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AnAmerican National Standard

Standard Specification for Aviation Turbine Fuels[1]

This standard is issued under the fixed designation D1655; 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.

This standard has been approved for use by agencies of the Department of Defense.

1. Scope*

1.1 This specification covers the use of purchasing agencies in formulating specifications for purchases of aviation turbine fuel under contract.

1.2 This specification defines specific types of aviation turbine fuel for civil use in the operation and certification of aircraft and describes fuels found satisfactory for the operation of aircraft and engines. The specification can be used as a standard in describing the quality of aviation turbine fuels from the refinery to the aircraft.

1.3 This specification does not include all fuels satisfactory for aviation turbine engines. Certain equipment or conditions of use may permit a wider, or require a narrower, range of characteristics than is shown by this specification.

1.4 Aviation turbine fuels defined by this specification may be used in other than turbine engines that are specifically designed and certified for this fuel.

1.5 This specification no longer includes wide-cut aviation turbine fuel (Jet B). FAA has issued a Special Airworthiness Information Bulletin which now approves the use of Specification D6615 to replace Specification D1655 as the specification for Jet B and refers users to this standard for reference.

1.6 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D56 Test Method for Flash Point by Tag Closed Cup Tester

D86 Test Method for Distillation of Petroleum Products at Atmospheric Pressure

D93 Test Methods for Flash Point by Pensky-Martens Closed Cup Tester

D129 Test Method for Sulfur in Petroleum Products (General High Pressure Decomposition Device Method)

D130 Test Method for Corrosiveness to Copper from Petroleum Products by Copper Strip Test

D156 Test Method for Saybolt Color of Petroleum Products (Saybolt Chromometer Method)

D240 Test Method for Heat of Combustion of Liquid Hydrocarbon Fuels by Bomb Calorimeter

D323 Test Method for Vapor Pressure of Petroleum Products (Reid Method)

D381 Test Method for Gum Content in Fuels by Jet Evaporation

D445 Test Method for Kinematic Viscosity of Transparent and Opaque Liquids (and Calculation of Dynamic Viscosity)

D1266 Test Method for Sulfur in Petroleum Products (Lamp Method)

D1298 Test Method for Density, Relative Density, or API Gravity of Crude Petroleum and Liquid Petroleum Products by Hydrometer Method

D1319 Test Method for Hydrocarbon Types in Liquid Petroleum Products by Fluorescent Indicator Adsorption

D1322 Test Method for Smoke Point of Kerosine and Aviation Turbine Fuel

D1405 Test Method for Estimation of Net Heat of Combustion of Aviation Fuels

D1660 Method of Test for Thermal Stability of Aviation Turbine Fuels (Withdrawn 1992)[3]

D1840 Test Method for Naphthalene Hydrocarbons in Aviation Turbine Fuels by Ultraviolet Spectrophotometry

D2276 Test Method for Particulate Contaminant in Aviation Fuel by Line Sampling

D2386 Test Method for Freezing Point of Aviation Fuels

D2622 Test Method for Sulfur in Petroleum Products by Wavelength Dispersive X-ray Fluorescence Spectrometry

D2624 Test Methods for Electrical Conductivity of Aviation and Distillate Fuels

[1] This specification is under the jurisdiction of ASTM Committee D02 on Petroleum Products and Lubricants and is the direct responsibility of Subcommittee D02.J0.01 on Jet Fuel Specifications.

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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.

[3] The last approved version of this historical standard is referenced on www.astm.org.

