

U.S. DEPARTMENT OF TRANSPORTATION FEDERAL AVIATION ADMINISTRATION TYPE CERTIFICATE DATA SHEET E12EU	TCDS NUMBER E12EU	
	REVISION: 26 DATE: April 25, 2019	
	ROLLS-ROYCE, Deutschland Ltd. & Co. KG	
	MODELS: RB211-22B-02 RB211-22B-02 (MOD 72-8700) RB211-524B-02 RB211-524B-B-02 RB211-524B2-19 RB211-524B2-B-19 RB211-524B3-02 RB211-524B4-02 RB211-524B4-D-02 RB211-524C2-19 RB211-524C2-B-19	
	RB211-524D4-19 RB211-524D4-39 RB211-524D4-B-19 RB211-524D4-B-39 RB211-524D4X-19 RB211-524D4X-B-19 RB211-535C-37 RB211-535E4-37 RB211-535E4-B-37 RB211-535E4-B-75 RB211-535E4-C-37	

Engines of models described herein conforming with this data sheet (which is part of Type Certificate Number E12EU) 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 (TC) HOLDER: Rolls-Royce, Deutschland Ltd. & Co. KG
Eschenweg 11, 15827 Blankenfelde-Mahlow, German

TYPE CERTIFICATE (TC) RECORD: Rolls-Royce, plc transferred to TC E12EU
Rolls-Royce, Deutschland on February 21, 2019

TYPE (For all models)

High bypass turbofan, three shaft. Single-stage low pressure fan driven by three-stage turbine. Seven-stage intermediate pressure compressor (see exceptions noted immediately below) driven by single stage turbine. Six-stage high pressure compressor driven by single stage turbine. Annular combustion chamber.

Exceptions: Models RB211-535C, -535E4, -535E4-B, and -535E4-C have a six-stage intermediate pressure compressor.

I. MODELS (See NOTES 1, 2, 5, and 10, For Models RB211-22C & RB211-524-02, see NOTE 15)	RB211-22B-02	RB211-22B-02 (MOD 72-8700)	RB211-524B-02, 524B-B-02	RB211-524B3-02, 524B4-02, 524B4-D-02
RATINGS				
Maximum continuous thrust pounds At sea level static	40,140 ISA+9° to 25,000 ft or to 26,000 ft at Mach numbers 0.5 to 0.6 ISA+13° above	--	44,780 ISA+9° to 25,000 ft ISA+10° above	-- --
Takeoff (5 minutes) thrust pounds At sea level static	41,030 ISA+13.9°	42,670 (1) --	49,120 --	49,120 (2) --

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LEGEND: "--" INDICATES "SAME AS PRECEDING MODEL"
"---" NOT APPLICABLE

1. ISA+8.4°C up to 5,600 feet, reducing linearly to 41,030 thrust pounds at ISA+13.9°C and 10,000 feet
2. RB211-524B4-D-02 only: 49,120 thrust pounds at ISA+17.8°C up to 5,000 feet.

I. MODELS (Continued) (See NOTES 1, 2, 5, and 10, For Models RB211-22C & RB211-524-02, see NOTE 15)	RB211-524B2-19, 524B2-B-19	RB211-524C2-19, 524C2-B-19		
RATINGS				
Maximum continuous thrust pounds At sea level static	44,780 ISA+9° to 25,000 ft ISA+10° above	46,120 --		
Takeoff (5 minutes) thrust pounds At sea level static	49,120 ISA+13.9°	50,600 --		

II. MODELS (See NOTES 1, 2, 5, and 10, For Models RB211-22C & RB211-524-02, see NOTE 15)	RB211-524D4-19, 524D4-39, 524D4-B-19, 524D4-B-39	RB211-524D4X-19, 524D4X-B-19	RB211-535C-37	RB211-535E4-37
RATINGS				
Maximum continuous thrust pounds At sea level static	47,320 ISA+10°C	--	33,500 --	35,205 --
Takeoff (5 minutes) thrust pounds At sea level static (See Note 24)	51,980 (3) ISA+15°	52,810 (3) --	36,720 (4)	39,610 (5)
	<ol style="list-style-type: none"> 3. RB211-524D4-19, -524D4-B-19, -524D4X-19, -524D4X-B-19 only: 53,460 thrust lbs. up to 2,000 ft., ISA+11.2°C 4. ISA+13.9° up to 3,400 ft., and between 10,000 ft. and 15,000 ft. ISA+17.2° between 5,000 ft. and 9,000 ft. with linear variations between 3,400 ft. and 5,000 ft and 9,000 ft. and 10,000 ft. 5. ISA+13.9° up to 10,000 ft. ISA+20° between 12,500 ft. and 15,000 ft. with linear variations between 10,000 ft. and 12,500 ft. 			

II. MODELS (Continued) (See NOTES 1, 2, 5, and 10, For Models RB211-22C & RB211-524-02, see NOTE 15)	RB211-535E4-B-37, 535E4-B-75	RB211-535E4-C-37		
RATINGS				
Maximum continuous thrust pounds At sea level static	35,205 ISA+10°C	35,205 ISA +10°C		
Takeoff (5 minutes) thrust pounds At sea level static (See Note 24)	42,540 (6)	42,540 (7)		
	<ol style="list-style-type: none"> 6. RB211-535E4-B-37/-535E4-B-75: ISA+10° at sea level, linear variation between ISA+10°C and ISA+13.9°C between sea level and 4,000 ft, ISA +13.9°C between 4,000ft and 10,000ft, linear variation between ISA +13.9°C and 20°C between 10,000ft and 12,500ft. 7. ISA +12.5°C at sea level, linear variation between ISA +12.5°C and ISA +16.2°C between sea level and 420ft, ISA + 16.2°C between 420ft and 820ft, linear variation between ISA +16.2°C and ISA +12.9°C between 820ft and 1,200ft, linear variation between ISA +12.9°C and ISA +13.9°C between 1,200ft and 4,000ft, ISA +13.9°C between 4,000ft and 10,000ft, linear variation between ISA +13.9°C and ISA +20°C between 10,000ft and 12,500ft, ISA +20°C between 12,500ft and 15,000ft. 			

