

**UK CIVIL AVIATION AUTHORITY  
ENGINE TYPE CERTIFICATE DATA SHEET NO. 1039**

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CIVIL TYPE APPROVAL OF RB211-22B-02 & RB211-22B-02 (MOD. 72-8700)

1     CONSTRUCTOR:   ROLLS-ROYCE LIMITED  
                          DERBY

2     CERTIFICATION:

The above-mentioned engine is approved for use in civil aircraft classified in the Transport Category (Passenger) subject to compliance with the appropriate installation requirements of British Civil Airworthiness Requirements. Type Certificate 043/1 issued.

Certification Basis:   BCAR Section C, Issue 6, dated 15 June 1966 together with  
                          Blue Papers 415, 435, 436, 464, 468, 474, 476, 480, 481,  
                          482, 499, 506, 544, 551 (para 3.2.2 only) and 554.

3     ENGINE PARTICULARS

3.1   Build Standard Specified in latest approved issue of DIS 1004

3.2   Description By-pass turbo-jet (by-pass ratio 5:1)

3.3   Compressor           LP, Single stage fan  
                          IP, 7 stage, axial flow  
                          HP, 6 stage, axial flow

Pressure ratio: (Nominal, at sea-level ISA conditions) 24.7:1

3.4   Combustion Chamber Annular

3.5   Turbine LP, 3 stage, axial flow  
                          IP, Single stage, axial flow  
                          HP, Single stage, axial flow

3.6   Overall Dimensions           Length 5190 mm (204.33 in)  
  Width (maximum over fan casing) 2438 mm  
  (96.0in)

Height (from lowest point on gearbox to top face of engine mounting pad) 2687 mm (105.8 in)

3.7   Engine dry weight  
       (as defined in lists 3 and 5 of DIS 1004) 5410 kg (11,929 lb)



4.2	<u>Maximum Continuous Rating</u>	<u>All types</u>
4.2.1	Thrust, minimum (lbf)	40,140**
	*An approved alternative definition of Test Bed Integrated Pressure Ratio is PINT divided by PIP (P1 probe pressure). Acceptance limitations for the ratio PINT /PIP are 1.532 maximum at 1.519 maximum at 40,140 lbf for the -22B and 1.559 maximum at 42670 lbf for the -22B (Mod. 72-8700).	
	**The thrusts quoted for the acceptance conditions include the losses of the production propulsion fan duct and thrust reverser, jet pipe and afterbody cowlings and that portion of the pylon washed by the fan stream. The equivalent bare engine thrust values are 42,000 lbf for take-off and 41,130 lbf for Maximum Continuous, for the -22B and 43680 lbf for the -22B (Mod 72-8700).	
4.2.2	RPM, maximum, (%) HP RPM, maximum, (%) IP RPM, maximum, (%) LP	91.9 98.0 93.3
4.2.3	Turbine Gas Temperature, maximum (°C)	667
4.2.4	Integrated Engine Pressure Ratio (PINT/PTO) maximum	1.510*
4.2.5	Fuel consumption, maximum (lb/lbf thrust/hr)	0.382
4.2.6	Oil consumption, maximum (Imp pt/hr)	2.0
4.2.7	Oil pressure, minimum for acceptance at 95°C oil inlet temperature	40

## 5 OPERATING LIMITATIONS

The following operating limitations are applicable when the accuracy of the installed engine instrumentation is in accordance with RR report APS 1018 issue 3.

The engines may be used in ambient temperatures up to ISA + 40°C. The -22B engine is flat rated to ISA + 13.9°C for Take-off rating and to ISA + 9°C for Maximum Continuous rating up to 25,000 ft (or 26,000 ft at Mach numbers between 0.5 and 0.6) and then ISA + 13°C for Maximum Continuous at higher altitudes. The -22B (Mod 72-8700) engine is flat rated to ISA + 8.4°C up to 5600 ft, thereafter thrust reduces linearly to be the same as the -22B at ISA + 13.9°C and 10000ft. The Maximum Continuous rating is unchanged from the -22B.

5.1	<u>Rotational Speed (%)</u>	HP	IP	LP
5.1.1	Maximum for take-off (5 min limit)+	95.0	102.5	99.5
5.1.2	Maximum continuous	93.	101.5	101.0
5.1.3	Maximum continuous (Post Mod 5089)	94.2	101.5	101.0
5.1.4	Maximum overspeed (20 sec limit)	96.2	106.0	103.0
5.1.5	Ground idling	-	-	21.0+2.3

Note: Limit applies to 15°C ambient temperature conditions and varies linearly by 0.5% per 15°C change in air temperature.

5.1.6 Maximum for reverse thrust (30 sec limit) - - 101.3

## 5.2 Turbine Gas Temperature (°C)

5.2.1 Momentary maximum during starts on the ground 550

5.2.2 Momentary maximum during re-lights in flight 550

5.2.3 Maximum for acceleration (2 min limit) 738

5.2.4 Maximum for take-off (5 min limit)+ 728

+ These operating limitations may be used for up to 10 minutes in the event of engine failure. (BCAR Section C Issue 13.)

5.2.5 Maximum continuous 700

5.2.6 Maximum continuous (Post Mod 5089) 710

5.2.7 Maximum overtemperature (20 sec limit) 750

5.2.8 Maximum for ground idling 460

## 5.3 Fuel

5.3.1 Approved fuels:

For list of fuels and fuel additives approved for use in the engine, see Operating Instructions.

