UK CIVIL AVIATION AUTHORITY
ENGINE TYPE CERTIFICATION DATA SHEET No. 1052

CANCELLED

Type: BR700-710

Variants: **BR700-710A1-10**

BR700-710A2-20

ISSUE	REASON FOR ISSUE	DATE
1	Initial issue for BR700-710A1-10	02/09/96
2	BR700-710A1-10 Changes to Operational Limitations	10/10/96
3	BR700-710A2-20 added	14/02/07
4	A1 - 10 & A2-20 Various Minor changes	03/02/98
5	BR700-710 A2-20 Changes to: Temperature limit for starting in flight, Min oil Temperature for starting. Rotational speeds, Max oil Consumption, Bleed Extraction. Revision of Type Certificate Holder name and address. Various minor changes	23/05/2000
6	Change of registered office address and company name.	01/03/01
7	Introduce speed band restriction for static ground operation, various corrections	18/11/01

CANCELLED

BR700-710A1-10

1. General:

1.	CAA ETCDS No.	1052 Issue: 7	Date: 18 November 2001
2.	Type/Variant:		BR700-710A1-10
3.	Type Certificate Holder:		Rolls-Royce Deutschland Ltd & Co KG Eschenweg 11 D-15827 Dahlewitz Germany
4.	UK CAA Type Certificate:		096/2
5.	Manufacturer:		Rolls-Royce Deutschland Ltd & Co KG
6.	JAA Certification Application Date:		February 16, 1993
7.	JAA Certification Reference Date:		August 31, 1993
8.	JAA Certification Recommendation Date:		August 14, 1996

9. In this case, the CAA Type Certification has been granted on the basis of a recommendation from the Joint Aviation Authorities (JAA) following an investigation carried out in accordance with JAA Joint Certification Procedures. Accordingly, the JAA Data Sheet No. JAA/E/96-15 Issue 4 dated September 5, 1996 has been used as the basis of this CAA Engine Type Certificate Data Sheet.

II. Certification Basis:

1.	Reference Application Date for CAA Certification:	August 31, 1993
2.	CAA Certification Date:	September 2, 1996
3.	CAA Certification Basis:	Same the JAA Certification Basis specified in paragraphs 4 to 8 below.
4.	JAA Airworthiness Requirements:	JAR-E Change 8 plus Amendment E/91/1 effective May 27, 1991 Amendment E/93/1 effective May 17, 1993

CANCELLED

5.	JAA Special Conditions:	SC1 Ingestion of Rain SC2 Ingestion of Hail
6.	JAA Exemptions:	JAR-E 890(a) Engine Calibration in Reverse Thrust
7.	JAA Equivalent Safety Finding:	JAR-E 840(a)(2) Rotor Integrity
8.	JAA Environmental Standards:	ICAO Annex 16, Volume II, Second Edition, July 1993 - Emissions and Fuel Venting.

III. Technical Characteristics:

1.	Type Design Definition:	Drawing Introduction Sheet (DIS) No. DIS 10002 ISS 3 or later approved issues.
2.	Description:	Two spool axial flow engine with a bypass ration of 4.2 (ISA, SLS, Takeoff) consisting of: LP Compressor: Single Stage Wide Chord fan HP Compressor: 10 Stage Axial Flow Annular Combustion Chamber Two Stage Axial Flow HP Turbine Two Stage Axial Flow LP Turbine Accessory Gearbox Thrust Reverser Full Authority Digital Engine Control (FADEC)
3.	Equipment:	See DIS 10002 ISS 2 or later approved issues. The equipment which is approved for use on the engine is identified in BMW Rolls-Royce Report E-TR150/95(FR) ISS 03, Engine Equipment Classification, or later approved issues.
4.	Dimensions:	Overall Length: 4669 mm Overall Diameter: 1820 mm

CANCELLED

5. Dry Weight: 1851.2 kg

Note: Dry weight includes thrust reverser and dressing, but excludes all fluids and all buyer furnished equipment.

