

型号认可证数据单
THE VALIDATION DATA SHEET

编号/No.: VTC0125E

版次/Revision: 1

型号/Type:

MAKILA 1A

MAKILA 1A1

MAKILA 1A2

批准人/Approved by: Xu Chaoqun

徐超群

职务/Title: Director General of CAAC-AAD

日期/Date: 2018-6-19

本数据单是型号认可证（编号 VTC125E）的组成部分，它规定了符合中国民用航空局的适航要求所颁发此型号认可证的产品状态和限制。

This data sheet, which is a part of Validation Type Certificate (No: VTC125E), prescribes conditions and limitations under which the product for which the Type Certificate was issued meets the airworthiness requirements of the Chinese Civil Aviation Regulation.

型号认可证持有人/Validation of Type Certificate Holder:

Safran Helicopter Engines

64510 Bordes, France

有效页清单/List of effective pages:

页数/Pages	1	2	3	4	5	6	7	8	9	10					
版次/Revision	1	1	1	1	1	1	1	1	1	1					

第1部分 概述

SECTION 1 GENERAL

1. CAAC 认可数据单和型号合格证数据单/CAAC Validation Data Sheet and Type Certificate Data Sheet

	中国民用航空总局认可数据单号、版次和颁发日期 CAAC Validation Data Sheet Number, Revision and issuance date	型号合格证数据单号、版次和颁发日期 Type Certificate Data Sheet Number, Revision and issuance date
当前 Current	VTC0125E, 版次1, 2018年6月19日 VTC0125E, Revision 1, June 19, 2018	EASA TCDS No. E072, 第3版, 2017年03月09日 EASA TCDS No. E072, Issue 3, March 09, 2017
历史 History	VTC125E, 版次0, 2002年4月15日 VTC125E, Revision 0, April 15, 2002	DGAC TCDS No. M10, 第14版, 1999年11月 DGAC TCDS No. M10, Edition 14, November, 1999

2. 类别/Category: 航空发动机/Aeroengine
3. 认可当局/Validation Authority: 中国民用航空局/CAAC
审定当局/Certifying Authority: 欧洲航空安全局/EASA
4. 型号合格证持有人/Type Certificate Holder: Safran Helicopter Engines
64510 Bordes, France
5. 双发延程飞行/ETOPS: 不适用/NA
6. CAAC 专用要求/CAAC Special Requirements: 无/None

第2部分 数据单

Section 2 DATA SHEET

I. 概述/General

1. 型号/类型/Type/Models:

Makila 1A、MAKILA 1A1、MAKILA 1A2, 这三个型别可用于满足下述规定的功率及使用条件的民用多发旋翼机, 同时需满足动力装置相应的安装条件。

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.

除非另行说明, 数据适用于所有型别/Except where otherwise noted, data applies to all variants.

2. 型号合格证持有人/Type Certificate Holder:

Safran Helicopter Engines

64510 Bordes

France

设计机构批准/DOA-ref: EASA.21J.070

2016 年 7 月 18 日前为透博梅卡/Until 18 July 2016 Turbomeca

2016 年 7 月 18 日后为赛峰直升机发动机/After 18 July 2016 Safran Helicopter Engines

3. Manufacturer/制造商:

赛峰直升机发动机公司/Safran Helicopter Engines

2016 年 7 月 18 日前为透博梅卡/Until 18 July 2016 Turbomeca

2016 年 7 月 18 日后为赛峰直升机发动机/After 18 July 2016 Safran Helicopter Engines

4. 申请日期/Certification Application Date:

MAKILA 1A	1977 年 9 月 12 日/12 September 1977
MAKILA 1A1	1983 年 11 月 18 日/18 November 1983
MAKILA 1A2	1989 年 1 月 31 日/31 January 1989

5.EASA 型号合格备案日期/EASA Certification Reference Date:

1977 年 9 月 12 日/12 September 1977

6. EASA 型号合格证审定日期/EASA Certification Date:

MAKILA 1A	1980 年 2 月 27 日/27 February 1980
MAKILA 1A1	1984 年 10 月 18 日/18 October 1984
MAKILA 1A2	1991 年 6 月 6 日/06 June 1991

