

European Aviation Safety Agency

EASA TYPE-CERTIFICATE DATA SHEET

Number: E.063

Issue: 03

Date: 30 June 2011

Type: Rolls-Royce Deutschland Ltd & Co KG
Tay series engines

Models

Tay 611-8

Tay 611-8C

Tay 620-15

Tay 650-15

Tay 651-54

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I. General

1. Type/Models:

Type: Tay

Models:

Tay 611-8	Tay 620-15	Tay 650-15	Tay 651-54	Tay 611-8C
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These models are approved for use on multi-engined civil aircraft at the ratings and within the operating limitations specified below, subject to compliance with the installation requirements appropriate to approved installations.

2. Type Certificate Holder:

Rolls-Royce Deutschland Ltd & Co KG
Eschenweg 11, Dahlewitz
15827 Blankenfelde-Mahlow
Germany

EASA Design Organisation Approval No: EASA.21J.065

3. Manufacturer:

Tay 611-8 and Tay 611-8C:
Rolls-Royce Deutschland Ltd & Co KG
Eschenweg 11, Dahlewitz
15827 Blankenfelde-Mahlow
Germany

Tay 611-8, Tay 620-15, Tay 650-15, Tay 651-54 and Tay 611-8C:
Rolls-Royce plc
P.O. Box 31
Derby, DE24 8BJ
United Kingdom

4. Certification Application Date:

Tay 611-8	Tay 620-15	Tay 650-15	Tay 651-54	Tay 611-8C
29 July 1987 (CAA-UK)	26 April 1983 (CAA-UK)	13 February 1986 (CAA-UK)	14 May 1990 (CAA-UK)	12 December 2001 (LBA)

5. Certification Reference Date:

26 April 1983

6. Certification Date:

Tay 611-8	Tay 620-15	Tay 650-15	Tay 651-54	Tay 611-8C
23 September 1987 (CAA-UK)	24 June 1986 (CAA-UK)	21 June 1988 (CAA-UK)	26 March 1992 (CAA-UK)	3 December 2002 (LBA)

II. Certification Basis

1. Tay 611-8, Tay 620-15, Tay 650-15, Tay 651-54, Tay 611-8C:

Tay 611-8	Tay 620-15	Tay 650-15	Tay 651-54	Tay 611-8C
<u>Airworthiness and Environmental Protection Requirements:</u>				
<ul style="list-style-type: none"> JAR-E, Change 6 Emissions: ICAO Annex 16, Volume II, First Edition, 1981 			<ul style="list-style-type: none"> JAR-E, Change 6 JAR-E, Change 10, E20 and E25 JAR-E, Change 10 for all new parts of the engine control system and its associated accessories ICAO Annex 16, Volume II, Second Edition, July 1993 – Emissions and venting Later compliance has been shown with CS-34 iaw ICAO Annex 16, Volume II, Third Edition 2008 incl. Amendment 6 – Aircraft Engine Emissions (approved 29.06.2011) 	
<u>Special Conditions:</u>				
<ul style="list-style-type: none"> Blue Paper C798, C3-4, 6.6.4 – “Endurance Tests, Temperatures (Hot Oil Running)” 			<ul style="list-style-type: none"> JAR-E790 at Change 10, Ingestion of Rain and Hail JAR-E540 and E800 at Amendment 11, Bird Strike / Ingestion JAR-E530(f) at Change 10 and AMJ 20X-1, EEC Fire & Overheat Protection 	
<u>Deviation:</u>				
				<ul style="list-style-type: none"> JAR-E, Change 6, C3-4, Paragraph 24.1, Engine Calibration in Reverse Thrust
<u>Equivalent Safety Findings:</u>				
				<ul style="list-style-type: none"> JAR-E, Change 6, C3-4, Paragraph 6, 150 hour Endurance Test JAR-E, Change 6, C3-4, Paragraph 2.2.1 and JAR-E, Change 10, E640(b)(1), Static Pressure Tests JAR-E, Change 6, C3-4, Paragraph 22, Compressor and Turbine Rotor Integrity Tests

