TYPE-CERTIFICATE DATA SHEET

No. E. 072

for
MAKILA 1 series engines

Type Certificate Holder

Safran Helicopter Engines

64510 Bordes

France

For Models:

MAKILA 1A
MAKILA 1A1
MAKILA 1A2

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I. General

1. Type/Models:

MAKILA 1A, MAKILA 1A1, MAKILA 1A2. These variants are approved for use on multi-engined civil rotorcraft at the ratings and within the operating limitations specified below, subject to compliance with the powerplant installation requirements appropriate to approved installations.

Except where otherwise noted, data applies to all variants.

2. Type Certificate Holder:

Safran Helicopter Engines
64510 Bordes
France

DOA-ref: EASA.21J.070

Until 18 July 2016 Turbomeca
After 18 July 2016 Safran Helicopter Engines

3. Manufacturer:

Safran Helicopter Engines

Until 18 July 2016 Turbomeca
After 18 July 2016 Safran Helicopter Engines

4. Certification Application Date:

MAKILA 1A	12 September 1977
MAKILA 1A1	18 November 1983
MAKILA 1A2	31 January 1989

5. EASA Certification Reference Date:

12 September 1977

6. EASA Certification Date:

MAKILA 1A	27 February 1980
MAKILA 1A1	18 October 1984
MAKILA 1A2	06 June 1991

Notes:

1. The present data sheet cancels and replaces the data sheet “Fiche de caractéristiques moteur N° M10” issued by the French Direction Générale de l’Aviation Civile (DGAC).
2. EASA type certification of the MAKILA 1A, MAKILA 1A1 and MAKILA 1A2 variants is granted in accordance with Article 2a, paragraph 1(a) of Commission Regulation (EC) 1702/2003, as amended by Commission Regulation (EC) 375/2007, based on the DGAC France type certification of these variants.

II. Certification Basis

1. Certification Specifications:

JAR-E Change 3, dated 22 March, 1977 (which incorporates by reference BCAR, Section C, Issue 10 dated March 22, 1977), plus BCAR amendments (Blue papers) 623, 678 and 679 dated October 21, 1977.

2. Special Conditions:

MAKILA 1A2	SC1 – SC9:	Special Conditions for approval of OEI ratings.
	SC10:	Assurance of power availability at OEI ratings

3. Deviations:

None

4. Equivalent Safety Findings:

None

5. Environmental Protection Requirements:

Fuel venting per CS-34, Original Issue, dated 17 October 2003 (ICAO Annex 16, Volume II, Amendment 5, dated 24 November 2005, Part II, Chapter 2)

III. Technical Characteristics

1. Type Design Definition:

MAKILA 1A	P/N 0 298 00 504 0
MAKILA 1A1	P/N 0 298 00 506 0
MAKILA 1A2	P/N 0 298 00 511 0

2. Description:

The MAKILA 1 engines consist of an annular air intake, a gas generator, a two stage axial power turbine, an exhaust pipe and rear power transmission off-take. The gas generator has a three stage axial compressor and a single stage centrifugal compressor, driven by a two stage axial turbine, and an annular combustion chamber with centrifugal fuel injection. An accessory drive located at the front and driven by the gas generator powers the engine accessories.

3. Equipment:

All equipment required for engine operation is included in the engine Type Design Definition. For additional details, refer to the applicable Installation Manual.

4. Dimensions:

	Length (mm)	Height (mm)	Width (not including exhaust pipe) (mm)
MAKILA 1A	2117	673	498
MAKILA 1A1	2117	673	498
MAKILA 1A2	2117	673	498

5. Dry Weight:

	Weight (completely equipped) -0/+1 % (kg)
MAKILA 1A	248
MAKILA 1A1	246
MAKILA 1A2	248

6. Ratings:

6.1 All Engines Operative kW

	Maximum Continuous	Take-off (5 minutes)
MAKILA 1A(1)(2)	1130	1240
MAKILA 1A1(1)(2)	1185	1357
MAKILA 1A2(1)(2)	1236	1376

6.2 One Engine Inoperative kW

	Continuous OEI	30-minute OEI / Intermediate Contingency	2½-minute OEI	2-minute OEI	30-second OEI
MAKILA 1A(1)(2)	N/A	1240	1310	N/A	N/A
MAKILA 1A1(1)(3)	N/A	1330	1400	N/A	N/A
MAKILA 1A2(1)(3)	1420	N/A	N/A	1467	1573

(1) The power values indicated in the table are defined under the following conditions:
- static, standard sea level conditions (15°C, 101.3 kPa);
- at the engine test bed with water brake system;
- with the air bleed ports closed;
- without accessory power extraction;
- with calibrated TURBOMECA air intake bellmouth P/N 6 202 88 704 0.