6. Ratings (ISA, SLS): Takeoff: 65.6 kN
Maximum Continuous: 64.3 kN

7. Control System: Full Authority Digital Engine Control (FADEC). EEC P/N 1501KDC01-817 or later approved standard.

Software verified to level A according to RTCA/EUROCAE Document DO-178B/ED-12B.

Note: Software standard included in the Engine Electronic Control (EEC) Part Number.

8. Fluids (Fuel, Oil, Additives) See OI-710-1BR Operating Instructions for approved fluids.

9. Accessory Drives:

Loads, Weights, and Power Extraction:

	Direction of Rotation (Looking Normal to Pad Along Shaft)	Transmission Ratio to N2	Torque daNcm	Weight kg	Static Overhang Moment daNcm	Maximum Power Extraction kW
Main Engine Fuel Pump (MEP) including weight of attached Fuel Metering Unit (FMU)	CW	0.530	2670	20.5	395.45	26.9
Hydraulic Pump No.1	CCW	0.270	4180	8.91	81	18.6
Hydraulic Pump No. 2	CCW	0.275	4180	8.91	81	18.6
Integrated Drive General (IDG)	CW	0.520	4125	32.61	564.92	32.7
Dedicated Generator (PMA)	CW	1.998	N.A.	1.0	10	1
Air Starter	CCW	0.986	8470	15.56	227	N.A
Oil Pump	CCW	0.408	518	9.07	66	3.2

CW = Clockwise
CCW = Counterclockwise

CANCELLED

IV. Operational Limitations:

At sea level the engine may be used in ambient temperatures up to ISA + 40ºC. Refer to the Installation Manual for the operating envelope.

1. Temperature Limits:

1.1 TGT (Trimmed):

(i)	Maximum prior to start:	150ºC
(ii)	Starting on ground:	700ºC
(iii)	Starting in Flight:	850ºC
(iv)	Takeoff*:	900ºC
(v)	Maximum Continuous:	860ºC
(vi)	Maximum Overtemperature (20 sec):	905ºC

1.2 Fuel Temperature:

(i)	LP pump inlet (measured at aircraft fuel tank) Maximum:	+54ºC
(ii)	HP Pump Outlet (measured at HP filter)	
	Maximum for continuous operation:	+158ºC
	Maximum transient (not to exceed 15 minutes):	+165ºC

1.3 Oil Temperature (Combined Scavenge Oil Temperature):

(i)	Minimum for starting (for temperatures below -30ºC see OI-710-2BR Operating Instructions):	-40ºC
(ii)	Minimum for acceleration for Takeoff:	+20ºC
(iii)	Maximum:	+160ºC

2. Maximum Rotational Speeds:

2.1	Takeoff*:	101.1% N1
		99.6% N2
2.2	Maximum Continuous	101.1% N1
		98.9% N2
2.3	Overspeed (20 sec. Maximum)	101.5% N1
		98.9% N2
2.4	Reverse Thrust (30 sec. maximum)	70.0% N1
	100% N1 is defined as	7431 min^{-1}
	100% N2 is defined as	15898 min^{-1}

CANCELLED

*Limited in use to a continuous period of not more than 5 minutes, and limited in use to a continuous period of not more than 10 minutes in the event of a power unit having failed or being shut down.

3. Pressure Limits:

3.1 Minimum pressure at LP fuel pump inlet: 34.5 kPa

3.2 Oil (Differential Pressure)

(i) Minimum acceptance for flight:

Idle to 72.3% N2:		241.2 kPa
72.3% to 90% N2:	Straight line interpolation from	241.2 kPa to 310.3 kPa
Above 90% N2:		310.3 kPa

(ii) Minimum to complete flight:

Flight Idle to 72.3% N2:		172.3 kPa
72.3% to 90% N2:	Straight line interpolation from	172.3 kPa to 241.2 kPa
Above 90% N2:		241.2 kPa

4. Oil Consumption Limit:

Maximum oil consumption: 0.28 l/hr

Usable oil tank contents: 3.83 l.