III. Technical Characteristics

1. Type Design Definition:

The Engine Type Designs are defined in the following Drawing Introduction Sheets (DIS):

Tay 611-8	Tay 620-15	Tay 650-15	Tay 651-54	Tay 611-8C
DIS 2078 ISSUE 1 or later approved issues	DIS 2038 ISSUE 2 or later approved issues	DIS 2075 ISSUE 2 or later approved issues	DIS 2128 ISSUE 5 or later approved issues	DIS 2226 ISSUE 03 or later approved issues

Changes to the Engine Type Design are introduced by approved Modification Bulletins.

2. Description:

Tay 611-8	Tay 620-15	Tay 650-15	Tay 651-54	Tay 611-8C
By-pass turbo-fan engine consisting of one single stage low pressure (LP) fan with a three-stage axial flow intermediate pressure (IP) compressor, twelve-stage axial flow high pressure (HP) compressor, tubo-annular combustion chamber with 10 flame tubes, two-stage axial flow high pressure (HP) turbine, three-stage axial flow low pressure (LP) turbine				

3. Equipment:

Approved equipment is listed in the following Documents:

Tay 611-8	Tay 620-15	Tay 650-15	Tay 651-54	Tay 611-8C
DIS 2078 ISSUE 1 or later approved issues	DIS 2038 ISSUE 2 or later approved issues	DIS 2075 ISSUE 2 or later approved issues	DIS 2128 ISSUE 5 or later approved issues	DNS 73078 E-TR914/02 ISS01 or later approved issues

4. Dimensions:

	Tay 611-8	Tay 620-15	Tay 650-15	Tay 651-54	Tay 611-8C
Overall Length	2407 mm				
Maximum Diameter	1796 mm				

5. Dry Weight:

	Tay 611-8	Tay 620-15	Tay 650-15	Tay 651-54	Tay 611-8C
Dry engine weight	1476 kg	1501 kg	1595 kg	1628 kg	1538 kg

6. Ratings:

	Tay 611-8	Tay 620-15	Tay 650-15	Tay 651-54	Tay 611-8C
Take off	61,61 kN		67,17 kN	68,50 kN	61,61 kN
Maximum Continuous	55,25 kN	59,94 kN	62,28 kN	62,28 kN	55,25 kN

See Note VI.3

7. Control System:

	Tay 611-8	Tay 620-15	Tay 650-15	Tay 651-54	Tay 611-8C
Type	Hydomechanical Control System				FADEC Control System
Part Number	Lucas CASC 504, or later approved standards	Lucas CASC 501, or later approved standards	Lucas CASC 506, or later approved standards	Lucas CASC 510, or later approved standards	TEEC2000-04-AE, or later approved standards

8. Fluids

Approved Oils, Fuels and Additives are listed in:

	Tay 611-8	Tay 620-15	Tay 650-15	Tay 651-54	Tay 611-8C
Operating Instructions	F-TAY-1RR	F-TAY-2RR	F-TAY-3RR	F-TAY-5RR	F-TAY-6RR

9. Aircraft Accessory Drives:

Tay 611-8C	Gear Ratio (HP rotor)	Direction of Rotation	Static Overhang Moment Nm (in.lb)	Shear Neck Torque Value Nm (in.lb)	Continuous Torque Nm (in.lb)
Hydraulic Pump	0.26146	Counter Clockwise	15.8 (140)	339 (3000)	82.7 (732)
IDG	0.5088	Clockwise	83.9 (743)	807 (7140)	74.5 (659)
Starter	1.0398	Clockwise	17.3 (153)	337 (2981)	292.9 (2592)

The direction of rotation is given looking on to the appropriate gearbox drive facing.

10. Maximum Permissible Air Bleed Extraction:

The compressor air bleeds may be used in accordance with the table providing that this does not result in any operating limitations being exceeded.

Maximum air delivery for aircraft services shall be such that the individual or total non-dimensional bleed flows listed are not exceeded.

