U.S. DEPARTMENT OF TRANSPORTATION FEDERAL AVIATION ADMINISTRATION TYPE CERTIFICATE DATA SHEET E12NE	TCDS NUMBER E12NE REVISION: 5* DATE: March 21, 2007 TURBOMECA MODELS: MAKILA 1A MAKILA 1A1 MAKILA 1A2

Engines of models described herein conforming with this data sheet (which is part of Type Certificate Number E12NE) and other approved data on file with the Federal Aviation Administration, meet the minimum standards for use in certificated aircraft in accordance with pertinent aircraft data sheets and applicable portions of the Federal Aviation Regulations, provided they are installed, operated, and maintained as prescribed by the approved manufacturer's manuals and other approved instructions.

TYPE CERTIFICATE HOLDER Turbomeca S.A.
64 511 Bordes Cedex
France

I. MODELS	**MAKILA 1A**	**MAKILA 1A1**	**MAKILA 1A2**	
TYPE	Twin spool (free turbine engine); turboshaft engine for twin-engined helicopters; three=stage axial compressor; single-stage centrifugal compressor; annular combustion chamber with centrifugal fuel injection; two-stage gas generator turbine; tow-stage power turbine.			
RATINGS (See NOTE 7)	SHP (kw)	SHP (kw)	SHP (kw)	
30-second OEI	---	---	2016(1504)	
2-minute OEI	---	---	1866(1392)	
2-1/2 minute OEI	1756(1310)	1877(1400)	---	
30-minute or continuous OEI	1662(1240)	1783(1330)	1799(1342)	
Takeoff (5 minutes)	1662(1240)	1819(1357)	1732(1292)	
Maximum continuous	1515(1130)	1589(1185)	1527(1139)	
FUEL (See NOTE 14)				
OIL (See NOTE 13)	MIL-L-7808 / MIL-L-23699 / AIR 3514			

CERTIFICATION BASIS

Makila 1A/1A1: FAR 21.29 and FAR 33 effective February 1, 1965, as amended by FAR 33-1 / -2 / -3 / -4 / -5 / -6 / -7 / -8.

Makila 1A2: FAR 21.29 and FAR 33 effective February 1, 1965, as amended by FAR 33-1 / -2 / -3 / -4 / -5 / -6 / -7 / -8 and Special Condition No. SC-92-01-NE.

MODEL	APPLICATION DATE	TYPE CERTIFICATE ISSUED / AMENDED	TYPE CERTIFICATE SURRENDERED
MAKILA 1A	03/07/78	04/13/81	
MAKILA 1A1		03/28/85	
MAKILA 1A2	07/07/89	03/17/92	

The aviation authority for France, the Direction Generale de L'Aviation Civile (DGAC)**,** originally type certificated this engine. The FAA validated this product under U.S. Type Certificate Number E12NE . Effective September 28, 2003, the European Aviation Safety Agency (EASA) began oversight of this product on behalf of France.

IMPORT REQUIREMENTS

To be considered eligible for installation on U.S. registered aircraft, each new engine to be exported to the United States with the DGAC or EASA airworthiness approval shall have a Joint Aviation Authorities (JAA) or EASA Form 1, Authorized Release Certificate. The JAA or EASA Form 1 should state that the engine conforms to the type design approved under the U.S. Type Certificate E12NE, is in a condition for safe operation and has undergone a final operational check.

NOTES

NOTE 1. MAXIMUM PERMISSIBLE OPERATING SPEEDS. For variation of these limits with OAT, refer to Operation Manual. If these limits are exceeded, refer to Operation Manual.

