TEMPORARY REVISION NO. 72-16

(PT6C-67C)

INSERT Temporary Revision 72-16 facing page 8, Chapter 72-00-00

ENGINE - DESCRIPTION AND OPERATION

PURPOSE: The purpose of this temporary revision is to revise anti-microbial organisms additives table and to update the fuel for Chinese issuing authority and to add a note for No. 3 jet fuel in approved fuels table.

2. Engine - Approved Fuels

A. Use of Approved Fuels

(1) The fuels specified in Tables 8 and 9 are recommended by P&WC. Airworthiness authorities normally require operators to follow these recommendations unless alternative fuels have been agreed between the operator and P&WC and approved by the operator's airworthiness authority.

(2) The fuels recommended have been substantiated by P&WC and are Transport Canada approved.

NOTE: The fuel properties specified in Tables 1 or 2 are the minimum requirements for fuel used in PT6C-67C/-67C1 engines. As these properties only meet minimum engine requirements, the list is not intended or suitable for use as a purchase specification for procurement of fuel for PT6C-67C/-67C1 engines. Rather, it is intended to allow operators to include minimum approved fuel requirements for PT6C-67C/-67C1 engines in conjunction with other functional requirements when formulating their own procurement specification or judging the acceptability of fuels manufactured to other national specifications that exist throughout the world.

(3) Technical requirement tests shall be performed, in accordance with the latest issue of the listed American Society for Testing and Materials (ASTM) or Energy Institute (EI) test methods.

TABLE 1, List of Minimum Requirements For Fuels (Ref. Table 8)

Properties	Units	Limits		ASTM (prefix D) or EI (prefix IP) Test Method
		Min	Max	
Acidity, Total	mg KOH/g		0.10	D3242
Gravity at 15°C (59°F)	°API	37	57	D287
Density at 15°C (59°F)	kg/L	0.775	0.840	D1298, D4052
Distillation Temperature				

TABLE 1, List of Minimum Requirements For Fuels (Ref. Table 8) (Cont'd)

Properties	Units	Limits		ASTM (prefix D) or EI (prefix IP) Test Method
		Min	Max	
10% Recovered	°C (°F)		205 (401)	D86, D2887 See Notes 4 and 5
50% Recovered	°C (°F)		To be reported	
90% Recovered	°C (°F)		To be reported	
Final Boiling Point	°C (°F)		300 (572)	
Loss %	%		1.5	
Residue %	%		1.5	
Total Sulphur	Weight%		0.30	D1266, D2622, D4294,D5453
Mercaptan Sulphur or	Weight%		0.003	D3227 or
Doctor Test	None	Nega-tive	Negative	D4952 (Doctor Test)
Net Heat of Combustion	MJ/kg (BTU/lb)	42.6 (18,300)		D3338, D4529, D4809
Freezing Point	°C (°F)		-40 (-40)	D2386, D5972, D7153, D7154
Reid Vapor Pressure	kPa (psia)		21 (3)	D323 See Note 7
Aromatics	Volume %		25	D1319 or
			26.5	D6379
Combustion Properties				
Smoke Point or	mm	25		D1322
Smoke Point and Napthalenes	mm Vol%	18	3.0	D1322 D1840
Copper Strip Corrosion 2 hrs at 100°C ± 1°C (212°F ± 1.8°F)	None		No. 1	D130
Viscosity at -20°C (-4.0°F)	cSt		8.5	D445
Existent Gum	mg/100 mL		7	D381 IP 540
Particulate Matter				

TABLE 1, List of Minimum Requirements For Fuels (Ref. Table 8) (Cont'd)

Properties	Units	Limits		ASTM (prefix D) or EI (prefix IP) Test Method
		Min	Max	
Notification and Investigation	mg/L	0.2	1.0	D2276, D5452
Rejection			> 1.0	
Microseparometer Rating (MSEP)				
Without electrical conductivity additive	None	85		ASTM D3948
With electrical conductivity additive		70		See Note 6
Thermal Stability				
Filter Differential Pressure	mmHg		25	D3241
Visual Tube Rating	None		< 3	See Note 1
Fatty Acid Methyl Ester (FAME)	mg/kg		5	IP585 / IP590 See Note 2
Lubricity, Wear Scar Diameter	mm		0.85	D5001 See Note 3

TABLE 1, List of Minimum Requirements For Fuels (Ref. Table 8) (Cont'd)

Properties	Units	Limits		ASTM (prefix D) or EI (prefix IP) Test Method
		Min	Max	

NOTE: 1. Standard operating conditions of paragraph 8 shall apply. Heater tube control temperature shall be 260 ± 2°C (500 ± 3.6°F).

