

DEPARTMENT OF TRANSPORTATION FEDERAL AVIATION ADMINISTRATION TYPE CERTIFICATE DATA SHEET E-282	Rolls-Royce Corporation Revision 30	E-282 25 July 2013
	501-D13 501-D13A 501-D13D 501-D13E 501-D13H	501-D22 501-D22A 501-D22C 501-D22G

Engines of models described herein conforming with this data sheet, (which is part of Type Certificate No. E-282) and other approved data on file with the Federal Aviation Administration, meet the minimum standards for use in certificated aircraft in accordance with pertinent aircraft data sheets and applicable portions of the Federal Aviation Regulations provided they are installed, operated, and maintained as prescribed by the approved manufacturer's manuals and other approved instructions.

Type Certificate Holder: Rolls-Royce Corporation
P.O. Box 420
Indianapolis, Indiana 46206-0420

Type Certificate Holder Record: E-282 originally issued to Allison Division, General Motors Corporation on 12 Sept 1957
E-282 reissued to Detroit Diesel Allison, General Motors Corporation on 1 Sept 1970
E-282 reissued to Allison Gas Turbine Division, General Motors Corporation on 1 May 1983
E-282 reissued to Allison Engine Company on 1 Dec 1993
E-282 reissued to Rolls-Royce Corporation on 1 Sept 2000

Model	501-D13, -D13A, -D13D, -D13E	501-D13H	501-D22
Description	14 stage axial compressor 4 stage turbine 6 cannular combustion chambers 13.54:1 propeller ratio	-- -- -- --	-- -- -- --
Ratings (see NOTE 3)			
<u>Takeoff (5 min.) at sea level</u>			
Equivalent shp (hp)	3750	--	4050
Propeller shp (hp)	3460	--	3755
Jet thrust (lbf)	726	--	740
RPM	13820	--	13820
<u>Takeoff (5 min.) at sea level with water-methanol injection</u>			
Propeller shp (hp)	---	3630	---
RPM	---	13820	---
(see NOTE 15)			
<u>Max. continuous at sea level</u>			
Equivalent shp (hp)	3420	--	3730
Propeller shp (hp)	3138	--	3443
Jet thrust (lbf)	705	--	718
RPM	13820	--	13820
Propeller shaft	No. 60A (and -10152)	--	--
Fuel control system	Bendix main control AP-B3, Temp. datum valve PB-A3	--	--

"- -" indicates "same as preceding model."

"---" indicates "does not apply."

Page	1	2	3	4	5	6	7	8
Rev	30	29	29	30	29	29	30	30

Model (cont'd)	501-D13, -D13A, -D13D, -D13E	501-D13H	501-D22
Fuel	Kerosene, commercial turbine fuel (Rolls-Royce Spec. EMS-64 or ASTM D1655 Type A or A1) or JP-4 commercial turbine fuel (MIL-DTL-5624 or ASTM D6615 Type B) or JP-5 (MIL-DTL-5624) or JP-8 (MIL-DTL-83133). Aviation gasoline grade 115/145 or lower when used in accordance with limitations in NOTE 11.	--	--
Lubricating oil (see NOTE 12)	Refer to CSL-161 for approved oils	--	Refer to CSL-1002 for approved oils
Principal dimensions:			
Length, in. overall	145.14	--	145.979
Width, in.	26.90	--	27.250
Height, in.	42.20	--	38.596
C.G. location, in. aft of thrust nut in shutdown position (see NOTE 14)	61.24	--	63.6
Weight, dry, lb. (see NOTE 14) includes basic engine, ext. shaft, reduction gear, all control boxes, torquemeter, fuel pumps and filter, ignition, fuel and temperature control systems, and water- methanol injection system (501-D13H only)	1756 1746 (-D13A only)	1762	1835
Ignition system	<u>Rolls-Royce P/N</u> <u>Vendor P/N</u> 6805307 40588 6814620 40074 6870592 43432 6887768 48950 6895689 10-111160-6 Capacitance discharge high energy type with two ignition plugs	--	<u>Rolls-Royce P/N</u> <u>Vendor P/N</u> 6805230 10-111160-3 6805307 40588 6870592 43432 6887768 48950 6895689 10-111160-6 Capacitance discharge high energy type with two ignition plugs

"--" indicates "same as preceding model."

