

**COMANDO DA AERONÁUTICA
DEPARTAMENTO DE PESQUISAS E DESENVOLVIMENTO
CENTRO TÉCNICO AEROESPACIAL**

TYPE CERTIFICATE DATA SHEET Nº EM-9005

Type Certificate Holder:

ROLLS-ROYCE DEUTSCHLAND LTD & CO KG
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GERMANY

EM-9005-01

Sheet 01

ROLLS-ROYCE

TAY 620-15

TAY 650-15

TAY 611-8

January 2005

Engines of models described herein conforming with this data sheet, which is part of Type Certificate No. 9005, 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 TAY 620-15, TAY 650-15, TAY 611-8

TYPE Dual rotor, axial flow high bypass turbofan, single stage fan, three stage low pressure compressor, twelve stage high pressure compressor, ten cannular combustion chambers, two stage high pressure turbine and three stage low pressure turbine.

RATINGS	Rating at Sea Level:	TAY 620-15	TAY 650-15	TAY 611-8
	Maximum continuous, static thrust, kN (lb)	59.94 (13 475)	62.28 (14 000)	55.25 (12 420)
	Takeoff (5 min.), static thrust, kN (lb)	61.61 (13 850)	67.17 (15 100)	61.61 (13 850)
	Takeoff (10 min. OEI), static thrust, kN (lb)	61.61 (13 850)	67.17 (15 100)	61.61 (13 850)

RATINGS (Cont.)	Components:	TAY 620-15	TAY 650-15	TAY 611-8
	FADEC: EEC Goodrich (1)P/N	N/A	--	--
	Fuel control: Goodrich (1)	CASC501	CASC506	CASC504
	or: Goodrich (1) P/N	CASC512	CASC508	CASC514
	or: Goodrich (1) P/N	#	CASC509	CASC515
	or: Goodrich (1) P/N	#	#	CASC516
	Fuel pump (LP): FR-HitTemp (2) P/N	BP230/6 MK5	--	--
	Fuel pump (HP): Goodrich P/N	GD500	GD501	GD501
	Ignitor Plugs: Smiths P/N	1401/RIG 1	--	--
	or: Smiths P/N	1401/RIG 2	--	--
	or: Champion (3) P/N	Y183-5	--	--
	or: Champion (3) P/N	#	Y183-6	#
	(1) formerly TRW and Lucas			
	(2) formerly Bae Systems & Plessey			
	(3) formerly Auburn			
	Principal Dimensions, mm (in):	TAY 620-15	TAY 650-15	TAY 611-8
	Length, front flange to rear flange	2 407 (94.95)	--	--
	Maximum diameter, encircling diameter	1 796 (70.76)	--	--
	Weight (dry) N (lb)	14 723 (3 310)	15 640 (3 516)	14 479 (3 255)
	Basic engine with all essential accessories necessary for engine operation, but excludes intake, Jet pipe and nozzle assembly and hydraulic pumps. Starter is included for models TAY 620-15, TAY 650-15			
	Center Of Gravity, mm (in):	TAY 620-15	TAY 650-15	TAY 611-8
	Aft front suspension centerline	351 (13.8)	361 (14.2)	351 (13.8)
	Below engine centerline	86 (3.4)	84 (3.3)	74 (2.9)
	Starboard from engine centerline	15 (0.6)	--	10 (0.4)
FUEL TYPE	See NOTE 10			

"--" Same as preceding

Not applicable

OIL LUBRICATION See NOTE 11

OIL CAPACITY 13.6 liter/ 5.1 liter usable

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 LBA Germany (or a third country authority, in case of used engine imported from such country) 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. The CTA type design corresponds to the LBA Germany approved type design, as stated in CTA Report V33-0410-0 dated 31 January 2005 or further revisions