NOTE: 2. Only FAME meeting the requirements of EN14214 or ASTM D6751 is acceptable.

NOTE: 3. Applies to fuels containing more than 95% hydroprocessed material, and where at least 20% is severely hydroprocessed. Also applies to any fuel containing synthetic components. Severely hydroprocessed components are defined as petroleum derived hydrocarbons that have been subjected to a hydrogen partial pressure of greater than 7000 kPa (1015 psia) during manufacture.

NOTE: 4. D86 distillation of jet fuel is run at Group 4 conditions, except Group 3 condenser temperature is used.

NOTE: 5. 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 D2887. Distillation residue and loss shall be reported as "not applicable" (N/A) when reporting D2887 results.

NOTE: 6. At point of manufacture.

NOTE: 7. Applies to wide cut fuel types only.

TABLE 2, List of Minimum Requirements for Fuels of Engines Operating in the Arctic Region (Ref. Table 8)

Properties	Limits	Test Method
Gravity, deg API	37 to 57	ASTM D287
Distillation Temperature °F (°C)		ASTM D86
50% Recovered	To be reported	
90% Recovered	Max. 600 (315)	
Final Boiling Point	Max. 650 (343)	
Sulphur, %	Max. 1.00	ASTM D1266
Mercaptan Sulfur, % by Weight (See Note 1)	Max. 0.005	ASTM D1323 or ASTM D1219

TABLE 2, List of Minimum Requirements for Fuels of Engines Operating in the Arctic Region (Ref. Table 8) (Cont'd)

Properties	Limits	Test Method
Potential Gum, mg per 100 ml (16 hours)	Max. 14.0	ASTM D873
Net Heat of Combustion BTU per lb.	Min. 18,300	ASTM D240, D3338, C4529 or D4809
J/kg	Min. 42.6 x 10^6	
Pour Point, °F (°C)	Max. -40 (-40)	ASTM D97
Cloud Point, °F (°C)	Max. -30 (-35)	ASTM D97
Carbon Residue (On 10% Bottoms), %	Max. 0.2	ASTM D524
Aromatic Content, % by Volume (See Note 2)	Max. 20	ASTM D1319
Ash, %	Max. 0.01	ASTM D482
Copper Strip Corrosion at 212°F (100°C), 2 hrs.	Max. 1-b	ASTM D130
Viscosity, cs at 100°F (38°C)	Min. 1.4	ASTM D445
High Temperature Stability (Ref. Para B.)		

NOTE: 1. Mercaptan sulfur determination may be omitted provided Doctor test in accordance with ASTM D484 is conducted and results are negative.

NOTE: 2. Currently a waiver is in effect which authorizes the use, as necessary, of approved fuels with aromatic contents of up to 25% by volume.

B. High Temperature Stability

(1) The Jet Fuel Thermal Oxidation Tester (JFTOT) ASTM D3241, is the only approved and accepted test method for civic and military fuels.

(a) Testing shall be conducted at 500°F (260°C), maximum heater tube temperature with maximum pressure change of 1.0 inch (25.4 mm) Hg.

(b) If JFTOT test at control temperature of 500°F (260°C) should fail to meet specification requirements of preceding sub-step (a), then test shall be conducted at a temperature of 473°F (245°C).

NOTE: The results from both the 500°F (260°C) and 473°F (245°C) Control-temperature tests must be reported by the refiner on all fuel analysis reports.

