COMANDO DA AERONÁUTICA
DEPARTAMENTO DE PESQUISA E DESENVOLVIMENTO
CENTRO TÉCNICO AEROESPACIAL

TYPE CERTIFICATE DATA SHEET Nº EM-2004T01

Type Certificate Holder:

ROLLS ROYCE PLC
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UNITED KINGDOM

EM-2004T01

Sheet 01

ROLLS ROYCE

RB211-535-E4-37
RB211-535-E4-B-37
RB211-535-E4-C-37

July 2004

Engines of models described herein conforming with this data sheet, which is part of Type Certificate No. 2004T01, meet the minimum standards for use in certificated aircraft in accordance with pertinent aircraft data sheets and applicable portions of the Brazilian Aeronautical Regulations provided they are installed, operated, and maintained as prescribed by the approved manufacturer's manuals and other instructions.

MODEL RB211-535-E4-37, RB211-535-E4-B-37 and RB211-535-E4-C-37.

TYPE High bypass turbofan, three shaft. Single-stage low pressure fan driven by three-stage turbine. Six-stage intermediate pressure compressor driven by single stage turbine. Six-stage high pressure compressor driven by single stage turbine. Annular combustion chamber.

RATINGS

	RB211-535-E4-37	RB211-535-E4-B-37	RB211-535-E4-C-37
Maximum continuous thrust kg (lb) At sea level static	15 968.72 (35 205)	15 968.72 (35 205) ISA + 10°C	15 968.72 (35 205) ISA +10°C
Takeoff (5 minutes) thrust kg (lb) At sea level static (See NOTE 24)	17 966.79 (39 610) (1)	19 295.82 (42 540) (2)	19 295.82 (42 540) (3)

Legend: "--" Same as preceding "---" Not applicable

RATINGS (Cont.)

(1) ISA + 13.9^{o} up 3 048 m (10 000 ft).
ISA + 20^{o} between 3 810 m (12 500 ft) and 4 572 m (15 000 ft) with linear variation between 3 048 m (10 000 ft) and 3 810 m (12 500 ft)

(2) ISA + 10^{o} at sea level, linear variation between ISA + 10^{o}C and ISA + 13.9^{o}C between sea level and 1 219.2 m (4 000 ft), ISA + 13.9^{o}C between1 219.2 m (4 000 ft) and 3 048 m (10 000 ft), linear variation between ISA 13.9^{o}C and 20^{o}C between 3 048 m (10 000ft) and 3 810 m (12 500 ft).

(3) ISA +12.5^{o}C at sea level, linear variation between ISA +12.5^{o}C and ISA +16.2^{o}C between sea level and 128.02 m (420 ft), ISA + 16.2^{o}C between 128.02 m (420 ft) and 249.94 m (820 ft), linear variation between ISA +16.2^{o}C and ISA +12.9^{o}C between 249.94 m (820 ft) and 365.76 m (1 200 ft), linear variation between ISA +12.9^{o}C and ISA +13.9^{o}C between 365.76 m (1 200 ft) and 1 219.2 m (4 000 ft), ISA +13.9^{o}C between 1 219.2 (4 000 ft) and 3 048 m (10 000 ft), linear variation between ISA +13.9^{o}C and ISA +20^{o}C between 3 048 m (10 000 ft) and 3 810 m (12 500 ft), ISA +20^{o}C between 3 810m (12 500 ft) and 4 572m (15 000 ft).

COMPONENTS

	RB211-535-E4-37	RB211-535-E4-B-37	RB211-535-E4-C-37
Fuel (See NOTE 7):			
Fuel control			
Lucas type	FFR 105	--	--
Wooward type	8062-514	8062-540	8062-553
Fuel Pump			
Lucs type	LP BPU 200	--	--
Oil (See NOTE 11):			
Tank capacity, liters (U.S. pints nominal)	19.3 (40.8)	--	--
Usable oil, liters (U.S. pints minimum) (includes altitude effects)	18.7 (38.4)	--	--
Ignition system:			
Two igniter units			
Simmonds type	49.731	49.761	---
Unison type	---	---	430152
Two igniter plugs			
Auburn type	YA 211-19	--	---
Champion type	---	---	CH34743