"__" indicates "does not apply."

Model	501-D22A	501-D22C	501-D22G
Description	14 stage axial compressor 4 stage turbine 6 cannular combustion chambers 13.54:1 propeller ratio	-- -- -- --	-- -- -- --
Ratings (see NOTE 3)			
<u>Takeoff (5 min.) at sea level</u>			
Equivalent shp (hp)	4680	--	4815
Propeller shp (hp)	4368	--	4500
Jet thrust (lbf)	781	--	788
RPM	13820	--	13820
<u>Takeoff (5 min.) at sea level with water-methanol injection</u>			
Propeller shp (hp)	---	4368	---
RPM (see NOTE 15)	---	13820	---
<u>Max continuous at sea level</u>			
Equivalent shp (hp)	4364	--	4365
Propeller shp (hp)	4061	--	4061
Jet thrust (lbf)	760	--	761
RPM	13820	--	13820
Propeller shaft	No. 60A (and -10152)	--	--
Fuel control system	Bendix main control AP-B3 Temp. datum valve PB-A3	--	--
Fuel	Kerosene, commercial turbine fuel (Rolls-Royce Spec. EMS-64 or ASTM D1655 Type A or A1) or JP-4 commercial turbine fuel (MIL-DTL-5624 or ASTM D6615 Type B) or JP-5 (MIL-DTL-5624) or JP-8 (MIL-DTL-83133). Aviation gasoline grade 115/145 or lower when used in accordance with limitations in NOTE 11.	--	--
Lubricating oil (see NOTE 12)	Refer to CSL-1002 for approved oils.	--	--
Principal dimensions:			
Length, in. overall	145.979	145.888	--
Width, in.	27.250	--	--
Height, in.	38.596	39.122	--
C.G. location, in. aft of thrust nut in shutdown position (see NOTE 14)	63.7	62.5	61.5

"--" indicates "same as preceding model."

"--" indicates "does not apply."

Model (cont'd)	501-D22A		501-D22C		501-D22G	
Weight, dry, lb. (see NOTE 14) includes basic engine, ext. shaft, reduction gear, all control boxes, torquemeter, fuel pumps and filter, ignition, fuel and temperature control system, and water-methanol injection system (501-D13H only)	1847		1910		1880	
Ignition system	<u>Rolls-Royce P/N</u> 6805230 6805307 6870592 6887768 6895689 Capacitance discharge high energy type with two ignition plugs.	<u>Vendor P/N</u> 10-111160-3 40588 43432 48950 10-111160-6	<u>Rolls-Royce P/N</u> 6870592 6887768 6895689	<u>Vendor P/N</u> 43432 48950 10-111160-6	<u>Rolls-Royce P/N</u> 6887768 6895689	<u>Vendor P/N</u> 48950 10-111160-6
Certification Basis	Part 13 of the Civil Air Regulations effective June 15, 1956. Application for Type Certificate dated August 10, 1956. Type Certificate No. 282 issued September 12, 1957 for Model 501-D13; Model 501-D13A added April 15, 1958; Model 501-D13D and 501-D13E added December 18, 1959; Model 501-D13H added February 20, 1964; Model 501-D22 added October 28, 1964; Model 501-D22A added January 23, 1968 and major design change approved 25 July 2013 (see NOTE 18); Model 501-D22C added December 27, 1968; Model 501-D22G added March 23, 1984.					
Production basis	Production Certificate No. 310	--		--		

"- -" indicates "same as preceding model."

"__" indicates "does not apply."