MODELS / Group 1	RB211-22B-02, 22B-02 (MOD 72-8700)	RB211-524B-02, 524B-B-02	RB211-524B3-02	RB211-524B4-02, 524B4-D-02	RB211-524B2-19, 524B2-B-19	RB211-524C2-19, 524C2-B-19
FUEL (see NOTE 7)						
Fuel control						
Lucas type	FFR 101	FFR 103	FFR 104	--	FFR 102	--
Woodward type	---	---	---	---	---	---
Fuel pump						
Lucas type	PAC 101	PAC 102	--	--	--	--
OIL (see NOTE 11)						
Tank capacity (U.S. pints nominal)	51.0	45.6	--	--	57.3	--
Usable oil (U.S. pints minimum) (includes altitude effects)	39.0	33.0	--	--	47.5	--
IGNITION SYSTEM						
Two igniter units						
Rotax type	NB10605	--	--	--	--	--
Simmonds type	---	---	---	---	---	---
Two igniter plugs						
Auburn type	YA 211-19	--	--	--	--	--
Champion type	CH34157B	--	--	--	--	--
PRINCIPLE DIMENSIONS, in.						
Length						
Front of nose to end of jet pipe nozzle	204.33	179.0	189.2	--	180.4	--
Width						
Maximum over fan casing	96.0	95.0	--	--	--	--
Height						
From lowest point on gearbox to top face of engine mounting pad	105.8	107.6	--	--	--	--
Center of Gravity						
Aft of engine front suspension center line	31.4	30.2	30.5	31.2	30.2	30.3
WEIGHT, lbs.	10,326	10,154	11,000	11,148	11,154	11,199
NOTES	1-16	1-15	--	--	1-14, 16, 22	1-14, 22

MODELS / Group 2	RB211-524D4-19, 524D4-B-19, 524D4-39, 524D4-B-39	RB211-524D4X-19, 524D4X-B-19	RB211-535C-37	RB211-535E4-37	RB211-535E4-B-37, 535E4-B-75, 535E4-C-37
FUEL (see NOTE 7)					
Fuel control					
Lucas type	FFR 105	--	---	---	---
Woodward type	---	---	8062-701	8062-514	8062-540(E4-B only) 8062-553 (C-37 only),
Fuel pump					
Lucas type	PAC 102	--	LP BPU 200	--	--
OIL (see NOTE 11)					
Tank capacity (U.S. pints nominal)	57.3	--	40.8	--	--
Usable oil (U.S. pints minimum) (includes altitude effects)	47.5	--	40.6	38.4	--
IGNITION SYSTEM					
Two igniter units					
Rotax type	NB10605	--	---	---	---
Simmonds type	---	---	49.731	--	--(E4-B only)
Unison type	---	---	---	---	430152(C-37 only,)
Two igniter plugs					
Auburn type	YA 211-19	--	--	--	--(E4-B only)
Champion type	CH34157B	--	--	---	CH34743(C-37 only)
PRINCIPLE DIMENSIONS, in.					
Length					
Front of nose to end of jet pipe nozzle	189.8	--	180.1	198.2	--
Width					
Maximum over fan casing	95.0	--	87.25	89.6	--
Height					
From lowest point on gearbox to top face of engine mounting pad	107.6	--	95.0	95.1	--
Center of Gravity					
Aft of engine front suspension center line	31.1	--	29.5	28.7	--
WEIGHT, lbs.	11,195	--	7,680	7,603	--
NOTES	1-14, 22	--	1-14, 17-21	--	--

CERTIFICATION BASIS (All models except RB211-535E4-C-37) FAR 21.29 and FAR 33, effective February 1, 1965, as amended by FAR 33-1 through 33-3 and Special Condition No. 33-39-EU-9.

Pursuant to FAR 21.29(a)(ii), Type Certificate E12EU was applied for on June 5, 1969 and issued on February 25, 1972, 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 FAR 33 regulations as follows:

BCAR Section C. Issue 6, dated June 15, 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.

(RB211-535E4-C-37) FAR 21.29 and FAR 33, effective February 1, 1965, as amended by FAR 33-1 through 33-3, FAR 33.73 Amendment 4, FAR 33.17 Amendment 6, FAR 33.75 Amendment 6, and FAR 34, effective September 10, 1990, as amended by FAR 34-1 through 34-3.

The United Kingdom Civil Aviation Authority originally type certificated this engine. The FAA validated this product under U.S. Type Certificate Number E12EU. Effective September 28, 2003, the European Aviation Safety Agency (EASA) began oversight of this product on behalf of UK.

IMPORT REQUIREMENTS To be considered eligible for installation on U.S. registered aircraft, each new engine to be exported to the United States with Civil Aviation Authority of United Kingdom or EASA airworthiness approval shall have a Joint Aviation Authorities (JAA) or EASA Form 1, Authorized Release Certificate. The JAA or EASA Form 1 should state that the engine conforms to the type design approved under the U.S. Type Certificate E12EU, is in a condition for safe operation and has undergone a final operational check.