I. MODELS:	**MAKILA 1A**	**MAKILA 1A1**	**MAKILA 1A2**		
A. GAS GENERATOR (Ng) RPM					
30-second OEI	---	---	34,650		
2-minute OEI	---	---	33,815		
2-1/2 minute OEI	34,000	- -	- -		
30-minute or continuous OEI	33,200	- -	33,565		
Takeoff (5 minutes)	33,200	33,350	33,245		
Maximum continuous	32,500	32,300	32,360		
Transient overspeed (20 seconds)	34,900	- -	33,625		
100% gas generator speed equals 33,200 rpm					
B. POWER TURBINE SPEED (Np) RPM					
Maximum stablized	25,100	- -	25,258		
Maximum Transient (20 seconds)	26,700	- -	27,072		
100% power turbine speed equals	22,850	- -	22,962		

NOTE 2. MAXIMUM PERMISSIBLE TEMPERATURES. Refer to Operation Manual for required action if limits are exceeded.

A. EXHAUST GAS (T4) MEASURED WITH FOUR THERMOCOUPLES ON GAS GENERATOR EXHAUST DIFFUSER

30-second OEI	---	---	---		
2-minute OEI	---	---	870°C		
2-1/2 minute OEI	810°C	830°C	- -		
30-minute or continuous OEI	775°C	785°C	825°C		
Takeoff (5 minutes)	785°C	795°C	760°C		
Maximum continuous	735°C	- -	- -		
Starting	750°C	- -	- -		
Transient (5 seconds)	800°C	800°C (1)	- -800°C (3)		
Transient (2 seconds)	810°C	810°C (1)	- -810°C (3)		
Transient (5 seconds)	---	820°C (2)	- -820°C (4)		
Transient (2 seconds)	---	850°C (2)	- -850°C (4)		
(1) Altitude less than 6,000 meters (2) Altitude equal to or greater than 6,000 meters (3) Altitude less than 6,100 meters (4) Altitude equal to or greater than 6,100 meters					

NOTE 2. (Continued)

B. OIL MEASURED AT OIL-FUEL EXCHANGER OUTLET

Maximum operating +120°C

Minimum for starting Between -50°C and -30°C, according to oil specifications. Refer to Operation Manual.

C. Fuel (See NOTE 8) MEASURED AT ENGINE INLET

Maximum operating +50°C

NOTE 3. FUEL AND OIL PRESSURE LIMITS (psig)

Fuel — Refer to Operation Manual

Oil — Minimum 24.7 psig, measured at engine pump outlet, after filter

NOTE 4. MAXIMUM PERMISSIBLE AIR BLEED (P2 air bleed from centrifugal compressor plenum). Standard day sea level condition.

Maximum air mass flow — 0.035 lb/second at maximum continuous rating

NOTE 5. AIR INTAKE REQUIREMENTS

These engines have not been tested in icing conditions in accordance with FAR 33.68.

These engines have not been tested to evaluate the effects of foreign object ingestion in accordance with FAR 33.77.

Operation under icing conditions and protection against foreign object ingestion should be evaluated before installation approval and suitable protection devices should be provided as required. Protection grid as defined by SNIAS drawing numbers 332 A58 0050 / 332 A58 0054 - 06 / -07 /
-08 / and -09 meet the requirements of FAR 33.77.

NOTE 6. ACCESSORY DRIVE PROVISIONS / ALL MODELS

COMPONENT	(*) ROTATION	RPM	REDUCTION RATIO	Maximum Permanent Power (kw/shp)	Maximum Over-Torque m.da.N (in-lb)	Maximum Static Overhant Moment	Shear Shaft Breaking-Torque m.da.N (in-lb)
Generator rotor	CCW (1)	33,200	0.70350				
Starter	CW (2)	23,355			1.7 (148)	0.5 (43.5)	6.6 to 7.4 (547- 643)
Oil pump unit (3)	CCW (2)	4,184	0.12602				
Fuel pump & governor	CW (2)	4,184	0.12602				
Free turbine rotor							
MAKILA 1A	CCW (1)	22,850		1240 / 1662			
MAKILA 1A1	CCW (1)	22,850		1357 / 1818			
MAKILA 1A2	CCW (1)	22,962		1292 / 1732			

(*) CCW = Counterclockwise / CW = Clockwise

(1) Direction of rotation of engine rotors and main drives is indicated according to French standard MF-L-85010: i.e., engine observed aft looking forward.

