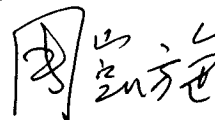


型号认可证数据单

TYPE VALIDATION CERTIFICATE DATA SHEET

编号/No: VTC190E
版次/Revision: 2
型号/Type:
TURBOMECA ARRIEL 2 系列发动机
Turboméca Arriel 2 series engines
衍生型 Variants
Arriel 2S1,2S2
Arriel 2C,2C1, 2C2
Arriel 2B,2B1, 2B1A
批准人/Approved By:



日期/Date: 2008-7-11

本数据单是型号认可证(编号: VTC190E)的组成部分, 它规定了符合中国民用航空总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 part of Validation of Type Certificate (No: VTC190E), prescribes condition and limitation 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:

TURBOMECA, 64511 Bordes Cedex - France

有效页清单/List of effective pages:

页数/ Pages	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
版次/Revision	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
页数/ Pages	16	17	18	19	20	21	22								
版次/Revision	2	2	2	2	2	2	2								

中国民用航空总局
GENERAL ADMINISTRATION OF CIVIL AVIATION OF CHINA

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	VTC190E、2、2008-7-11	E.001、04、12 February 2007
历史 History	VTC190E、1、2007-05-24	E.001、04、12 February 2007

2. 类别/Category: 航空发动机/aviation engine

3. 认可当局/Validation Authority: 中国民用航空总局/CAAC

审定当局/Certifying Authority: 欧洲航空安全局/EASA

申请EASA审定日期/EASA Certification Application Date:

Arriel 2S1	Arriel 2S2	Arriel 2C	Arriel 2C1	Arriel 2C2	Arriel 2B	Arriel 2B1	Arriel 2B1A
1993年5月14 日	2003年12月4 日	1996年12月9 日	1997年9月10 日	1999年1月12 日	1996年12月9 日	1998年6月3 日	2002年6月7 日

EASA审定日期/EASA Certification Date:

Arriel 2S1	Arriel 2S2	Arriel 2C	Arriel 2C1	Arriel 2C2	Arriel 2B	Arriel 2B1	Arriel 2B1A
1996年4月26 日	2005年12月6 日	1997年8月28 日	1998年12月8 日	2002年7月5 日	1997年12月1 日	2000年11月 15日	2003年12月11 日

4. 型号合格证持有人/Type Certificate Holder: TURBOMECA

Address: 64511 Bordes Cedex - France

5. 制造厂/Manufacturer: TURBOMECA

6. ETOPS: 不适用/NA

7. CAAC专用要求/CAAC Special Requirements:

明确中国3号喷气燃料使用条件/define the operation condition for the P.R.C. JET fuel No.3.

第2部分/Section 2

A. Arriel 2S1, 2S2

I 审定基础/Certification Basis

1. 适航标准/Airworthiness Standards:

1994年10月21日JAR-E, 更改 9 / JAR-E Change 9 dated 21 October 1994

1996年8月8日橙色页 E/96/1 / Orange Paper E/96/1 dated 08 August 1996

2. 专用条件/Special Conditions (SC):

Arriel 2S1:

SC1至SC12: 专用条件针对30秒, 2分钟和连续一发不工作功率级的批准

SC1 to SC12: Special Condition for approval of "30-second, 2- minutes and continuous OEI ratings"

SC13至SC15: 专用条件针对HIP/SARM 功率级的批准

SC13to SC15: Special Condition for approval of the HIP/SARM ratings"

Arriel 2S2:

SC1至C2: 专用条件针对30秒和2分钟一发不工作功率级的批准

SC1-C2: Special Condition for certification of "30 second and 2 minutes OEI ratings"

SC2至C2: 专用条件针对HIP/SARM 功率级的批准

SC2-C2: Special Condition for certification of HIP/SARM rating

3. 偏离/Deviations:

JAR-E 570(a)(4)(ii) and (5)(ii) – 机组人员指示 / JAR-E 570(a)(4)(ii) and (5)(ii) – Indication to the flight crew

4. 等效安全项目/Equivalent Safety Findings (ESF): 无/none

5. 环境标准/Environmental Standards:

Arriel 2S1:

按ICAO 附录16 Vol. II , 第2部分, 第2节 (1993 版)燃油排放规定

For 2S1:

Fuel venting provisions of ICAO Annex 16, vol II, Part 2,
Chapter 2 (Edition 1993)

Arriel 2S2:

环境保护按规章 (EC)1702/2003 21A.18(b)

For 2S2:

Environmental protection as per 21A.18(b) of Regulation
(EC) 1702/2003

II 技术特性/Technical Characteristics

1. 型号设计定型/Type Design Definition:

Arriel 2S1: P/N 0 292 00 531 0

Arriel 2S2: P/N 0 292 00 545 0

2. 描述/Description:

ARRIEL 2S1型发动机是涡轮轴发动机, 包括轴流式进气道, 由单级涡轮驱动的一级轴流式压气机和一级离心式压气机, 直流环形燃烧室, 和驱动位于尾部减速齿轮组件的单级动力涡轮。位于前端的附件齿轮箱由燃气发生器驱动。发动机挂架是发动机型号定义的一部分。启动发电机不是发动机型号定义的一部分。

The Arriel 2S1 engine is a turboshaft engine consisting of an axial air intake, an axial compressor and a centrifugal compressor driven by a single stage turbine, a combustion chamber, and a single stage power turbine driving a reduction gearbox located at the rear. An accessory drive gearbox, driven by the gas generator, is located at the front. Mounts are part of the engine type definition. Starter-generator is not part of the engine type definition.

Arriel 2S2与Arriel 2S1相似: 一样的涡轮机械, 减速齿轮, 动力轴和附件齿轮箱。主要不同如下:

中国民用航空总局
GENERAL ADMINISTRATION OF CIVIL AVIATION OF CHINA

The Arriel 2S2 is similar to the Arriel 2S1: common turbo machinery, reduction gears, power shaft and accessory gearbox.