Legend: "--" Same as preceding "---" Not applicable

PRINCIPAL DIMENSIONS

	RB211-535-E4-37	RB211-535-E4-B-37	RB211-535-E4-C-37
Weight, kg (lb)	19.31 (7.603)	19.31 (7.603)	19.31 (7.603)
Length, cm (in) (Front of nose to end of jet pipe nose)	503.43 (198.2)	503.43 (198.2)	503.43 (198.2)
Width, cm (in) (Maximum over fan casing)	227.58 (89.6)	227.58 (89.6)	227.58 (89.6)
Center of Gravity, cm (in) (Aft of engine front suspesion center line)	72.9 (28.7)	72.9 (28.7)	72.9 (28.7)
Height, cm (in) (From lowest point on gearbox to top face of engine mounting pad)	241.55 (95.1)	241.55 (95.1)	241.55 (95.1)

FUEL TYPE See NOTE 7

TEMPERATURE LIMITS See NOTE 2

PRESSURE LIMITS See NOTE 3

COMPRESSION See NOTE 4

IMPORT REQUIREMENTS Each engine imported separately and/or spare parts must be accompanied by an Airworthiness Certificate for Export and/or an Airworthiness Approval Tag respectively, issued by CAA, attesting that the particular engine and/or parts were submitted to the governmental quality control before delivery and are in conformity with the CTA approved type design.

CERTIFICATION BASIS

- For Model RB211-535E4-37 and RB211-535-E4B-37
  The certification basis for the engine is RBHA 33 corresponding to FAR 33, effective 01 February 1965, as amended by FAR 33-1 through 33-3 and Special Condition No. 33-39-EU-9.
  Pursuant to RBHA/FAR 21.29(a)(ii) , Type Certificate 2004T01 was applied on 15 June 2004 and issued on 08 July 2004, in validation of the British Air Registration Board's certification of compliance with Special Condition No. 33-39-EU-9 and BCAR standards, which were found to provide a level of safety equivalent to the above RBHA/FAR 33 regulations as follows:
  BCAR Section C, Issue 6, dated 15 June 1966, plus Blue Papers 415, 435, 436, 464, 468, 474,476, 480, 481, 482, 499, 506, 544, 551 (Paragraph 3.2.2. only); and 554.

CERTIFICATION BASIS (Cont.)

- For Model RB211-535E4-C-37
  The Certification basis for the engine is RBHA 33 corresponding to FAR 33, effective 01 February 1965, as amended by FAR 33-1 through 33-3;
  RBHA/FAR 33.73 Amendment 4;
  RBHA/FAR 33.17 Amendment 6;
  RBHA/FAR 33.75 Amendment 6; and
  RBHA 34 corresponding to FAR 34, effective 10 September 1990, as amended by RBHA/FAR 34-1 through 34-3.

NOTES:

NOTE 1

Rotor speed limitations / percents (See Note 24)

Model	LOW PRESSURE ROTOR (N1)					
	N1 100%=rpm	Takeoff 5 minutes	Maximum Continuous	Maximum for reverse Thrust per./sec.	Transient 20 seconds	Ground Idle (*) Min / Max
RB211-535-E4-37	4 500	108.8	108.4	84.3 / 40	110.0	See NOTE 19
RB211-535-E4-B-37	4 500	108.8	108.4	84.3 / 40	110.0	See NOTE 19
RB211-535-E4-C-37	4 500	108.8	108.4	84.3 / 40	110.0	See NOTE 19

(*) Ground idle varies with O.A.T: see Rolls-Royce Operating Instructions

Model	INTERMEDIATE PRESSURE ROTOR (N2) 100% N2=7 000 rpm			HIGH PRESSURE ROTOR (N3) 100% N3 = 10 611 rpm			
	Takeoff 5 minutes	Maximum Continuous	Transient 20 seconds	Takeoff 5 minutes	Maximum Continuous	Maximum Continuous (MOD 5089)	Transient 20 seconds
RB211-535-E4-37	100.3	98.0	101.3	99.0	95.8	---	100.2
RB211-535-E4-B-37	100.3	98.0	101.3	99.0	95.8	---	100.2
RB211-535-E4-C-37	100.7	98.0	102.3	99.0	95.8	---	100.2