To be considered eligible for installation on U.S. registered aircraft, each engine to be exported to the United States must comply with the following Rolls-Royce service bulletins, approved by the United Kingdom Civil Aviation Authority as Airworthiness Directives:

Service Bulletin	UK CAA AD Number	UK CAA AD Approval Date
RB.211-73-5184	CAA AD 019-03-81	February 20, 1981
RB.211-72-A6820	CAA AD 006-05-82	March 31, 1982
RB.211-72-5201	CAA AD 0037 PRE 80	May 11, 1982
RB.211-73-4305	CAA AD 0030 PRE 80	September 19, 1984
RB.211-73-3673	CAA AD 0025 PRE 80	September 19, 1984
RB.211-71-7383	CAA AD 010-05-84	August 30, 1988
RB.211-71-9270	CAA AD 014-03-90	March 6, 1990
RB.211-78-9274	CAA AD 019-10-90	September 3, 1990
RB.211-71-9546	CAA AD 003-07-92	April 30, 1992
RB.211-72-8963	CAA AD 010-01-90	February 20, 1997
RB.211-78-9574	CAA AD 007-06-92	July 12, 2001
RB.211-71-9276	CAA AD 002-07-92	July 12, 2001

Additional guidance is contained in FAA Advisory Circular 21-23, "Airworthiness Certification of Civil Aircraft, Engines, Propellers, and Related Products Imported into the United States.

NOTES

NOTE 1.

ROTOR SPEED LIMITATIONS / PERCENT (See Note 24)

MODELS: RB211-	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
22B-02	3,900 rpm	99.5	101.0	101.3/30	103.0	21.0/23.3
22B-02 (MOD 72-8700)	3,900 rpm	--	--	--	--	--
524B-02	3,900 rpm	103.0	103.0	90.0/60	104.0	22.5/23.5
524B-B-02	3,900 rpm	--	--	--	--	--
524B3-02	3,900 rpm	--	--	--	--	--
524B4-02	3,900 rpm	--	--	--	--	--
524B4-D-02	3,900 rpm	--	--	--	--	--
524B2-19	3,900 rpm	--	--	--	--	22.0/23.5
524B2-B-19	3,900 rpm	--	--	--	--	--
524C2-19	3,900 rpm	104.0	103.0	--	105.0	--
524C2-B-19	3,900 rpm	--	--	--	--	--
524D4-19	3,900 rpm	104.4	103.7	--	106.0	22.6/24.1
524D4-B-19	3,900 rpm	--	--	--	--	--
524D4-39	3,900 rpm	--	--	--	--	--
524D4-B-39	3,900 rpm	--	--	--	--	--
524D4X-19	3,900 rpm	--	--	--	--	--
524D4X-B-19	3,900 rpm	--	--	--	--	--
MODELS: RB211-	N1 100%= rpm	Takeoff 5 minutes	Maximum Continuous	Maximum for Reverse Thrust per./sec.	Transient 20 seconds	Ground Idle(*) Min/Max
535C-37	4,500 rpm	110.0	108.5	100.0/60	111.0	See NOTE 19
535E4-37	4,500 rpm	108.8	108.4	84.3/40	110.0	--
535E4-B-37	4,500 rpm	--	--	--	--	--
535E4-B-75	--	--	--	--	--	--
535E4-C-37	--	--	--	--	--	--
(*) Ground idle varies with O.A.T; see Rolls-Royce Operating Instructions						

MODELS: RB211-	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
22B-02	102.5	101.5	106.0	95.0	93.7	94.2	96.2
22B-02 (MOD 72-8700)	--	--	--	--	--	---	--
524B-02	106.0	102.0	107.0	97.0	94.5	---	98.3
524B-B-02	--	104.0	--	98.3	96.3	---	99.3
524B3-02	--	102.0	--	97.0	94.5	---	98.3
524B4-02	107.0	103.5	108.0	97.5	95.3	---	98.5
524B4-D-02	106.0	102.0	107.0	97.0	94.5	---	98.3
524B2-19	--	102.0	--	96.5	93.7	---	98.3
524B2-B-19	--	104.0	--	98.4	96.3	---	99.4
524C2-19	--	102.5	--	97.1	94.4	---	98.3
524C2-B-19	--	104.0	--	98.6	96.3	---	99.6

524D4-19	--	103.0	--	97.5	95.2	---	98.9
524D4-B-19	--	--	--	98.6	96.5	---	99.6
524D4-39	--	--	--	97.5	95.2	---	98.9
524D4-B-39	--	--	--	98.0	95.7	---	99.0
524D4X-19	--	--	--	97.5	95.2	---	98.9
524D4X-B-19	--	--	--	98.6	96.5	---	99.6
535C-37	101.9	99.3	102.9	94.6	93.0	---	95.6
535E4-37	100.3	98.0	101.3	99.0	95.8	---	100.2
535E4-B-37	--	--	--	--	--	---	--
535E4-B-75	--	--	--	--	--	---	--
535E4-C-37	100.7	--	102.3	--	--	---	--
535E4-C-37-37(with SB RB.211-73-D716)	101.7	--	103.3	99.7	--	--	101.5

NOTE 2. TEMPERATURE LIMITATIONS / DEGREES CENTIGRADE (See Note 24)

NOTE 2. TEMPERATURE LIMITATIONS / DEGREES CENTIGRADE (See Note 24)

