



TYPE CERTIFICATE DATA SHEET Nº EM-2021T02

Type Certificate Holder:

SAFRAN HELICOPTER ENGINES
64510 BORDES
FRANCE

EM-2021T02-00

Sheet 01

SAFRAN
Arrano 1A

18 August 2021

Engines of models described herein conforming with this data sheet, which is part of Type Certificate No. 2021T02, meet the minimum standards for use in certificated aircraft in accordance with pertinent aircraft data sheets and applicable portions of the Brazilian Aeronautical Regulations provided they are installed, operated, and maintained as prescribed by the approved manufacturer's manuals and other instructions.

MODEL ARRANO 1A

TYPE This model is approved for use on multi-engine civil rotorcraft at the ratings and within the operating limitations specified below, subject to compliance with the powerplant installation requirements appropriate to approved installations.

RATINGS

	Arrano 1A
Max. continuous, hp.: Sea level pressure altitude:	990
Takeoff, hp.: Sea level pressure altitude:	1 141

REDUCTION GEAR RATIO #

CONTROL SYSTEM Dual channel electronic engine control system

FUEL PUMP Refer to Installation Manual

IGNITION SYSTEM High energy ignition generator with dual output, 2 Igniter plugs and cables

**MAXIMUM
PERMISSIBLE
TEMPERATURE
OR
TEMPERATURES
LIMITS****TEMPERATURE LIMITS****MAXIMUM EXHAUST GAS TEMPERATURE (T45 °C)**

Measured with thermocouples at the gas generator turbine outlet

ARRANO 1A

Takeoff 912

Maximum continuous 886

30-minute AEO 912

Continuous OEI 914

2 min OEI 957

30 sec OEI 991

AEO Transient (20 second limit) 934

Starting (unlimited) 800

Starting (maximum over-temperature): 850

APU mode 665

FUEL TEMPERATURE (°C)

Measured at engine inlet

ARRANO 1A

Maximum operating temperature: +57°C

Minimum fuel temperature for operating, starting and restart envelope: The highest temperature between -45°C and Freezing point temperature defined for the applicable fuel standard.

Refer to the Installation and Operating Manual for detailed definition and limitations of normal fuels usage.

The minimum fuel temperature is subject, for certain fuels, to mandatory use of anti-icing additive for temperatures below -30°C. Refer to the Installation and Operating Manual for further details

OIL TEMPERATURE (°C)

Measured at the oil filter outlet.

ARRANO 1A

Maximum operating temperature: 115°C

Minimum oil temperature for starting:

-36°C for oils with viscosity rating of 5 cSt

-45°C for oils with viscosity rating of 3 cSt

Minimum oil temperature before applying power:

- Without anti-icing additives in fuel, the minimum oil temperature before applying power is +20 °C. The authorization of applying power is given by the flag "powering up not allowed" set to 0 ;
- With anti-icing additives in fuel, the minimum oil temperature before applying power is 0 °C.

During the oil warm-up period, the engine shall be run in APU mode or in IDLE mode, or in

FLIGHT mode with the minimum collective pitch position.

Refer to Installation and Operating Manual for detailed oil temperature limitations

