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An American National Standard

Standard Practice for Ground-Based Octane Rating Procedures for Turbocharged/Supercharged Spark Ignition Aircraft Engines[1]

This standard is issued under the fixed designation D6812; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This practice covers ground-based octane rating procedures for turbocharged/supercharged spark ignition aircraft engines. This practice has been developed to allow the widest range of applicability possible but may not be appropriate for all engine types. This practice is specifically directed to ground-based testing and actual in-flight octane ratings may produce significantly different results.

1.2 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D2700 Test Method for Motor Octane Number of Spark-Ignition Engine Fuel

3. Terminology

3.1 *Definitions:*

3.1.1 *amine number of reference fuels above 100, AN*—determined in terms of the weight percent of 3-methylphenylamine in reference grade *iso*octane (2,2,4-trimethylpentane). For example, 5 % of 3-methylphenylamine in reference grade *iso*octane has an amine number if 105 (AN 105). No attempt has been made to correlate performance number of leaded reference fuels to the amine number of unleaded reference fuels, and none is implied.

3.1.2 *engine octane requirement*—one full number greater than the maximum number that results in knock (graphic knock level descriptions can be seen in Annex A1). For example, a test engine knocks on primary reference fuels with 98 and 99 motor octane numbers. The test engine does not knock on a primary reference fuel with a 100 motor octane number. The maximum motor octane number that results in knock is 99 so the motor octane requirement is 100. If a test engine knocks on a reference fuel with a 3-amine number and does not knock on a fuel with a 4-amine number, then the engine requirement is a 4-amine number.

3.1.3 *full rich*—condition where the mixture control is at the full-rich stop position with the fuel flow within the manufacturer's recommended settings.

3.1.4 *house fuel, n—for engine operation*, a fuel that does not contain metallic additives used for engine warm-up and all non-octane rating engine operation.

3.1.5 *knock, n—in an aircraft spark ignition engine*, abnormal combustion caused by autoignition of the air/fuel mixture.

3.1.6 *knock condition, n—for octane rating*, where the knock intensity in any cylinder is light knock or greater, as described in Annex A1.

3.1.7 *knock number, n— for octane rating*, a numerical quantification of knock intensity.

3.1.8 *motor octane number of primary reference fuels from 0 to 100*—the volume % of *iso*octane (equals 100.0) in a blend with *n*-heptane (equals 0.0).

3.1.9 *no-knock condition, n—for octane rating*, where the knock intensity in all cylinders is less than light knock. Refer to Annex A1 for description of knock intensity.

3.1.10 *peak EGT, n—for octane rating*, as the mixture is manually leaned from a state rich of stoichiometric, the exhaust gas temperature will increase with the removal of excess fuel. As the mixture is continually leaned, a peak temperature will be attained, after which continued leaning will result in lower exhaust gas temperatures.

3.1.11 *primary reference fuels, n—for octane rating*, blended fuels of reference grade *iso*octane and *n*-heptane.

3.1.12 *reference fuels above 100, n—for octane rating*, blended fuels of reference grade *iso*octane and 3-methylphenylamine.

3.1.12.1 *Discussion*—This practice describes reference fuels above 100 MON in terms of *iso*octane/3-methylphenylamine.

[1] This practice is under the jurisdiction of ASTM Committee D02 on Petroleum Products, Liquid Fuels, and Lubricantsand is the direct responsibility of Subcommittee D02.J0.02 on Spark and Compression Ignition Aviation Engine Fuels.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

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