MODELS: RB211-	TURBINE GAS TEMPERATURES							
	Indicated temperatures measured at the low pressure NGV when fitted with the approved ballast resistor specified 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
22B-02	738	728	700	710	750	550	550	460
22B-02								
(MOD 72-8700)	--	--	--	---	--	--	--	--
524B-02	---	785	732	---	800	600	--	---
524B-B-02	---	--	--	---	--	--	--	---
524B3-02	---	--	--	---	--	--	--	---
524B4-02	---	--	--	---	--	--	--	---
524B4-D-02	---	--	--	---	--	--	--	---
524B2-19	---	--	--	---	--	--	--	---
524B2-B-19	---	--	--	---	--	--	--	---
524C2-19	---	--	--	---	--	--	--	---
524C2-B-19	---	--	--	---	--	--	--	---
524D4-19	---	--	722	---	--	--	--	---
524D4-B-19	---	--	722	---	--	--	--	---
524D4-39	---	--	722	---	--	--	--	---
524D4-B-39	---	--	722	---	--	--	--	---
524D4X-19	---	--	722	---	--	--	--	---
524D4X-B-19	---	--	722	---	--	--	--	---
535C-37	---	850	795	---	870	570	570	---
535E4-37	---	--	--	---	--	--	--	---
535E4-B-37	---	877	--	---	897	--	--	---
535E4-B-75	---	--	--	---	--	--	--	---
535E4-C-37	---	--	--	---	--	--	--	---

(*) Total combined time period for acceleration takeoff and takeoff not to exceed 5 minutes

Note 2. (Continued)

	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
Models: RB211-					
22B-02	95	115	100 (1)		600
22B-02 (MOD 72-8700)	--	--	--		--
524B-02	--	--	170 (2)		--
524B-B-02	--	--	--		--
524B3-02	--	--	--		--
524B4-02	--	--	160		--
524B4-D-02	--	--	--		--
524B2-19	--	--	170		--
524B2-B-19	--	--	--		--
524C2-19	--	--	--		--
524C2-B-19	--	--	--		--
524D4-19	--	--	167		--
524D4-B-19	--	--	--		--
524D4-39	--	--	--		--
524D4-B-39	--	--	--	---	--
524D4X-19	--	--	--	---	--
524D4X-B-19	--	--	--	---	--
535C-37	49(3)	---	160	---	--
535E4-37	--	---	170	---	--
535E4-B-37	--	---	177	---	--
535E4-B-75	--	---	--	---	--
535E4-C-37	--	--	--	--	--
	(1) HP filter outlet (2) Combined scavenge (3) LP pump inlet				

NOTE 3. FUEL AND OIL PRESSURE LIMITATIONS (psig)

	FUEL PRESSURE		OIL PRESSURE				
	Minimum (1)	Maximum (2)	Normal between ground/low idle and 70% N3	Normal above 70% N3	Minimum, between ground/low idle and 70%N3	Minimum above 70% N3	Transient Minimum 5-min. limit
Models: RB211-							
22B-02	5	50	35 to 100	40 to 100	35	35	18
22B-02 (MOD 72-8700)	--	--	--	--	--	--	--
524B-02	--	--	--	--	25	--	--
524B-B-02	--	--	--	--	--	--	--
524B3-02	--	--	--	--	--	--	--
524B4-02	--	--	--	--	--	--	--
524B4-D-02	--	--	--	--	--	--	--
524B2-19	--	55	--	--	--	--	--
524B2-B-19	--	--	--	--	--	--	--

Note 3. FUEL AND OIL PRESSURE LIMITATIONS (psig)
(Continued)

Models: RB211-	FUEL PRESSURE		OIL PRESSURE				
	Minimum(1)	Maximum(2)	Normal between ground/low idle and 70% N3	Normal above 70% N3	Minimum, between ground/low idle and 70%N3	Minimum above 70% N3	Transient Minimum 5-min. limit
524C2-19	--	--	--	--	--	--	--
524C2-B-19	--	--	--	--	--	--	--
524D4-19	--	--	--	--	--	--	--
524D4-B-19	--	--	--	--	--	--	--
524D4-39	--	--	--	--	--	--	--
524D4-B-39	--	--	--	--	--	--	--
524D4X-19	--	--	--	--	--	--	--
524D4X-B-19	--	--	--	--	--	--	--
535C-37	--	--	25 to 100	35 to 100	18 at 50% N3 to 25 at 70% N3	25 at 70% N3 to 35 at 93%N3 or greater	---
535E4-37	--	--	--	--	--	--	---
535E4-B-37	--	--	--	--	--	--	---
535E4-B-75	--	--	--	--	--	--	---
535E4-C-37	--	--	--	--	--	--	---
	1. Minimum (measured at inlet to LP fuel pump) plus true fuel vapor pressure with vapor/liquid ratio of zero between sea level and 45,000 feet. 2. Maximum (measured at inlet to LP fuel pump)						

NOTE 4.**(A) BLEED AIR AND (B) POWER EXTRACTION LIMITATIONS**

FOR MODELS RB211-	(A) Maximum Bleed (percent of gas generator compressor flow) for aircraft services.
22B-02 22B-02 (MOD 72-8700) 524B-02 524B-B-02 524B3-02 524B4-02 524B4-D-02	<p>(1) HP bleed</p> <p>From ground idle to changeover point, 9 percent for normal operation and 12 percent in the event of temporary unbalanced system operation or after an engine or system failure which eliminates bleed flow from the affected engine.</p> <p>Above the changeover point, zero.</p> <p>(2) IP Bleed</p> <p>For normal operation from ground idle to changeover, 1.5 percent; and from changeover to takeoff, 6.5 percent. In the event of temporary unbalanced system operation or after an engine or system failure, 6.5 percent from ground idle to takeoff.</p> <p>HP/IP changeover point is controlled by a switching valve and varies linearly with ambient pressure from 39.5 ± 3 psig IP compressor delivery pressure (P3) at sea level to 22 ± 1.5 psig (P3) at 35,000 feet altitude, with straight line variation above and below 35,000 feet.</p> <p>Bleed air for nose cowl anti-icing, which is approximately 1.5 percent compressor flow, is taken from the IP port and is included in the maximum bleed flow values quoted for IP bleed.</p>