(2) The detailed performance curves are given in the applicable Operating Manual

(3) The detailed performance curves are given in the applicable Performance Brochure

7. Control System:

MAKILA 1A	Hybrid hydromechanical / analogue electronic
MAKILA 1A1	Hybrid hydromechanical / analogue electronic
MAKILA 1A2	Hybrid hydromechanical / digital electronic (DECU)

8. Fluids (Fuel/Oil/Additives):

8.1 Fuel

For a list of fuels and fuel additives approved for use in each variant refer to the applicable Operating Manual.

8.2 Oil

For a list of oils approved for use in each variant refer to the applicable Operating Manual.

9. Aircraft Accessory Drives:

None

10. Bleed Extraction:

P2 air bleed extraction for helicopter use – maximum mass flow rate at sea level standard conditions:

160 g/s at maximum continuous rating
180 g/s at take-off rating and continuous OEI ratings

Refer to the applicable Operating Manual for further details.

IV. Operational Limitations

1. Temperature limits

1.1 Gas generator exhaust temperature (T45) limits

On start-up:

	For an unlimited duration	Maximum overtemperature (< 25 s)	Maximum overtemperature (< 5 s)	Maximum overtemperature (< 2 s)
MAKILA 1A	750°C	770°C	800°C	810°C
MAKILA 1A1	750°C	770°C	800°C at Zp < 6 000 m 820°C at Zp ≥ 6 000 m	810°C at Zp < 6 000 m 850°C at Zp ≥ 6 000 m
MAKILA 1A2	750°C	N/A	800°C at Zp < 6 100 m 820°C at Zp ≥ 6 100 m	810°C at Zp < 6 100 m 850°C at Zp ≥ 6 100 m

In flight:

	2½-minute OEI	Continuous OEI	30-minute OEI / Intermediate Contingency	Take-off	Maximum Continuous
MAKILA 1A	810°C	N/A	785°C	785°C	735°C
MAKILA 1A1	830°C	N/A	785°C	795°C	735°C
MAKILA 1A2	N/A	840°C	N/A	825°C	770°C

1.2 Fuel temperature

Refer to the applicable Installation Manual

1.3 Oil temperature

Minimum oil temperature for power-up: refer to the applicable Operating Manual
Maximum oil temperature: 120°C

2. Maximum / Minimum Speeds:

2.1 Gas generator speed (N1)

100% N1 = 33200 rpm

Maximum stabilised speed – All Engines Operative:

	Take-off	Maximum Continuous
MAKILA 1A	100% (33 200 rpm)	98% (32 500 rpm)
MAKILA 1A1	100.45% (33 350 rpm)	97.3% (32 300 rpm)
MAKILA 1A2	100.1% (33 220 rpm)	97.4% (32 335 rpm)

Maximum stabilised speed – One Engine Inoperative:

	Continuous OEI	30-minute OEI / Intermediate Contingency	2½-minute OEI	2-minute OEI	30-second OEI
MAKILA 1A	N/A	100% (33 200 rpm)	102.4% (34 000 rpm)	N/A	N/A
MAKILA 1A1	N/A	100% (33 200 rpm)	102.4% (34 000 rpm)	N/A	N/A
MAKILA 1A2	100.75% (33 450 rpm)	N/A	N/A	101.8% (33 815 rpm)	104.4% (34 650 rpm)

Maximum transient (≤20s) overspeed – All Engines Operative:

MAKILA 1A	N/A
MAKILA 1A1	N/A
MAKILA 1A2	101.30% (33 625 rpm)

Maximum transient (≤20s) overspeed – One Engine Inoperative:

MAKILA 1A	105 % (34 900rpm)
MAKILA 1A1	105 % (34 900rpm)
MAKILA 1A2	N/A

2.2 Power turbine speed (N2)

100% N2:

MAKILA 1A	22 850 rpm
MAKILA 1A1	22 850 rpm
MAKILA 1A2	22 962 rpm

Maximum stabilised speed: 104 % (all variants)

Maximum transient (≤20s) overspeed:

MAKILA 1A	117%
MAKILA 1A1	117%
MAKILA 1A2	117.9%

The instructions to be followed if speed limits are exceeded are given in the Operating Manual.

3. Torque Limits:

No operating limits are defined. The maximum transmitted torque is 750 Nm, corresponding to MAKILA 1A2 operation at rated 30-second OEI power.