FUEL AND OIL PRESSURE LIMITS	<p>PRESSURE LIMITS</p> <p>FUEL</p> <p>ARRANO 1A Detailed information about fuel pressures depending on atmospheric conditions and fuel specifications are provided in the Installation and Operating Manual.</p> <p>OIL</p> <p>ARRANO 1A Normal oil pressure during operation: between 58 PSI (400 kPa) (relative pressure) and 130.5 PSI (900 kPa) (relative pressure). Minimum and Maximum level warnings are functions of N1 and oil temperature</p>						
PRINCIPAL DIMENSIONS	<table border="0"> <tr> <td style="padding-right: 20px;">Length (mm)</td> <td style="text-align: right;">1 219</td> </tr> <tr> <td>Height (mm)</td> <td style="text-align: right;">623.2</td> </tr> <tr> <td>Width (mm)</td> <td style="text-align: right;">817</td> </tr> </table>	Length (mm)	1 219	Height (mm)	623.2	Width (mm)	817
Length (mm)	1 219						
Height (mm)	623.2						
Width (mm)	817						
WEIGHT(KG)	173.5						
CENTER OF GRAVITY	Refer to Installation Manual						
EQUIPMENT AND COMPONENTS	The equipment necessary to operate the engine and that is not included in the Engine Type Design Definition is defined in the applicable Installation and Operating Manual.						
LIMITATIONS	#						
AIR BLEED	<p>MAXIMUM PERMISSIBLE P3 AIR BLEED FROM THE OUTLET OF THE 2ND STAGE CENTRIFUGAL COMPRESSOR</p> <p>Maximum air mass flow: P3 air bleed extraction for helicopter use is limited by the section of the P3 extraction restrictor. The maximum possible extraction is 205 g/s and corresponds to Take-Off power at ISA Sea Level conditions. For any other operating point, refer to Installation and Operating Manual Power loss due to air bleed: Refer to Installation and Operating Manual.</p>						
PRIMARY AUTHORITY	EASA – European Aeronautic Safety Agency – TC EASA.E.095						
IMPORT REQUIREMENTS	<p>“Each engine imported separately and/or spare parts must be accompanied by a EASA Export Airworthiness Approval through the EASA Form 1, Authorized Release Certificate (or equivalent third country certification authority document), certifying that the engine conforms to a type design approved by the ANAC, as specified in the ANAC’s type certificate data sheet No. EM-2021T02, latest revision, is in condition for safe operation and has undergone a final operational check. The original Authorized Released Certificate should be sent with the engine and a copy remains with the issuing organization.</p> <p>For each engine it is required a list of exceptions (if any) in respect to the ANAC approved Type Design, listed in the EASA Authorized Release Certificate above mentioned”</p>						

PUBLICATIONS Installation and Operating Manual ARRANO 1A - X3561A0022.
Maintenance Manual - X 356 1A 460 2

Manuals	Installation and Operating Manual	Performance Brochure
ARRANO 1A	X3561A0022	X3561A0012

Instructions for Continued Airworthiness	Maintenance Manual	Overhaul Manual	Maintenance Manual Trouble Shooting Book	Service Letter and Service Bulletins Refer to the S and SL directory
ARRANO 1A	X3561A4602	X3561A5002	X3561A4612	

CERTIFICATION BASIS Brazilian Type Certificate No.2021T02 based on the RBAC 21.29 and RBAC 33, which correspond to 14 CFR Part 33, Amendments 33-1 through 33-34, effective 01 Feb 1969.

- Per RBAC 21.29 (a)(1)(ii), the compliance was verified through equivalency finding to EASA Certification Specification E (CS-E), Amendment 4 including:

Special Condition:

- Approval of a 30-minute power rating;
- Operation in 'APU' mode;
- Transient over-temperature, over-speed and over-torque limit approval;
- Engine Mounts – Non-Declaration of Approved Life;

And for Environmental Protection Requirements:
CS-34.1 - Fuel venting

PRODUCTION BASIS #

**SHAFT OR
ROTORS SPEED
LIMITS****PERMISSIBLE ENGINE ROTOR AND OUTPUT SHAFT SPEEDS:
GAS GENERATOR SPEED (PERCENT N1)**

ARRANO 1A

100% N1 = 44,139 rpm

In-flight and APU mode Minimum speeds:

Idle Mode (1)	Idle with PT locked	APU Mode	Flight Mode (2)
57%	57%	59.8%	69.8

(1) This speed corresponds to the minimum stabilized N1 speed in IDLE mode with N2=80%

(2) This speed corresponds to the minimum stabilized N1 speed in FLIGHT mode with N2=100%

In-flight maximum speeds, All Engine Operative (*):

Take-off (5 minutes)	30-minute AEO	Maximum Continuous	AEO transient (20 seconds)
104%	104%	103%	105.5%

In-flight maximum speeds, One Engine Inoperative:

30-second OEI	2-minute OEI	Continuous OEI
107.8%	105.6%	104.5%

POWER TURBINE SPEED (PERCENT N2)

ARRANO 1A

100% N2 = 34,767 rpm (Power turbine)

100% N2 = 7,939 rpm on the power drive.

