conditions.

6. MEASUREMENTS:

6.1 The sound level meter shall be set for slow response and the A-weighting network.

6.2 The meter shall be observed during the complete cycle of operation. The applicable reading shall be the highest sound level obtained, ignoring unrelated peaks due to extraneous ambient noises. Reading shall be taken at the 8 locations specified in Para. 5.

6.3 The sound level for each location shall be the arithmetic average of the two highest readings which are within 2 dBA of each other. If, for each specific location, none of the readings are within 2 dBA of each other, then additional readings shall be taken until there are two that are within 2 dBA of each other. The final report shall include readings from all locations.

7. GENERAL COMMENTS:

7.1 It is strongly recommended that technically trained personnel select equipment and that tests be conducted only by qualified persons trained in the current techniques of sound measurement.

7.2 Instrument manufacturer's specifications for orientation of the microphone relative to the source of sound and the location of the observer relative to the meter should be adhered to.

7.3 When a windscreen is required, a previously calibrated windscreen should be used.

7.4 Proper acoustical calibration procedures, to include the influence of extension cables, etc., should be performed. Field calibration shall be made immediately before and after each test sequence of a piece of ground equipment. Internal calibration means is acceptable for field use provided that external calibration is accomplished immediately before and after field use.