C. Quality

(1) Fuel shall consist solely of petroleum derived hydrocarbon components except as otherwise specified herein or as permitted in an approved military specification. It shall be clear and free of undissolved water, sediment and suspended matter, and shall be suitable for use in aircraft turbine engines. Approved military specifications are shown in Table 8.

(2) The odor of the fuel shall not be nauseating or irritating. No substances of known dangerous toxicity under usual conditions of handling and use shall be present.

(3) Fuel that contains dissolved metals is not fit for the purpose.

(4) Semi-synthetic fuel produced to ASTM D7566 and re-certified to an approved national standard for kerosene fuel such as ASTM D1655 or U.K Defence Standard 91-91 is approved for use. Approved national standards are included in Table 8.

(5) Synthetic hydrocarbons are permitted in a blend with conventional petroleum-derived fuel which meets an approved kerosene standard. The synthetic blending component shall meet the requirements of ASTM D7566 Annex A1, A2 or A3. Annex A1 and A2 blending components may be used up to 50% by volume and Annex A3 blending components up to 10% by volume. Once blended with the conventional fuel, the resultant blend shall meet the requirements of the national standard. Approved national standards are included in Table 8.

(6) SASOL semi-synthetic fuel and SASOL fully synthetic fuel conforming to U.K Defence Standard 91-91, U.K Defence Standard 91-87 or ASTM D1655 are approved for use.

D. Additives

(1) Antioxidants may be added to jet fuels after manufacture to prevent the formation of gums and peroxides during storage. Antioxidants are required in some fuels, notably those that contain blending stocks that have been hydrogen treated. In other fuels, the addition of antioxidant is at the option of the supplier. The following antioxidant formulations are approved at concentrations not to exceed 24 mg of active ingredient per litre of fuel:

- 2, 4-Dimethyl-6 Tertiary Butyl Phenol
- 2, 6-Ditertiary-Butyl-4 Methyl Phenol
- 2, 6-Ditertiary Butyl Phenol
- 75% Min. 2, 6-Ditertiary-butylphenol and 25% Max. tertiary-butylphenol and tritertiary-butylphenol
- 55% Min. 2, 4-dimethyl-6 tertiary butylphenol and 15% Min. ditertiary -butyl-4-methylphenol and 30% Max. mixed methyl and dimethyl tertiary-butylphenols.
- 72% Min. 2, 4 - ditertiary - 6 tertiary butylphenol and 28% Max. tertiary-butyl methylphenol and tertiary butyl dimethylphenol.

(2) The additives in Tables 3 thru 6, in addition to the antioxidant inhibitors listed in Step (1) above, are acceptable for use in engine fuel subject to the limitations stated.

NOTE: These fuel additives were approved on the basis of information received from manufacturers or suppliers of the additives. Analysis of this information and results of tests on product samples have indicated no significant adverse effect on engine materials provided the concentration does not exceed the recommended maximum.

(3) Corrosion Inhibitor/Lubricity Improver: The lubricating properties of jet fuel are important in preventing wear or seizure of rubbing surfaces such as engine controls, servo valves, pump bearings, and gear and piston-type pumps. The lubricating properties of fuels can be improved by adding an approved corrosion inhibitor/lubricity improver. Approved improvers are those shown on the Qualified Products List QPL 25017 of products qualified under Performance Specification MIL-PRF-25017, Inhibitor, Corrosion/Lubricity Improver, Fuel Soluble, within the concentration limits specified therein.

(a) The following additives in Table 3 have been shown to improve jet fuel thermal stability, in some applications to significantly reduce fuel nozzles coking and to improve hot section cleanliness. The additives consist of an antioxidant, a metal deactivator and a dispersant. They are identical to each other except that Turboline FS100 (diluted) and GE Betz Spec Aid 8Q462W are easier to use at lower temperatures.

1 The use of these additives shall be in accordance to the provisions of MIL-DTL-83133.

2 The point of injection of the additive should consider the potential of deactivating any downstream water coalescer system by the detergent/dispersant action of this additive. Treated fuel offloaded from aircraft must be stored in separate containers and must not be passed through filter or water coalescer units when used again.