Tay 611-8	HP Comp.St.7 $\frac{M7\sqrt{T1}}{P1}$	HP Comp.St.12 $\frac{M12\sqrt{T1}}{P1}$	HP Comp.Total $\frac{M_T\sqrt{T1}}{P1}$	Fan Delivery $\frac{M_F\sqrt{T1}}{P1}$
Take-off	0,46 (7,0)	N/A	N/A	0,69 (10,5)
Max. Continuous and below	0,46 (7,0)	0,66 (10)	0,66 (10)	0,69 (10,5)

Tay 620-15 Tay 650-15	HP Comp.St.7 $\frac{M7\sqrt{T1}}{P1}$	HP Comp.St.12 $\frac{M12\sqrt{T1}}{P1}$	HP Comp.Total $\frac{M_T\sqrt{T1}}{P1}$
Take-off	0,46 (7,0)	N/A	N/A
Max. Continuous and below	0,46 (7,0)	0,66 (10)	0,66 (10)

Tay 651-54	HP Comp.St.7 $\frac{M7\sqrt{T1}}{P1}$	HP Comp.St.12 $\frac{M12\sqrt{T1}}{P1}$	HP Comp.Total $\frac{M_T\sqrt{T1}}{P1}$	Fan Delivery $\frac{M_F\sqrt{T1}}{P1}$
Take-Off	0,64 (9,69)	N/A	N/A	0,95 (14,51)
Max. Continuous and below	0,60 (9.1)	0,85 (12.9)	0,85 (12.9)	0,92 (13,94)

Tay 611-8C	HP Comp.St.7 $\frac{M7\sqrt{T1}}{P1}$	HP Comp.St.12 $\frac{M12\sqrt{T1}}{P1}$	HP Comp.Total $\frac{M_T\sqrt{T1}}{P1}$	Fan Delivery $\frac{M_F\sqrt{T1}}{P1}$
Take-off (Normal Operation)	0,46 (7.0)	N/A	N/A	0,69 (10.5)
Max. Continuous and below (Normal Operation)	0,46 (7.0)	0,45 (6.9)	0,66 (10.0)	0,69 (10.5)
Take-off (Single Engine Operation)	0,60 (9.1)	0,25 (3.8)	0,85 (12.9)	0,69 (10.5)
Max. Continuous and below (Single Engine Operation)	0,60 (9.1)	0,73 (11.1)	1,33 (20.2)	0,69 (10.5)

T₁= Total temperature at engine intake (°K)

P₁= Total pressure at engine intake kPa (psia)

M₇= Stage 7 bleed mass flow kg/s (lb/s)

M₁₂= Stage 12 bleed mass flow kg/s (lb/s)

M_T= M₇ + M₁₂ kg/s (lb/s)

M_F = Fan take-off mass flow kg/s (lb/s)

IV. Operating Limitations:

1. Temperature Limits

The engine is approved for use up to:

	Tay 611-8	Tay 620-15	Tay 650-15	Tay 651-54	Tay 611-8C
The engine is approved for use up to:	ISA + 40°C			ISA + 35°C	see IV.5 Installation Assumptions
The engine is flat-rated for Take-off to:	ISA + 15°C				

Turbine Gas Temperatures (indicated)	Tay 611-8	Tay 620-15	Tay 650-15	Tay 651-54	Tay 611-8C
Starting on ground*	700°C		740°C		700°C
Starting in flight*	780°C				
Take-off**	800°C		850°C	865°C	800°C
Maximum Continuous	715°C	735°C	795°C		715°C
Maximum Overtemperature (20 sec.)	820°		870°C	885°C	820°C

* Time limited as defined in the Maintenance Manuals (see section V)

** Limited to 5 minutes and to max. 10 minutes after one engine has failed

Fuel Temperatures:	Tay 611-8	Tay 620-15	Tay 650-15	Tay 651-54	Tay 611-8C
LP Pump Inlet, minimum	N/A				-40°C
LP Pump Inlet, maximum	54°C				
HP Pump Inlet, Unrestricted	90°C		95°C		
HP Pump Inlet, Transient (15 min Limit)	120°C		130°C		