5.3.2 Minimum pressure at engine inlet (measured at inlet to engine LP fuel pump): not less than 5 lbf/in<sup>2</sup> abs plus true fuel vapour pressure with zero vapour/liquid ratio between sea-level and 45,000 ft altitude.

5.3.3 Maximum temperature (°C)

(a) At inlet to LP fuel pump 57

(b) At inlet to HP fuel pump (measured at fuel filter outlet)

(i) Unrestricted 95

(ii) Maximum during transient overshoots on reducing rpm (15 min limit) 115

5.3.4 Minimum drainage period (from closing HP fuel cock after a false start) (sec) 30

## 5.4 Oil

5.4.1 Approved types: Castrol 5000 Gas Turbine Oil  
Castrol 599 Gas Turbine Oil  
Aeroshell Turbine Oil 560  
Aeroshell Turbine Oil 500 (Also known as  
Royco Turbine Oil 500)

Aeroshell Turbine Oil 555 (Also known as  
 Royco Turbine Oil 555)  
 Castrol 580 Gas Turbine Oil  
 Esso/Exxon Turbo Oil 25  
 Esso/Exxon Turbo Oil 2380  
 Mobil Jet Oil 254

Note: Oil of the above types when re-claimed to the approved Rolls-Royce standards for the appropriate viscosity grade, are approved for use.

#### 5.4.2. Temperature at outlet from oil pressure pump (°C)

(a)	Minimum for starting	minus 40
(b)	Minimum for opening up	minus 10
(c)	Maximum	
(i)	Unrestricted	100
(ii)	During transient overshoots on reducing rpm (15 min limit)	135

#### 5.4.3 Pressure (lbf/in<sup>2</sup>)

(a)	Minimum acceptance for flight	
(i)	Ground idling to 70% HP rpm	35
(ii)	Above 70% HP rpm	40
(b)	Minimum to complete flight	35

Note: Large reductions in engine rpm to below 70% HP rpm may result in transient reductions in oil pressure below 35 lbf/in<sup>2</sup>. This is acceptable provided the oil pressure does not fall below 18 lbf/in<sup>2</sup> and recovers to at least 35 lbf/in<sup>2</sup> within 5 minutes of throttling back.

#### 5.4.4 Consumption (Imp pt/hr) Overall in flight, maximum for unrestricted operation 2.0

#### 5.4.5 Capacity (Imp pt)

(a)	Nominal total oil system capacity	67.5
(b)	Nominal oil tank capacity	42.5
(c)	Usable oil (including effect of attitude) minimum	32.5

## 6 COMPRESSOR AIR BLEEDS

The engine bleed is automatically scheduled from the engine IP and HP bleed ports by a valve in the aircraft ducting which selects the appropriate supply in response to a signal sensing IP compressor delivery pressure (P3).

At engine power settings above that giving a P3 greater than 42 lbf/in<sup>2</sup> (gauge) at sea-level (decreasing to 25 lbf/in<sup>2</sup> at 35,000 ft) bleed air is extracted from the IP delivery port.

At power settings below this pressure, bleed is extracted from the HP bleed port, with the exception of the nose cowl anti-icing air, which is always taken from the IP port. This nose cowl anti-icing air is approximately 1.5% of IP compressor flow.

The compressor air bleeds are to be used in accordance with the Rolls-Royce instructions, and such that the Operating Limitations are not exceeded.

- |       |   |              |
|-------|---|--------------|
| 6.1   | Maximum rpm at which bleed may be used:   | Unrestricted |
| 6.2   | Air delivery for aircraft services  |              |
| 6.2.1 | Maximum HP bleed (for mixed HP and IP bleed)<br>(% compressor flow)                       |              |
| (a)   | Normal operation:-<br>Ground idle to changeover point 42 lbf/in <sup>2</sup> (gauge) )    | 9            |
| (b)   | Abnormal operation:-<br>Ground idle to changeover point (42 lbf/in <sup>2</sup> (gauge) ) | 12           |
| 6.2.2 | Maximum IP bleed (% compressor flow)  |              |
| (a)   | Normal Operation:-<br>Ground idle to flight idle  | 1.5          |
|       | Flight idle to maximum take-off conditions  | 6.5          |
| (b)   | Abnormal operation:- Ground idle to maximum<br>take-off conditions                        | 6.5          |

## 7 EQUIPMENT

For identification of equipment approved for use on this engine refer to Chapter 6 of the engine DIS.

## 8 SPECIAL FEATURES

A thrust reverser system is incorporated to reverse the fan stream. All reference to the fitment and operation of a hot stream spoiler was deleted at Issue 16 of this ETCDS dated 28th January 1982.

## 9 MANUALS

Operating Instructions	F-RB211-T
Maintenance	M-211-TRR
Overhaul	0-211En-TRR

## 10 ENGINE VARIANTS

The RB211-22B-02 was approved originally on 9 February 1973. It has installation features to suit the Lockheed Tristar aircraft. Three variants of this engine, the -22-02, -22C-02 and the -22CA-02 which were approved originally on 22 February 1972, 18 May 1972 and 2 April 1973 respectively, are no longer in service and have been deleted from this TCDS as from December 1974.

The RB211-22B-02 (Mod 72-8700) was originally approved on 25 March 1988. It is a re-rate of the existing -22B-02 model, defined to give increased take-off thrust at lower altitudes/ambient temperatures.