Civil Aviation Authority
United Kingdom

TYPE-CERTIFICATE DATA SHEET

UK.TC.E.00073

for

LEAP-1A & LEAP-1C series engines

Type Certificate Holder

CFM International SA
2, boulevard du Général Martial Valin
75015 Paris
France

Model(s):

LEAP-1A23	LEAP-1C28
LEAP-1A24	LEAP-1C30
LEAP-1A24E1	LEAP-1C30B1
LEAP-1A26	
LEAP-1A26CJ	
LEAP-1A26E1	
LEAP-1A29	
LEAP-1A29CJ	
LEAP-1A30	
LEAP-1A32	
LEAP-1A33	
LEAP-1A33B2	
LEAP-1A35A	

Issue:	01
Date of issue:	08 March 2024

TABLE OF CONTENT

Contents

Section 1 General (All Models)

I. General

This Type-Certificate Data Sheet (TCDS) is the concise definition of the type-certificated product accepted and or approved by the CAA in the UK for the affected types and models.

This TCDS includes:

1. Details of the type design that affect the TCDS that have been approved or accepted by the CAA in the UK from 01 January 2021.

2. Details of the type design that affected the TCDS and were approved or accepted by EASA before 01 January 2021, and were incorporated into EASA.E.110 at Issue 09 dated 20 December 2019 and are therefore accepted by the UK under Article 15 of Annex 30 of the UK-EU Trade and Cooperation Agreement.

Section 2

I. General

1. Type / Variant or Model

LEAP-1A & LEAP-1C	LEAP-1A23, LEAP-1A24, LEAP-1A24E1, LEAP-1A26, LEAP-1A26CJ, LEAP-1A26E1, LEAP-1A29, LEAP-1A29CJ, LEAP-1A30, LEAP-1A32, LEAP-1A33, LEAP-1A33B2, LEAP-1A35A LEAP-1C28, LEAP-1C30, LEAP-1C30B1

2. Type Certificate Holder

CFM International SA
2, boulevard du Général Martial Valin 75015 Paris
France

Design Organisation Approval No.: EASA.21J.086

3. Manufacturer

Safran Aircraft Engines Production Organisation Approval FR.21G.0007 10 allée du Brévent - CE 1420 - Courcouronnes 91019 Evry Cedex France.	GE Production Certification No. 108 One Neumann Way Cincinnati - Ohio 45215 United States of America

(See note 4)

4. Date of Application at EASA (Certificating Authority)

LEAP-1A35A	06 February 2012
LEAP-1A23, LEAP-1A24, LEAP-1A24E1, LEAP-1A26, LEAP-1A26E1, LEAP-1A30, LEAP-1A32, LEAP-1A33, LEAP-1A33B2	24 November 2015
LEAP-1C28, LEAP-1C30, LEAP-1C30B1	01 December 2015
LEAP-1A26CJ, LEAP-1A29, LEAP-1A29CJ	26 July 2017

5. Type Certification date at EASA (Certificating Authority)

LEAP-1A35A	20 November 2015
LEAP-1A23, LEAP-1A24, LEAP-1A24E1, LEAP-1A26, LEAP-1A26E1, LEAP-1A30, LEAP-1A32, LEAP-1A33, LEAP-1A33B2	11 March 2016
LEAP-1C28, LEAP-1C30, LEAP-1C30B1	21 December 2016
LEAP-1A26CJ, LEAP-1A29, LEAP-1A29CJ	30 May 2018

6. Date of Application at CAA (Validating Authority)

Model	Application Date
LEAP-1A23, LEAP-1A24, LEAP-1A24E1, LEAP-1A26, LEAP-1A26CJ,LEAP-1A26E1, LEAP-1A29, LEAP-1A29CJ, LEAP-1A30, LEAP-1A32, LEAP-1A33, LEAP-1A33B2, LEAP-1A35A, LEAP-1C28, LEAP-1C30, LEAP-1C30B1	11th April 2023

