AERONAUTICAL MATERIAL SPECIFICATION

Society of Automotive Engineers, Inc.
29 West 39th Street
New York City

AMS 3036B

Issued 11-15-46
Revised 2-15-52

AVIATION FUEL
Grade 115/145

1. ACKNOWLEDGMENT: A vendor shall mention this specification number and its revision letter in all quotations and when acknowledging purchase orders.

2. GRADE: The fuel shall be the one grade known as Aviation Grade 115/145.

3. APPLICATION: Primarily for use in aircraft engines requiring Grade 115/145 fuel.

4. TECHNICAL REQUIREMENTS:

4.1 General: Except as otherwise specified herein, the fuel shall consist of a blend of refined hydrocarbons derived from crude petroleum, natural gasoline, or blends thereof with other aliphatic and/or aromatic hydrocarbons.

4.2 Properties: The fuel shall conform to the following requirements when tested in accordance with the methods specified. If multiple determinations are made, average results shall be used.

4.2.1 Knock Rating:

4.2.1.1 Knock Rating, Lean: The lean mixture knock rating of the fuel shall be not lower than that of iso-octane (or approved reference fuel) to which has been added 0.47 ml tetraethyl lead per U.S. gallon when determined in accordance with ASTM D614-49T.

4.2.1.2 Knock Rating, Rich: The rich mixture knock rating of the fuel shall be not lower than that of iso-octane (or approved reference fuel) to which has been added 2.80 ml tetraethyl lead per U.S. gallon when determined in accordance with ASTM D909-48T. The rich mixture knock rating of the fuel shall be determined at the fuel-air ratio at which the maximum indicated mean effective pressure for iso-octane (or approved reference fuel) plus 2.80 ml tetraethyl lead per U.S. gallon is obtained.

4.2.2 Color: The color shall be purple. The finished fuel blend shall contain per gallon a maximum of 7.0 mg of blue dye, essentially an alkyl substituted anthraquinone, plus a maximum of 3.27 mg of red dye, Red-O, 2, 3'-dimethylazobenezene -4'-azo-B-Naphthol (National Color Index Reference No. 258).

4.2.2.1 Color Comparison: Color comparison shall be made by any suitable apparatus or by visual examination using identical transparent containers for the fuel sample and for the appropriate Air Force-Navy Aeronautical purple color standard for maximum intensity and minimum intensity. Samples of Air Force-Navy Aeronautical standards which have been exposed to light for more than twenty-four hours shall not be used for this test.

4.2.3 Lead: The lead content per U.S. gallon of fuel shall not exceed 4.5 ml of tetraethyl lead in the form of an antiknock mixture containing not less than 61% by weight of tetraethyl lead and sufficient ethylene dibromide to provide two bromine atoms per atom of lead. The balance shall contain no added ingredients other than kerosene, and approved inhibitor, and blue dye, as specified herein.

4.2.4 Distillation: The results of distillation of the fuel in accordance with ASTM D86-46 shall be as follows:

Thermometer	Reading	140 F	10% max evaporated
"	"	158 F	10% min evaporated
"	"	221 F	50% min evaporated
"	"	212-257 F	90% evaporated
"	"	338 F max	End Point
		Residue	1.5% max
		Loss	1.5% max
	Distillate	Recovery	97.0% min

4.2.4.1 The sum of the individual thermometer readings of the 10% and 50% evaporated points shall be not less than 307.

4.2.5 Acidity: The aqueous extract of the distillation residue shall show no pink or red color when tested in accordance with ASTM D1093-50T.

4.2.6 Sulfur: The sulfur content shall not exceed 0.05% by weight when determined in accordance with ASTM D90-50T.

4.2.7 Corrosiveness, Air-Well: Shall be no worse than No. 1 comparison standard when tested in accordance with ASTM D130-50T.