CERTIFICATION BASIS		<u>Model</u>	<u>Application</u>	<u>Issued TC</u>
RBHA 21.29 and RBHA 33 equivalent to FAR 33 effective 01 February 1965, as amended by amendments 33-1 through 33-9 according to RBHA 21.29(a) 1(ii). Type Certificate 9005 was issued in validation of the British Civil Aviation Authority's Certification of Compliance with BCAR Standards, JAR-E change 6, dated 28 August 1981 (BCAR Section C, Issue 13) which were found to provide a level of safety equivalent to the above "Certification Basis".		TAY 620-15	27 July 1990	21 September 1990
		TAY 650-15	27 July 1990	21 September 1990
		TAY 611-8	10 February 2004	31 January 2005

NOTES:

NOTE 1 <u>Maximum permissible engine operating speeds:</u> (see NOTES 8, 14, and 18)			
Model 611-8		100% HP= 12 484 rpm, 100% LP= 8 393 rpm	
Models 620-15 and 650-15		100% HP= 12 136 rpm, 100% LP= 8 393 rpm	
Low Pressure Rotor (N1)	TAY 620-15	TAY 650-15	TAY 611-8
Takeoff (5 min.)	8 100	8 015	8 015
Takeoff (10 min. OEI)	8 100	8 015	8 015
Maximum continuous	8 100	8 015	8 015
Transient (20 sec.)	8 343	8 250	8 250

NOTE 1	High Pressure Rotor (N2)	TAY 620-15	TAY 650-15	TAY 611-8
(Cont.)	Takeoff (5 min.)	12 560	--	12 446
	Takeoff (10 min. OEI)	12 560	--	12 446
	Maximum continuous	12 197	--	12 172
	Transient (20 sec.)	12 937	--	12 809
	Minimum idle, ground and flight	5 813	--	5 818
	Maximum for reverse thrust	11 602	11 310	11 485
NOTE 2	<u>Maximum permissible temperatures:</u> (see NOTE 14)			
	Turbine Gas Temperature	Measured at first stage low pressure turbine nozzle guide vane		
	°C (°F)	TAY 620-15	TAY 650-15	TAY 611-8
	Takeoff (5 min.)	800 (1 472)	850 (1 562)	800 (1 472)
	Takeoff (10 min. OEI)	800 (1 472)	850 (1 562)	800 (1 472)
	Maximum continuous	735 (1 355)	795 (1 463)	715 (1 319)
	Over temperature (20 sec.)	820 (1 508)	870 (1 598)	820 (1 508)
	Starting, ground (2 sec.)	700 (1 292)	740 (1 364)	700 (1 292)
	Starting, inflight (2 sec.)	780 (1 436)	--	--
	Fuel Temperature	Measured at inlet to the high pressure stage of fuel pump (see NOTE 10)		
	°C (°F)	TAY 620-15	TAY 650-15	TAY 611-8
	Continuous operation	90 (194)	95 (203)	90 (194)
	Transient operation (15 min.)	120 (248)	130 (266)	120 (248)
	Oil Inlet Temperature	Measured at oil pump exit (see NOTE 11)		
	°C (°F)	TAY 620-15	TAY 650-15	TAY 611-8
	Continuous operation	105 (221)	--	--
	Transient operation (15 min.)	120 (248)	--	--
NOTE 3	<u>Fuel and oil pressure limits / all models:</u>			
	FUEL	Measured at inlet to low pressure stage of fuel pump		
	Minimum operation	12 psia or 6 psi above tank pressure, which ever is lower, but not less than 2 psig		
	Minimum starting	10 psia		

NOTE 3 (Cont.)	Maximum	40 psig
	OIL	Measured at oil pump exit.
	Minimum for takeoff	30 psig
	Maximum continuous	25 psig
	Idle to 9 500 rpm (1)	16 psig

(1) Oil pressure increase follows a straight line relationship between 9 500 rpm N2 and maximum continuous condition.

NOTE 4 Maximum permissible air bleed extractions:

Compressor air bleed may be used in accordance with Rolls-Royce instruction such that the operating limitations are not exceeded, up to either the individual or combined non-dimensional bleed extraction defined. Bleed air for nose cowl anti-icing is included.