7. Type Certification date at CAA (Validating Authority)

Model	Certification Date
LEAP-1A23, LEAP-1A24, LEAP-1A24E1, LEAP-1A26, LEAP-1A26CJ,LEAP-1A26E1, LEAP-1A29, LEAP-1A29CJ, LEAP-1A30, LEAP-1A32, LEAP-1A33, LEAP-1A33B2, LEAP-1A35A LEAP-1C28, LEAP-1C30, LEAP-1C30B1	08 March 2024

II. Certification Basis

1. Reference Date for determining the applicable airworthiness requirements:

20 November 2012 (3 years prior to initial Type Certification date according to Part 21.A.17)

2. EASA Certification Basis

2.1 Airworthiness Standards

CS-E amendment 3 (23 December 2010)

2.2 Special Conditions (SC)

SC1: Fan Blade Containment - Woven Composite Fan Blade
SC2: 30 Seconds Transient Over-Temperature Approval

2.3 Equivalent Safety Findings (ESF)

ESF1: CS-E 740 Endurance Tests – Alternative Schedule
ESF2: CS-E 840 Rotor Integrity – High Pressure Turbine Stage 2 Rotor Compliance

2.4 Deviations

None

2.5 Environmental Protection

Model	Environmental Protection Requirements
LEAP-1A35A, LEAP-1A23, LEAP-1A24, LEAP-1A24E1, LEAP-1A26, LEAP-1A26CJ, LEAP-1A26E1, LEAP-1A29, LEAP-1A29CJ, LEAP-1A30, LEAP-1A32, LEAP-1A33, LEAP-1A33B2, LEAP-1C28, LEAP-1C30, LEAP-1C30B1	CS-34 Amendment 4 as adopted by CAA ORS9 Decision No.36 (applicable from 20 December 2023), meeting the requirement of ICAO Annex 16 Volume II, Amendment 10 applicable 1 January 2021. o NOx standard in accordance with ICAO Annex 16 Volume II, Part III, Chapter 2, § 2.3.2 e) (CAEP/8). o HC, CO standards in accordance with ICAO Annex 16 Volume II, Part III, Chapter 2, §2.3.2. o Maximum nvPM mass concentration levels in compliance with Part III, Chapter 4, paragraph 4.2.2.1. nvPM mass and number emissions in compliance with Part III, Chapter 4, paragraph 4.2.2.2 a) 1) and 4.2.2.2 b) 1) (CAEP/11 In-Production standard.

III. Technical Characteristics

1. Type Design Definition

Engine type is identified by an engine model list including an identification plug reference:

LEAP-1A	Engine model list
LEAP-1A23, LEAP-1A24, LEAP-1A24E1, LEAP-1A26, LEAP-1A26CJ, LEAP-1A26E1, LEAP-1A29, LEAP-1A29CJ, LEAP-1A30, LEAP-1A32, LEAP-1A33, LEAP-1A33B2, LEAP-1A35A	LEAP-1AxxGyy xx denotes model rating. yy denotes model configuration group number Refer to the latest revision of CFM Service Bulletin LEAP-1A 72-0220

Model	Engine identification plug reference	Model	Engine identification plug reference
LEAP-1A23	2531M61P54	LEAP-1A29CJ	2531M61P42
LEAP-1A24	2531M61P62	LEAP-1A30	2531M61P06
LEAP-1A24E1	2531M61P58	LEAP-1A32	2531M61P14
LEAP-1A26	2531M61P34	LEAP-1A33	2531M61P22
LEAP-1A26CJ	2531M61P46	LEAP-1A33B2	2531M61P24
LEAP-1A26E1	2531M61P30	LEAP-1A35A	2531M61P02
LEAP-1A29	2531M61P26	-	-