NOTE 2

Temperature limitations / degrees centrigrade (See Note 24)

Model	TURBINE GAS TEMPERATURES Indicated temperatures measured at the low pressure NGV when fitted with the approved ballast resistor specifield in the applicable engine manual.							
	Maximum for Acceleration Takeoff 2 min. (*)	Maximum for Takeoff 5 min. (*)	Maximum Continuous	Maximum continuous (MOD 5089)	Maximum Over-temperature 20 secs.	Starting on ground	Starting in flight	Ground Idle
RB211-535-E4-37	---	877	795	---	897	570	570	---
RB211-535-E4-B-37	---	877	795	---	897	570	570	---
RB211-535-E4-C-37	---	877	795	---	897	570	570	---

(*) Total combined time period for acceleration takeoff not to eceed 5 minutes.

Model	FUEL TEMPERATURES See NOTE 13 Measured at fuel filter outlet		OIL TEMPERATURES		TURBINE COOLING AIR TEMPERATURE
	Maximum for continuous operation	Maximum Transient 15 min. max.	Maximum Unrestricted	Maximum Transient 15 min.	Maximum
RB211-535-E4-37	49 (1)	---	170	---	600
RB211-535-E4-B-37	49 (1)	---	177	---	600
RB211-535-E4-C-37	49 (1)	115	177	---	600

(1) LP pump inlet.

NOTE 3

Fuel and oil pressure limitations kpa (psig)

Model	FUEL PRESSURE		OIL PRESSURE				
	Minimum (1)	Maximum (2)	Normal, between ground / low idle and 70% N3	Normal above 70% N3	Minimum, between groud / low idle and 70% N3	Minimum above 70% N3	Transient minimum 5 min. limit
RB211-535-E4-37	52.42 (5)	379.21 (55)	172.37 to 689.48 (25 to 100)	241.32 to 689.48 (35 to 100)	124.11 at 50% N3 to 172.37 at 70% N3 (18 at 50% N3 to 25 at 70% N3)	172.37 at 70% N3 to 241.32 at 93% N3 or greater (25 at 70% N3 to 35 at 93% N3 or greater)	---
RB211-535-E4-B-37	52.42 (5)	379.21 (55)	172.37 to 689.48 (25 to 100)	241.32 to 689.48 (35 to 100)	124.11 at 50% N3 to 172.37 at 70% N3 (18 at 50% N3 to 25 at 70% N3)	172.37 at 70% N3 to 241.32 at 93% N3 or greater (25 at 70% N3 to 35 at 93% N3 or greater)	---
RB211-535-E4-C-37	52.42 (5)	379.21 (55)	172.37 to 689.48 (25 to 100)	241.32 to 689.48 (35 to 100)	124.11 at 50% N3 to 172.37 at 70% N3 (18 at 50% N3 to 25 at 70% N3)	172.37 at 70% N3 to 241.32 at 93% N3 or greater (25 at 70% N3 to 35 at 93% N3 or greater)	---

(1) Minimum (measured at inlet to LP fuel pump) plus true fuel vapor pressure with vapor / liquid ratio of zero between sea level and 13 716 m (45 000 ft)

(2) Maximum (measured at inlet to LP fuel pump)