Oil Temperatures:	Tay 611-8	Tay 620-15	Tay 650-15	Tay 651-54	Tay 611-8C
Minimum for Starting	-40°C	-50°C		-40°C	
Minimum for Acceleration for Take-off	-30°C				
Maximum for unrestricted use	105°C				
Maximum Transient (15 min limit)	120°C				

2. Permissible Rotational Speeds

Low Pressure Rotor (N1):	Tay 611-8	Tay 620-15	Tay 650-15	Tay 651-54	Tay 611-8C
Maximum Take-off	8015rpm (95,5%)	8100rpm (96,5%)	8015rpm (95,5%)		
Maximum Continuous	8015rpm (95,5%)	8100rpm (96,5%)	8015rpm (95,5%)		
Minimum in Flight	N/A				1770rpm (21,1%)
Minimum on Ground	N/A				1600rpm (19,1%)
Maximum Overspeed (20 sec.)	8250rpm (98,3%)	8343rpm (99,4%)	8250rpm (98,3%)		8100rpm (96,5%)
Reverse Thrust (maximum 30 sec.)	N/A				5457rpm (65%)

Note: 100% N1 rpm = 8393 rpm

High Pressure Rotor (N2):	Tay 611-8	Tay 620-15	Tay 650-15	Tay 651-54	Tay 611-8C
Maximum Take-off	12446rpm (99,7%)	12560rpm (103,5%)		12670rpm (104,4%)	12560rpm (100,6%)
Maximum Continuous	12172rpm (97,5%)	12197rpm (100,5%)			12172rpm (97,5%)
Minimum Low Idle	5818rpm (46,6%)	5813rpm (47,9%)			6130rpm (49,1%)
Maximum Overspeed (20 sec.)	12809rpm (102,6%)	12937rpm (106,6%)			12684rpm (101,6%)
Reverse Thrust (maximum 60 sec.)*	11485rpm (92%)	11935rpm (95,6%)**	11310rpm (93,2%)***	11650rpm (96%)	N/A

Note: 100% N2 rpm = 12484 rpm (Tay 611-8, Tay 611-8C)
100% N2 rpm = 12136 rpm (Tay 620-15, Tay 650-15, Tay 651-54)

* Note: The limit quoted is relative to an engine fitted with:

	Tay 611-8	Tay 620-15	Tay 650-15	Tay 651-54	Tay 611-8C
Thrust Reverser	1159P41460 1/-2 of Grumman Aerospace	1159P41530 -1/-2/-9/-10 or RDP41530-51/-52 of Grumman Aerospace	1159P41530 -7/-8/-9/-10 of Grumman Aerospace	TR6510 of Dee Howard with the engine mounted in the side configuration.	08ND78006-1 (for left hand installation) and 08ND78006-2 (for right hand installation) of Nordam

Note: This approval for operation in Reverse Thrust does not imply approval of the Thrust Reverser itself.

** Note: Tay 620-15: A value of 12136rpm (100%) HP spool speed for reverse thrust operation is applicable to engines with modification 73-1315 incorporated and fitted with thrust reversers identified by aircraft modification number SBPD 9302 (ref: Fokker SBF100-78-010).

*** Note: Tay 650-15: A value of 12039rpm (99,2%) HP spool speed for reverse thrust operation is applicable to engines with modification 73-1315 incorporated and fitted with thrust reversers identified by aircraft modification number SBPD 9302 (ref: Fokker SBF100-78-010).

Operational Limitations:

	Tay 611-8	Tay 620-15	Tay 650-15	Tay 651-54	Tay 611-8C
Static Ground Running and Taxiing			Stabilised operation is not permitted in the Low Pressure rotor speed (N1) range 57% to 75% LP during all static ground running operations in forward thrust, and during taxiing. It is permitted to pass through this range whilst increasing or decreasing thrust.		During static ground running the park brake must be used. For ground checks with the aircraft stationary and during taxiing the use of reverse thrust is limited to idle.
Reverse Thrust			Stabilised operation is not permitted in the Low Pressure rotor speed (N1) range 57% to 75% LP	Stabilised operation at any intermediate position between idle and maximum reverse thrust is prohibited	
Take-off				For take-off, the thrust levers must be initially being set to 1.15 Engine Pressure Ratio (EPR) or below, then set the required take-off EPR between 40 and 80 kts forward speed	
Powerback	The use of powerback is prohibited.				