The main differences being as follows:

- 控制系统包括一个双通道FADEC，并有机械备份模式
- 增加功率额定值（热力参数）
- 新的高压涡轮叶片材料
- 新的轴流压气机叶轮
- the control system featuring a dual channel FADEC with mechanical backup mode,
- increased power ratings(thermal)
- New HPT blade material
- New axial compressor wheel

3. 设备/Equipment:

包含在型号设计定义中/Included in Type Design Definition

4. 尺寸/Dimensions:

尺寸 Dimension(m)	2S1	2S2
总长 Overall Length	1.539	1.539
总高 Overall height	0.715	0.715
宽 Width	0.504	0.497

5. 干重/Dry Weight:

2S1: 131kg

2S2: 131.2 kg

6. 额定值/Rating:

额定值 Rating	最大持续时间 Maximum duration	功率 Power(kw)	
		2S1	2S2
OEI-30 sec	30 sec	735	771
OEI-2 min	2 min	663	699
OEI Continuous	Unlimited	639	659
HIP/SARM	30 min	601	601
Take off	5min	601	601
Maximum Continuous	Unlimited	592	601

注：下列条件定义了上述相应的性能参数最小值

The performance values specified above correspond to minimum values defined under the following conditions.

- 在压气机进气平面中平均涡流角小于或等于0.5°
- 试车台在海平面国际标准大气温度条件下
- 发动机装有试车台进气和主排气管
- 没有引气
- 除了发动机运转必须的没有任何附件的功率提取
- 输出轴旋转速度：6409rpm
- 燃油的最低热值：43 136 kJ/kg
- mean swirl angle in the compressor air intake plane less than or equal to 0.5° ,
- ISA conditions at sea level, on test bed,
- engine equipped with a test bed air intake and primary exhaust pipe,
- no air bleed,

中国民用航空总局
GENERAL ADMINISTRATION OF CIVIL AVIATION OF CHINA

- no power drawn by any accessories other than those required for engine operation,
- output shaft rotation speed :6409rpm,
- fuel Low Heat Value: 43 136 kJ/kg.

注 2: 由最先达到的限制值限定声明的功率: 热力参数或是机械参数限制值。对于起飞, HIP/SARM 和最大连续状态, 机械限制与在生效的机械限制和 EECU 扭矩限制两者之间最先达到的扭矩限制相关。

Note 2: Declared Power are limited by the first reached limit: either by thermal or mechanical limits. For Take off, HIP/SARM, and Maximum Continuous the mechanical limits corresponds to the first torque limits reached between validated mechanical limit and EECU torque limit.

7.控制系统/Control System

2S1: 带有手工备份的单通道电子发动机控制系统/Single channel electronic engine control system with manual backup

2S2: 带有机电备份的双通道电子发动机控制系统

Dual channel electronic engine control system with optional mechanical backup

8.油料(燃油/滑油/添加剂)/Fluids (Fuel/Oil/Additives):

见安装手册/see Installation Manual

9.航空器附件驱动/Aircraft Accessory Drives:

名称 Designation	旋转方向 Rotation direction	旋转速度 Rotation speed (rpm)	过载时最大扭矩 Maximum Torque in overload (daN.m)	最大静悬吊 Maximum static overhang (daN.m)	保险轴分离扭矩Fuse shaft breakaway torque (daN.m)	最大持续轴扭矩Maximum Permanent Shaft Power (kw)	
						双发 Twin engine	一发不工作状态 OEI situation
启动发电机 Starter generator	CW	11 330	5	2.5	9.5	7.5 *	7.5
风扇输出断 Fan output	CCW	12 253	1	1.5	10	1.5	1.5

* 对于Arriel 2S2: 特定飞行条件下相关OEI计数的专用说明。

** for Arriel 2S2 : refer to Installation Manual and Airworthiness Limitation Section of the Maintenance Manual for specific instructions relative to OEI counting in certain flight conditions*

附加注释/Notes:

—CW: 顺时针/clockwise,

—CCW: 逆时针/counter clockwise,

—从动力传动装置的外侧看指示附件传动装置的旋转方向

The rotation direction of the power drives for the accessories is indicated considering the power drive seen from the outside.

—从发动机的后部看指示发动机转子的旋转方向

The rotation direction of the engine rotors is indicated with respect to viewing the engine from its rear end. For further details

see Installation Manual.

10. 引气/Bleed Extraction

对于航空器使用的P3引气, 在标准海平面条件下的最大气流为

P3 air bleed for aircraft use, Maximum flow rate at standard sea level conditions:

-起飞额定值在100 g/s / 100 g/s at Take off rating,

-最大持续额定值在98 g/sec / 98 g/sec at Maximum Continuous rating.

中国民用航空总局
GENERAL ADMINISTRATION OF CIVIL AVIATION OF CHINA

对于更多的详细情况, 见安装手册 / For further detail, see Installation Manual.

III 使用限制/Operational Limitations

1. 温度限制/Temperature limits:

1. 1 燃起发生器排气温度 (T45) 限制/Gas generator exhaust temperature (T45) limits

起动/on start-up:

	Arriel 2S1	Arriel 2S2
无限制时间/For an unlimited duration	750°C	750°C
最大超温/Maximum over temperature (<10 s)	865°C	840°C

飞行中/in flight:

	Arriel 2S1	Arriel 2S2
OEI 30s	1000°C	996°C
OEI 2min	941°C	944°C
OEI continuous	912°C	926°C
Take off	912°C	930°C
HIP/SARM	912°C	930°C
Max continuous	877°C	893°C

1. 2 燃油温度/Fuel temperature

最大温度/Maximum temperature: 见安装手册/see Installation Manual

发动机起动时的最低温度/Minimum temperature for engine starting: 见安装手册/see Installation Manual

—使用防冰添加剂的燃油温度/Use of anti-icing additive for fuel temperature

Arriel 2S1 小于等于-20°C /Arriel 2S1 ≤ -20°C

Arriel 2S2 小于30°C /Arriel 2S2 < -30°C

1. 3 滑油温度/Oil temperature

发动机起动时最低滑油温度/Minimum oil temperature for engine starting:

-30°C for oil with a $5 \times 10^{-6} \text{ m}^2/\text{s}$ cinematic viscosity

-50°C for oil with a 3 to $3.9 \times 10^{-6} \text{ m}^2/\text{s}$ cinematic viscosity

加速时的最低滑油温度/ Minimum oil temperature for power-up:

-0°C for oil with a $5 \times 10^{-6} \text{ m}^2/\text{s}$ cinematic viscosity

-10°C for oil with a 3 to $3.9 \times 10^{-6} \text{ m}^2/\text{s}$ cinematic viscosity

最大滑油温度/Maximum oil temperature: 115°C

2. 最大 /最小转速 Maximum / Minimum Speeds:

2.1 燃气发生器转速 (N1) /Gas generator speed (N1) : 100% N1=52110 rpm

最小稳定转速/Minimum stabilized speed:

-慢车模式转速范围/ IDLE mode speed range: 48% to 52% (25 013 to 27 097 rpm)

-飞行模式(人工控制模式)/ Flight mode (manual control mode) : 62%(32308rpm)

最大稳定转速 Maximum stabilized speed:

额定值 Rating	转速 Speed % (rpm)	
	2S1	2S2
OEI 30 sec	105.8 (55 156)	105.89 (55 178)
OEI 2 min	102.4 (53 386)	102.38 (53 348)
OEI continuous	101.2 (52 756)	101.28 (52 776)
Take off	101.2 (52 756)	101.88 (53 089)

中国民用航空总局
GENERAL ADMINISTRATION OF CIVIL AVIATION OF CHINA

HIP/SARM	101.2 (52 756)	101.88 (53 089)
Max Continuous	99.1(51 616)	99.71 (51 959)

瞬时转速/Transient speed:

从慢车到飞行模式转换/Transfer from IDLE to FLIGHT mode: 52% to 62%(27 097 to 32 308rpm)

避免在这个范围内连续运行

avoid continuous operation in this range

最大超转/Maximum over speed :

Arriel 2S1: 102.3 % (53 312rpm) 所有发动机 运行/all engine operating

Arriel 2S2: 102.98 % (53 661rpm) 所有发动机 运行/all engine operating

2.2 自由涡轮转速 (N2) /Power turbine speed (N2)

100% N2 =39 095 rpm

除起动和慢车限制值 (FLIGHT 模式) /Limit values other than during starting and idle (FLIGHT mode):

稳态最小/ Minimum stabilized: 90.5% (35 381 rpm)

稳态最大/Maximum stabilized: 108.5% (42 418 rpm)

瞬态最小/Minimum transient (<20 s): 68% (26584 rpm)

瞬态最大 /Maximum transient (<20 s): power off: 121% (47305 rpm)

power on:

Arriel 2S1: 109% (42 613 rpm)

Arriel 2S2: 112% (43 719 rpm)

地面开车时避免在 87% to 90.5% (34012 to 35381 rpm)范围内连续运转

During ground run avoid continuous operation in the range 87% to 90.5% (34012 to 35381 rpm)

3. 推力 /扭矩限制 Thrust / Torque Limits:

运行中轴上的最大扭矩/maximum torque on shaft during operation :

额定值/Rating	扭矩/torque (daN.m)
OEI 30 sec	120.3
OEI 2 min	113.2
OEI continuous	102.5
Take off	92.5
HIP/SARM	92.5
Max Continuous	92.5

所有发动机运转时的最大超扭/Max over-torque (<20 s), all engines operating: 143.0 daN.m

注: 上述声明的扭矩相当于最小稳定 N2 时在生效的发动机扭矩限制和 EECU 原理扭矩限制之间最先达到的扭矩限制。

Note :Torque declared above correspond to the first reached torque limit between the validated engine torque limit and EECU torque law limit at minimum N2 stabilized.

4. 压力限制/Pressure Limits:

4.1 滑油压力 Oil pressure

最小滑油压力/Minimum oil pressure: 170 kPa

最大滑油压力 /Maximum oil pressure: 600 kPa

正常工作范围/Normal operating range: 200 to 600 kPa

4.2 燃油压力 Fuel pressure

最小燃油压力/Minimum fuel pressure:

— 正常工作不包括起动阶段, 下列条件的最大值规定了最小绝对压力

Normal operation , i.e. excluding starting phase, the minimum (absolute) pressure is defined by the highest of the following

中国民用航空总局
GENERAL ADMINISTRATION OF CIVIL AVIATION OF CHINA

conditions:

20 kPa 绝对压力

35% 的大气压力

使用燃油的蒸汽压上 7 kPa

对应于蒸气体积与液体体积之比大于 0.3 的燃油压力

20 kPa absolute,

35% of atmospheric pressure,

7 kPa above the vapour pressure of the fuel used,

Fuel pressure corresponding to a Vapour volume over Liquid volume ratio of 0.30.

一起动阶段或再起动（相关压力）/During starting phase or at relight (relative pressure):

Arriel 2S1:-25kPa

Arriel 2S2:-20 kPa

最大燃油压力/Maximum fuel pressure:

在所有的运行阶段小于或等于 150 kPa (相关压力)/Less than or equal to 150 kPa (relative pressure), in all operating phase

5. 安装保证/Installation Assumptions: 见安装手册 /see Installation Manual

6. 派遣限制 Dispatch Limitation:

Arriel 2S1:有设备失效的派遣时间限制条件由相关飞机制造厂批准的 MMEL 给定。对于安装 Arriel 2S1 涡轴发动机的情况，发动机制造厂的派遣建议在安装手册 § 15 给出。

Arriel 2S1:

Conditions for time limit dispatch of equipments in failure are given in approved MMEL of concerned aircraft manufacturer. Engine manufacturer dispatch recommendations for equipment of Arriel 2S1 turboshaft engine are listed in Installation Manual §15.

对于 Arriel 2S2:

所有的设备和发动机系统在航空器起飞之前必须功能正常。飞行中发生失效的所有设备和发动机系统在下次起飞前应更换或修理。

Arriel 2S2:

All engine system and equipment must be functional prior to aircraft take-off. Any engine system or equipment the failure of which occur in flight shall be replaced or repair prior to commencement of next flight.