T1 = total temperature at engine intake (°K) M7 = HP stage 7 offtake mass flow (lb/sec) MT = M7 + M12 offtake mass flow (lb/sec)
P1 = total pressure at engine intake (psia) M12 = HP stage 12 offtake mass flow (lb/sec) MF = LP (fan) offtake mass flow (lb/sec)

7 th -stage HPC Bleed $((M7)(T1^{**0.5}))/P1$	TAY 620-15	TAY 650-15	TAY 611-8
Maximum takeoff	7.0	--	--
Maximum continuous and below	7.0	--	--
12 th -stage HPC Bleed $((M12)(T1^{**0.5}))/P1$	TAY 620-15	TAY 650-15	TAY 611-8
Maximum takeoff	#	#	#
Maximum continuous and below	10.0	--	--
HPC Total Bleed $((MT)(T1^{**0.5}))/P1$	TAY 620-15	TAY 650-15	TAY 611-8
Maximum takeoff (a)	7.0	--	--
Maximum continuous and below (b)	10.0	--	--
Fan Bleed $((MF)(T1^{**0.5}))/P1$	TAY 620-15	TAY 650-15	TAY 611-8
Maximum takeoff	10.5	6.5	10.5
Maximum continuous and below	10.5	6.5	10.5

(a) For maximum takeoff, the bleed air may be extracted from 7th stage only.

(b) For maximum continuous, the bleed air may be extracted either from 12th stage or from combination of 7th and 12th stages.

NOTE 5 Basis of Ratings:

Use of the 10-minute one engine inoperative (OEI) takeoff rating is approved for use only in the event of an inoperative engine(s) due to shutdown or failure, and is limited to periods of not more than 10-minutes. Takeoff thrust under normal conditions, i.e. when all engines are operative, is limited to periods of not more than 5-minutes.

Ratings are based on static test stand operation under the following conditions:

- (a) Compressor inlet air at 15°C (59°F) and (29.92 in Hg)
- (b) Rolls Royce test bed flaremeter TA1, TA2 or TA3 (ATF 9476) for the TAY611-8 and 620-15 and TA10 or TA11 (ATF10173) for the TAY 650-15
- (c) Rolls Royce jet pipe/final Nozzle Assembly JP2 or JP3 (ATF 9786) for the TAY 611-8 and TAY 620-15 and TAY 650-15.
- (d) Turbine gas temperature measured by 9 pairs of thermocouples mounted in the first stage low pressure turbine nozzle guide vane (NGV) with ballast resistor, specified in the applicable engine manual.
- (e) No aircraft accessory loads or bleed air extraction
- (f) Turbine gas temperature limits and engine rotor speed limits are not exceeded
- (g) 100% air intake recovery.

NOTE 6 Accessory drive provisions:

Drive	Rotation	Speed Ratio to HP Rotor Speed	Torque (lb.in)		Overhang (in.lb)
			Max. Continuous	Instantaneous	
Starter All models	CW	1.0398	2 592	2 981	153
Main Hydraulic pump 611-8	CCW	0.2615	732	3 000	140
620-15 / 650-15	CCW	0.3397	461	1 455	36
Auxiliary hydraulic pump 620-15 / 650-15	CW	0.3176	176	500	11
IDG 620-15 / 650-15	CW	0.5088	659	4 286	743
AC generator 611-8	CCW	0.8821	500	2 310	250

NOTES: CW = clockwise, looking into the appropriate gearbox face.

CCW = counter-clockwise.

NOTE 7 Thrust setting, thrust check and control of engine output in all operations are to be based on Rolls-Royce engine charts included in the relevant operating instructions. On the hydromechanically controlled engines, pressure ratio (EPR) indication is not reliable as the primary thrust setting parameter due to the EPR probe's susceptibility to icing. N1 thrust setting procedures must be used for the TAY 620-15 model unless the EPR probes are modified in accordance with Rolls-Royce Service Bulletins 75-1036 and 75-1055 or the equivalent and with appropriate EPR thrust setting charts.

