TYPE-CERTIFICATE DATA SHEET

E.095
Issue 4

for
ARRANO 1 engine series

Type Certificate Holder

Safran Helicopter Engines

64510 Bordes
France

For Models:
ARRANO 1A

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I. General

1. Type/Models:

ARRANO 1 Series/ ARRANO 1A. 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.

2. Type Certificate Holder:

Safran Helicopter Engines
64510 Bordes
France

DOA reference: EASA.21J.070

3. Manufacturer:

Safran Helicopter Engines

4. Certification Application Date:

ARRANO 1A	20 June 2012

5. EASA Certification Reference Date:

30 December 2016

6. EASA Certification Date:

ARRANO 1A	18 June 2019

II. Certification Basis

1. Certification Specifications:

CS-E Amendment 4, effective 12 March 2015

2. Special Conditions:

- Approval of a 30 minute power rating ;
- Operation in 'APU' mode ;
- Transient over-temperature, over-speed and over-torque limit approval ;

3. Deviations:

None

4. Equivalent Safety Findings:

None

5. Environmental Protection Requirements:

CS-34.1 - Fuel venting

III. Technical Characteristics

1. Type Design Definition:

ARRANO 1A	P/N 0356000010

2. Description:

The ARRANO 1 series turboshaft engines have an annular inlet integrating inlet guide vanes, a two-stage centrifugal compressor driven by a single-stage high pressure turbine, a reverse flow combustion chamber and a single-stage low pressure turbine (power turbine) driving a reduction gearbox located at the front of the engine and an exhaust pipe. The high pressure (gas generator) shaft drives the accessory gearbox. The engine is controlled by a Full Authority Digital Electronic Control (FADEC).

3. Equipment:

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.

4. Dimensions:

	Length (mm)	Height (mm)	Width (mm)
ARRANO 1A	1219	817	623.2

5. Dry Weight:

	Weight (completely equipped with EECU) (kg)
ARRANO 1A	173.5

6. Ratings:

6.1 All Engines Operative (kW)

	Maximum Continuous	Take-off (5 minutes)	30-minute AEO
ARRANO 1A (1)(2)	738	851	851

6.2 One Engine Inoperative (kW)

	Continuous OEI	2-minute OEI	30-second OEI
ARRANO 1A (1)(2)	924	1040	1094

(1) The performance values specified above are defined in the Installation and Operating Manual and correspond to minimum values at 109% N2.

(2) For detailed performance curves, refer to the applicable Installation and Operating Manual.

7. Control System:

ARRANO 1A	Dual channel electronic engine control system Electronic Engine Control Unit (EECU) P/N 70QMA01000 or later approved standard (software standard included in the EECU P/N)

8. Fluids (Fuel/Oil/Additives):

Refer to the applicable Installation and Operating Manual.

9. Aircraft Accessory Drives:

	Rotation direction	Rotation Speed	Maximum Torque in overload condition	Maximum static cantilever	Maximum unbalance (ISO 1940)	Shear shaft maximum breakaway torque	Maximum Continuous shaft power (1)	
							Idle, AEO and OEI continuous	2-min and 30-sec OEI
		rpm	daN.m	daN.m	G	daN.m	kW	kW
Starter-Generator	CW	11727 (100% N1)	8	2.5	2.5	18	13	13

(1) Transient mechanical offtake is allowed up to 19 kW for 2 minutes and up to 25 kW for 5 seconds.

10. Bleed Extraction:

The 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.

Refer to the applicable Installation and 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
ARRANO 1A	800°C	850°C

In APU mode:

	For an unlimited duration
ARRANO 1A	665°C

In flight, All Engine Operative:

	Take-off (5 minutes)	30-minute AEO	Maximum Continuous	AEO transient (20 seconds)
ARRANO 1A (1)	912°C	912°C	886°C	934°C

In flight, One Engine Inoperative:

	30-second OEI	2-minute OEI	Continuous OEI
ARRANO 1A	991°C	957°C	914°C

1.2 Fuel temperature (Engine inlet)

		Minimum fuel temperature Operating, starting and restart envelope	Maximum fuel temperature
ARRANO 1A (1)(2)(3)(4)(5)(6)	Normal Fuels	The highest temperature between -45°C and Freezing point temperature defined for the applicable fuel standard	+57°C

(1) Refer to the Installation and Operating Manual for detailed definition and limitations of normal fuels usage.
(2) Replacement fuels are authorized on ARRANO 1A engine. Refer to Installation and Operating Manual for detailed definition and limitations of replacement fuels usage.
(3) Emergency fuels are authorized on ARRANO 1A engine, except for APU mode. Refer to Installation and Operating Manual for detailed definition and limitations of emergency fuels usage.
(4) 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.
(5) List of authorized additives is defined in the Installation and Operating Manual.
(6) Climatic operating, starting, and restarting envelopes of normal, replacement and emergency fuels are defined in the Installation and Operating Manual.