***A Summary of Changes section appears at the end of this standard**

D2887 Test Method for Boiling Range Distribution of Petroleum Fractions by Gas Chromatography
D2892 Test Method for Distillation of Crude Petroleum (15-Theoretical Plate Column)
D3120 Test Method for Trace Quantities of Sulfur in Light Liquid Petroleum Hydrocarbons by Oxidative Microcoulometry
D3227 Test Method for (Thiol Mercaptan) Sulfur in Gasoline, Kerosine, Aviation Turbine, and Distillate Fuels (Potentiometric Method)
D3240 Test Method for Undissolved Water In Aviation Turbine Fuels
D3241 Test Method for Thermal Oxidation Stability of Aviation Turbine Fuels
D3242 Test Method for Acidity in Aviation Turbine Fuel
D3338 Test Method for Estimation of Net Heat of Combustion of Aviation Fuels
D3343 Test Method for Estimation of Hydrogen Content of Aviation Fuels
D3701 Test Method for Hydrogen Content of Aviation Turbine Fuels by Low Resolution Nuclear Magnetic Resonance Spectrometry
D3828 Test Methods for Flash Point by Small Scale Closed Cup Tester
D3948 Test Method for Determining Water Separation Characteristics of Aviation Turbine Fuels by Portable Separometer
D4052 Test Method for Density, Relative Density, and API Gravity of Liquids by Digital Density Meter
D4057 Practice for Manual Sampling of Petroleum and Petroleum Products
D4171 Specification for Fuel System Icing Inhibitors
D4176 Test Method for Free Water and Particulate Contamination in Distillate Fuels (Visual Inspection Procedures)
D4294 Test Method for Sulfur in Petroleum and Petroleum Products by Energy Dispersive X-ray Fluorescence Spectrometry
D4306 Practice for Aviation Fuel Sample Containers for Tests Affected by Trace Contamination
D4529 Test Method for Estimation of Net Heat of Combustion of Aviation Fuels
D4809 Test Method for Heat of Combustion of Liquid Hydrocarbon Fuels by Bomb Calorimeter (Precision Method)
D4865 Guide for Generation and Dissipation of Static Electricity in Petroleum Fuel Systems
D4952 Test Method for Qualitative Analysis for Active Sulfur Species in Fuels and Solvents (Doctor Test)
D4953 Test Method for Vapor Pressure of Gasoline and Gasoline-Oxygenate Blends (Dry Method)
D5001 Test Method for Measurement of Lubricity of Aviation Turbine Fuels by the Ball-on-Cylinder Lubricity Evaluator (BOCLE)
D5006 Test Method for Measurement of Fuel System Icing Inhibitors (Ether Type) in Aviation Fuels
D5190 Test Method for Vapor Pressure of Petroleum Products (Automatic Method) (Withdrawn 2012)[3]
D5191 Test Method for Vapor Pressure of Petroleum Products (Mini Method)
D5452 Test Method for Particulate Contamination in Aviation Fuels by Laboratory Filtration
D5453 Test Method for Determination of Total Sulfur in Light Hydrocarbons, Spark Ignition Engine Fuel, Diesel Engine Fuel, and Engine Oil by Ultraviolet Fluorescence
D5972 Test Method for Freezing Point of Aviation Fuels (Automatic Phase Transition Method)
D6045 Test Method for Color of Petroleum Products by the Automatic Tristimulus Method
D6379 Test Method for Determination of Aromatic Hydrocarbon Types in Aviation Fuels and Petroleum Distillates—High Performance Liquid Chromatography Method with Refractive Index Detection
D6469 Guide for Microbial Contamination in Fuels and Fuel Systems
D6615 Specification for Jet B Wide-Cut Aviation Turbine Fuel
D6751 Specification for Biodiesel Fuel Blend Stock (B100) for Middle Distillate Fuels
D7153 Test Method for Freezing Point of Aviation Fuels (Automatic Laser Method)
D7154 Test Method for Freezing Point of Aviation Fuels (Automatic Fiber Optical Method)
D7524 Test Method for Determination of Static Dissipater Additives (SDA) in Aviation Turbine Fuel and Middle Distillate Fuels—High Performance Liquid Chromatograph (HPLC) Method
D7566 Specification for Aviation Turbine Fuel Containing Synthesized Hydrocarbons
E29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications

