



TYPE-CERTIFICATE DATA SHEET

No. E.110

for Engine
LEAP-1A & LEAP-1C series engines

Type Certificate Holder
CFM International SA

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

For Models:

LEAP-1A23
LEAP-1A24
LEAP-1A24E1
LEAP-1A26
LEAP-1A26E1
LEAP-1A30
LEAP-1A32
LEAP-1A33
LEAP-1A33B2
LEAP-1A35A



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I. General

1. Type / Models

LEAP-1A	LEAP-1A23, LEAP-1A24, LEAP-1A24E1, LEAP-1A26, LEAP-1A26E1, LEAP-1A30, LEAP-1A32, LEAP-1A33, LEAP-1A33B2, LEAP-1A35A
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2. Type Certificate Holder

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

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

3. Manufacturers

Snecma 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
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(See note 4)

4. Date of Application

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

5. EASA Type Certification Date

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

II. Certification Basis

1. Reference Date for determining the applicable airworthiness requirements:

20 November 2012 (3 years prior to 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

LEAP-1A35A	ICAO Annex 16 Volume II, third edition, July 2008, including Amendment 7, 18/08/11, as applicable to turbofan engines. NOx Standard in accordance with CAEP/8.
LEAP-1A23, LEAP-1A24, LEAP-1A24E1, LEAP-1A26, LEAP-1A26E1, LEAP-1A30, LEAP-1A32, LEAP-1A33, LEAP-1A33B2	ICAO Annex 16 Volume II, third edition, July 2008, including Amendment 8, 14/7/14, as applicable to turbofan engines

III. Technical Characteristics

1. Type Design Definition

Engine type is identified by an engine part list reference and an engine identification plug reference:

LEAP-1A	Engine part list reference
LEAP-1A23, LEAP-1A24, LEAP-1A24E1, LEAP-1A26, LEAP-1A26E1, LEAP-1A30, LEAP-1A32, LEAP-1A33, LEAP-1A33B2, LEAP-1A35A	M10G01 M10G02

LEAP-1A	Engine identification plug reference	LEAP-1A	Engine identification plug reference
LEAP-1A23	2531M61P54	LEAP-1A30	2531M61P06
LEAP-1A24	2531M61P62	LEAP-1A32	2531M61P14
LEAP-1A24E1	2531M61P58	LEAP-1A33	2531M61P22
LEAP-1A26	2531M61P34	LEAP-1A33B2	2531M61P24
LEAP-1A26E1	2531M61P30	LEAP-1A35A	2531M61P02



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)

3. Equipment

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

4. Dimensions (mm)

	LEAP-1A M10G01	LEAP-1A M10G02	Reserved
Length (fan case forward flange to turbine rear frame aft flange)	3328	3328	-
Width (maximum envelope)	2543	2533	-
Height (maximum envelope)	2368	2362	-

5. Weight (kg)

	LEAP-1A M10G01	LEAP-1A M10G02	Reserved
Weight of the basic engine, including basic engine equipment and fluids (oil, fuel)	2990	3153	-

6. Ratings

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

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

(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	Reserved
Factory Loadable Software P/N	2500M34P03	2500M34P03	-
Application Software P/N	2590M00P02	2590M00P03	-
Health Monitoring Software P/N	2590M01P01	2590M01P01	-
Pressure Sub Systems (PSS) Software P/N	2474M65P05	2474M65P05	-

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

Oil: Refer to the latest revision of CFM Service Bulletin LEAP-1A 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

CCW = counter-clockwise when looking at the gearbox drive pad

10. Maximum Permissible Air Bleed Extraction

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

*Absolute maximum. Refer to the LEAP-1A 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
- Inflight Start: 875

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:	minus25
Minimum for acceleration to take-off power:	38
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: 4137 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

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

V. Operating and Service Instructions

Manuals	LEAP-1A	Reserved
Turbofan Engine Installation Manual (EIM)	Configuration M10G01: CRL-2106a Issue 1 (IM.20) Configuration M10G02: CRL-2106a_1 Issue 1 (IM.20.1)	-
Installation Drawing	Configuration M10G01: CRL-2107a Configuration M10G02: CRL-2107a_1	-
Specific Operating Instructions (SOI)	CRL-2105a Revision 1 (GEK 131717)	-

Or later approved Issues or Revisions

Instructions for Continued Airworthiness (ICA)	LEAP-1A	Reserved
Maintenance Manual	See Aircraft Maintenance Manual (AMM)	-
Fault Isolation Manual	See Aircraft Fault Isolation Manual (FIM)	-
Engine Shop Manual (ESM)	ESM.20	-
Standard Practices Manual (SPM)	SPM.25	-
Consumable Product Manual (CPM)	CPM.25	-
Non Destructive Test Manual (NDTM)	NDTM.25	-
Components Maintenance Manuals (CMM)	As published by CFM	-
Service Bulletins (SB)	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 Snecma (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, Snecma and GE act as licensees of CFM International. The engine final assembly location is recorded on the engine identification plate.
- 5.** The LEAP-1A engine is approved for use with Aircelle thrust reverser system P/N BDL0011-12-0.



SECTION: ADMINISTRATIVE

I. Acronyms and Abbreviations

n/a

II. Type Certificate Holder Record

n/a

III. Change Record

TCDS Issue	Date	Changes	TC issue date
Issue 01	20 November 2015	Initial issue with LEAP-1A35A model	Initial Issue, 20 November 2015
Issue 02	11 March 2016	Addition of LEAP-1A23, LEAP-1A24, LEAP-1A24E1, LEAP-1A26, LEAP-1A26E1, LEAP-1A30, LEAP-1A32, LEAP-1A33, LEAP-1A33B2 models	Revised, 11 March 2016

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