LEAP-1C	Engine model list
LEAP-1C28, LEAP-1C30, LEAP-1C30B1	LEAP-1CxxGyy xx denotes model rating yy denotes model configuration group number Refer to the latest revision of CFM Service Bulletin LEAP-1C 72-0007

Model	Engine identification plug reference	Model	Engine identification plug reference
LEAP-1C28	2531M61P30	LEAP-1C30B1	2531M61P23
LEAP-1C30	2531M61P22	-	-

2. Description

Dual rotor, axial flow, high bypass ratio turbofan engine:

- single stage fan, 3-stage low pressure compressor (LPC), 10-stage high pressure compressor (HPC)
- annular combustion chamber
- 2-stage high pressure turbine (HPT), 7-stage low pressure turbine (LPT)
- dual channel full authority digital engine control (FADEC)

The LEAP-1C engine Type Certificate includes the thrust reverser. This thrust reverser is actuated by an Electrical Trust Reverser Actuation System (ETRAS) including a digital Thrust Reverser Control Unit (TRCU). The left-hand engine thrust reverser includes a translating O-duct SIN 95000, P/N BCL0005-06-0 or BCL0005-04-0, and the right-hand one a translating O-duct SIN 95000, P/N BCL0006-06-0 or BCL0006-04- 0.

3. Equipment

The engine starter is part of the engine type design. Refer to the engine model list for details.

4. Dimensions

	LEAP-1A..G01	LEAP-1A..G02 and up	LEAP-1C..G01 and up
Length (fan case forward flange to turbine rear frame aft flange)	3328	3328	-
Length (fan cowl hinge beam front to centre vent tube end)	-	-	4505
Width (maximum envelope)	2543	2533	2659
Height (maximum envelope)	2368	2362	2714

5. Dry Weight (kg)

Weight of the basic engine, including basic engine equipment, as given in the applicable engine "Installation Manual" document:

	LEAP-1A..G01	LEAP-1A..G02 and up	LEAP-1C..G01	LEAP-1C..G02 and up
With fluids (oil, fuel)	2990	3008	-	-
Without fluids (oil, fuel), including thrust reverser	-	-	3935	3929

6. Ratings (daN)

LEAP-1A Take-Off Thrust				
LEAP-1A23	LEAP-1A24 LEAP-1A24E1	LEAP-1A26 LEAP-1A26CJ LEAP-1A26E1	LEAP-1A29 LEAP-1A29CJ	LEAP-1A30 LEAP-1A32 LEAP-1A33 LEAP-1A33B2 LEAP-1A35A
10680	10680	12064	13029	14305

LEAP-1A Maximum Continuous Thrust			
LEAP-1A23	LEAP-1A24 LEAP-1A24E1	LEAP-1A26 LEAP-1A26CJ LEAP-1A26E1 LEAP-1A29 LEAP-1A29CJ	LEAP-1A30 LEAP-1A32 LEAP-1A33 LEAP-1A33B2 LEAP-1A35A
10458	10676	11868	14096

LEAP-1C Take-Off Thrust (daN)			
LEAP-1C28	LEAP-1C30 LEAP-1C30B1	-	-
12998	13714	-	-

LEAP-1C Maximum Continuous Thrust (daN)			
LEAP-1C28	LEAP-1C30 LEAP-1C30B1	-	-
12793	13322	-	-

(See notes 2 and 3)
Engine models which have the same approved ratings in standard static conditions will provide different level of thrust at altitude and/or high temperature conditions. This is controlled by the engine identification plug.