In flight Minimum Speeds:

Stabilized	Transient (20 seconds)
90%	70%

Operation with turbine locked is only authorized in APU mode and for engine starting.

In flight Maximum Speeds:

Stabilized
109%

A Maximum Inadvertent Overspeed of 115% has been certified for the ARRANO 1A model. This corresponds to the maximum N2 speed for which inadvertent occurrence of up to 20 seconds has been demonstrated not to require rejection of the engine from service or maintenance action (other than to correct the cause).

SHAFT TORQUE LIMITS OR EPR TRUST LIMITS**MAXIMUM OUTPUT/SHAFT TORQUE LIMITS (N.m)**

Maximum torque, All Engines Operative (1):

Take-off (5 minutes)	30-minute AEO	Maximum Continuous	AEO Transient (20 seconds) (2)
940	940	816	940

Maximum torque, One Engine Inoperative (2):

30 second OEI	2 minute OEI	Continuous OEI
1327	1176	1033

(1) For AEO ratings, torque values presented above correspond to the maximum torque validated for the engine.

(2) For OEI ratings and AEO transient 20s, engine torque values are limited by torque toppings sent by the helicopter on ARINC frame to the EECU in order to protect the helicopter main gearbox. Values presented above correspond to the maximum value of the torque topping range authorized by the EECU for each power rating.

Accessory	Direction Rotation*	Rotation Speed, rpm	Max. Torque in Overload N.m	Max. Static Overhang N.m	Max. Steady State Power kW (shp)
Starter-Generator	CW	11,727 (100% N1)	708.1	221.3	17.4

* CW = Reference Facing Engine Accessory Pad Clockwise

MODEL DESCRIPTION ARRANO 1A: Base model

ACCESSORIES Accessories, Components, Or System Assemblies, With Aircraft Level Requirements, Provided as Part Of Engine Type Design
- Refer to Installation and Operating Manual

Aircraft Accessories, Components, Or System Assemblies Installed On The Engine But Are Not Provided As Part Of Engine Type Design
- Refer to Installation and Operating Manual

NOTES:**NOTE 1****Engine Ratings**

The performance values specified are defined in the installation and operating manual and correspond to minimum values at 109% n2 under the following conditions:

- uninstalled performance;
- worst aged engine;
- no temperature, pressure or flow angle distortion at air inlet;
- power measured on engine test bed with reference exhaust;
- sea level static, ISA condition;
- no back pressure downstream of the exhaust pipe;
- no air bleed;
- no electrical power off-take;
- no power drawn by any accessories other than those required for engine operation;
- fuel heating value at 43 136 kJ/kg;

- humidity considered is the reference value of 0.0069 kg/kg dry air humidity mixing ratio, which corresponds to 65% relative humidity at sea level ISA condition;
- torque limits presented in note 20.

NOTE 2**SPECIAL ANTI-ICING OR DE-ICING REQUIREMENTS**

Refer to **MAXIMUM PERMISSIBLE TEMPERATURE OR TEMPERATURES LIMITS** and the Installation and Operating Manual for requirements for the use of fuel anti-icing additives.

NOTE 3**SPECIAL INSTALLATION REQUIREMENTS****AIR INTAKE REQUIREMENTS**

The engine was certified for ingestion of bird, hail, rain and snow based on the capability of the aircraft inlet design as defined in the installation manual. The following inlets have been approved for use with this engine: ECP H160.001893 and ECP H160.000900

INSTALLATION CONDITIONS

ARRANO 1A EECU shall be installed outside of a designated fire zone and outside of a zone that might lead to overheat conditions. Corresponding installation assumptions are defined in the Installation and Operating Manual. Fire detection is not part of the Engine design and is under Helicopter manufacturer responsibility.