2.2 *Energy Institute Standards:*[4]
IP 225 Copper Content of Aviation Turbine Fuel
IP 227 Silver Corrosion of Aviation Turbine Fuel
IP 540 Determination of the existent gum content of aviation turbine fuel — Jet evaporation method
IP 585 Determination of fatty acid methyl esters (FAME), derived from bio-diesel fuel, in aviation turbine fuel — GC-MS with selective ion monitoring/scan detection method
IP 590 Determination of fatty acid methyl esters (FAME) in aviation fuel—HPLC evaporative light scattering detector method

2.3 *ANSI Standard:*[5]
ANSI 863 Report of Test Results

2.4 *Other Standards:*
Defence Standard (Def Stan) 91-91 Turbine Fuel, Aviation Kerosine Type, Jet A-1[6]
IATA Guidance Material on Microbiological Contamination

[4] Available from Energy Institute, 61 New Cavendish St., London, WIG 7AR, U.K., http://www.energyinst.org.uk.
[5] Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036.
[6] Available from Procurement Executive DFS (Air), Ministry of Defence, St. Giles Court 1, St. Giles High St., London WC2H 8LD.

in Aircraft Fuel Tanks Ref. No: 9680-02[7]
EN14214 Automotive fuels - Fatty acid methyl esters (FAME) for diesel engines - Requirements and test methods[8]

3. General

3.1 This specification, unless otherwise provided, prescribes the required properties of aviation turbine fuel at the time and place of delivery.

4. Classification

4.1 Two types of aviation turbine fuels are provided, as follows:

4.1.1 *Jet A and Jet A-1*—Relatively high flash point distillates of the kerosine type.

4.2 Jet A and Jet A-1 represent two grades of kerosine fuel that differ in freezing point. Other grades would be suitably identified.

4.3 This specification previously cited the requirements for Jet B. Requirements for Jet B fuel now appear in Specification D6615.

5. Materials and Manufacture

5.1 Aviation turbine fuel is a complex mixture predominantly composed of hydrocarbons and varies depending on crude source and manufacturing process. Consequently, it is impossible to define the exact composition of Jet A/A-1. This specification has therefore evolved primarily as a performance specification rather than a compositional specification. It is acknowledged that this largely relies on accumulated experience; therefore the specification limits aviation turbine fuels to those made from conventional sources or by specifically approved processes.

5.1.1 Aviation turbine fuel, except as otherwise specified in this specification, shall consist predominantly of refined hydrocarbons (see Note 1) derived from conventional sources including crude oil, natural gas liquid condensates, heavy oil, shale oil, and oil sands. The use of jet fuel blends containing components from other sources is permitted only in accordance with Annex A1.

NOTE 1—Conventionally refined jet fuel contains trace levels of materials that are not hydrocarbons, including oxygenates, organosulfur, and nitrogenous compounds.

5.1.2 Fuels used in certified engines and aircraft are ultimately approved by the certifying authority subsequent to formal submission of evidence to the authority as part of the type certification program for that aircraft and engine model. Additives to be used as supplements to an approved fuel must also be similarly approved on an individual basis (see X1.2.4 and X1.15.1).

5.2 *Additives*—May be added to each type of aviation turbine fuel in the amount and of the composition specified in Table 2 or the following list of approved material:

5.2.1 Other additives are permitted under 5.1 and 7.1. These include fuel performance enhancing additives and fuel handing and maintenance additives as found under Table 2. The quantities and types must be declared by the fuel supplier and agreed to by the purchaser. Only additives approved by the aircraft certifying authority are permitted in the fuel on which an aircraft is operated.

5.2.1.1 Biocidal additives are available for controlled usage. Where such an additive is used in the fuel, the approval status of the additive and associated conditions must be checked for the specific aircraft and engines to be operated.

5.2.1.2 *Fuel System Icing Inhibitor:*

(1) Diethylene Glycol Monomethyl Ether (DiEGME), conforming to the requirements of Specification D4171, Type III, may be used in concentrations of 0.10 to 0.15 volume %.