注释/Notes:

1. 该数据单取消并替代法国民航局 (DGAC) “Fiche de caractéristiques moteur N° M10”数据单。

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. MAKILA 1A, MAKILA 1A1 and MAKILA 1A2 的型号合格证是 EASA 根据欧盟委员会规章 1702/2003 第 2a 条款, 第 1(a)段颁发的, 该条款是欧盟委员会在法国民航局 (DGAC) 的型号合格证的基础上, 由欧盟委员会 375/2007 条例修正制定的。

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. 审定基础/Certification Basis

1. 审定规范/Certification Specifications:

1977 年 3 月 22 日的 JAR-E 第 3 更改(包括 1977 年 3 月 22 日参考的 BCAR, 第 C 部, 第 10 问题), 以及 1977 年 10 月 21 日 BCAR623、678 及 679 修正条款(蓝皮书)。

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. 专用条件/Special Conditions:

MAKILA 1A2	SC1 – SC9: SC10:	OEI 功率专用条件/Special Conditions for approval of OEI ratings. OEI 功率动力保证/Assurance of power availability at OEI ratings
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3. 偏离/Deviations:

无/None

4. 等效安全/Equivalent Safety Findings:

无/None

5. 环境保护要求/Environmental Protection Requirements:

2003 年 10 月 17 日, 原始版, CS-34 燃油排泄要求(2005 年 11 月 24 日, 第 II 部, 第 2 章的 ICAO 附录 16, 第 II 卷, 第 5 修正案)。

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. 技术特性/Technical Characteristics

1. 型号设计定/Type Design Definition

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

2. 描述/Description:

MAKILA 1 系列发动机包括一个环形进气道, 一个燃气发生器, 一个两级轴流动力涡轮, 一个尾喷管和动力输出装置后部组成。燃气发生器由三级轴流压气机和单级离心压气机组成, 并由一个两级轴流涡轮, 一个环形离心喷嘴燃烧室。附件驱动位于前部, 由为发动机附件系统提供动力的燃气发生器驱动。

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. 设备/Equipment:

发动机运行的所有设备都包括在发动机型号设计定义当中。如需额外信息, 请参考适用的安装手册。

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

4. 尺寸/Dimensions:

型号/Model	长(毫米)/Length (mm)	高(毫米)/Height (mm)	宽(不包括尾喷管)(毫米)/Width (not including exhaust pipe) (mm)
MAKILA 1A	2117	673	498
MAKILA 1A1	2117	673	498
MAKILA 1A2	2117	673	498

5. 干重/Dry Weight:

型号/Model	重量(加上所有设备)(千克)/Weight (completely equipped) (kg)
MAKILA 1A	243
MAKILA 1A1	241
MAKILA 1A2	247

6. 额定值/ Ratings:**6.1 所有发动机工作 千瓦/ All Engines Operative kW**

型号/Model	最大连续/Maximum Continuous	起飞 (5分钟)/Take-off(5 minutes)
MAKILA 1A ⁽¹⁾⁽²⁾	1130	1240
MAKILA 1A1 ⁽¹⁾⁽²⁾	1185	1357
MAKILA 1A2 ⁽¹⁾⁽²⁾	1236	1376

6.2 单发失效(千瓦) / One Engine Inoperative (kW)

型号/Model	连续单发失效 Continuous OEI	30 分钟单发失效/中等偶然性 30-minute OEI / Intermediate Contingency	2.5 分钟单发失效 2½-minute OEI	2 分钟单发失效 2-minute OEI	30 秒单发失效 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) 表格中的功率是按如下条件定义的

The power values indicated in the table are defined under the following conditions:

- 静态, 标准海平面/static, standard sea level conditions (15°C, 101.3 kPa);
- 带有水力测功器的发动机车台状态/at the engine test bed with water brake system;
- 引气关闭/with the air bleed ports closed;
- 无附件提取功率/without accessory power extraction;
- 装有透博梅卡校准的进气道, 件号 P/N 6 202 88 704/ 0 with calibrated TURBOMECA air intake bellmouth.