NOTE 4. (Continued)

FOR MODELS RB211-	(A) Maximum Bleed (percent of gas generator compressor flow) for aircraft services.																																							
524B2-19 524B2-B-19 524C2-19 524C2-B-19 524D4-19 524D4-B-19 524D4-39 524D4-B-39 524D4X-19 524D4X-B-19	<p>The engine bleed is automatically scheduled from the engine IP and HP ports by a switching valve which selects from the appropriate port.</p> <p>With switching valve 60B40123-2, bleed air is extracted from the IP delivery port at engine power settings above that giving P4 (HP compressor delivery pressure) greater than 84±3 psig at sea level and 84±4 psig at 30,000 feet altitude, then decreasing linearly with ambient pressure 71±3 psig at 45,000 feet.</p> <p>With switching valve 60B40123-3, bleed air is extracted from the IP delivery port at engine power settings above that giving, at maximum setting, a P4 greater than 89 psig between sea level and 36,000 feet, decreasing linearly to 66 psig at 45,000 feet, and, at minimum setting, 79 psig between sea level and 30,000 feet, decreasing linearly to 56 psig at 45,000 feet.</p> <p>Bleed air for nose cowl anti-icing, which is approximately 1.5 percent compressor flow, is taken from whichever bleed port is supplying air for aircraft service and is included in the maximum flows quoted below:</p> <table><tr><td>(1) HP bleed: From ground idle to changeover point:</td><td>9.0 percent</td></tr><tr><td>(2) IP bleed: Decrease linearly with increase of HP compressor delivery pressure so that bleed is:</td><td></td></tr><tr><td>At the changeover point:</td><td>7.2 percent</td></tr><tr><td>At maximum continuous condition:</td><td>5.0 percent</td></tr><tr><td>At maximum takeoff conditions:</td><td>3.4 percent</td></tr><tr><td>(3) LP bleed (percent fan flow)</td><td></td></tr><tr><td>From ground idle to 93 percent N3 RPM:</td><td>0.5 percent</td></tr><tr><td>At maximum continuous:</td><td>0.4 percent</td></tr><tr><td>From maximum continuous to maximum takeoff:</td><td>0.6 percent</td></tr></table>	(1) HP bleed: From ground idle to changeover point:	9.0 percent	(2) IP bleed: Decrease linearly with increase of HP compressor delivery pressure so that bleed is:		At the changeover point:	7.2 percent	At maximum continuous condition:	5.0 percent	At maximum takeoff conditions:	3.4 percent	(3) LP bleed (percent fan flow)		From ground idle to 93 percent N3 RPM:	0.5 percent	At maximum continuous:	0.4 percent	From maximum continuous to maximum takeoff:	0.6 percent																					
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From ground idle to 93 percent N3 RPM:	0.5 percent																																							
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FOR MODELS RB211-	(A) Maximum Bleed (percent of gas generator compressor flow) for aircraft services.																																							
535C-37 535E4-37 535E4-B-37 535E4-B-75 535E4-C-37	<p>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:</p> <table><tr><td colspan="3">HP Compressor</td></tr><tr><td><u>Delivery Pressure (P4)</u></td><td><u>Sea Level to 31,000 Ft.</u></td><td><u>Above 31,000 Ft.</u></td></tr><tr><td>535C-37:</td><td>94 psig</td><td>75 psig</td></tr><tr><td>535E4-37:</td><td>107 psig</td><td>91 psig</td></tr><tr><td>535E4-B-37:</td><td>107 psig</td><td>91 psig</td></tr><tr><td>535E4-B-75:</td><td>107 psig</td><td>91 psig</td></tr><tr><td>535E4-C-37:</td><td>107 psig</td><td>91 psig</td></tr></table> <p>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.</p> <table><tr><td><u>(1) HP6 Bleed</u></td><td><u>Normal Operation</u></td><td><u>Failure Conditions</u></td></tr><tr><td>535C-37:</td><td>4.0 percent</td><td>10.0 percent</td></tr><tr><td>535E4-37:</td><td>5.5 percent</td><td>9.4 percent</td></tr><tr><td>535E4-B-37:</td><td>5.5 percent</td><td>9.4 percent</td></tr><tr><td>535E4-B-75:</td><td>5.5 percent</td><td>9.4 percent</td></tr><tr><td>535E4-C-37:</td><td>5.5 percent</td><td>9.4 percent</td></tr></table>	HP Compressor			<u>Delivery Pressure (P4)</u>	<u>Sea Level to 31,000 Ft.</u>	<u>Above 31,000 Ft.</u>	535C-37:	94 psig	75 psig	535E4-37:	107 psig	91 psig	535E4-B-37:	107 psig	91 psig	535E4-B-75:	107 psig	91 psig	535E4-C-37:	107 psig	91 psig	<u>(1) HP6 Bleed</u>	<u>Normal Operation</u>	<u>Failure Conditions</u>	535C-37:	4.0 percent	10.0 percent	535E4-37:	5.5 percent	9.4 percent	535E4-B-37:	5.5 percent	9.4 percent	535E4-B-75:	5.5 percent	9.4 percent	535E4-C-37:	5.5 percent	9.4 percent
HP Compressor																																								
<u>Delivery Pressure (P4)</u>	<u>Sea Level to 31,000 Ft.</u>	<u>Above 31,000 Ft.</u>																																						
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535E4-B-37:	107 psig	91 psig																																						
535E4-B-75:	107 psig	91 psig																																						
535E4-C-37:	107 psig	91 psig																																						
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535E4-37:	5.5 percent	9.4 percent																																						
535E4-B-37:	5.5 percent	9.4 percent																																						
535E4-B-75:	5.5 percent	9.4 percent																																						
535E4-C-37:	5.5 percent	9.4 percent																																						