LIGHTNING AND ELECTROMAGNETIC INTERFERENCES PROTECTION

Qualified environmental conditions of the ARRANO 1A control system components, including EMI and HIRF, are detailed in the Installation and Operating Manual.

TIME LIMITED DISPATCH

ARRANO 1A has been approved for Time Limited Dispatch. The maximum rectification period for each dispatchable state is specified in the Airworthiness Limitations Section of the Maintenance Manual. The TLD dispatchable fault configurations are defined in the Installation and Operating Manual. (See NOTE 15)

EMISSIONS STANDARDS

The following emissions standards promulgated in 14 CFR Part 34, Amendment 5A, effective October 23, 2013 have been complied with for the ARRANO 1A:

- Fuel Venting Emission Standards: 14 CFR 34.11

OVERSPEED PROTECTION

ARRANO 1A is equipped with a power turbine overspeed shutdown device. Refer to the Installation and Operating Manual for additional details.

NOTE 4**MANUFACTURER'S SERVICE BULLETINS OR OTHER INSTRUCTIONS COVERING MATTERS OF INTEREST**

Each of the documents listed below must state that it is approved by the European Aviation Safety Agency (EASA) or approved under EASA.21J.070. Any such documents including those approved under a delegated authority, are accepted by the ANAC and are considered ANAC approved.

- Service bulletins,
- Structural repair manuals,
- Vendor manuals,
- Overhaul and Maintenance Manuals,

These approvals pertain to the type design only.

- NOTE 5** SPECIAL OPERATING PROCEDURES
OEI TRAINING MODE
ARRANO 1A EECU features an OEI TRAINING mode for training crews in the event of engine failure. Refer to the applicable Installation and Operating Manual for additional details.
APU MODE
ARRANO 1A engine has APU mode capability. Use conditions of APU mode are defined in Installation and Operating Manual.
- NOTE 6** LIFE LIMITED PART INFORMATION:
Life-limited components are listed in Chapter 05 of the engine Maintenance Manual.
- NOTE 7** SOFTWARE:
The ARRANO 1A EECU software has been validated in accordance with the requirements of DO-178B guidelines for a level A software.
- NOTE 8** ARRANO 1A engine is certified according to Airworthiness requirements of CS-E 780 for satisfactory operation in icing conditions only when installed in accordance with the Installation and Operating Manual, which specifies an Aircraft air intake as defined in ECP H160.000900.
- NOTE 9** ARRANO 1A is not certified for hail and bird ingestion.
- NOTE 10** Helicopter requirements for protection of ARRANO 1A against foreign object (including bird), water, snow, hail and ice ingestion are defined in the Installation and Operating Manual. The helicopter air intake design shall be such as to prevent instantaneous ingestion of ice, snow and water in excess of maximum quantities defined in the Installation and Operating Manual.
- NOTE 11** ARRANO 1A EECU shall be installed outside of a designated fire zone and outside of a zone that might lead to overheat conditions. Corresponding installation assumptions are defined in the Installation and Operating Manual.
- NOTE 12** The operating / starting / relight envelopes of ARRANO 1A are provided in the Installation and Operating Manual.
- NOTE 13** Qualified environmental conditions of the ARRANO 1A EECU, including EMI and HIRF, are detailed in the Installation and Operating Manual.
- NOTE 14** ARRANO 1A is equipped with a power turbine overspeed shutdown device. Refer to the Installation and Operating Manual for additional details.

CHANGE RECORD

Revision	Application Date	Changes
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This TCDS is available at ANAC website:
<https://sistemas.anac.gov.br/certificacao/Produtos/EspecificacaoOrgE.as>