NOTE 1.	Maximum permissible temperatures:		
			<u>All except -D22A, -D22C and -D22G</u>
			<u>-D22A, -D22C and -D22G</u>
	Turbine inlet gas temperatures:	Takeoff	1790°F (977°C)
	Max. continuous	1710°F (932°C)	
	Max. transient (not to exceed 5 sec. above takeoff temperature)	1958°F (1070°C)	
Oil inlet temperatures: -25°F with EMS-35 and -65°F minimum with MIL-L-7808, during starting. Below 32°F engine operation is limited to idle operation. Between 32°F and 140°F engine operation is limited to 1000 shp max except that powers in excess of 1000 shp are permitted when oil inlet temperature is above 105°F and is increasing. 185°F max except for 212°F max at flight idle and below and for 5 min. above flight idle for the 501-D13 series and 185°F max except 212°F max for 5 min. then 195°F max for 5 min. for the 501-D22 Series. External engine components, 165°F to 600°F surrounding air temperature, depending upon specific component, as defined in Rolls-Royce Spec. C398-C or later for 501-D13 and D13A; C521 for 501-D13D and D13H; C464B for 501-D22; C787 for 501-D22A; C794 for 501-D22C; and C929 for 501-D22G.			

NOTE 2.	Fuel and oil inlet pressure limits:											
	Fuel:	<p>Minimum at fuel line connection to engine:</p> <p>Kerosene – not less than ambient pressure minus 7 in. Hg at sea level and ambient pressure minus 2.88 in. Hg at 30,000 ft (120°F max).</p> <p>JP-4 – not less than ambient pressure minus 7 in. Hg at sea level and ambient pressure minus 4.00 in. Hg at 15,000 ft (110°F max for the 501-D13 and 120°F max for the 501-D22).</p> <p>Aviation gasoline – Reid vapor pressure 5.5 to 7.0 psia – not less than ambient pressure minus 7 in. Hg at sea level and ambient pressure minus 2 in. Hg at 6000 ft altitude (110°F max).</p> <p>Operating fuel inlet gage pressures: 0-40 psig max for the 501-D13 and 15 psia to 40 psig max for the 501-D22.</p>										
	Oil:	<p>Minimum at oil line connection to engine: 2.5 psia</p> <p>Operating oil gage pressures:</p> <p>Power Section:</p> <table style="margin-left: 40px;"> <tr> <td>Normal Operating Range</td> <td>55 ± 5 psig</td> </tr> <tr> <td>Cold Start/Warm up (max)</td> <td>75 psig (501-D13 series) 100 psig (501-D22 series)</td> </tr> <tr> <td>Low Speed Ground Idle</td> <td>Positive oil pressure, provided oil pressure is within limits at 100% rpm (13,820 rpm)</td> </tr> </table> <p>Reduction Gear:</p> <table style="margin-left: 40px;"> <tr> <td>Normal Operating Range</td> <td>130 – 240 psig and – 250 psig permitted momentarily (501-D13 series) 130 – 250 psig (501-D22, -D22A, and -D22C) 150 – 250 psig (501-D22G)</td> </tr> <tr> <td>Low Speed Ground Idle</td> <td>50 psig (minimum)</td> </tr> </table> <p>(psia – lb. per sq. in. absolute) (psig – lb. per sq. in. gage)</p>	Normal Operating Range	55 ± 5 psig	Cold Start/Warm up (max)	75 psig (501-D13 series) 100 psig (501-D22 series)	Low Speed Ground Idle	Positive oil pressure, provided oil pressure is within limits at 100% rpm (13,820 rpm)	Normal Operating Range	130 – 240 psig and – 250 psig permitted momentarily (501-D13 series) 130 – 250 psig (501-D22, -D22A, and -D22C) 150 – 250 psig (501-D22G)	Low Speed Ground Idle	50 psig (minimum)
Normal Operating Range	55 ± 5 psig											
Cold Start/Warm up (max)	75 psig (501-D13 series) 100 psig (501-D22 series)											
Low Speed Ground Idle	Positive oil pressure, provided oil pressure is within limits at 100% rpm (13,820 rpm)											
Normal Operating Range	130 – 240 psig and – 250 psig permitted momentarily (501-D13 series) 130 – 250 psig (501-D22, -D22A, and -D22C) 150 – 250 psig (501-D22G)											
Low Speed Ground Idle	50 psig (minimum)											