7. Control System

The software is part of the engine Type Design – At initial certification:

	LEAP-1A35A	LEAP-1A23, -1A24, -1A24E1, -1A26, -1A26E1, -1A30, -1A32, -1A33, -1A33B2	LEAP-1A26CJ, -1A29, -1A29CJ
Factory Loadable Software P/N	2500M34P03	2500M34P03	2500M34P03 2500M34P04 2500M34P05 2500M34P06 2500M34P08
Application Software P/N	2590M00P02	2590M00P03	2590M00P07

Health Monitoring Software P/N	2590M01P01	2590M01P01	n/a
Prognostic Health Management P/N	n/a	n/a	2784M64P01
Open Multimedia Applications Platform P/N	n/a	n/a	2590M01P05 2590M01P06
Pressure Sub Systems (PSS) Software P/N	2474M65P05	2474M65P05	2474M65P05

	LEAP-1C28, -1C30, -1C30B1	-	-
Factory Loadable Software P/N	2500M35P03 2500M35P04	-	-
Application Software P/N	2590M02P01	-	-
Health Monitoring Software P/N	2590M03P01	-	-
Pressure Sub Systems (PSS) Software P/N	2474M65P05	-	-
TRCU Operating Software P/N	According to SCI SK-0000492539-16	-	-
TRCU Application Software P/N	262074891-0230	-	-

8. Fluids (Fuel, Oil, Coolant, Additives)

Fuel and fuel additives: Refer to the latest revision of CFM Service Bulletin LEAP-1A S/B 73-0001 and CFM Service Bulletin LEAP-1C S/B 73-0001.
Oil: Refer to the latest revision of CFM Service Bulletin LEAP-1A S/B 79-0001 and CFM Service Bulletin LEAP-1C S/B 79-0001.

9. Aircraft Accessory Drives

LEAP-1A						
Component	Rotation direction	Speed ratio / HP rotor	Max. power or max. torque	Max. shear torque (m.daN)	Max. weight (wet) (kg)	Max. overhung moment (m.daN)
Electrical generator	CCW	0.462	129 kW	106.2	65	11.3
Hydraulic pump	CCW	0.211	14.7 m.daN	48	17.5	2.3

LEAP-1C						
Component	Rotation direction	Speed ratio / HP rotor	Max. power or max. torque	Max. shear Torque (m.daN)	Max. weight (wet) (kg)	Max. Overhung moment (m.daN)
Electrical generator	CCW	1.066	151 kW	86.6	65.2	13.9
Hydraulic pump	CW	0.203	14 m.daN	40.7	15.4	1.98

CW = clockwise when facing the gearbox drive pad
CCW = counter-clockwise when facing the gearbox drive pad

10. Maximum Permissible Air Bleed Extraction

LEAP-1A and LEAP-1C		
Bleed location	LP rotor speed	Airflow limit
Bypass duct	Above minimum idle	2 % of secondary airflow
HPC 4th stage	Above minimum idle	9.97% of primary airflow*
HPC 7th stage	Below 2314 rpm N1K**	2.9% of primary airflow
	Above 2314 rpm N1K**	2.45% of primary airflow
HPC 10th stage	Above minimum idle	15% of primary airflow

*Absolute maximum. Refer to the applicable Installation Manual for detailed HPC 4th stage bleed schedule.
**N1K = Temperature corrected fan rotor speed.
It is not allowed to extract air from 4th and 10th stages simultaneously.

IV. Operating Limitations

1. Temperature Limits

1.1 Exhaust Gas Temperature (°C):

The Exhaust Gas Temperature (EGT=T48) is measured at the low pressure turbine inlet. Maximum Exhaust Gas Temperature (Indicated):

- Take-Off: 1060
- Maximum Continuous: 1025
- Ground Start: 750 (Measured 750 – Pre LEAP-1A S/B 73-0034 and pre LEAP-1C S/B 73-0003)
  750 (Measured 800 – Post LEAP-1A S/B 73-0034 and post LEAP-1C S/B 73-0003)
- Inflight Start: 875 (Starter assist or steady state windmill)
  920 (Quick windmill relight)
  970 (High power fuel cut)

All models are certified for a transitory exhaust gas temperature (EGT) exceedance at take-off of 5°C, during 30 seconds maximum. Refer to the applicable "Specific Operating Instructions" document.