(b) The metal deactivator in Table 4 is approved.

WARNING: THESE FUEL SYSTEM ANTI-ICING ADDITIVES CONTAIN ETHYLENE OR DIETHYLENE GLYCOL MONOMETHYL ETHER WHICH IS HIGHLY TOXIC. THESE PRODUCTS MUST BE HANDLED WITH EXTREME CARE. AVOID ALL DIRECT CONTACT WITH SKIN OR CLOTHING. ANY CLOTHING ACCIDENTALLY CONTAMINATED BY SPLASHING SHOULD BE PROMPTLY REMOVED AND THE SKIN WASHED WITH SOAP AND WATER. PREVENT CONTACT WITH EYES AND AVOID INHALATION OF VAPORS. IF CONTACT IS MADE WITH EYES, THEY SHOULD BE FLUSHED WITH WATER FOR 15 MINUTES. CONSULT WITH A PHYSICIAN AS RAPIDLY AS POSSIBLE AFTER ALL CONTACT CASES.

(c) Any anti-icing additive which is directly equivalent to any of those listed in Table 5 is approved.

(d) The anti-static additives in Table 6 are approved.

(e) Anti-microbial Organisms Additive (Ref. Table 7).

1 The following biocide additive may be used on a limited basis. Limited basis is defined as intermittent or non-continuous use in a single application to sterilize aircraft systems suspected or found to be contaminated by microbial organisms, such as fungi, bacteria and yeasts. For those operators, where the need for biocide use is indicated, P&WC recommends, as a guide, a dosage interval of once a month. This interval can then be adjusted, either greater or lesser, as the operator's own experience dictates. Engines operated in private and executive aircraft, where overhaul periods and utilization are relatively low, may use the additive continuously.

TABLE 3, Thermal Stability Additive

Additive (Trade Name)	Maximum Concentration Allowed (mg/L)
GE Betz Spec Aid 8Q462	256-300
GE Betz Spec Aid 8Q462W	256-300
AeroShell Performance Additive 101	256-300
Turboline FS100 (Concentrate)	256-300
Turboline FS100 (Diluted)	533-625
BP Lubrizol OSD169558F	256-300
Infineum NB31011-33 (AV100)	256-300
Nalco EC5100A Plus	256-300
BASF KeroJetTM100	256-300

TABLE 4, Metal Deactivator Additive

Additive (Trade Name)	Maximum Concentration Allowed (mg/L)
N, N1 - Disalicylidene - 1, 2 Propane - Diamine	5.7

TABLE 5, Anti-icing additives

Additive (Trade Name)	Maximum Concentration Allowed % by Volume
Diethylene Glycol Monomethyl Ether (Diegme) to ASTM D4171 Type III or MIL-DTL-85470B	0.15
Liquid "I" (GOST 8318)	0.3

TABLE 5, Anti-icing additives (Cont'd)

Additive (Trade Name)	Maximum Concentration Allowed % by Volume
Liquid "I-M" (TU-6-10-1458) (50/50 blend of Liquid "I" and Methyl Alcohol)	0.3

TABLE 6, Anti-static Additives

Additive (Trade Name)	Maximum Concentration Allowed (mg/L)
Innospec Stadis 450	3.0
Russian Additive "Sigbol"	3.0

TABLE 7, Anti-microbial Organisms Additives

Additive (Trade Name)	Maximum Concentration (mL/L)
Biobor JF	0.199 mL per L
Kathon FP 1.5	0.100 mL per L

NOTE: It is recommended to add Biobor JF or Kathon FP 1.5 into the fuel supply line to make sure that the solution fully mixes with the fuel and flows along the fuel system. Refer to Biobor JF or Kathon FP 1.5 Technical Data Sheet and the AMM for more information.

E. Acceptable Fuels (Unrestricted Use)

(1) Fuels listed in Table 8 comply with P&WC specifications and are approved for unrestricted use in PT6C-67C/-67C1 engines.

NOTE: 1. Unless otherwise specified, the latest issue of fuel specifications applies.

NOTE: 2. An acceptable fuel or any mixture of acceptable fuels may be used.