NOTE 4

(A) Bleed Air and (B) Power Extraction Limitations

Model	(A) Maximum bleed (percent of gas generator compressor flow) for aircraft services.
RB211-535-E4-37 RB211-535-E4-B-37 RB211-535-E4-C-37	The engine bleed is automatically scheduled from the HP2 and HP6 bleed ports by a switching valve which selects from the appropriate port. The switching valve settings are: HP Compressor: Delivery Pressure (P4) — Sea Level to 31 000 ft. — Above 31 000 ft. 535E4-37: 737.74 kPa (107 psig) — 672.42 kPa (91 psig) 535-E4-B-37: 737.74 kPa (107 psig) — 672.42 kPa (91 psig) 535-E4-C-37: 737.74 kPa (107 psig) — 672.42 kPa (91 psig) Bleed air for nose cowl anti-icing (approximately 1.5 percent compressor flow) is taken from the HP2 port and is included in the maximum bleed flow values quoted for HP2 bleed. (1) HP6 Bleed — Normal Operation — Failure Conditions 535E4-37: 5.5 percent — 9.4 percent 535-E4-B-37: 5.5 percent — 9.4 percent 535-E4-C-37: 5.5 percent — 9.4 percent (2) HP2 Bleed Normal Operation — Low Idle to Changeover Point — Changeover Point to Maximum Continuous — Maximum Continuous to Takeoff 535E4-37: 2.3 percent — 4.8 percent — 2.0 percent 535-E4-B-37: 2.3 percent — 4.8 percent — 2.0 percent 535-E4-C-37: 2.3 percent — 4.8 percent — 2.0 percent Failure Conditions 535E4-37: 2.3 percent — 7.7 percent* — 2.5 percent 535-E4-B-37: 2.3 percent — 7.7 percent* — 2.5 percent 535-E4-C-37: 2.3 percent — 7.7 percent* — 2.5 percent (3) LP Bleed (percent fan flow) — For both normal and failure conditions LP bleed is 1.0 percent between low idle and takeoff.

*5.4 percent at maximum continuous

NOTE 4 (Cont.)

Model	(B) Shaft power extraction limitations Accessory drive provision (continuous power as listed may be extracted under all engine operating conditions).					
	Drive	Rotation	Speed Ratio to HP rotor speed	Torque kg-m (lb-in)		
				Continuous	Maximum Instantaneous	Overhang
RB211-535-E4-37 RB211-535-E4-B-37 RB211-535-E4-C-37	IDG kW (hp)	CCW	0.8660	130.55 (175)	335.7 /5 secs (450 /5 secs)	0.0202 (1.750)
	Tachometer kW (hp)	CCW	0.3953	0.08 (7)	0.576 (50)	---

CW = Clockwise CCW = Counterclockwise

NOTE 5

The ratings are based on static test stand operation under Contions A and B which follow:

	CONDITION A
For All Models	(1) Compressor inlet air at 15° C (59° F) and 76 cm Hg (29.92 in Hg). (2) No aircraft accessory loads or optional air extraction (3) 100% air intake recovery (4) Turbine temperature and engine rotor ratings not exceeded.

Model	CONDITION B				
	Equivalent bare engine thrust (1)		Exhaust nozzle configuration (2)		
	Takeoff kg (lb)	Maximum continuous kg (lb)	T/R Simulator	Fan Nozzle	Jet pipe
RB211-535-E4-37	18 189.05 (40 100)	16 166.03 (35 640)	TR 552	---	JP 552
RB211-535-E4-B-37	19 549.83 (43 100)	16 166.03 (35 640)	TR 552	---	JP 552
RB211-535-E4-C-37	19 549.83 (43 100)	16 166.03 (35 640)	TR 564	---	JP 552

(1) The equivalent bare engine thrust kg (lb) is rated thrust, exclusive of propulsion fan duct and thrust reverser, jet pipe, and portion of the pylon washed by the fan stream.

(2) Includes one configuration each of the three items or an approved equivalent to the same aerodynamic configuaration.

NOTE 6 For the RB211-535E4-37, -535E4-B-37 and -535E4-C-37 models, power setting, power check, and control of the engine output are to be based on Rolls-Royce engine charts included in relevant Operating Instructions (listed in Note 10) regarding Integrated Engine Pressure Ratio (IEPR) or Engine Pressure Ratio (EPR). Pressure probes are included in the engine for this purpose.

NOTE 7 Approved fuels and fuel additives are listed in relevant Operating Instructions as listed in Note 10.

NOTE 8 Life limited parts are identified in relevant Time Limits Manuals as follows:
T-211 (535) - 6RR RB211-535E4, E4-B-37, E4-C-37

NOTE 9 This engine approval includes the bare engine plus thrust reverser, engine mounting feet and links, core engine cowlings, engine accessories, coolers, filters, harness, and instrumentation transmitters as defined in Lists 3 and 5 of the Rolls-Royce Drawing Introduction Sheet (DIS) as listed in Note 10.