CANCELLED

BR700-710A1-10

5. Engine Acceptance Limitations

	Max Continuous 64.3 kN ISA, SLS	Max Takeoff 65.6 kN ISA, SLS	Transient Overshoot Limits ISA, SLS
LP Speed (min $^{-1}$/N1%)	6767 / 91.1	6810/91.6	6810 / 91.6
HP Speed (min $^{-1}$/N2%)	15035 / 94.6	15078/94.8	15158 / 95.3
TGT untrimmed ºC	759	765	795
Max. Oil Consumption 1/h			0.19
Max. Slam Acceleration time from datum condition to 95% of maximum thrust.			5 Seconds
Max. Corrected thrust at low idle, ISA, SLS kN			2.66

These values defined under the following conditions:

- Test bed Air Intake System Flare
- BRE010F2030, P/N BRF2455, S/N 95.092 or P/N BRF1471, S/N 94.005 and P/N BRF1451, S/N 94.006. Debris Guard BRE010F1058
- Slave Exhaust System
  Production Slave Jetpipe
  P/N BRF2400, S/N 95.121 or BRF 1982, S/N3 Nozzle
  P/N BFR2402, S/N 95.129 or P/N BRF1989, S/N A or P/N 2307, S/N 95,057 or P/N 2402, S/N 95.130.
- All Optional Bleeds closed.
- Aircraft Service Equipment Drives unloaded.
- Fuel Low Heat Value43.179 kJ/kg

6. Bleed Extraction: %

Power Level	Normal Flow			Maximum Flow		
	Stage 5	Stage 8	Fan	Stage 5	Stage 8	Fan
Idle to 1.06 EPR	--	7.8	--	3.0	12.1	0.6
1.06 to 1.3. EPR	4.4	4.2	0.2	8.3	7.9	1.6
Above 1.3 EPR	4.3	--	0.4	8.5	8.0	1.8

Notes: 1. $$EPR = \frac{\text{Core Engine Exhaust Total Pressure}}{\text{Engine Inlet Total Pressure}} = \frac{P50}{P20}$$

2. Stage 5 and Stage 8 high pressure compressor bleed is expressed as a percentage of core entry mass flow, W26.

CANCELLED

3. Fan bleed flow is quoted as a percentage of fan entry mass flow, W1A.

7. Dispatch Limitations: See Report Reference ETR 361/96 (FR) ISS 00 or later approved issue. Full Authority Digital Engine Control System Dispatchability Summary.

V. Operation and Service Instructions:

1. Installation Drawing and Manual: See BRR Report E-TR206/95 ISS 06 Installation Requirements or later approved issue.

2. Operating Instructions: OI-710-1BR Operating Instructions

3. Maintenance Manual: M-70-1BR Operating Instructions

4. Engine Manual (Overhaul Manual): E-710-1BR Engine Manual

5. Life Limits Manual: T-710-1BR Time Limits Manual

6. Service Bulletin and Service Letters As Required.

VI. Notes:

1. The engine DIS includes a thrust reverser:
P/N 04G0001-039 for Left Hand Installations
and
P/N 04G0001-041 for Right Hand Installations

The engine is approved for operation with these thrust reversers.

These thrust reversers are approved for ground use only. Powerback is prohibited.

2. Life Limitations: See time Limits Manual.

3. Lightning protection magnetic interference information are included in the Installation Requirements.

4. Assumptions: See BRR Reports Reference E-TR 149/96 (FR) ISS 01 Assumptions or later approved issues and E-TR 421/95 (FR) ISS 04 FADEC Assumptions Summary Report or later approved issue.