1.2 Oil Temperature (°C)

Minimum for starting: minus 29 (LEAP-1A Pre LEAP-1A S/B 72-0034, S/B 72-0035, S/B 72-0036 and LEAP-1C..G01)
Minimum for starting: minus 40 (LEAP-1A Post LEAP-1A S/B 72-0034, S/B 72-0035, S/B 72-0036 and LEAP-1C..G02 and up)

Minimum for acceleration to take-off power: 19
Maximum steady state: 140
Maximum transient (15 minutes): 155

1.3 Fuel Inlet Temperature (°C)

Maximum steady state: 55

1.4 Engine Equipment Temperatures:

Refer to the applicable engine “Installation Manual” document for engine equipment steady state and transient skin temperature limits.

2. Speed Limits

2.1 Maximum Rotational Speeds (rpm=revolutions per minute):

Low pressure rotor (N1): 3894 (101 % - 100 % N1 is defined as 3856 rpm)
High pressure rotor (N2): 19391 (116.5 % - 100 % N2 is defined as 16645 rpm)

3. Pressure Limits

3.1 Fuel Pressure:

Minimum: 345 hPa (differential pressure)
Maximum (LEAP-1A): 4137 hPa (differential pressure)
Maximum (LEAP-1C): 3800 hPa (differential pressure)
When the engine is running, the fuel pressure at the engine pump inlet must be kept 345 hPa above the true vapour pressure of the fuel with a zero vapour/liquid ratio under normal operating conditions.

3.2 Oil Pressure:

Minimum at Idle conditions: 1200 hPa (differential pressure)
Minimum at Maximum Continuous conditions: 2000 hPa (differential pressure)
When the engine is running, the oil pressure varies with the rotational speed of the HP rotor (Refer to the applicable engine "Installation Manual" document). Deliberate operation of the engine with oil pressure below minimum is prohibited. However, aircraft "negative g" manoeuvres may cause temporary oil supply interruption. Under "negative g" operating conditions only, it is permissible to operate the engine below the minimum oil pressure for a maximum of 14 seconds before engine shutdown is required.

4. Time Limited Dispatch (TLD)

The engine is approved for Time Limited Dispatch in accordance with CS-E 1030. The maximum rectification period for each dispatchable state is specified in the applicable “Engine Shop Manual” document, chapter 5 “Airworthiness Limitations”.

5. ETOPS Capability

LEAP-1A: When compliant with CFM Service Bulletin LEAP-1A 71-0006, the LEAP-1A engine is approved for ETOPS capability in accordance with CS-E 1040 amendment 3 by EASA Certificate 10062224 dated 16 June 2017 for a Maximum Approved Diversion Time of 180 minutes at maximum continuous thrust plus 15 minutes at hold thrust. ETOPS does not require any special engine limitation, marking, placard, or configuration other than as instructed by the Service Bulletin.
This approval does not constitute an approval to conduct ETOPS operations.

LEAP-1C: The LEAP-1C engine is not approved for ETOPS capability in accordance with CS-E 1040.

V. Operating and Service Instructions

LEAP-1A - Manuals	Refer to the latest revision of CFM Service Bulletin LEAP-1A 72-0220
Turbofan Engine Installation Manual (EIM – IM.20)	LEAP-1A..G01: CRL-2106a LEAP-1A..G02 and up: CRL-2106a_3
Installation Drawing	LEAP-1A..G01: CRL-2107a LEAP-1A..G02 and up: CRL-2107a_x
Specific Operating Instructions (SOI)	LEAP-1A: CRL-2105a (GEK 131717)

LEAP-1C - Manuals	Refer to the latest revision of CFM Service Bulletin LEAP-1C 72-0007
Turbofan Engine Installation Manual (EIM – IM.22)	LEAP-1C..G01: CRL-2106c LEAP-1C..G02: CRL-2106c_1 LEAP-1C..G03: CRL-2106c_2 LEAP-1C..G04 and up: CRL-2106c_3
Installation Drawing	LEAP-1C..G01: CRL-2107c LEAP-1C..G02 and up: CRL-2107c_x
Specific Operating Instructions (SOI)	LEAP-1C: CRL-2105c (GEK 131718)