TABLE 8, Approved Fuels

ISSUING AUTHORITY / BODY	KEROSENE TYPE	FREEZE POINT °C (°F)	HIGH FLASH KEROSENE TYPE	FREEZE POINT °C (°F)
ASTM (D1655)	Jet A	-40 (-40)	-	-
	Jet A-1	-47 (-53)	-	-
IATA	Kerosene Type Fuel	-47 (-53)	-	-

TABLE 8, Approved Fuels (Cont'd)

ISSUING AUTHORITY / BODY	KEROSENE TYPE	FREEZE POINT °C (°F)	HIGH FLASH KEROSENE TYPE	FREEZE POINT °C (°F)
Military				
US MIL-DTL-5624	-	-	JP-5 (See Note 1)	-46 (-51)
US MIL-DTL-83133 See Note 8)	JP-8 (See Note 1)	-47 (-53)	-	-
	JP-8 +100 (See Notes 1, 3 and 7)	-47 (-53)	-	-
British Joint Services Designation	AVTUR (See Note 2)	NA	-	NA
	AVTUR/FSII (See Notes 1 and 2)	NA	AVCAT/FSII (See Notes 3 and 4)	NA
NATO Code	F34 (See Notes 1 and 2)	NA	F43	NA
	F35 (See Note 2)	NA	F44 (See Note 2)	NA
	F37 (See Notes 1, 2, 3 and 7)	NA		
	F24 (See Notes 1 and 2)	NA		
	F27 (See Notes 1, 2, 3 and 7)	NA		
Governments				

TABLE 8, Approved Fuels (Cont'd)

ISSUING AUTHORITY / BODY	KEROSENE TYPE	FREEZE POINT °C (°F)	HIGH FLASH KEROSENE TYPE	FREEZE POINT °C (°F)
Canadian General Standards Board	CAN/ C.G.S.B.- 3.23		CAN/ C.G.S.B.- 3.24	
	Jet A	-40 (-40)	Grade F-44 (See Note 1)	-46 (-51)
	Jet A-1	-47 (-53)		
	CAN/CGSB- 3.24 Grade F34 (See Note 1)	-47 (-53)		
British Ministry of Defence	DEF STAN 91-87 (See Note 1)	-47 (-53)	DEF STAN 91-86 (See Note 1)	-46 (-51)
	DEF STAN 91-91	-47 (-53)	-	-
French Ministry of the Armed Forces	AIR 3405	-50 (-58)	AIR 3404	-46 (-51)
	DCSEA 134/B	-47 (-53)		
CIS				
GOST 10227	RT	-55 (-67)	-	-
GOST 10227, in addition complying to Decree 118 (See Note 5)	TS-1	-60 (-77)	-	-
GOST R 52050	Jet A-1	-47 (-53)		
Peoples Republic of China National Technology Supervisory Bureau	No. 3 Jet fuel (GB6537- 2018) (See Note 9)	-47 (-53)	-	-
Other	Jet A-50 (See Note 4)	-47 (-53)		

TABLE 8, Approved Fuels (Cont'd)

ISSUING AUTHORITY / BODY	KEROSENE TYPE	FREEZE POINT °C (°F)	HIGH FLASH KEROSENE TYPE	FREEZE POINT °C (°F)

NOTE: 1. Contains fuel system icing inhibitor (FSII).

NOTE: 2. These designations are not specifications, therefore there are no freeze point definitions.

NOTE: 3. Contains thermal stability improver additive.

NOTE: 4. This is a brand sold in Alaska. It is basically Jet A with a lower freezing point.

NOTE: 5. Decree No. 118 was issued on Feb 27/2008 by the Russian Federation Government. Decree No. 118, Appendix 4, calls out ASTM D3241 "Standard Test Method of Aviation Turbine Fuels for Thermal Oxidative Stability" for the purpose of meeting fuel thermal stability oxidation requirements of gas turbine engine manufacturers.

NOTE: 6. AN8 is an unofficial term used by the U.S. Military for MIL-DTL-83133 fuel with a lower
maximum freezing point. The lower maximum freezing point is controlled by contract.