(2) Test Method D5006 may be used to determine the concentration of DiEGME in aviation fuels.

5.3 *Incidental Materials*—Incidental materials are chemicals and compositions that can occur in turbine fuels as a result of production, processing, distribution, or storage. Table 3 lists specific materials that have an agreed limit. Specification D1655 does not require that each batch of fuel be analyzed for incidental materials where there is essentially no risk of contamination exceeding Table 3 limits. Where a supplier risk assessment suggests that incidental materials could exceed Table 3 limits, jet fuel should be confirmed to comply with Table 3 limits prior to airport supply because airports generally are not equipped to mitigate incidental material content that exceeds specification limits. Further guidance concerning these materials is presented in X1.16.

5.4 Guidance material is presented in Appendix X2 concerning the need to control processing additives in jet fuel production.

6. Detailed Requirements

6.1 The aviation turbine fuel shall conform to the requirements prescribed in Table 1.

6.2 Test results shall not exceed the maximum or be less than the minimum values specified in Table 1. No allowance shall be made for the precision of the test methods. To determine conformance to the specification requirement, a test result may be rounded to the same number of significant figures as in Table 1 using Practice E29. Where multiple determinations are made, the average result, rounded in accordance with Practice E29, shall be used.

7. Workmanship, Finish, and Appearance

7.1 The aviation turbine fuel specified in this specification shall be visually free of undissolved water, sediment, and suspended matter. The odor of the fuel shall not be nauseating or irritating. If the fuel has an odor similar to that of "rotten egg," please refer to X1.12.5 for further discussion. No substance of known dangerous toxicity under usual conditions of handling and use shall be present, except as permitted in this specification.

[7] Available from International Air Transport Association (IATA), (Head Office) 800 Place Victoria, PO Box 113, Montreal, H4Z 1M1, Quebec, Canada. www.iata-online.com.

[8] Available from European Committee for Standardization (CEN), 36 rue de Stassart, B-1050, Brussels, Belgium, http://www.cenorm.be.

TABLE 1 Detailed Requirements of Aviation Turbine Fuels[A]

Property		Jet A or Jet A-1	ASTM Test Method[B]
COMPOSITION			
Acidity, total mg KOH/g	max	0.10	D3242
1. Aromatics, vol %	max	25	D1319
2. Aromatics, vol %	max	26.5	D6379
Sulfur, mercaptan,[C] mass %	max	0.003	D3227
Sulfur, total mass %	max	0.30	D1266, D2622, D4294, or D5453
VOLATILITY			
Distillation temperature, °C:			D86,[D]D2887[E]
10 % recovered, temperature	max	205	
50 % recovered, temperature		report	
90 % recovered, temperature		report	
Final boiling point, temperature	max	300	
Distillation residue, %	max	1.5	
Distillation loss, %	max	1.5	
Flash point, °C	min	38[F]	D56, D93, or D3828[G]
Density at 15°C, kg/m^3		775 to 840	D1298 or D4052
FLUIDITY			
Freezing point, °C	max	–40 Jet A[H] –47 Jet A-1[H]	D5972, D7153, D7154, or D2386
Viscosity –20°C, mm^2/s[I]	max	8.0	D445
COMBUSTION			
Net heat of combustion, MJ/kg	min	42.8[J]	D4529, D3338, or D4809
One of the following requirements shall be met:			
(*1*) Smoke point, mm, or	min	25	D1322
(*2*) Smoke point, mm, and	min	18	D1322
Naphthalenes, vol, %	max	3.0	D1840
CORROSION			
Copper strip, 2 h at 100°C	max	No. 1	D130
THERMAL STABILITY			
(2.5 h at control temperature of 260°C min)			
Filter pressure drop, mm Hg	max	25	D3241
Tube deposits less than		3[K]	
		No *Peacock* or *Abnormal* Color Deposits	
CONTAMINANTS			
Existent gum, mg/100 mL	max	7	D381, IP 540
Microseparometer,[L] Rating			D3948
Without electrical conductivity additive	min	85	
With electrical conductivity additive	min	70	
ADDITIVES		See 5.2	
Electrical conductivity, pS/m		[M]	D2624