CANCELLED

5. The engine to aircraft interface is defined as the intercase including mount lugs and fixed bushing but excluding the thrust trunnion assembly, and the rear mount ring including mount lugs and fixed bushing.

6. For acceleration to take-off with crosswinds above 20kts the fan speed is limited to 66% N1 until a forward speed of 20kts has been reached. Above 20kts forward speed a slam accel to take-off is required.

7. While the aircraft is static on the ground, stabilised engine operation in the band between 66% and 80% N1 (fan speed) is prohibited. Any acceleration or deceleration through this band must not exceed 10 seconds. This limitation only applies to forward thrust.

CANCELLED

1. General:

1.	CAA ETCDS No.	1052 Issue: 7	Date: 18 November 2001
2.	Type/Variant:		BR700-710A2-20
3.	Type Certificate Holder:		Rolls-Royce Deutschland Ltd & Co KG Eschenweg11 D-15827 Dahlewitz Germany
4.	UK CAA Type Certificate:		096/2
5.	Manufacturer:		Rolls-Royce Deutschland Ltd & Co KG
6.	JAA Certification Application Date:		March 23, 1994
7.	JAA Certification Reference Date:		August 31, 1993
8.	JAA Certification Recommendation Date:		January 24, 1997

9. In this case, the CAA Type Certification has been granted on the basis of a recommendation from the Joint Aviation Authorities (JAA) following an investigation carried out in accordance with JAA Joint Certification Procedures. Accordingly, the JAA Data Sheet No. JAA/E/96-15 Issue 2 dated January 17, 1997 has been used as the basis of this CAA Engine Type Certificate Data Sheet.

II. Certification Basis:

1.	Reference Application Date for CAA Certification:	August 31, 1993
2.	CAA Certification Date:	February 14, 1997
3.	CAA Certification Basis:	Same the JAA Certification Basis specified in paragraphs 4 to 8 below.
4	JAA Airworthiness Requirements:	JAR-E Change 8 plus Amendment E/91/1 effective May 27, 1991 Amendment E/93/1 effective May 17, 1993

CANCELLED

5.	JAA Special Conditions:	SC1 Ingestion of Rain SC2 Ingestion of Hail
6.	JAA Exemptions:	JAR-E 890(a) Engine Calibration in Reverse Thrust
7.	JAA Equivalent Safety Finding:	JAR-E 840(a)(2) Rotor Integrity
8.	JAA Environmental Standards:	ICAO Annex 16, Volume II, Second Edition, July 1993 - Emissions and Fuel Venting.

III. Technical Characteristics:

1.	Type Design Definition:	Drawing Introduction Sheet (DIS) No. DIS 10005 ISS 2 or later approved issues.	
2.	Description:	Two spool axial flow engine with a bypass ration of 4.2 (ISA, SLS, Takeoff) consisting of: LP Compressor: Single Stage Wide Chord fan HP Compressor: 10 Stage Axial Flow Annular Combustion Chamber Two Stage Axial Flow HP Turbine Two Stage Axial Flow LP Turbine Accessory Gearbox Thrust Reverser Full Authority Digital Engine Control (FADEC)	
3.	Equipment:	See Type Design Definintion. The equipment which is approved for use on the engine is identified in BMW Rolls-Royce Report E-TR427/96(FR) ISS 01, Engine Equipment Classification, or later approved issues.	
4.	Dimensions:	Overall Length: Overall Diameter:	4669 mm 1820 mm
5.	Dry Weight:		1891 kg

Note: Dry weight includes thrust reverser and dressing, but excludes all fluids and all buyer furnished equipment.

6.	Ratings (ISA, SLS):	Takeoff: Maximum Continuous:	65.6 kN 64.3 kN

CANCELLED

7. Control System: Full Authority Digital Engine Control (FADEC). EEC P/N 1520KDC01-605 or later approved standards.

Software verified to level A according to RTCA/EUROCAE Document DO-178B/ED-12B.