(2) 详细性能曲线列在适用的运行手册当中

The detailed performance curves are given in the applicable Operating Manual.

(3) 详细性能曲线列在适用的性能手册当中

The detailed performance curves are given in the applicable Performance Brochure.

7. 控制系统/Control System:

MAKILA	混合液压机械/Hybrid hydromechanical/模拟电子/analogue electronic
MAKILA 1A1	混合液压机械/Hybrid hydromechanical/模拟电子/analogue electronic
MAKILA 1A2	混合液压机械/Hybrid hydromechanical/数字电子/digital electronic (DECU)

8. 液体（燃油/滑油/添加剂）/Fluids (Fuel/Oil/Additives):**8.1 燃油/Fuel**

各型号适用的燃油或燃油添加剂清单，请参见适用的运行手册

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

8.2 滑油/Oil

各型号适用滑油，请参见适用的运行手册

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

9. 航空器附件传动装置/Aircraft Accessory Drives:

无/None

10. Bleed Extraction/引气:

在海平面标准大气条件下直升机使用的 P2 最大引气量:

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

最大连续功率状态为 160g/s

160 g/s at maximum continuous rating

起飞功率和连续单发失效功率状态下为 180g/s

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

详情请见运行手册。

Refer to the applicable Operating Manual for further details.

IV. 使用限制/Operational Limitations**1. 温度限值/Temperature limits****1.1 燃气发生器排气温度（T45）限值/Gas generator exhaust temperature (T45) limits**

起动时/On start-up:

型号/Model	无限制时间 For an unlimited	最大超温(< 5 s)/Maximum overtemperature (< 5 s)	最大超温(< 2 s)/Maximum overtemperature (< 2 s)
MAKILA 1A	750°C	800°C	810°C
MAKILA 1A1	750°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	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

飞行中/In flight:

型号/Model	2.5 分钟单发失效 2½-minute OEI	连续单发失效 Continuous OEI	30 分钟单发失效/中等偶然性 30-minute OEI / Intermediate Contingency	起飞 Take-off	最大连续 Maximum Continuous
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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 燃油温度/Fuel temperature

参见适用的安装手册/Refer to the applicable Installation Manual

1.3 滑油温度/Oil temperature

通电最低温度: 见适用运行手册

最高温度: 120°C

Oil temperature:

Minimum oil temperature for power-up: refer to the applicable Operating Manual

Maximum oil temperature: 120°C

2. 最大/最小速度 Maximum / Minimum Speeds:

2.1 燃气发生器速度 Gas generator speed (N1)

100% N1 = 33200 rpm

最大稳定转速-所有发动机工作/Maximum stabilised speed -All Engines Operative:

型号/Model	起飞/Take-off	最大连续/Maximum Continuous
MAKILA 1A	100% (33200 rpm)	98% (32500 rpm)
MAKILA 1A1	100.45% (33350 rpm)	97.3% (32300 rpm)
MAKILA 1A2	100.1% (33220 rpm)	97.4% (32335 rpm)

最大稳定转速-单发失效/Maximum stabilised speed-One Engine Inoperative:

型号/Model	连续单发失效 Continuous OEI	30 分钟单发失效/中等偶然性 30-minute OEI / Intermediate Contingency	2.5 分钟单发失效 2½-minute OEI	2 分钟单发失效 2-minute OEI	30 秒单发失效 30-second OEI
MAKILA 1A	N/A	100% (33200 rpm)	102.4% (34000 rpm)	N/A	N/A
MAKILA 1A1	N/A	100% (33200 rpm)	102.4% (34000 rpm)	N/A	N/A
MAKILA 1A2	100.75% (33450rpm)	N/A	N/A	101.8% (33815 rpm)	104.4% (34650 rpm)

最大瞬态超转(≤20s)-所有发动机工作状态/Maximum transient (≤20s) overspeed-All Engines Operative:

MAKILA 1A	N/A
MAKILA 1A1	N/A
MAKILA 1A2	101.3% (33625 rpm)

最大瞬态超转($\leq 20s$)–单发失效/Maximum transient ($\leq 20s$) overspeed-One Engine Inoperative:

MAKILA 1A	105 % (34900rpm)
MAKILA 1A1	105 % (34900rpm)
MAKILA 1A2	N/A

动力涡轮转速/Power turbine speed (N2):

100% N2:

MAKILA 1A	22850 rpm
MAKILA 1A1	22850 rpm
MAKILA 1A2	22962 rpm

最大稳定速度(所有型号)/Maximum stabilised speed(all variants):104 %

最大瞬时超转($\leq 20s$) /Maximum transient ($\leq 20s$) overspeed:

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

超过最大转速时所需操作参见运行手册。

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

3. 扭矩限值 Torque Limits:

无定义的限制值。最大传输扭矩为 750Nm，相当于 Makila 1A2 在 30 秒单发失效下的功率。

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

4. 压力限值/Pressure Limits:

4.1 滑油压力/Oil pressure

最小滑油压力: 170 kPa 标准计量/Minimum oil pressure: 170 kPa gauge

最大滑油压力: 600 kPa 标准计量/Maximum oil pressure: 600 kPa gauge

4.2 燃油压力/Fuel pressure

参见适用的运行手册/Refer to the applicable Operating Manual

5. 安装假设/Installation Assumptions:

参见适用的安装手册/Refer to the applicable Installation Manual

6. 限时签派/Time Limited Dispatch:

MAKILA 1 发动机没有被批准限时签派/The MAKILA 1 engines are not approved for time limited dispatch.

V. 操作和服务指令 Operational and Service Instructions

注释/Note: 以下表格中，以“/”分隔的参考编码，前者为法语版文件编码，后者为英语班文件编码。若两者有出入，以法语版为准。

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.

型号/Model	安装手册 Installation Manual	运行手册 Operating Manual	性能手册 Performance Brochure	维修手册 Maintenance Manual	大修手册 Overhaul Manual
MAKILA 1A	298 00 930 / 298 00 931	298 01 930 / 298 01 933	N/A	X 298 76 460 1	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	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	298 01 935

服务信函和服务通告，参看服务信函和服务通告指南。

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

VI. 注释/Notes

1. MAKILA 1 发动机未开展审定规范中规定的结冰试验和外物吸入试验。因此，在发动机获准安装在直升机上之前，需对结冰条件和外物吸入保护的运行特征进行评估。

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. MAKILA 1A2 的数字电子系统需安装在指定的防火区。安装条件在适用的安装手册中有所规定。

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

3. 在对 MAKILA 1A 和 MAKILA 1A1 调整，MAKILA 1A2 没有调整后，发动机控制单元提供了发动机停车的机组人员培训模式。培训模式详情参见适用的运行手册。

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. MAKILA 1A2 的数字电子系统软件是按照 RTCA/DO-178A，1 级要求进行验证的。

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

5. 起动和运行包线在适用的运行手册中有所规定。

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

6. 针对 MIL-STD-461B 中列出的设备，MAKILA 1A2 数字电子电磁干扰试验是按照 1980 年 4 月 1 日的 MIL-STD-461B 和 MIL-STD-462 通知 2 中的规定开展的。数字电子系统的雷电试验按照 SAE 标准 AE4L87-3，B 版规定进行。已验证的雷电电击水平在适用的安装手册当中有所规定。

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. 发动机装有自由涡轮超转停止装置。MAKILA 1A 和 MAKILA 1A1 的 N2 停止极限为 120%，MAKILA 1A2 为 121.5%。

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. 透博梅卡组装的 MAKILA 1 系列发动机最早是用于军事，海关，警务及他们非民用领域。在将这些发动机转为民用之前，需确认发动机是否符合颁发飞行器标准适航证的欧盟安全条例。发动机的构型、包括设计更改和维修，并非完全符合 EASA 授权的型号定义，在运行过程中，可能超出 EASA 授权的界限值。在对装有该型号发动机的航空器颁发标准适航证之前，需对发动机颁发 EASA Form1。这就要求必须包含透博梅卡的强制服务通告 A298 72 0804，B 版（或任何后续授权问题）。

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).

结束

END