(2) Direction of rotation of accessory drives is indicated with the off-take flange seen from outside; i.e., the direction of rotation of the accessory drive shaft on the engine.

(3) Integrated accessories (engine internal accessories); otherwise data not given.

NOTE 7. Engine ratings are based on calibrated static test stand performance under the following conditions:

Static sea level standard conditions at 59°F and 29.92 in/Hg.

No airbleed, no accessory power offtake other than that necessary for the engine running.

For the Makila 1A and 1A1: 22,850 rpm power shaft speed.

For the Makila 1A2: 22,962 rpm power shaft speed.

FOR THE MAKILA 1A AND 1A1, the indicated ratings are minimum final test performance of production and overhaul engines measured with engine acceptance test specification Number 0.298.00.940.9, calibrated test bed air intake Number 6.202.88.704.0, and Turbomeca exhaust duct Number 0.301.51.755.0.

FOR THE MAKILA 1A2, the indicated ratings are minimum final test performance of production and overhaul engines measured with engine acceptance test specification Number 0.298.00.950.0, calibrated test bed air intake Number 6.202.88.704.0, and Turbomeca exhaust duct Number 0.301.53.731.0.

NOTE 8. FUEL SUPPLY REQUIREMENTS

Fuel supply from helicopter system must be delivered to the engine through a 10-microm filter provided by the aircraft manufacturer.

NOTE 9. OIL SYSTEM: Refer to Operation Manual

NOTE 10. ENGINE MONITORING TRANSMITTERS: Refer to Operation Manual

NOTE 11. ELECTRICAL EQUIPMENT: Refer to Operation Manual

NOTE 12. ENGINE FIRE DETECTORS

Six fire detectors are provided on the engine. The characteristics of the fire detectors are to be evaluated prior to approval of the engine installation.

NOTE 13. OIL BRANDS: Refer to Operation Manual for approved oil brands. Mixing of different oil brands or specifications is prohibited.

NOTE 14. FUEL AND FUEL ADDITIVES: Refer to Operation Manual for specifications.

NOTE 15. Certain engine parts are life-limited. These limits are listed in the DGAC-approved Maintenance Manual, Chapter 5.

NOTE 16. MANUALS REQUIRED BY far 33.5

I. MODELS:

	MAKILA 1A	**MAKILA 1A1**	**MAKILA 1A2**		
Operation manual	298 01 933	- -	X 298 H2 101 2		
Installation manual	298 00 931	X298 EO 001 1	X 298 H2 001 2		
	---	X298 EO 001 9	X 298 H2 202 G		
Maintenance manual	298 00 934	X298 EO 300 2	X 298 H2 400 2		
Overhaul manual	298 01 936	- -	- -		

NOTE 17. Engine maintenance program requirements are defined in the approved Maintenance Manual.

NOTE 18. The electronic section of the fuel control will be located in the airframe in accordance with applicable Installation Manual requirements and Turbomeca Drawing Number 0 177 69 9000.

NOTE 19. The electronic control must receive electrical power from two separate and independent buses, either one of which is capable of supplying the full electrical needs of the control, or to be switched to an independent secondary bus in the event of a failure of the primary bus.

NOTE 20. The effects of an inoperative electronic control on aircraft operational characteristics must be evaluated prior to installation approval.

NOTE 21 SERVICE INFORMATION:

Each of the documents listed below must state that it is approved by the European Aviation Safety Agency (EASA) or, for approvals made before September 28, 2003 by Direction Generale de L'Aviation Civile (DGAC). Any such documents including those approved under a delegated authority, are accepted by the FAA and are considered FAA approved.

- Service bulletins,
- Structural repair manuals,
- Vendor manuals,
- Aircraft flight manuals, and
- Overhaul and maintenance manuals.

These approvals pertain to the type design only.

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