[A] For compliance of test results against the requirements of Table 1, see 6.2.
[B] The test methods indicated in this table are referred to in Section 10.
[C] The mercaptan sulfur determination may be waived if the fuel is considered sweet by the doctor test described in Test Method D4952.
[D] D86 distillation of jet fuel is run at Group 4 conditions, except Group 3 condenser temperature is used.
[E] D2887 results shall be converted to estimated D86 results by application of the correlation in Appendix X5 on Correlation for Jet and Diesel Fuel in Test Method D2887. Distillation residue and loss limits provide control of the distillation process during the use of Test Method D86, and they do not apply to Test Method D2887. Distillation residue and loss shall be reported as "not applicable" (N/A) when reporting D2887 results.
[F] A higher minimum flash point specification may be agreed upon between purchaser and supplier.
[G] Aviation turbine fuel results obtained by Test Method D93 may be up to 1°C higher than those obtained by Test Method D56. Results obtained by Test Method D3828 may be up to 2°C lower than those obtained by Test Method D56, which is the preferred method. In case of dispute, Test Method D56 shall apply.
[H] Other freezing points may be agreed upon between supplier and purchaser.
[I] 1 mm^2/s = 1 cSt.
[J] For all grades use either Eq 1 or Table 1 in Test Method D4529 or Eq 2 in Test Method D3338. Test Method D4809 may be used as an alternative. In case of dispute, Test Method D4809 shall be used.
[K] Tube deposit ratings shall always be reported by the Visual Method.
[L] At point of manufacture.
[M] If electrical conductivity additive is used, the conductivity shall not exceed 600 pS/m at the point of use of the fuel. When electrical conductivity additive is specified by the purchaser, the conductivity shall be 50 to 600 pS/m under the conditions at point of delivery.

$$1\ \text{pS/m} = 1 \times 10^{-12}\ \Omega^{-1}\ m^{-1}$$

8. Sampling

8.1 Because of the importance of proper sampling procedures in establishing fuel quality, use the appropriate procedures in Practice D4057 to obtain a representative sample from the batch of fuel for specification compliance testing. This requirement is met by producing fuel as a discrete batch then testing it for specification compliance. This requirement is not satisfied by averaging online analysis results.

TABLE 2 Detailed Information for Additives for Aviation Turbine Fuels

Additive	Dosage
Fuel Performance Enhancing Additives	
Antioxidants[A,B]	24.0 mg/L max[C]
One of the following:	
2,6 ditertiary-butyl phenol	
2,6 ditertiary-butyl-4-methyl phenol	
2,4 dimethyl-6-tertiary-butyl-phenol	
75 % minimum, 2,6 ditertiary-butyl phenol plus	
25 % maximum mixed tertiary and tritertiary butyl-phenols	
55 % minimum 2,4 dimethyl-6-tertiary-butyl phenol plus	
15 % minimum 2,6 ditertiary-butyl-4-methyl phenol,	
remainder as monomethyl and dimethyl tertiary-butyl phenols	
72 % minimum 2,4 dimethyl-6-tertiary-butyl phenol plus	
28 % maximum monomethyl and dimethyl-tertiary-butyl-phenols	
Metal Deactivator (MDA)[A]	
N,N-disalicylidene-1,2-propane diamine	
On initial blending	2.0 mg/L max[C,D]
After field reblending cumulative concentration	5.7 mg/L max
Fuel System Icing Inhibitor[E]	0.10 vol % min
Diethylene Glycol Monomethyl Ether (see Specification D4171)	0.15 vol % max
Fuel Handling and Maintenance Additives	
Electrical Conductivity Improver[F]	
Stadis 450[G,H]	
On initial blending	3 mg/L max
After field reblending, cumulative concentration	5 mg/L max
If the additive concentration is unknown at time of retreatment, additional concentration is restricted to 2 mg/L max	
Leak Detection Additive	1 mg/kg max
Tracer A (LDTA-A)[I]	
Biocidal Additives[E,J,K]	
Biobor JF[L]	
Kathon FP1.5[M]	
Corrosion Inhibitor/Lubricity Improvers[N]	
One of the following:	
HiTEC 580	23 mg/L max
Innospec DCI-4A	23 mg/L max
Nalco 5403	23 mg/L max