NOTE 3.	<p>Engine ratings are based on static sea level conditions.</p> <p>Compressor inlet air (dry) 59°F, 29.92 in. Hg except 501-D13H takeoff rating based on 100°F inlet air.</p> <p>Jet nozzle as shown on the installation drawing.</p> <p>No external accessory loads and no air bleed.</p> <p>Max rated turbine inlet gas temperature as indicated by average of 18 gas temperature thermocouples.</p> <p>Equivalent shaft horsepower (hp) = Propeller shaft horsepower (hp) + $\frac{\text{Jet thrust (lbf)}}{2.5}$</p>
----------------	---

NOTE 4.	The following accessory drive provisions are available on Prop Reduction Gear Housing:					
	Accessory	*Direction of Rotation	Speed Ratio to Turbine	Max. Torque (in-lb)		Maximum Overhang Moment (in-lb)
				Continuous	Static	
	Starter	C	1.030	**3600	4800	625
	Alternator	C	.432	1500	6600	1475
	***Cabin supercharger	C	.267	1385	4400	625
	****Hydraulic pump	C	.267	1000	4400	400
	Tachometer	C	.304	25		
	Generator (on 501-D22C, -D22G, -D13D and -D13H only)	C	.432	1000	4400	1475
	*C – Clockwise viewing drive pad.					
	**A maximum instantaneous impact load of 4800 in-lb during starter operation is permitted. Except a maximum instantaneous impact load of 6600 in-lb during starter operation is permitted on the 501-D22A, -D22C, and -D22G engines only. Starter pad and drive are not adaptable for use with any accessory requiring continuous operation.					
	***Cabin supercharger drive on the 501-D22 series used as hydraulic pump drives.					
	****Not used on the 501-D22 series.					

NOTE 5.	A maximum bleed air of 8% of the 501-D13 engine airflow is available for continuous use and 9.5% for intermittent use with the exception of maximum reverse thrust. A maximum bleed air of 12% of the 501-D22 engine airflow is available when operating at all conditions with the exception of maximum reverse thrust. Available bleed air varies from 8% (60°F day) to 0% (110°F day) for the 501-D13 engine, and from 8% (90°F day) to 2.5% (130°F day) for the 501-D22 engine when operating at maximum reverse thrust. For both 501-D13 and 501-D22 engines, up to 2.5% bleed air is permitted during all conditions including ground idle and low speed operation when engine rpm is less than or equal to 10,000. In addition, up to 5% bleed air is permissible during operation when the power lever is in the “start” position.
---------	--

NOTE 6.	Propellers to be used with this engine must have functioning characteristics which are compatible with the engine and its control system.
---------	---

NOTE 7.	Engine control equipment which is aircraft mounted includes the following: relay box, temperature adjustment box (not required with transistorized temperature datum system), temperature datum control amplifier, torquemeter phase detector (not required for 501-D13H), torquemeter indicator, water-methanol regulator (501-D13H and -D22C).
---------	--

NOTE 8.	The maximum allowable power, as measured by the torquemeter, for below standard inlet air temperature and/or ram conditions is 4000 hp for takeoff and 3400 hp for max continuous for the 501-D13 series; 4300 hp for takeoff and 3950 hp for max continuous for the 501-D22; 4600 hp for takeoff and 4300 hp for max continuous for the 501-D22A and -D22C; and 4600 hp for takeoff and 4161 hp for max continuous for the 501-D22G.
---------	---

NOTE 9.	This engine meets FAA requirements for adequate turbine disc integrity and rotor blade containment and does not require external armoring.
---------	--

NOTE 10.	The maximum overspeed limit is 16,000 rpm for momentary transients and 14,900 rpm for power transients. When these limits are exceeded, or speeds outside the normal limits of 13,680 to 13,960, or 13,544 to 14,096 for the 501-D22 series are encountered repeatedly during flight operation, consult the maintenance instructions for corrective action.
----------	---