1.3 Oil temperature

	Minimum oil temperature for starting	Maximum oil temperature
ARRANO 1A (1)	-36°C for 5 cSt -45°C for 3 cSt	115°C

(1) Refer to Installation and Operating Manual for detailed oil temperature limitations

2. Maximum / Minimum Speeds:

2.1 Gas generator speed (N1)

100% N1 = 44 139 rpm

In-flight and APU mode minimum speeds:

	IDLE mode (1)	IDLE with PT locked	APU mode	FLIGHT mode (2)
ARRANO 1A	57%	57%	59.8%	69.8%

(1) This speeds corresponds to the minimum stabilized N1 speed in IDLE mode with N2 = 80%.
(2) This speeds 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)
ARRANO 1A	104%	104%	103%	105.5%

In-flight maximum speeds, One Engine Inoperative:

	30-second OEI	2-minute OEI	Continuous OEI
ARRANO 1A	107.8%	105.6%	104.5%

2.2 Power turbine speed (N2)

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

In-flight minimum speeds:

	Stabilised	Transient (20 seconds)
ARRANO 1A	90%	70%

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

In-flight maximum speeds:

	Stabilised
ARRANO 1A	109%

Note: 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) according CS-E 830.

3. Torque Limits:

Maximum torque, All Engine Operative:

	Take-off (5 minutes) (1)	30-minute AEO(1)	Maximum Continuous(1)	AEO transient (20 seconds)(2)
ARRANO 1A	940 N.m	940 N.m	816 N.m	940 N.m

Maximum torque, One Engine Inoperative:

	30-second OEI	2-minute OEI	Continuous OEI
ARRANO 1A (2)	1327 N.m	1176 N.m	1033 N.m

(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. For further details refer to Installation and Operating Manual.

4. Pressure Limits:

4.1 Oil pressure

Normal oil pressure for engine operation is between 400 kPa (relative pressure) and 900 kPa (relative pressure).

Minimum and Maximum levels warnings are functions of N1 and oil temperature.

4.2 Fuel pressure (Engine inlet)

Detailed information about fuel pressures depending on atmospheric conditions and fuel specifications are provided in the Installation and Operating Manual.

5. Installation Assumptions:

Refer to the applicable Installation and Operating Manual.

6. 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.

V. Operational and Service Instructions

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 Letters and Service Bulletins
ARRANO 1A	X3561A4602	X3561A5002	X3561A4612	Refer to the SB and SL directory

VI. Notes

1. 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.

2. ARRANO 1A is not certified for hail and bird ingestion.

3. 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.

4. 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.

5. 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.

6. The ARRANO 1A EECU software has been validated in accordance with the requirements of DO-178B guidelines for a level A software.

7. The operating / starting / relight envelopes of ARRANO 1A are provided in the Installation and Operating Manual.

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

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

10. The EASA approved Airworthiness Limitations Section of the Instructions for Continued Airworthiness is published in the Engine Maintenance Manual and Overhaul Manual documents, chapter 5 “Airworthiness Limitations”.

11. ARRANO 1A engine has APU mode capability. Use conditions of APU mode are defined in Installation and Operating Manual.

SECTION: ADMINISTRATIVE

I. Acronyms and Abbreviations

AEO: All Engine Operative
CW: Clock Wise
DOA: Design Organisation Approval
EECU: Electronic Engine Control Unit
EMI: Electromagnetic Interference
HIRF: High Intensity Radiated Fields
ISA: International Standard Atmosphere
OEI: One Engine Inoperative

II. Type Certificate Holder Record

Safran Helicopter Engines

III. Change Record

Issue	Date	Changes	TC issue
Issue 01	18 June 2019	Initial Issue	18 June 2019
Issue 02	24 August 2020	Cancellation of Special Condition: Engine Mounts – Non-Declaration of Approved Life (EASA Major Change Approval 10074078)	24 August 2020
Issue 03	16 December 2020	Numbering of notes correction Modification of Note 1 § VI Modification of Dry Weight	
Issue 04	12 March 2025	Correction of Power for 2-minute OEI and 30-second OEI ratings (EASA Major Change Approval 10086628)	

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