NOTE 4. (Continued)

FOR MODELS RB211- (Cont)	(A) Maximum Bleed (percent of gas generator compressor flow) for aircraft services.			
535C-37 535E4-37 535E4-B-37 535E4-B-75 535E4-C-37	(2) <u>HP2 Bleed</u>	<u>Normal Operation</u>		
		Low Idle to <u>Changeover Point</u>	Changeover Point to <u>Maximum Continuous</u>	Maximum Continuous <u>To Takeoff</u>
	535C-37:	1.5 percent	4.0 percent	2.0 percent
	535E4-37:	2.3 percent	4.8 percent	2.0 percent
	535E4-B-37:	2.3 percent	4.8 percent	2.0 percent
	535E4-B-75:	2.3 percent	4.8 percent	2.0 percent
	535E4-C-37	2.3 percent	4.8 percent	2.0 percent
		<u>Failure Conditions</u>		
	535C-37:	2.3 percent	7.6 percent	2.4 percent
	535E4-37:	2.3 percent	7.7 percent*	2.5 percent
	535E4-B-37:	2.3 percent	7.7 percent*	2.5 percent
	535E4-B-75:	2.3 percent	7.7 percent*	2.5 percent
	535E4-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			

FOR MODEL SERIES	(B) SHAFT POWER EXTRACTION LIMITATIONS Accessory drive provision (continuous power as listed may be extracted under all engine operating conditions)					
RB211-22B- RB211-524-				Torque (lb-in)		
	Drive	Rotation	Speed Ratio to HP Rotor Speed	Continuous	Maximum Instantaneous	Overhang (in-lb)
	Starter	CCW	1.0036	15,300	19,320	800
	IDG	CCW	0.8524	(190 HP)	950 HP 5 secs	1,750
	Tachometer (HP)	CW	0.3958	7	50	---
	Hydraulic Pump (For each of two drives)	CCW	0.3842	1,450	7,250	400
		CW = Clockwise CCW = Counterclockwise				

FOR MODEL SERIES	(B) SHAFT POWER EXTRACTION LIMITATIONS Accessory drive provision (continuous power as listed may be extracted under all engine operating conditions).						
RB211-535-	Drive	Rotation	Speed Ratio to HP Rotor Speed	Torque (lb-in)			
				Continuous	Maximum Instantaneous	Overhang (in-lb)	
	IDG Tachometer (HP)	CCW CCW	0.8660 0.3953	(175 HP) 7	450 HP 5 secs 50	1,750 ---	
RB211-535E4-B-75	Hydraulic Pump (For each of two drives)	CCW	0.3677	1,300	---		400
		--	--	1,600	---		---
	Drive	Rotation	Speed Ratio to HP Rotor Speed	MaxTorque (lb-in)at and above 1,700			
				Static	Overhang (in-lb)	Transient	Starter RPM
	Starter	CCW	0.9942	8,160	800	16,320	6,120
			CW = Clockwise CCW = Counterclockwise				

NOTE 5. The ratings are based on static test stand operation under Conditions A and B which follow.

FOR ALL MODELS:	CONDITION A (1) Compressor inlet air at 59°F and 29.92" Hg. (2) No aircraft accessory loads or optional air extraction (3) 100% air intake recovery (4) Turbine temperature and engine rotor ratings not exceeded				
For Models RB211	Condition B				
	Equivalent Bare Engine Thrust (1)		Exhaust Nozzle Configuration (2)		
	Takeoff (lb)	Maximum Continuous (lb)	T/R Simulator	Fan Nozzle	Jet Pipe
22B-02	42,000	41,130	ATF Sch 4809/TR 502	ATF Sch 4808	ATF 475/JP 505
22B-02 (MOD 72-8700)	43,680	41,130	--	--	--
524B-02	50,000	45,625	ATF Sch 4809/TR 514	LJ 28,580	LJ 30,982/JP 515
524B-B-02	--	--	--	--	--
524B3-02	--	--	ATF Sch 4809/TR 512	LJ 27,530	--
524B4-02	--	--	--	--	--
524B4-D-02	--	--	--	--	--
524B2-19	--	--	--	--	LJ 30,920/JP 512
524B2-B-19	--	--	--	--	--
524C2-19	51,500	47,000	--	--	--
524C2-B-19	--	--	--	--	--
524D4-19	53,000(3)	48,160	TR 525	---	LJ 31,118/JP518
524D4-B-19	53,000(3)	48,160	--	---	--
524D4-39	53,000	48,160	--	---	--
524D4-B-39	--	--	--	---	--
524D4X-19	53,835(3)	48,160	--	---	--
524D4X-B-19	53,835(3)	48,160	--	---	--
535C-37	37,400	34,150	TR 551	---	JP 551
535E4-37	40,100	35,640	TR 552	---	JP 552
535E4-B-37	43,100	35,640	--	---	--
535E4-B-75	--	--	--	---	--
535E4-C-37	--	--	TR 564	---	--
(1) The equivalent bare engine thrust (lbs) 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 configuration (3) 54,500 lbs equivalent thrust for reduced envelope takeoff					