[A] The active ingredient of the additive must meet the composition specified.
[B] Supporting data have been filed at ASTM International Headquarters and may be obtained by requesting Research Report RR:D02-1125.
[C] Active ingredient (not including weight of solvent).
[D] MDA may be added to fuel to counteract the effects of metals known to be deleterious to thermal stability, such as Copper, Cadmium, Iron, Cobalt and Zinc, provided that the nature of the contamination is reported. Where metallic contamination is unproven, an MDA may be used to recover thermal stability provided that the Thermal Stability Test (in accordance with Table 2) is determined before and after MDA addition and reported on the test certificate. Initial addition of more than 2.0 mg/L MDA is permitted when fuel will be transported in supply chains where copper contamination may occur; the maximum cumulative addition in Table 2 still applies. Note that fuel containing MDA has been shown to promote the dissolution of copper and may exacerbate thermal stability problems.
[E] The quantity must be declared by the fuel supplier and agreed to by the purchaser.
[F] If electrical conductivity improver is used, the conductivity shall not exceed 600 pS/m at the point of use of the fuel. When electrical conductivity additive is specified by the purchaser, the conductivity shall be 50 to 600 pS/m under the conditions at point of delivery.

$$1\ \text{pS/m} = 1 \times 10^{-12}\ \Omega^{-1} m^{-1}$$

[G] Stadis 450 is a registered trademark marketed by Innospec Inc., Innospec Manufacturing Park, Oil Sites Road, Ellesmere Port, Cheshire, CH65 4EY, UK.
[H] Stadis 450 content can be analyzed by Test Method D7524.
[I] Tracer A (LDTA-A) is a registered trademark of Tracer Research Corp., 3755 N. Business Center Dr., Tucson, AZ 85705.
[J] Biocidal additives are available for controlled usage. Where such an additive is used in the fuel, the approval status of the additive and associated conditions must be checked for the specific aircraft and engines to be operated.
[K] Refer to the Aircraft Maintenance Manual (AMM) to determined if either biocide is approved for use and for their appropriate use and dosage.
[L] Biobor JF is a registered trademark of Hammonds Technical Services, Inc. 910 Rankin Rd., Houston, TX 77073.
[M] KATHON is a trademark of The Dow Chemical Company ("Dow") or an affiliated company of Dow, 2030 Dow Center, Midland, MI 48674.
[N] More information concerning minimum treat rates of corrosion inhibitor/lubricity improver additives is contained in X1.10.2.

8.2 A number of jet fuel properties, including thermal stability, water separation, electrical conductivity, and others, are very sensitive to trace contamination, which can originate

TABLE 3 Incidental Materials

Material	Permitted Level	Test Method
Fatty Acid Methyl Ester (FAME)[A]	<5 mg/kg max[B]	IP 585–10, IP 590–10

[A]For the purpose of meeting this requirement FAME is defined as material meeting the limits of EN14214 or Specification D6751. Fatty acid methyl esters that fail to meet the biodiesel quality standards are not permitted in aviation turbine fuel.
[B]FAME is not approved as an additive for jet fuel. This level is accepted by approval authorities as the functional definition of "nil addition." The aviation industry is currently applying the additive approval process to evaluate the possible allowance of the presence of up to 100 mg/kg of FAME in aviation turbine fuel to facilitate the distribution of aviation turbine fuel in systems containing multiple products.

from sample containers. For recommended sample containers, refer to Practice D4306.