IV 操作和服务说明/Operational and Service Instructions

文件/ Document	2S1	2S2
安装图纸和手册/ Installation Drawing and Manual	X 292 L0 001 1	X 292 P5 0012
安装手册第 15 章提供了操作说明/Operating Instructions are provided in Installation Manual Chapter 15	X 292 L0 001 1	X 292 P5 0012
性能手册/ Performance Brochure	X 292 L0 001 9	X 292 P5 0019
维护手册/Maintenance Manual	X 292 L0 301 2	X 292 P5 4512
维修手册/Repair Manual	X 292 L0 500 2	X 292 P5 5502
服务信件和服务通报/Service letters and Service Bulletins	参考 SB 和 SL 指南/Refer to SB and SL directory	

V 注释/Notes

Note 1: Arriel 2S1 发动机限于多发直升机。

The operation of the Arriel 2S1 engine is restricted to multi-engine helicopter applications

Note 2: 发动机抵抗外物吸入的能力没有被完全评估[JAR-E 790 (a) and JAR-E 800(a)(3)], 除了雨, 发动机防止外物打击的保护由航空器上动力装置的安装保证。

The engine capability against ingestion of foreign matter has not been fully assessed [JAR-E 790 (a) and JAR-E 800(a)(3)]. The

中国民用航空总局
GENERAL ADMINISTRATION OF CIVIL AVIATION OF CHINA

protection of the engine against strike / ingestion of foreign matter other than rain is to be ensured by the powerplant installation on the aircraft.

Note 3: 电子控制单元不能被安装在指定火区，安装条件规定在安装手册中。

The electronic control unit must not be installed in a dedicated fire zone. The installation conditions are defined in the Installation Manual.

Note 4: 对于机组在发动机失效情况的训练，电子控制系统提供了“训练”功能，这一功能的特性参考安装手册。

The electronic control system provides a “TRAINING” function for training crew in an engine failure situation. Refer to the Installation Manual for the characteristics of this function.

Note 5: 已经生效的EECU软件依据DO 178 A, level 1

The software of the EECU has been validated according to DO 178 A, level 1.

Note 6: 在安装手册中提供了使用和启动包线。

The operating / starting envelope is provided in the Installation Manual.

Note 7: 电磁干扰/闪电（详细参考安装手册）EMI / lighting (Refer to Installation Manual for details.)

根据下列规范检验了已认可的级别 / Validated levels has been tested according to the following standards:

-感应信号的敏感性/Induced signal susceptibility: DO-160C section 19, Category Z

-无线电频率的敏感性/Radio Frequency Susceptibility (BCI):

DO-160C section 20.4, Category Y;

MIL STD 461C- CS01, CS02, CS06, RS02, RS03.

-发射无线电频率的能量/Emission of Radio Frequency Energy:

DO-160C section 21, Category Z;

MIL STD 461C- CE01, CE03, CE07, RE02.

-闪电感应的瞬时敏感性/Lightning induced transient susceptibility : DO-160 section 22.

Note 8: 动力涡轮超速停车设备，之前是作为选装设备，现在作为基本型号设计的一部份并已安装在所有放行的发动机上。

Power turbine overspeed shut-down device, previously available as an option, is now part of the basic Type Design and has been fitted to all the delivered engines.

Note 9: Arriel 2S1和Arriel 2S2发动机由Turbomeca公司在法国组装，也可以在Turbomeca USA（前身是Turbomeca 发动机公司）授权下在美国组装。

Arriel 2S1 and Arriel 2S2 engines are assembled by Turbomeca in France and under licence by Turbomeca USA (formerly Turbomeca Engine Corporation) in the USA.

-在法国组装的发动机装有按照法国规章的识别牌。

- Engines assembled in France have an identification plate in accordance with the regulations applicable in France,

-在美国组装的发动机装有按照FAR规章的识别牌，并且在序号前加上前缀“TEC”或“TM USA”。

-Engines assembled in the USA have an identification plate in accordance with the FAR regulations and the prefix “TEC” or “TM USA” is added to the serial number.

B. Arriel 2C, 2C1, 2C2

I 审定基础/Certification Basis

1. 适航标准/Airworthiness Standards:

1994年10月21日JAR-E, 更改 9 / **JAR-E Change 9 dated 21 October 1994**

1996年8月8日橙色页 E/96/1 / **Orange Paper E/96/1 dated 08 August 1996**

2. 专用条件/Special Conditions (SC):

Arriel 2C 和Arriel 2C1:

SC1至SC12: 专用条件针对30秒, 2分钟和连续一发不工作功率级的批准

SC1 to SC12 :Special Condition for approval of "30-second, 2- minutes and continuous OEI ratings"

Arriel 2C2:

SC1至C2: 专用条件针对30秒和2分钟一发不工作功率级的批准

SC1-C2:Special Condition for certification of "30 second and 2 minutes OEI ratings"

SC2至C2: 专用条件针对HIP/SARM 功率级的批准

SC2-C2:Special Condition for certification of HIP/SARM rating

3. 偏离/Deviations:

JAR-E 570(a)(4)(ii) and (5)(ii) – 机组人员指示 / JAR-E 570(a)(4)(ii) and (5)(ii) – Indication to the flight crew

4. 等效安全项目/Equivalent Safety Findings (ESF):

Arriel 2C1: JAR E-80, E-740 《双通道控制系统续航力》

2C1 : JAR E-80, E-740 « Dual channel control system endurance »

Arriel 2C2: 无/none

5. 环境标准/Environmental Standards:

按ICAO 附录 16 Vol. II , 第2部分, 第2节 (1993 版) 燃油排放规定

For 2S1:

Fuel venting provisions of ICAO Annex 16, vol II, Part 2, Chapter 2 (Edition 1993)

II 技术特性/Technical Characteristics

1. 型号设计定型/Type Design Definition:

Arriel 2C: P/N 0 292 00 536 0

Arriel 2C1: P/N 0 292 00 539 0

Arriel 2C2: P/N 0 292 00 542 0

2. 描述/Description:

Arriel 2C与Arriel 2S1相似: 一样的涡轮机械, 减速齿轮, 动力轴和附件齿轮箱。控制系统设计也一样, 也保留了同样的功率级结构(2分钟和30秒一发不工作功率级)。和Arriel 2S1主要不同的是发动机挂架, 去掉了Arriel 2S1齿轮箱上的直升机风扇冷却装置。

The Arriel 2C is similar to the Arriel 2S1 : common turbomachinery, reduction gears, power shaft and accessory gearbox. Control system design is also similar and retains the same rating structure (with 2 min and 30 sec OEI ratings). The main differences with the Arriel 2S1 are the mounts, and the deletion of the helicopter fan cooler drive on the 2S1 gearbox.