3. Pressure Limits

Fuel Pressures:	Tay 611-8	Tay 620-15	Tay 650-15	Tay 651-54	Tay 611-8C
Minimum Fuel Inlet Pressure	With the engine running, the minimum requirement is 83 kPa (absolute) (12 Psia) or 41 kPa (6psi) above the tank pressure, whichever is lower. These are subject to an overriding minimum of 14 kPa (gauge) (2 psig). During engine starts the minimum requirement is 69 kPa (absolute) (10psia).				
Maximum Fuel Inlet Pressure	276 kPa above ambient atmospheric pressure (40 psig)				

Oil Pressures:	Tay 611-8	Tay 620-15	Tay 650-15	Tay 651-54	Tay 611-8C
Minimum acceptable for flight:	Low idle to 8500 HP rpm 117 kPa above ambient atmospheric pressure (17psig), linear to 200 kPa above ambient atmospheric pressure (29psig) at 12500 HP rpm				
Minimum to complete flight:	Low idle to 9500 HP rpm 110 kPa above ambient atmospheric pressure (16psig), linear to 172 kPa above ambient atmospheric pressure (25psig) at Maximum Continuous				

4. Oil Capacity

	Tay 611-8	Tay 620-15	Tay 650-15	Tay 651-54	Tay 611-8C
Total Oil System Capacity	13.6 litres (24 imp pts)				
Total Oil Tank Capacity	6.8 litres (12 imp pts)				
Usable Oil	5.1 litres (9 imp pts)				
Max. Oil Consumption	0.355 l/h (0.625 imp pts/h)	0.43 l/h (0.757 imp pts/h)			0.355 l/h (0.625 imp pts/h)

5. Installation Assumptions:

	Tay 611-8	Tay 620-15	Tay 650-15	Tay 651-54	Tay 611-8C
Report	MDR 19800 Issue 2 or later approved issuses	MDR 19926 Issue 4 or later approved issuses	MDR 19757 Issue 2 or later approved issuses	MDR 19577 Issue 1 or later approved issuses	O-TR0817/03 or later approved issuses

Note: The reports define the installation requirements that must be fulfilled by the Aircraft Constructor when installing the engine.

6. Time Limited Dispatch:

For the Tay 611-8C information on engine operation with FADEC system dispatch limitations is contained in the Time Limits Manual T-TAY-6RR chapter 95-20-03.

7. Fuel System Limitations:

Minimum drainage period from closing fuel cock after a false start:

	Tay 611-8	Tay 620-15	Tay 650-15	Tay 651-54	Tay 611-8C
	3min				N/A

V. Operating and Service Instructions:

	Tay 611-8	Tay 620-15	Tay 650-15	Tay 651-54	Tay 611-8C
Installation Manual	EL 2825	EL 1716	EL 2823	EL 2834	N/A
Operating Instructions	F-TAY-1RR	F-TAY-2RR (Fokker 100) F-TAY(70)- 2RR (Fokker70)	F-TAY-3RR	F-TAY-5RR	F-TAY-6RR
Maintenance Manual	M-TAY-1RR	M-TAY-2RR	M-TAY-3RR	M-TAY-5RR	M-TAY-6RR
Engine Manual	E-TAY-1RR	E-TAY-2RR	E-TAY-3RR	E-TAY-5RR	E-TAY-6RR
Time Limits Manual	T-TAY-1RR	T-TAY-2RR	T-TAY-3RR	T-TAY-5RR	T-TAY-6RR
Service Bulletins	As issued by Rolls-Royce Deutschland Ltd & Co KG or before January 2001 by Rolls-Royce plc				