9. Report

9.1 The type and number of reports to ensure conformance with the requirements of this specification shall be mutually agreed upon by the seller and the purchaser of the aviation turbine fuel.

9.2 A suggested form for reporting inspection data on aviation turbine fuels is given in Appendix X3 as Fig. X3.1. This form is optimized for electronic data entry.

9.3 When Table 1 test results and Table 2 additive additions are reported at the point of batch origination or at full certification in a form commonly known as a "Certificate of Quality" or "Certificate of Analysis," at least the following should be included:

9.3.1 The designation of each test method used,

9.3.2 The limits from Table 1 and Table 2 for each item reported with units converted as appropriate to those measured and reported, and

9.3.3 The designation of the quality system used by the reporting test laboratory. If no quality system is used then this shall be reported as "None."

9.4 A suggested, nonmandatory form for reporting inspection data in a Certificate of Quality or Analysis format is given in Appendix X3 as Fig. X3.2.

NOTE 2—This form is appropriate for reporting complete certification results. A different form (not reproduced here) showing original and retest results is more appropriate for reporting test results intended to assess if a specific batch of fuel has changed as it moves through the distribution system.

10. Test Methods

10.1 Determine the requirements enumerated in this specification in accordance with the following ASTM test methods.

10.1.1 *Density*—Test Method D1298 or D4052.

10.1.2 *Distillation*—Test Method D86. For Jet A and Jet A-1, Test Method D2887 can be used as an alternate. Results from Test Method D2887 shall be reported as estimated D86 results by application of the correlation in Appendix X5 on Correlation for Jet and Diesel Fuel in Test Method D2887. In case of dispute, Test Method D86 shall be the referee method (see X1.6.1.1).

10.1.3 *Flash Point*—Test Method D56, D93, or D3828. Test Method D56 is the referee method.

10.1.4 *Freezing Point*—Test Method D5972, D7153, D7154, or D2386. Any of these test methods can be used to certify and recertify jet fuel. However, Test Method D2386 is the referee method. An interlaboratory study (RR: D02–1572[9]) that evaluated the ability of freezing point methods to detect jet fuel contamination by diesel fuel determined that Test Methods D5972 and D7153 provided significantly more consistent detection of freeze point changes caused by contamination than Test Methods D2386 and D7154. It is recommended to certify and recertify jet fuel using either Test Method D5972 or Test Method D7153, or both, on the basis of the reproducibility and cross-contamination detection reported in RR:D02-1572.[9] The cause of freezing point results outside specification limits by automated methods should be investigated, but such results do not disqualify the fuel from aviation use if the results from the referee method (Test Method D2386) are within the specification limit.

10.1.5 *Viscosity*—Test Method D445.

10.1.6 *Net Heat of Combustion*—Test Method D4529, D3338, or D4809.

10.1.7 *Corrosion (Copper Strip)*—Test Method D130.

10.1.8 *Total Acidity*—Test Method D3242.

10.1.9 *Sulfur*—Test Method D1266, D2622, D4294, or D5453.

10.1.10 *Mercaptan Sulfur*—Test Method D3227.

10.1.11 *Water Separation*—Test Method D3948.

10.1.12 *Existent Gum*—Test Method D381 or IP 540. Test Method D381, using steam jet operating conditions, shall be the referee test method.

10.1.13 *Thermal Stability*—Test Method D3241.

10.1.14 *Aromatics*—Test Method D1319 or D6379. Test Method D1319 shall be the referee test method.

10.1.15 *Smoke Point*—Test Method D1322.

10.1.16 *Naphthalene Content*—Test Method D1840.

10.1.17 *Electrical Conductivity*—Test Method D2624.

11. Keywords

11.1 aviation turbine fuel; avtur; Jet A; Jet A-1; jet fuel; turbine fuel

[9] Supporting data have been filed at ASTM International Headquarters and may be obtained by requesting Research Report RR:D02-1572.