中国民用航空总局
GENERAL ADMINISTRATION OF CIVIL AVIATION OF CHINA

Arriel 2C1与Arriel 2C发动机相似，除了控制系统中有一个带有可选手工备份双通道 FADEC外（在Arriel 2C型号上带有手工备份单通道）。发动机挂架是发动机型号定义的一部分。起动发电机不是发动机型号定义的一部分

The Arriel 2C1 is similar to the Arriel 2C engine, with the exception of the control system featuring a dual channel FADEC with optional manual backup (single channel with manual backup on the 2C version). Mounts are part of the engine type definition. Starter-generator is not part of the engine type definition.

Arriel 2C2 与 Arriel 2C1 发动机相似，主要的不同如下：

- 增加功率额定值（热力参数 和 扭矩）
- HIP/SARM 额定值(与Arriel 2S1相同)
- 新的高压涡轮叶片材料
- 新的轴流压气机叶轮

The Arriel 2C2 is similar to the Arriel 2C1, the main differences being as follows:

- **increased power ratings (thermal and torque)**
- **HIP/SARM rating (identical to Arriel 2S1 engine)**
- **New HPT blade material**
- **New axial compressor wheel**

3. 设备/Equipment:

包含在型号设计定义中/Included in Type Design Definition

4. 尺寸/Dimensions:

尺寸 Dimension(m)	2C	2C1	2C2
总长 Overall Length	1.181	1.105	1.015
总高 Overall height	0.616	0.576	0.576
宽 Width	0.498	0.498	0.498

5. 干重/Dry Weight:

2C: 131.0kg
2C1: 129.2kg
2C2: 131.5 kg

6. 额定值/Rating:

额定值 Rating	最大持续时间 Maximum duration	功率 Power(kw)		
		2 C	2 C 1	2 C 2
OEI-30 sec	30 sec	704	718	750
OEI-2 min	2 min	636	646	713
OEI Continuous	Unlimited	610	616	640
Take off	5min	531	581	612
HIP/SARM	30 min	N/A	N/A	612
Maximum Continuous	Unlimited	531	531	612

注：下列条件定义了上述相应的性能参数最小值

The performance values specified above correspond to minimum values defined under the following conditions.

- 在压气机进气平面中平均涡流角小于或等于0.5°
- 试车台在海平面国际标准大气温度条件下
- 发动机装有试车台进气和主排气管
- 没有引气
- 除了发动机运转必须的没有任何附件的功率提取
- 输出轴旋转速度：6000rpm

中国民用航空总局
GENERAL ADMINISTRATION OF CIVIL AVIATION OF CHINA

- 燃油的最低热值: 43 136 kJ/kg
- mean swirl angle in the compressor air intake plane less than or equal to 0.5° ,
- ISA conditions at sea level, on test bed,
- engine equipped with a test bed air intake and primary exhaust pipe,
- no air bleed,
- no power drawn by any accessories other than those required for engine operation,
- output shaft rotation speed :6000rpm,
- fuel Low Heat Value: 43 136 kJ/kg.

注 2: 由最先达到的限制值限定声明的功率: 热力参数或是机械参数限制值。对于起飞和最大连续状态, 机械限制与在生效的机械限制和 EECU 扭矩限制两者之间最先达到的扭矩限制相关。

Note 2: Declared Power are limited by the first reached limit: either by thermal or mechanical limits. For Take off , and Maximum Continuous the mechanical limits corresponds to the first torque limits reached between validated mechanical limit and EECU torque limit.

7. 控制系统/Control System

2C: 带有手工备份的单通道电子发动机控制系统/Single channel electronic engine control system with manual backup

2C1 和 2C2: 带有可选机械备份的双通道电子发动机控制系统

Dual channel electronic engine control system with optional mechanical backup

8. 油料 (燃油/滑油/添加剂) /Fluids (Fuel/Oil/Additives):

见安装手册/see Installation Manual

9. 航空器附件驱动/Aircraft Accessory Drives:

名称 Designation	旋转方向 Rotation direction	旋转速度 Rotation speed (rpm)	过载时最大扭矩 Maximum Torque in overload (daN.m)	最大静悬吊 Maximum static overhang (daN.m)	保险轴分离扭矩Fuse shaft breakaway torque (daN.m)	最大持续轴扭矩Maximum Permanent Shaft Power (kw)	
						双发 Twin engine	一发不工作状态 OEI situation
起动发电机 Starter generator	CW	11 330	5	2.5	9.5	2C/2C1: 3.5 2C2 : 5	5. 0
风扇输出断 Fan output	CCW	12 253	1	1.5	10	1.5	1.5

注释/Notes:

-CW: 顺时针/clockwise,

-CCW: 逆时针/counter clockwise,

-从动力传动装置的外侧看指示附件传动装置的旋转方向

The rotation direction of the power drives for the accessories is indicated considering the power drive seen from the outside.

-从发动机的后部看指示发动机转子的旋转方向

The rotation direction of the engine rotors is indicated with respect to viewing the engine from its rear end. For further details see Installation Manual.