Note: Software standard included in the Engine Electronic Control (EEC) Part Number.

8. Fluids (Fuel, Oil, Additives) See OI-710-2BR Operating Instructions for approved fluids.

9. Accessory Drives:

Loads, Weights, and Power Extraction:

	Direction of Rotation (Looking Normal to Pad Along Shaft)	Transmission Ratio to N2	Torque daNcm	Weight kg	Static Overhang Moment daNcm	Maximum Power Extraction kW
Main Engine Fuel Pump (MEP) including weight of attached Fuel Metering Unit (FMU)	CW	0.530	2670	20.5	395.45	26.9
Hydraulic Pump No.1	CCW	0.335	3051	6.57	61	10.3
Generator No. 1	CW	1.083	2830	20.0 (dry)	325	52
Generator No. 2	CCW	1.080	2830	20.0 (dry)	325	52
Dedicated Generator (PMA)	CW	1.998	N.A.	1.0	10	1
Air Starter	CCW	0.986	8470	15.56	227	N.A
Oil Pump	CCW	0.421	518	9.07	66	3.2

CW = Clockwise
CCW = Counterclockwise

IV. Operational Limitations:

At sea level the engine may be used in ambient temperatures up to ISA + 40ºC. Refer to the Installation Manual for the operating envelope.

CANCELLED

1. Temperature Limits:

1.1 TGT (Trimmed):

(i)	Maximum prior to start:	150ºC
(ii)	Starting:	700ºC
(iii)	Starting in Flight:	850ºC
(iv)	Takeoff*:	900ºC
(v)	Maximum Continuous:	860ºC
(vi)	Maximum Overtemperature (20 sec):	905ºC

1.2 Fuel Temperature:

(i)	LP pump inlet (measured at aircraft fuel tank) Maximum:	+54ºC
(ii)	HP Pump Outlet (measured at HP filter):	
	Maximum for continuous operation:	+158ºC
	Maximum transient (not to exceed 15 minutes):	+165ºC

1.3 Oil Temperature (Combined Scavenge Oil Temperature):

(i)	Minimum for starting (for temperatures below -30ºC see OI-710-2BR Operating Instructions):	-40ºC
(ii)	Minimum for acceleration for Takeoff:	+20ºC
(iii)	Maximum:	+160ºC

2. Maximum Rotational Speeds:

2.1	Takeoff*:	102.1% N1 99.6% N2
2.2	Maximum Continuous	102.1% N1 98.9% N2
2.3	Overspeed (20 sec. Maximum)	102.5% N1 98.9% N2
2.4	Reverse Thrust (30 sec. maximum)	70.0% N1
	100% N1 is defined as	7431 min^{-1}
	100% N2 is defined as	15898 min^{-1}

*Limited in use to a continuous period of not more than 5 minutes, and limited in use to a continuous period of not more than 10 minutes in the event of a power unit having failed or being shut down.

CANCELLED

3. Pressure Limits:

3.1 Minimum pressure at LP fuel pump inlet: 34.5 kPa

3.1 Oil (Differential Pressure)

(i) Minimum acceptance for flight:

Idle to 72.3% N2: 241.2 kPa

72.3% to 90% N2: Straight line interpolation from 241.2 kPa to 310.3 kPa

Above 90% N2: 310.3 kPa

(ii) Minimum to complete flight:

Flight Idle to 72.3% N2: 172.3 kPa

72.3% to 90% N2: Straight line interpolation from 172.3 kPa to 241.2 kPa

Above 90% N2: 241.2 kPa

4. Oil Consumption Limit:

Maximum oil consumption: 0.28 l/hr
Usable oil tank contents: 3.83 l.