NOTE 8 For inflight operation during icing condition, the minimum allowable fan speed (N1) is 21% (1 760 rpm).

NOTE 9 Certain engine parts are life-limited. These parts are listed in time limit section of the relevant engine Manuals. Maintenance is to be carried out in accordance with the manual (see NOTE 12).

NOTE 10 Approved fuels and fuel additives are listed in the appropriate Rolls Royce Operating Instructions (see NOTE 12).
 For the TAY 611-8, minimum fuel temperature measured at inlet to low pressure stage of fuel pump is -40°C (-40°F)
 For the TAY 620-15 and TAY 650-15, minimum fuel temperature measured at inlet to low pressure stage of fuel pump is -50°C (-58°F).

NOTE 11 Approved oils are listed in the appropriate Rolls-Royce Operating Instructions (see NOTE 12). Oils of the approved types when reclaimed to the approved Rolls-Royce standards are approved for use. Minimum oil temperatures, measured at oil pump exit, are as follows:

TAY Model	Minimum Oil Temperature			
	Starting		Acceleration From Idle	
	°C	°F	°C	°F
611-8	-40	-40	-30	-22
620-15 / 650-15	-50	-58	-30	-22

NOTE 12	TAY Model	Operating Instructions	Maintenance Manual	Engine Manual	Installation Manual
	611-8	F-TAY-1RR	M-TAY-1RR	E-TAY-1RR	EL2825
	620-15	F-TAY-2RR	M-TAY-2RR	E-TAY-2RR	EL1716
	650-15	F-TAY-3RR	M-TAY-3RR	E-TAY-3RR	EL2823

NOTE 13 These engines meet the smoke, fuel venting, and gaseous emission requirements of SFAR 27-5 dated 01 January 1984.

NOTE 14 Limits regarding transient rotor shaft overspeed and transient gas temperature and number of occurrence are specified in the appropriate Rolls-Royce Maintenance Manual (see NOTE 12).

NOTE 15 The engines are approved for use to the following ambient temperature in Column 1 and 2 and are flat rated to the values in column 3 and 4.

TAY Model	Maximum Ambient		Flat Takeoff	
	°C	°F	°C	°F
611-8	55	131	30	86
620-15	55	131	30	86
650-15	55	131	30	86

NOTE 16 The maximum inlet throat area of the engines including aircraft air intake is limited to 1500 square inches.

NOTE 17 The maximum engine inlet distortion limit is specified in the appropriate Rolls-Royce Installation Manual (see NOTE 12)

NOTE 18 The limits quoted are relative to the engines equipped with one of the following thrust reverser types.

TAY 611-8: Grumman Aerospace type 1159P41460-1 / -2

TAY 620-15: Grumman Aerospace type 1159P41530-1 / -2 / -9 / -10 and 1159RDP41530-51 / 52.

TAY 650-15: Grumman Aerospace type 1159RDP41530-7 / -8 / -9 / -10.

Approval for operation in reverse thrust does not imply approval of the thrust reversers themselves.

NOTE 19 These engine models incorporate the following general characteristics:

TAY 610-8: Base Engine with Installation features to suit Gulfstream IV series aircraft No longer in service.

TAY 620-15: Same as 610-8, except takeoff and maximum continuous static thrust increase at sea level flat rated to 86°F ambient temperature. Installation features to suit Fokker 70 and Fokker 100 series aircraft.

TAY 611-8: Same as 610-8, except takeoff static thrust increase at sea level flat rated to 86°F ambient temperature. Installation features to suit Gulfstream IV and IV-SP series aircraft.

TAY 650-15: Same as 620-15, except with increased diameter fan, improved combustors, new high pressure turbine blades and vanes, and other minor hardware changes to accommodate higher thrust. Installation features to suit Fokker 100 series aircraft.

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