10 引气/Bleed Extraction

对于航空器使用的P3引气, 在标准海平面条件下的最大气流为

P3 air bleed for aircraft use, Maximum flow rate at standard sea level conditions:

-起飞额定值在100 g/s / 100 g/s at Take off rating,

中国民用航空总局
GENERAL ADMINISTRATION OF CIVIL AVIATION OF CHINA

-最大持续额定值在98 g/sec / 98 g/sec at Maximum Continuous rating.

对于更多的详细情况, 见安装手册 / For further detail, see Installation Manual.

III 使用限制/Operational Limitations

1. 温度限制/Temperature limits:

1. 1 燃起发生器排气温度 (T45) 限制/Gas generator exhaust temperature (T45) limits

启动/on start-up:

	Arriel 2C / Arriel 2C1	Arriel 2C2
无限制时间/For an unlimited duration	750°C	750°C
最大超温/Maximum over temperature (<10 s)	865°C	840°C

飞行中/in flight:

	Arriel 2C / Arriel 2C1	Arriel 2C2
OEI 30s	1000°C	996°C
OEI 2min	941°C	944°C
OEI continuous	912°C	926°C
Take off	912°C	929°C
HIP/SARM	N/A	929°C
Max continuous	877°C	891°C

1. 2 燃油温度/Fuel temperature

最大温度/Maximum temperature: 见安装手册/see Installation Manual

发动机启动时的最低温度/Minimum temperature for engine starting: 见安装手册/see Installation Manual

—使用防冰添加剂的燃油温度/Use of anti-icing additive for fuel temperature

Arriel 2C/2C1: 小于-20°C /Arriel 2S1< -20°C

Arriel 2C2: 小于30°C /Arriel 2S2< -30°C

1. 3 滑油温度/Oil temperature

发动机启动时最低滑油温度/Minimum oil temperature for engine starting:

-30°C for oil with a $5 \times 10^{-6} \text{ m}^2/\text{s}$ cinematic viscosity

-50°C for oil with a 3 to $3.9 \times 10^{-6} \text{ m}^2/\text{s}$ cinematic viscosity

加速时的最低滑油温度/ Minimum oil temperature for power-up:

-0°C for oil with a $5 \times 10^{-6} \text{ m}^2/\text{s}$ cinematic viscosity

-10°C for oil with a 3 to $3.9 \times 10^{-6} \text{ m}^2/\text{s}$ cinematic viscosity

最大滑油温度/Maximum oil temperature: 115°C

2. 最大 /最小转速 Maximum / Minimum Speeds:

2.1 燃气发生器转速 (N1) /Gas generator speed (N1) : 100% N1=52110 rpm

最小稳定转速/Minimum stabilized speed:

-慢车模式转速范围/ IDLE mode speed range: 67% to 68% (34914 to 35435 rpm)

-飞行模式(人工控制模式)/ Flight mode (manual control mode) : 62%(32308rpm)

最大稳定转速 Maximum stabilized speed:

中国民用航空总局
GENERAL ADMINISTRATION OF CIVIL AVIATION OF CHINA

rating	speed % / (rpm)		
	2C	2C1	2C2
OEI 30-sec	105.6 (55 051)	105.52 (54 986)	106.05 (55265)
OEI 2-min	102.1 (53 192)	101.95 (53 126)	102.74 (53275)
OEI Continuous	100.9 (52 571)	100.76 (52 506)	101.26 (52764)
Take-off	101.1 (52 660)	101.27 (52 776)	101.86 (53079)
HIP/SARM	N/A	N/A	101.86 (53079)
Max Continuous	98.9 (51 520)	99.09 (51 637)	99.64 (51922)

瞬时转速/Transient speed:

最大超转/Maximum over speed : 102.3 % (53 312rpm) 所有发动机 运行/all engine operating

2.2 自由涡轮转速 (N2) /Power turbine speed (N2)

100% N2 =39 095 rpm

除起动和慢车限制值 (FLIGHT 模式) /Limit values other than during starting and idle (FLIGHT mode):

稳态最小/ Minimum stabilized: power off: 85% (33230 rpm)
power on: 90.5% (35 381 rpm)

稳态最大/Maximum stabilized: 108.5% (42 418 rpm)

瞬态最小/Minimum transient (<20 s): 68% (26584 rpm)

瞬态最大 /Maximum transient (<20 s): power off: 121% (47305 rpm)
power on: 109% (42 613 rpm)

地面开车时避免在: 87% to 90.5% (34012 to 35381 rpm)范围内连续运转

During ground run avoid continuous operation in the range 87% to 90.5% (34012 to 35381 rpm)

3. 推力 /扭矩限制 Thrust / Torque Limits:

运行中轴上的最大扭矩/maximum torque on shaft during operation :

额定值/Rating	扭矩/torque (daN.m)		
	Arriel 2C	Arriel 2C1	Arriel 2C2
OEI 30 sec	116.8	118.7	119.3
OEI 2 min	107.3	107.9	116
OEI continuous	103.0	101.55	101.8
Take off	92.5	92.5	97.3
HIP/SARM	N/A	N/A	97.3
Max Continuous	92.5	92.5	97.3

所有发动机运转时的最大超扭/Max over-torque (<20 s), all engines operating: 132.2 daN.m

注 1: 上述声明的扭矩相当于最小稳定 N2 时在生效的发动机扭矩限制和 EECU 原理扭矩限制之间最先达到的扭矩限制。

Note 1: Torque declared above correspond to the first reached torque limit between the validated engine torque limit and EECU torque law limit at minimum N2 stabilized.

注 2: 对于没有特定维护要求的无限制连续 OEI 的使用, 121.9 daN. m 的 扭矩限制已经生效。

Note 2: Torque limit of 121.9 daN. m has been validated for unlimited continuous OEI usage with no specific maintenance actions.