5. Engine Acceptance Limitations

	Max Continuous 64.3 kN ISA, SLS	Max Takeoff 65.6 kN ISA, SLS	Transient Overshoot Limits ISA, SLS
LP Speed (min $^{-1}$/N1%)	6767 / 91.1	6810 / 91.6	6810 / 91.6
HP Speed (min $^{-1}$/N2%)	15035 / 94.6	15078 / 94.8	15158 / 95.3
TGT untrimmed ºC	759	765	795
Max. Oil Consumption 1/h			0.19
Max. Slam Acceleration time from datum condition to 95% of maximum thrust.			5 Seconds
Max. Corrected thrust at low idle, ISA, SLS kN			2.66

CANCELLED

These values defined under the following conditions:

- Test bed Air Intake System Flare
- BRE010F2030, P/N BRF2455, S/N 95.092 or P/N BRF1471, S/N 94.005 and P/N BRF1451, S/N 94.006. Debris Guard BRE010F1058

- Slave Exhaust System
  Production Slave Jetpipe
  P/N BRF2400, S/N 95.121 or BRF 1982, S/N3 Nozzle
  P/N BFR2402, S/N 95.129 or P/N BRF1989, S/N A
  All Optional Bleeds closed.
- Aircraft Service Equipment Drives unloaded.
- Fuel Low Heat Value 43.179 kJ/kg

6. Bleed Extraction: %

Power Level	Normal Flow			Maximum Flow		
	Stage 5	Stage 8	Fan	Stage 5	Stage 8	Fan
Idle to 1.06 EPR	--	7.8	0.4	3.0	12.1	0.6
1.06 to 1.3. EPR	4.4	4.2	0.4	8.3	7.9	0.9
Above 1.3 EPR	4.3	--	0.4	8.5	8.0	1.1

Notes: 1. $$EPR = \frac{\text{Core Engine Exhaust Total Pressure}}{\text{Engine Inlet Total Pressure}} = \frac{P50}{P20}$$

2. Stage 5 and Stage 8 high pressure compressor bleed is expressed as a percentage of core entry mass flow, W26.

3. Fan bleed flow is quoted as a percentage of fan entry mass flow, W1A.

7. Dispatch Limitations: See Report Reference ETR 737/96 (FR) ISS 01 or later approved issue. Full Authority Digital Engine Control System Dispatchability Summary.

V. <u>Operation and Service Instructions:</u>

1. Installation Drawing and Manual: See BRR Report E-TR364/95 ISS 01 Installation Requirements or later approved issue.

2. Operating Instructions: OI-710-2BR Operating Instructions

CANCELLED

3. Maintenance Manual: M-70-2BR Operating Instructions

4. Engine Manual (Overhaul Manual): E-710-2BR Engine Manual

5. Life Limits Manual: T-710-2BR Time Limits Manual

6. Service Bulletin and Service Letters As Required.

VI. Notes:

1. The engine DIS includes a thrust reverser:
P/N 07G0001-005 for Left Hand Installations
and
P/N 07G0001-007 for Right Hand Installations or later approved standards.

The engine is approved for operation with these thrust reversers.

These thrust reversers are approved for ground use only. No power back is approved.

2. Life Limitations: See time Limits Manual.

3. Lightning protection magnetic interference information are included in the Installation Requirements.

4. Assumptions: See BRR Reports Reference Assumptions E-TR 340/96 (FR) ISS 00 or later approved issue and E-TR 480/96 (FR) ISS 01 FADEC Assumptions Summary Report or later approved issue.

5. The engine to aircraft interface is defined as the intercase including mount lugs and fixed bushing but excluding the thrust trunnion assembly, and the rear mount ring including mount lugs and fixed bushing.

6. For acceleration to take-off with crosswinds above 20kts the fan speed is limited to 66% N1 until a forward speed of 20kts has been reached. Above 20kts forward speed a slam accel to take-off is required.

7. While the aircraft is static on the ground, stabilised engine operation in the band between 66% and 80% N1 (fan speed) is prohibited. Any acceleration or deceleration through this band must not exceed 10 seconds. This limitation only applies to forward thrust.

CANCELLED