NOTE 10 RB211 series manuals and drawing introduction sheets (DIS) approved under BCAR requirements and accepted as equivalent to RBHA/FAR 33.5 requirements

Model	Introduction Sheets (DIS)	Operating instructions	Maintenace Manual	Installaton Manual	Exhaust Nozzle Configuartion	
					Engine	Thrust reverser
RB211-535-E4-37	2015 (2)	F-211(535E4)-B	M211(535)-B	EL 2811A	E-211(535E)-6RR	E-211(535E)-6RR
RB211-535-E4-B-37	2106 (2)	--	--	--	--	--
RB211-535-E4-C-37	2224 (2)	--	D633N193(5)	--	--	--

(1) Intentionaly left blank
(2) Include engine starter
(3) Intentionaly left blank
(4) Intentionaly left blank
(5) Boieng 757 Aircraft Maintenance Manual.

NOTE 11 Approved oils are listed in the relevant Rolls-Royce Operating Instructions (Note 10). Also, oils of the approved types when reclaimed to approved Rolls-Royce standards for the appropriate viscosity grade are approved for use.

NOTE 12 These engines comply with the applicable exhaust emissions and fuel venting requirements of SFAR 27-5 and 40CRF 87.7(b) under exemption 3914 25 January 1984.

NOTE 13 Although acceptable, it is not mandatory that individual engine instruments and red line markings be provided for these fuel temperature limitations, provided that the installer can prove to the aircraft certification authority that these limits are not likely to be exceeded within the approved aircraft operating envelope under reasonably probable fault conditions for each proposed installation.

NOTE 14 Model characteristics of the RB-211 engine series:
The -535E4-37 engine is an increased thrust and improved specific fuel consumption derivative of the -535C-37 and is installed in the Boeing 757 aircraft. The -535E4-37 engine was added on 28 February 1984.
The -535E4-B-37 engine is a derivative of the -535E4-37 with increased maximum takeoff thrust and is installed in the Boeing 757 aircraft. The -535E4-B-37 was added on 22 March 1989.
The -535E4-C-37 engine is similar to the -535E4-B-37, but it incorporates various modifications to permit a takeoff "bump" rating at a range of ambient conditions at an altitude of 620 ft. The -535E4-C-37 was added on 22 June 2001.

NOTE 15 Intentionaly left blank.

NOTE 16 Intentionaly left blank.

NOTE 17 The -535E4-37, -535E4-B-37 and -535E4-C-37 engines comply with FAR 33.77 as introduced by Amendment 33-6.

NOTE 18 Intentionaly left blank.

NOTE 19 The aircraft crew drill for ground starting the -535E4-37, -535E4-B-37 and -535E4-C-37 engines must include a statement that at stabilized low idle, LP rotor speed (N1) must not be below 19.8 percent for the -535E4-37, -535E4-B-37 and -535E4-C-37.

NOTE 20 During flight in icing conditions, the -535E4-37, -535E4-B-37 and -535E4-C-37 engine may be operated satisfactorily at LP rotor speeds (N1) down to low idle. Minimum corresponding N1 at low idle for the -535E4-37, -535E4-B-37 and -535E4-C-37 is 29.5 percent.
On the ground in icing conditions, the engines may be operated satisfactorily at LP rotor speeds down to low idle. Minimum corresponding N1 at low idle is 19.8 percent for the -535E4-37, -535E4-B-37 and -535E4-C-37.

NOTE 21 An optional feature of the -535E4-37, -535E4-B-37 and -535E4-C-37 engine is a supervisory Electronic Engine Control system by which the trimming of fuel is applied through the prime hydromechancial fuel flow regulator. Electronic Engine Control software meets “critical” standard of RTCA DO-178.

NOTE 22 Intentionaly left blank.

NOTE 23 Service bulletins, structural repair manuals, vendor manuals, aircraft flight manuals, overhaul and maintenance manuals which contain a statement that the document is UK CAA approved, are accepted by the CTA and are considered CTA-approved. These approvals pertain to the type design only.

NOTE 24 For the RB211-535 models, the takeoff rating and its associated limitations may be used for up to 10 minutes in the event of engine out contingency, but their use is otherwise limited to not more than 5 minutes.

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