4.2.8 Gum Content:

4.2.8.1 Copper Dish: The residue from 100 ml of the fuel shall not exceed 5 mg when tested in accordance with ASTM D910-50T, Section 9(j). No gray or black discoloration of the inside of the dish shall be apparent.

4.2.8.2 Potential Gum:

4.2.8.2.1 Five Hour Test: The accelerated aging test with 5 hr induction time at 212 F (100 C), starting with 100 lb oxygen pressure, shall be conducted in the ASTM bomb according to ASTM D873-49. The gum residue after the foregoing accelerated aging test shall not exceed 6 mg per 100 ml and the total weight of visible lead precipitate shall not exceed 3 mg per 100 ml.

4.2.8.2.2 Sixteen Hour Test: If mutually agreed upon by purchaser and vendor, aviation gasoline may be required to meet a 16 hr accelerated aging gum test in accordance with ASTM D873-49 instead of the 5 hr aging gum test. In such fuel the permissible gum inhibitors shall not exceed 8.4 lb per 1000 bbl (42 gal per bbl). For this 16 hr accelerated aging test, the gum residue shall not exceed 10 mg per 100 ml and the total weight of visible lead precipitate shall not exceed 4 mg per 100 ml.

4.2.9 Vapor Pressure, Reid Method: The vapor pressure shall not exceed 7.0 psi when determined in accordance with ASTM D323-49.

4.2.10 Freezing Point: The freezing point shall be not higher than -76 F (-60 C) when determined in accordance with ASTM D910-50T, Section 9(m).

4.2.11 Water Tolerance: The volume of the aqueous layer shall not increase or decrease by more than 2 ml when tested in accordance with ASTM D1094-50T.

4.2.12 Net Heat of Combustion: The net heat of combustion shall be not less than 18,800 Btu per lb when determined in accordance with the following procedure:

4.2.12.1 Gross Heat of Combustion: The heat of combustion at constant volume shall be determined in an oxygen-bomb calorimeter. Any suitable procedure may be employed provided its accuracy is recognized by the purchasing or receiving agency as being equal or superior to that of ASTM D240-50 suitable modified for use with volatile liquids.

4.2.12.2 Calculation of Net Heat of Combustion: The gross heat of combustion as determined above shall be corrected, if necessary, to 77 F (25 C) by adding to it a quantity equal to 1.6(T-25), where T is the final temperature in degrees Centigrade. The net heat of combustion shall be calculated from the gross heat of combustion as follows:

$$\text{Net Btu/lb} = 4310 + 0.7195 \times \text{gross Btu/lb}$$

4.2.12.3 The net heat of combustion determination may be waived if the product of the gravity of the fuel in degrees API as determined in accordance with ASTM D287-39 and the aniline point of the fuel in degrees Fahrenheit as determined in accordance with ASTM D611-47T, is equal to or above 8200. The product of the aniline point and the API gravity shall be known as the aniline-gravity constant.

4.2.13 Gum Inhibitor: The following active inhibitors may be added separately or in combination to the fuel in total concentration not to exceed 4.2 lb of inhibitor, not including weight of solvent, per 1000 bbl (42 gal per bbl) of fuel except as provided in 4.2.8.2.2 in order to prevent the formation of gum and the precipitation lead compounds:

N, N'-di-secondary-butyl-para-phenylenediamine
2, 4-dimethyl-6-tertiary-butyl- phenol
2, 6-diteritary-butyl,4-methyl phenol

5. QUALITY: The fuel shall be free from water, sediment, and suspended matter. The odor shall not be nauseating or irritating. No substance of known dangerous toxicity under usual conditions of handling and use shall be present.

6. REPORTS: Unless otherwise specified, the vendor of fuel shall furnish with each batch three copies of a report showing the results of tests to determine conformance to the requirements of this specification.

7. APPROVAL:

7.1 To assure adequate performance characteristics, fuel shall be approved by purchaser on the basis of adequate full-scale bench and flight tests and/or flight service experience to prove the safety and practicability of its use in the contemplated operation, unless such approval be waived.