4. Pressure Limits:

4.1 Oil pressure

Minimum oil pressure: 170 kPa gauge
Maximum oil pressure: 600 kPa gauge

4.2 Fuel pressure

Refer to the applicable Operating Manual

5. Installation Assumptions:

Refer to the applicable Installation Manual

6. Time Limited Dispatch:

The MAKILA 1 engines are not approved for time limited dispatch.

V. Operational and Service Instructions

Note: In the table below, where two references separated by "/" are provided, the first one refers to the document in the French language and the second one to the document in the English language. In the event of a conflict, the French version shall take precedence.

	Installation Manual	Operating Manual	Performance Brochure	Maintenance Manual	Overhaul Manual
MAKILA 1A	298 00 930 / 298 00 931	298 01 930 / 298 01 933	N/A	X 298 76 460 1 / X 298 76 460 2	298 01 935
MAKILA 1A1	X 298 E0 001 1 / X 298 E0 001 2	298 01 930 / 298 01 933	X 298 E0 001 9	X 298 E0 460 1 / X 298 E0 460 2	298 01 935
MAKILA 1A2	X 298 H2 001 1 / X 298 H2 001 2	X 298 H2 101 1 / X 298 H2 101 2	X 298 H2 202 9	X 298 H2 400 1 / X 298 H2 400 2	298 01 935

For Service Letters and Service Bulletins, refer to the SB and SL directory.

VI. Notes

1. The MAKILA 1 engines have not been subjected to icing tests nor to foreign object ingestion tests as defined in the Certification Specifications. The operating characteristics in ice-forming conditions and the level of protection against damage from ingestion of foreign objects must therefore be assessed prior to approval of the engine installation in any helicopter type.

2. The MAKILA 1A2 DECU must not be installed in a designated fire zone. Installation conditions are defined in the applicable Installation Manual.

3. The engine control unit provides, after modification for the MAKILA 1A and MAKILA 1A1, and without modification for the MAKILA 1A2, a TRAINING mode for training crews in the event of engine failure. Refer to the applicable Operating Manual for additional details of the TRAINING mode.

4. The MAKILA 1A2 DECU software has been validated in accordance with the requirements of RTCA/DO-178A, Level 1.

5. The starting and operating envelopes are provided in the applicable Operating Manual.

6. MAKILA 1A2 DECU EMI tests were performed as specified in MIL-STD-461B dated April 1, 1980, and in MIL-STD-462 Notice 2, for equipment classified in MIL-STD-461B as A1b. Validated EMI levels are specified in the Installation Manual. The DECU lightning tests were performed as specified in SAE standard AE4L 87-3, revision B. Validated lightning strike levels are specified in the applicable Installation Manual.

7. The engines are equipped with a free turbine overspeed shutdown device. The N2 shutdown limit is set at 120% for the MAKILA 1A and MAKILA 1A1, and 121.5% for the MAKILA 1A2.

8. Conversion from non-civil use. MAKILA 1 series engines originally assembled by Turbomeca may have been in service with military, customs, police or other operators not under the jurisdiction of a civil Authority. Before such engines can be converted to civil operation, their compliance with the European rules enabling issuance of an aircraft standard certificate of airworthiness must be checked. Their configuration, including design changes and repairs, does not necessarily conform to the type definition approved by EASA, and it is possible that in operation they have exceeded the limits approved by EASA. Before a standard certificate of airworthiness is issued to an aircraft in which such an engine is installed, an EASA Form 1 must be issued for the engine. This requires incorporation of TURBOMECA Mandatory Service Bulletin A298 72 0804, Version B (or any subsequent approved issue).

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SECTION: ADMINISTRATIVE

I. Acronyms and Abbreviations

n/a

II. Type Certificate Holder Record

Until 18 July 2016 Turbomeca
After 18 July 2016 Safran Helicopter Engines

III. Change Record

Issue	Date	Changes	TC issue
Issue 01	24 November 2009	Initial Issue	24 November 2009
Issue 02	01 August 2016	Name Change from Turbomeca to Safran Helicopter Engines	01 August 2016
Issue 03	09 March 2017	Major Change Approval 10051034 (Mod DM96968) certified by EASA on November 03rd 2014	01 August 2016
Issue 04	31 May 2024	- Introduction of a transient T45 limit of 770°C over a maximum period of 25 s at engine starting, reference EASA Major Change Approval 10078324 - Editorial changes	01 August 2016
Issue 05	01 August 2025	Revised dry weight following update of the Installation Manual, EASA Major Change approval 10086030 refers	01 August 2016

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