NOTE 6. For the RB211-535E4-37, -535E4-B-37, -535E4-B-75 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 (22B) - 1RR	RB211-22B's
T-211 (524) - 2RR	RB211-524B2, C2, and D4 Series
T-211 (524) - 3RR	RB211-524B, B3, and B4 Series
T-211 (535) - 4RR	RB211-535E4-B-75
T-211 (535) - 5RR	RB211-535C-37
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 FAR 33.5 requirements

For Models RB211					Exhaust Nozzle Configuration	
	Introduction Sheet (DIS)	Operating Instructions	Maintenance Manual	Installation Manual	Engine	Thrust Reverser
22B-02	1004	F-RB211-T	M-211-TRR	EL2605(1)	0-211En-TRR	0-211Tr-TRR
22B-02 (MOD 72-8700)	1004	--	--	--	--	--
524B-02	1068	F-211(524)-T	M-211(524)-T	EL2805 Part A		
524B-B-02	2079	--	--	--	--	--
524B3-02	1088	--	--	--	--	--
524B4-02	1089 (2)	--	--	--	--	--
524B4-D-02	2077 (2)	--	--	--	--	--
524B2-19	1071 (2)	F-211(525)-BSP(3)	M-211(524)-B	EL 2806	B0-211En(524)-T/B	B0-211TR(524)T/B
524B2-B-19	2068	--	--	--	--	--
524C2-19	1093 (2)	F-211(524)-B	M-211(524)-B	EL 2806	0-211En(524)-T/B	0-211TR(524)-T/B
524C2-B-19	2069	--	--	--	--	--
524D4-19	1091 (2)	F-211(524)-BSP(3)	M-211(524)-B	EL 2806	0-211En(524)-T/	0-211TR(524)LW-
524D4-B-19	2070	--	--	--	--	--
524D4-39	2028 (2)	--	--	--	--	--
524D4-B-39	2028 (2)	--	--	--	--	--
524D4X-19	2107	--	--	--	--	--
524D4X-B-19	2108	--	--	--	--	--
535C-37	1094 (4)	F-211(535)-B	M211(535)-B	EL 2811A	E-211(535)-BRR	E-211(535)-BRR
535E4-37	2015 (2)	F-211(535E4)-B	--	--	E-211(535E)-6RR	E-211(535E)-6RR
535E4-B-37	2106 (2)	--	--	--	--	--
535E4-B-75	2142	F-211(535)-Tu	M211(535)-Tu	MISC 2717	E-211(535)-4RR	E-211(535)-4RR
535E4-C-37	2224(2)	F-211(535E4)-B	D633N193(5)	EL2811A	E-211(535)-6RR	E-211(535)-6RR
	(1) Part A, Addendum 1 (2) Includes the engine starter (3) Both F-211(524)-BSP and F-211(524)-B apply to this model (4) For the RB211-535C-37, the build standard for FAA approval is defined by Quick Engine Change (QEC) Number UL10055 or UL20056, or subsequently approved alternatives. These parts lists specify the heated, metallic spinner. (5) Boeing 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 January 25, 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 -22C-02 is the basic model installed in the Lockheed Tristar aircraft. The -22C was added May 23, 1972 and deleted on 04/22/2019. (see NOTE 15). The -22B-02 is an improved performance variant of the -22C-02 with higher limits and maximum continuous thrust. The -22B-02 was added April 4, 1973.

The -524 series of engines are growth versions of the -22B with increased takeoff and maximum continuous ratings achieved by approved temperature capability and efficiency of the HP and IP turbine components and by increased airflow of the core engine.

The -524-02 engine is fitted in the Lockheed Tristar aircraft (NOTE 15). The -524-02 and -524B-19 were added on March 24, 1976, and the -524B-19 engine was deleted on October 16, 1979 (NOTE 16). The -524-02 was deleted on March 22, 1989 (NOTE 16).

The -524B2-19 and -524B2-39 engines incorporate improved performance margins and handling features and are installed in Boeing 747 aircraft. The -524B2-19 engine was added on December 6, 1977. The -524B2-39 engine was added on November 17, 1978.

The -524B-02 engine is a derivative of the -524-02 engine with improved hot day thrust capability and is installed in the Lockheed Tristar aircraft. The -524B-02 engine was added on November 17, 1978.

The -524B3-02 engine is a derivative of the -524B-02 engine with reduced weight and improved specific fuel consumption and is installed in the Lockheed Tristar aircraft. The -524B3-02 was added October 16, 1979.

The -524C2-19 is an updated derivative of the -524B2-19 with an improved HP turbine cooling systems and is installed in the Boeing 747 aircraft.

The -524C2-19 was added on April 25, 1980.

The -524B4-02 engine is a derivative of the -524B3-02 engine with improved specific fuel consumption and is installed in Lockheed Tristar aircraft. The -524B4-02 engine was added on December 24, 1980.

The -524D4-19 and -524D4-39 engines are updated derivatives of the -524C2-19 engine with improved specific fuel consumption and are installed in Boeing 747 aircraft. The -524D4-19 engine was added on June 30, 1981. The -524D4-39 engine was added September 26, 1983.

The -535C-37 engine is a reduced thrust derivative of the -22B and -524 engines with a reduced diameter fan and is installed in the Boeing 757 aircraft. The -535C-37 was added on September 15, 1981.

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 February 28, 1984.

The -524D4-19 and -524D4-B-19 engines may be used at an increased takeoff thrust subject to flat rating specified, within the existing operating limitation. This variation was added on January 22, 1986.