Instructions for Continued Airworthiness (ICA)	**LEAP-1A**	**LEAP-1C**
Maintenance Manual	See Aircraft Maintenance Manual (AMM)	See Aircraft Maintenance Manual (AMM)
Fault Isolation Manual	See Aircraft Fault Isolation Manual (FIM)	See Aircraft Fault Isolation Manual (FIM)
Power Plant Build-up Manual (PPBM)	n/a	PP.22
Structural Repair Manual	n/a	See Aircraft Structural Repair Manual (SRM)
Engine Shop Manual (ESM)	SM.20	SM.22
Standard Practices Manual (SPM)	SPM.25	SPM.25
Consumable Product Manual (CPM)	CPM.25	CPM.25
Non Destructive Test Manual (NDTM)	NDTM.25	NDTM.25
Components Maintenance Manuals (CMM)	As published by CFM	As published by CFM
Service Bulletins (S/B)	As published by CFM	As published by CFM

VI. Notes

1. The EASA approved Airworthiness Limitations Section of the Instructions for Continued Airworthiness is published in the applicable "Engine Shop Manual" document, chapter 5 "Airworthiness Limitations".

2. Engine ratings are based on calibrated test stand performance, and performance calculations are based on accepted parameter correction methods documented in the “Production Test Requirements” document. These calculations assume the following conditions:

- Sea level corner point conditions as defined in the “Production Test Requirements”;
- No aircraft accessory loads or air extraction;
- No anti-icing; no inlet distortion; no inlet screen losses; and 100% ram recovery;
- Production engine inlet and production exhaust system.

3. The take-off thrust, with the associated limits, shall not be used continuously more than 5 minutes. The duration may be extended to 10 minutes in case of engine failure in multi-engine aircraft. If the duration exceeds 5 minutes, this shall be recorded in the engine log book.

4. The type certificate holder, CFM International, is a company jointly owned by Safran Aircraft Engines (France) and GE (USA). CFM International is responsible for the certification program, the sale and the customer support activities. With respect to the benefits of type certification for production of certified engines, Safran Aircraft Engines and GE act as licensees of CFM International. The engine final assembly location is recorded on the engine identification plate. Engines produced by GE (USA) are identical to, and fully interchangeable with, engines produced by Safran Aircraft Engines (France).

5. The LEAP-1A engine is approved for use with Aircelle thrust reverser system P/N BDL0011-12-0 for the left hand thrust reverser half and P/N BDL0051-12-0 for the right hand thrust reverser half. The LEAP-1C engine Type Certificate includes the thrust reverser.

Section 3 Administration

I. Acronyms and Abbreviations

Acronym / Abbreviation	Definition
EASA	European Union Aviation Safety Agency
CS-E	Certification Specification- Engines
ORS	Official Record Series
ICAO	International Civil Aviation Organisation
CAEP	Committee on Aviation Environmental Protection
nvPM	non-volatile Particulate Matter
daN	dekca Newtons
HPC	High Pressure Compressor
hPa	Hecto Pascals
N/A	Not Applicable
P/N	Part Number
S/B	Service Bulletin
SIN	Significant Item Number
ETOPS	Extended Twin Engine Operations

II. Type Certificate Holder Record

TCH Record	Period
CFM International SA 2, boulevard du Général Martial Valin 75015 Paris France. Design Organisation Approval No.: EASA.21J.086	Since initial issue

III. Amendment Record

TCDS Issue No.	TCDS Issue Date	Changes	TC Issue and Date
1	08 March 2024	Initial Issue and records compliance to CS-34 Amend. 4 for ICAO- CAEP 11.	Issue 01, 08 March 2024