NOTE: 7. The point of injection of the additive should consider the potential of deactivating any downstream water coalescer system by the detergent/ dispersant action of this additive. Treated fuel offloaded from aircraft must be stored in separate containers and must not be passed through filter/water coalescer units which are not fitted with EI 1581 category 'M100' or equivalent filter or separators.

NOTE: 8. Jet A +100 is an unofficial term used by the U.S. Military for F-27 NATO fuel grade code.

NOTE: 9. Specification GB 6537 for Peoples Republic of China No. 3 Jet Fuel is approved for fuel only, not for additives.

F. Acceptable Fuels (Restricted Use)

(1) The fuels listed in Table 9 and Table 10 are considered by P&WC to be satisfactory for occasional use only. If these fuels are used in an engine for more than 1000 hours (intermittently or continuously), a fuel nozzle and fuel filter inspection must be carried out when 1000 hours running has accumulated. To enable continuous use of these fuels in excess of 1000 hours, the results of the inspection must be acceptable to P&WC.

NOTE: Unless otherwise specified, the latest issue of fuel specifications applies.

TABLE 9, Acceptable Fuels Subject to Restricted Use

ISSUING AUTHORITY BODY	KEROSENE TYPE	FREEZE POINT °C (°F)	WIDE CUT TYPE	FREEZE POINT °C (°F)	HIGH FLASH KEROSENE TYPE	FREEZE POINT °C (°F)
CIS						
GOST 10227 Not additionally complying with Decree 118	TS-1	-60 (-76)	-	-	-	-
Ukrainian	TS-1		-	-	-	-
GSTU		-55 (-67)				
320.00149943.011						

G. Alternate/Emergency Fuels

CAUTION: ADDITIVES SUCH AS TETRA-ETHYL LEAD AND PHOSPHORUS COMPOUNDS, COMMON TO GASOLINE FUELS ARE HARMFUL TO HOT SECTION PARTS FROM A CORROSION, SULFIDATION AND METALLURGICAL STANDPOINT.

(1) The use of aviation gasoline (avgas) is restricted and must be used only during an emergency. Avgas must not be used for more than 150 hours between engine overhauls.

CAUTION: ALTHOUGH DIESEL AND HEATING FUELS ARE CHEMICALLY SIMILAR TO JET FUELS, THEIR COLD FLOW, VISCOSITY AND FREEZING POINT CHARACTERISTICS ARE SPECIFICALLY CONTROLLED DURING REFINING TO LEVELS NOT SUITABLE FOR USE IN AIRCRAFT.

(2) The operation of PT6C-67C/-67C1 engines on fuels other than the approved jet fuels is not recommended. Specifically excluded as possible alternate or emergency fuels are such products as automotive gasoline, blended diesel fuel, biodiesel, heating fuel or any combination of these products with the approved fuels.

TABLE 10, Approved Automotive and Aviation Fuels Subject to Restrictions On Use

Fuel Type	ASTM	IATA	U.S. Federal U.S. Military	Canadian CGSB	Restrictions on use
Automotive Diesel Fuel (CPW 46) (Arctic Grade)	D975 No. 1D	-	VV-F-800 DF-A Type A	CAN 2-3.6	Shall not be used below -15°C (5°F) OAT
Automotive Diesel Fuel (Winter Grade)	-	-	VV-F-800 DF-1 Type A	CAN 2-3.6	Shall not be used below -7°C (20°F) OAT

TABLE 10, Approved Automotive and Aviation Fuels Subject to Restrictions On Use (Cont'd)

Fuel Type	ASTM	IATA	U.S. Federal U.S. Military	Canadian CGSB	Restrictions on use
Automotive Diesel Fuel (Regular Grade)	D975 No. 2D	-	VV-F-800 DF-2 Type B	CAN2-3.6	Shall not be used below 5°C (40°F) OAT
Aviation Gasoline (Grades: 80,100 & 100LL)	D910	-		CAN 2-3.25	Shall not be used for more than 150 hours during any period between engine overhauls.