NOTE 11.	Use of grade 80/87 aviation gasoline is limited to 1000 hours between engine overhauls. Use of any grade of aviation gasoline higher than 80/87 is limited to 100 hours between engine overhauls. Gasoline containing TCP, Boron or similar additives shall not be used. All approved fuels may be used separately or mixed in any proportions without adversely affecting engine operation or power output. No fuel control adjustment or system purging is required when switching fuel types. Anti-icing additives conforming to MIL-I-85470 are approved for use in fuels in amounts not to exceed 0.15% by volume. Shell ASA-3 anti-static additive is approved for use at a concentration that will provide not in excess of 300 conductivity units, which is equivalent to one ppm.
NOTE 12.	Refer to the appropriate Customer Service Letters for approved oil types, limitations on mixing of oils and all other oil details.
NOTE 13.	<p>The 501-D13A is similar to the 501-D13 except for provision for Hamilton Standard propeller.</p> <p>The 501-D13D is similar to the 501-D13 except for D.C. generator drive provisions and the rear mount is on the bottom of the diffuser.</p> <p>The 501-D13E is similar to the 501-D13 except the rear mount is on the bottom of the diffuser.</p> <p>The 501-D13H is similar to the 501-D13D except for provisions for water-methanol injection.</p> <p>The 501-D22 is similar to the 501-D13A except for a shrouded turbine, the gear box is offset up, and there are no auto-feathering provisions.</p> <p>The 501-D22A (Engine P/N 6870231 or Power Section P/N 6870232) is similar to the 501-D22 except for air-cooled first stage turbine blades, vanes and stalk blades in all four turbine stages.</p> <p>The 501-D22A (Engine P/N 23090863 or Power Section P/N 23090864) is similar to the 501-D22A (Engine P/N 6870231 or Power Section P/N 6870232) except for compressor wheels, un-cooled first stage turbine blades, vanes and stalk blades in all four turbine stages.</p> <p>The 501-D22C is similar to the 501-D22A (Engine P/N 6870231 or Power Section P/N 6870232) except the gearbox is offset down and has integral mount pads, and for provisions for water-methanol injection.</p> <p>The 501-D22G is similar to the 501-D22C except water-methanol injection is deleted, a three-mount system is employed, and provisions for auto-feather have been added. Also, the 501-D22G takeoff and maximum continuous ratings and limitations have been revised to reflect a more accurate power versus turbine inlet temperature relationship.</p>
NOTE 14.	<p>The engine-mount systems:</p> <p>(a) Models 501-D13, -D13A, -D13D, -D13E, -D13H, -D22, -D22A, -D22G Three-mount system consisting of one on each side of gearbox with a vertical mount at diffuser section. Basic configuration.</p> <p>(b) Models 501-D13 and -D13A Four-mount system consisting of mount on each side of gearbox with one vertical and lateral mount at diffuser. No change in weight of C.G. location.</p> <p>(c) Models 501-D13, -D13A, and -D22C Six-mount system consisting of a mount on each side, one at top and one at bottom of gear box with a vertical and lateral mount at the diffuser section. Weight increase 17 lb; C.G. location moves to 60.9 for the 501-D13 and -D13A.</p>
NOTE 15.	For operation with water-methanol injection, water flow rate is 8 gal per minute at a pressure between 140 and 200 psig. This permits operation at rated takeoff power with water-methanol solution to consist of 67 ± 5% purified water, Rolls-Royce Spec. EMS-120 or equivalent and 33 ± 5% alcohol, Rolls-Royce Spec. EMS-125 or equivalent.
NOTE 16.	501-D13 engines which have been exported and are returned to the United States for certification must have 1 st to 2 nd Stage Turbine Wheel Spacer (P/N 6796871) removed before being eligible for airworthiness certification.
NOTE 17.	Life limits established for critical components are published in the Rolls-Royce Commercial Service Letter CSL-120 for -D13, -D13A, -D13D, -D13E, and -D13H engines and CSL-1001 for -D22, -D22A, -D22C, and -D22G engines.

NOTE 18.

A major design change published in the Rolls-Royce Commercial Engine Bulletin CEB 72-1153 releases the engine enhancement package to the -D22A service configuration. The -D22A engine (Engine P/N 23090863 or Power Section P/N 23090864) has identical ratings and limitations as the -D22A engine (Engine P/N 6870231 or Power Section P/N 6870232). To remove potential asymmetrical power between engines, no inter-mixing of the -D22A engine (Engine P/N 23090863 or Power Section P/N 23090864) and -D22A engine (Engine P/N 6870231 or Power Section P/N 6870232) is permissible on a multi-engine aircraft.

...END...