VI. Notes

1. For the Tay 611-8C engine the EEC software has been developed and verified in accordance with RTCA/DO-178B /EUROCAE ED-12B level A.
2. Life limited critical parts are included in the respective Time Limits Manuals.
3. The ratings shown under III. 6 are static ratings achieved at the following conditions:
 - Sea level and ISA standard day conditions
 - Compressor bleeds closed
 - Auxiliary gearbox drives unloaded
 - using slave intakes and jet pipe nozzles as defined in reports:

	Tay 611-8	Tay 620-15	Tay 650-15	Tay 651-54	Tay 611-8C
Test Bed Flaremeter P/No.:	ATFSch15661		ATF 10173		ATFSch10173
Jet Pipe / Final Nozzle Assy, P/No.:	ATF 9786		ATF 9786		BRE010F2386

4. The operating limitations under IV. are only applicable when the accuracy of installed engine instrumentation is in accordance with Rolls-Royce reports or later approved issues:

	Tay 611-8	Tay 620-15	Tay 650-15	Tay 651-54	Tay 611-8C
Report	APS 1049	APS 1042 or APS 1045	APS 1046	APS 1055	E-TR0895/06- ISS01

The operating limitations for temperatures under IV. 1. are only valid when TGT trimming is established in accordance with reports or later approved issues:

	Tay 611-8	Tay 620-15	Tay 650-15	Tay 651-54	Tay 611-8C
Report	O-TR0916/03- ISS01	O-TR0917/02- ISS01	O-TR0918/03- ISS01	O-TR0919/03- ISS01	DHU113605 Issue 2

5. Tay 611-8 and Tay 620-15 were previously covered under CAA-UK Type Certificate Data Sheets 1045 and Tay 650-15 and Tay 651-54 were previously covered under CAA-UK Type Certificate Data Sheets 1047. Tay 611-8, Tay 620-15 and Tay 611-8C were subsequently covered under LBA Engine Type Certificate 6327 and Tay 650-15 and Tay 651-54 were subsequently covered under LBA Type Certificate Data Sheets 6328 prior to being superseded by the EASA Type Certificate and Type Certificate Data Sheet.

6. EASA considers that all Airworthiness Directives (ADs) issued by CAA-UK and LBA-Germany related to these products are still applicable unless EASA replaces or cancels them.

At the time of issuance of Engine Type Certificate Data Sheet Issue 1 the following CAA-UK Airworthiness Directives were applicable. The engine is approved only when these and the associated Mandatory Rolls-Royce Service Bulletins have been complied with.

CAA-UK AD No.	Service Bulletin	Title	Tay 611-8	Tay 620-15	Tay 650-15	Tay 651-54
002-03-88	76-1083R1	Engine controls – Emergency fuel shut down system – Rear cable guide plate in stainless steel	Yes	Yes	N/A	N/A
016-09-87	72-1069	Engine – Nose cone spinner – Inspection of spinner fairing to nose cone spinner radial gaps	N/A	Yes	N/A	N/A
002-02-88	75-1055	Engine – Air tubes and fittings – Introduction of 'non flowing' EPR manifold system and modified pressure rakes	N/A	Yes	N/A	N/A
027-04-90	73-1207	Engine – Fuel and control – Fuel flow regulator – Revised variable metering orifice (VMO) by-pass adjuster	N/A	N/A	Yes	N/A
017-10-90	73-1220	Engine – Fuel and control – Inspection of fuel flow regulator for pilot burner simulator fault	N/A	N/A	Yes	N/A
002-01-99	73-1459	Engine – Fuel and control – Revision of the in-service life of the fuel flow regulator	N/A	N/A	Yes	N/A
003-03-98	76-1434R3	Emergency fuel shut off system – Inspection of emergency fuel shut off cable	N/A	Yes	Yes	Yes
006-04-2000	72-1492	Engine – Auxiliary gearbox assembly	N/A	N/A	N/A	Yes

7. Tay 650-15/10 and Tay 620-15/20 engines are approved configuration specific build standards of the Tay 650-15 and Tay 620-15 engines respectively.
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