Note 14. (Continued)

The -524B4-D-02 engine may be used at an extended maximum takeoff thrust flat rating specified. This variation was added on August 30, 1987.

The -524B-B-02, -524B2-B-19, -524C2-B019, -524D4-B-19, and -524D4-B-39 models are introduced by the incorporation of Rolls-Royce Modification SB 72-7730, which introduces an improved HP turbine assembly and necessitates a revision to HP and IP speed limitations. these variants were added on August 30, 1987.

The -22B-02 (Mod 72-8700) is a re-rate of the existing -22B-02 model. The new rating increases takeoff performance at lower ambient conditions. This variant was added on June 6, 1988.

The -524-D4X-19 and -524D4X-B-19 engines are mechanically identical to the -524D4-19 and -524D4-B-19 respectively but features a 1.6 percent increase in maximum takeoff thrust over the whole takeoff envelope. These variants were added on March 22, 1989.

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 March 22, 1989.

The -535E4-B-75 engine is similar to the -535E4-B-37 but has installation features to suit the Tupplov TU204 Aircraft. The -535E4-B-75 was added on February 19, 1997.

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 June 22, 2001.

NOTE 15.

There are no -22C or -524-02 engine models in existence. The -22C was retained on this TCDS until April 25, 2019 when it was deleted based on its removal from the UK CAA TCDS as of December 1974 per EASA's April 15, 2019 statement. Therefore, -22C and -524-02 rating limits are not shown. The -22C engines was flat rated to ISA+3.9 degrees at 41,030 pounds; i.e., bare engine equivalent 42,000 lbs. The -22C engine was converted to -22B standard by incorporation of Rolls-Royce Service Bulletin RB211-72-2500. The -524-02 engine was flat rated to ISA+13.9 degrees at 47,140 lbs. (bare engine thrust equivalent 48,000 pounds). The -524-02 engine was converted to -524B-02 standard by incorporation of Rolls-Royce Service Bulletin No. 5232.

NOTE 16.

These engine models are deleted:

Some initial engines were identified as -22 with the same configuration as -22C but performance flat rated to different ambient air temperature. No engines now exist to -22 standard. They were deleted from this TCDS on May 13, 1974.

The -22CA engine was full -22B mechanical standard operated at -22C thrust levels as defined in Rolls-Royce Modification 3001. Some -22CA limits were different from -22B and -22C added April 4, 1973, and deleted on March 24, 1976. All -22CA engines have been converted to -22B models.

The -524B-19 engine model was deleted October 16, 1979. All -524B-19 engines have been converted to -524B2-19 engines.

The -524B2-39 engine model was deleted on August 30, 1987, as none of these engines exist in service. The -524-02 engine model was deleted on March 22, 1989, as all such engines have been converted to the -524B-02 variant.

NOTE 17.

The -535C-37, -535E4-37, -535E4-B-37, -535E4-B-75, and -535E4-C-37 engines comply with FAR 33.77 as introduced by Amendment 33-6.

NOTE 18.

The introduction of SB 75-6556 on the -535C-37 incorporated the Deceleration Detection Unit (DDU) into the Bleed Control Valve Unit (BCVU) and hence provided the ability to functionally check the CCU with the Built-In Test Equipment (BITE) system.

NOTE 19.

The aircraft crew drill for ground starting the -535C-37, -535E4-37, -535E4-B-37, -535E4-B-75, and -535E4-C-37 engines must include a statement that at stabilized low idle, LP rotor speed (N1) must not be below 22.5 percent for the -535C-37 and 19.8 percent for the -535E4-37, -535E4-B-37, -535E4-B-75 and -535E4-C-37.

NOTE 20. During flight in icing conditions, the -535C-37 engine may be operated satisfactorily at LP rotor speeds (N1) down to high idle and the -535E4-37, -535E4-B-37, -535E4-B-75 and -535E4-C-37 down to low idle. Minimum corresponding N1 at high idle for the -535C-37 is 33.5 percent and minimum corresponding low idle for the -535E4-37, -535E4-B-37, -535E4-B-75 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 22.5 percent for the -535C-37 and 19.8 percent for the -535E4-37, -535E4-B-37, -535E4-B-75 and -535E4-C-37.

NOTE 21. An optional feature of the -535C-37, -535E4-37, -535E4-B-37, -535E4-B-75 and -535E4-C-37 engine is a supervisory Electronic Engine Control system by which the trimming of fuel is applied through the prime hydromechanical fuel flow regulator. Electronic Engine Control software meets "critical" standard of RTCA DO-178.

NOTE 22. During flight in icing conditions, the -524B2-19, -524B2-B-19, -524C2-19, -524C2-B-19, -524D4-319, -524D4-B-19 and -524D4-B-39 engines may be operated satisfactorily at LP rotor speeds (N1) down to low idle. Minimum corresponding N1 at low idle for these engines is 22.0 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 22.0 percent for the -524B2-19, -524B2-B-19, -524C2-19, -524C2-B-19 and 22.6 percent for the -524D4-19, -524D4-39, -524D4-B-19, -524D4-B-39, -524D4X-19 and -524D4X-B-19.

NOTE 23. SERVICE INFORMATION:

Each of the documents listed below must state that it is approved by the European Aviation Safety Agency (EASA) or, for approvals made before September 28, 2003 by CAA (UK). Any such documents including those approved under a delegated authority, are accepted by the FAA and are considered FAA approved.

- Service bulletins,
- Structural repair manuals,
- Vendor manuals,
- Aircraft flight manuals, and
- Overhaul and maintenance manuals.
- Technical Variances

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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