4. 压力限制/Pressure Limits:

4.1 滑油压力 Oil pressure

最小滑油压力/Minimum oil pressure: Arriel 2C / Arriel 2C1: 110 kPa ; Arriel 2C2: 170 kPa

最大滑油压力 /Maximum oil pressure: 600 kPa

正常工作范围/Normal operating range: 200 to 600 kPa

4.2 燃油压力 Fuel pressure

最小燃油压力/Minimum fuel pressure:

一正常工作不包括起动阶段, 下列条件的最大值规定了最小绝对压力

Normal operation , i.e. excluding starting phase, the minimum (absolute) pressure is defined by the highest of the following

中国民用航空总局
GENERAL ADMINISTRATION OF CIVIL AVIATION OF CHINA

conditions:

20 kPa 绝对压力
35% 的大气压力
使用燃油的蒸汽压上 7 kPa
对应于蒸气体积与液体体积之比大于 0.3 的燃油压力
20 kPa absolute,
35% of atmospheric pressure,
7 kPa above the vapour pressure of the fuel used,
Fuel pressure corresponding to a Vapour volume over Liquid volume ratio of 0.30.

一起动阶段或再起动（相关压力）/During starting phase or at relight (relative pressure): 25kPa

最大燃油压力/Maximum fuel pressure:

在所有的运行阶段小于或等于 150 kPa (相关压力)/Less than or equal to 150 kPa (relative pressure), in all operating phase

5. 安装保证/Installation Assumptions: 见安装手册 /see Installation Manual

6. 派遣限制 Dispatch Limitation:

所有的设备和发动机系统在航空器起飞之前必须功能正常。飞行中发生失效的所有设备和发动机系统在下次起飞前应更换或修理。

All engine system and equipment must be functional prior to aircraft take-off. Any engine system or equipment the failure of which occur in flight shall be replaced or repair prior to commencement of next flight.

IV 操作和服务说明/Operational and Service Instructions

文件/ Document	Arriel 2C	Arriel 2C 1	Arriel 2C 2
安装图纸和手册/ Installation Drawing and Manual	X 292 M1 001 2	X 292 N4 001 2	X 292 N6 404 1
安装手册第 15 章提供了操作说明/Operating Instructions are provided in Installation Manual Chapter 15	X 292 M1 001 2	X 292 N4 001 2	X 292 N6 404 1
性能手册/ Performance Brochure	X 292 M1 001 9	X 292 N4 002 9	X 292 N6 002 9
维护手册/Maintenance Manual	X 292 M1 450 2	X 292 N4 450 2	X 292 N6 450 2
维修手册/Repair Manual	X 292 M1 500 2	X 292 N4 500 2	X 292 N6 500 2
服务信件和服务通报/Service letters and Service Bulletins	参考 SB 和 SL 指南/Refer to SB and SL directory		

V 注释/Notes

Note 1: Arriel 2C、Arriel 2C1 和 Arriel 2C2 发动机限于多发直升机。

The operation of the Arriel 2C, 2C1 and 2C2 engines are restricted to multi-engine helicopter applications

Note 2: 发动机抵抗外物吸入的能力没有被完全评估[JAR-E 790 (a) and JAR-E 800(a)(3)], 除了雨, 发动机防止外物打击的保护由航空器上动力装置的安装保证。

The engine capability against ingestion of foreign matter has not been fully assessed [JAR-E 790 (a) and JAR-E 800(a)(3)]. The protection of the engine against strike / ingestion of foreign matter other than rain is to be ensured by the powerplant installation on the aircraft.

Note 3: 电子控制单元不能被安装在指定火区, 安装条件规定在安装手册中。

The electronic control unit must not be installed in a dedicated fire zone. The installation conditions are defined in the Installation Manual.

中国民用航空总局
GENERAL ADMINISTRATION OF CIVIL AVIATION OF CHINA

Note 4: 对于机组在发动机失效情况的训练，电子控制系统提供了“训练”功能，这一功能的特性参考安装手册。

The electronic control system provides a "TRAINING" function for training crew in an engine failure situation . Refer to the Installation Manual for the characteristics of this function.

Note 5: 已经生效的EECU软件依据DO 178 A, level 1，对于Arriel 2C系列的各种发动机，被鉴定的构型包括版本5.01和以后批准的版本。

The software of the EECU has been validated according to DO 178 A, level 1. For Arriel 2C variant, certified configuration includes software version 5.01 or latter approved version.

Note 6: 在安装手册中提供了使用和启动包线。

The operating / starting envelope is provided in the Installation Manual.

Note 7: 电磁干扰/闪电（详细参考安装手册）EMI / lighting (Refer to Installation Manual for details.)

根据下列规范检验了已认可的级别 / Validated levels has been tested according to the following standards:

-感应信号的敏感性/Induced signal susceptibility: DO-160C section 19, Category Z

-无线电频率的敏感性/Radio Frequency Susceptibility (BCI):

DO-160C section 20.4, Category Y;

MIL STD 461C- CS01, CS02,CS06,RS02,RS03.

-发射无线电频率的能量/Emission of Radio Frequency Energy:

DO-160C section 21, Category Z;

MIL STD 461C- CE01, CE03,CE07,RE02.

-闪电感应的瞬时敏感性/Lightning induced transient susceptibility : DO-160 section 22.

C. Arriel 2B, 2B1, 2B1A

I 审定基础/Certification Basis

1.适航标准/Airworthiness Standards:

1994年10月21日JAR-E, 更改 9 / **JAR-E Change 9 dated 21 October 1994**

1996年8月8日橙色页 E/96/1 / **Orange Paper E/96/1 dated 08 August 1996**

2.专用条件/Special Conditions (SC): 无/none

3. 偏离/Deviations:

JAR-E 570(a)(4)(ii) and (5)(ii) – 机组人员指示 / JAR-E 570(a)(4)(ii) and (5)(ii) – Indication to the flight crew

4. 等效安全项目/Equivalent Safety Findings (ESF): JAR E-740 续航力测试/ JAR E-740 Endurance test

5. 环境标准/Environmental Standards:

按ICAO 附录 16 Vol. II , 第2部分, 第2节 (1993 版) 燃料通风条款

For 2S1:

Fuel venting provisions of ICAO Annex 16, vol II, Part 2,
Chapter 2 (Edition 1993)

II 技术特性/Technical Characteristics

1.型号设计定型/Type Design Definition:

Arriel 2B: P/N 0 292 00 534 0

Arriel 2B1: P/N 0 292 00 541 0

Arriel 2B1A: P/N 0 292 00 547 0

2.描述/Description:

2.描述/Description:

Arriel 2B1A型发动机是一种单发涡轴发动机, 用在中国昌河 Z11直升机上。是Arriel 2B1的降额型号, 一些控制系统软件改型以符合在Z11直升机上的应用。Arriel 2B1 涡轴发动机 是为单发Eurocopter EC130 (以前称作AS 350 B4) 直升机而设计。Arriel 2B1 涡轴发动机 与Arriel 2B 相似, 除了控制系统中有一个带有可选手工备份双通道 FADEC外 (在Arriel 2B 型号上带有手工备份单通道)。Arriel 2B涡轮发动机 与Arriel 2S1 相似: 一样的涡轮机械, 减速齿轮, 动力轴和附件齿轮箱。控制系统设计也一样, 为单发应用简化了功率级结构: 仅有起飞 (TO) 和最大持续功率 (MCP)。Arriel 2B 的 TO 和 MCP 功率级比Arriel 2S1 的低。和Arriel 2S1主要不同的是发动机挂架, 为了适合AS 350应用 和符合 Arriel 1B 以及 为尾部驱动的批准 (同Arriel 1B一样)。发动机挂架是发动机型号定义的一部分。起动发电机不是发动机型号定义的一部分。

The Arriel 2B1A turboshaft engine is designed for single engine application on the Chinese Changhe Z11 helicopter ; it is a derated version of the Arriel 2B1 with some control system software modification to accommodate its installation on the Z11. The Arriel 2B1 turboshaft engine is designed for single engine application on the Eurocopter EC130 helicopter (formerly named AS 350 B4). The Arriel 2B1 is similar to the Arriel 2B engine, with the exception of the control system featuring a dual channel FADEC with optional manual backup (single channel with manual backup on the 2B version). The Arriel 2B is similar to the Arriel 2S1 : common turbomachinery, reduction gears, power shaft and accessory gearbox. Control system design is also similar. The rating structure is simplified for the single engine application : Take-Off (TO) and Maximum Continuous Power (MCP) only. Arriel 2B TO and MCP ratings are lower than the Arriel 2S1 TO and MCP ratings. The main differences with the Arriel 2S1 are the mounts, adapted to the AS 350 application and coming from the Arriel 1B and the provision for the tail rotor drive (also similar to the Arriel 1B). Mounts are part of the engine type definition. Starter-generator is not part of the engine type definition.

3. 设备/Equipment:

包含在型号设计定义中/Included in Type Design Definition

4. 尺寸/Dimensions:

尺寸 Dimension(m)	2B	2B1 /2B1A
总长 Overall Length	1.181	1.140
总高 Overall height	0.616	0.616
宽 Width	0.498	0.491

5. 干重/Dry Weight:

2B: 134 kg

2B1: 132.2kg

2B1A: 129.2kg

注: 2B 和2B1 发动机重量不包括组装的车轮; 2B1A 包括。该部分按 2B /2B1/2B1A直升机相应条款。

Note: 2B and 2B1 engine weight include free wheel assembly; 2B1A does not. This part is under helicopter responsibility for 2B/2B1/2B1A.

6. 额定值/Rating:

额定值 Rating	最大持续时间 Maximum duration	2B	2 B 1	2B1A
Take off	5min	557	557	501
Maximum Coutinuous	Unlimited	543	543	501

注1: 对于2B 和2 B 1, 在起动时热功率为 632 KW, 按照 EECU 扭曲限制法案, 限制机械值在557KW。对于2 B 1A, 在起动时热功率为 632 KW, 按照 EECU 扭曲限制法案, 限制机械值在543KW。

Note 1 : For 2B and 2B1 versions, the thermal power at Take-off is 632 kW, limited at a mechanical value of 557 kW by the EECU torque limit law. For 2B1A version, the thermal power at Take-Off is 632 kW and 543 at Max continuous, limited at a mechanical value of 501 kW by the EECU torque limit law.

注2: 下列条件定义了上述相应的性能参数最小值

Note 2:The performance values specified above correspond to minimum values defined under the following conditions.

- 在压气机进气平面中平均涡流角小于或等于0.5°
- 试车台在海平面国际标准大气温度条件下
- 发动机装有试车台进气和主排气管
- 没有引气
- 除了发动机运转必须的没有任何附件的功率提取
- 输出轴旋转速度: 6000rpm
- 燃油的最低热值: 43 136 kJ/kg
- mean swirl angle in the compressor air intake plane less than or equal to 0.5° ,
- ISA conditions at sea level, on test bed,
- engine equipped with a test bed air intake and primary exhaust pipe,
- no air bleed,
- no power drawn by any accessories other than those required for engine operation,
- output shaft rotation speed :6000rpm,
- fuel Low Heat Value: 43 136 kJ/kg.

注 3: 由最先达到的限制值限定声明的功率: 热力参数或是机械参数限制值。对于起飞和最大连续状态, 机械限制与在生效的机械限制和 EECU 扭矩限制两者之间最先达到的扭矩限制相关。

Note 3: Declared Power are limited by the first reached limit: either by thermal or mechanical limits. For Take off , and Maximum Continuous the mechanical limits corresponds to the first torque limits reached between validated mechanical limit and EECU torque limit.

7.控制系统/Control System

2B: 带有手工备份的单通道电子发动机控制系统/Single channel electronic engine control system with manual backup

2B1 和 2B1A: 带有可选机械备份的双通道电子发动机控制系统

Dual channel electronic engine control system with optional mechanical backup

8.油料(燃油/滑油/添加剂)/Fluids (Fuel/Oil/Additives):

见安装手册/see Installation Manual

9.航空器附件驱动/Aircraft Accessory Drives:

中国民用航空总局
GENERAL ADMINISTRATION OF CIVIL AVIATION OF CHINA

名称 Designation	旋转方向 Rotation direction	旋转速度 Rotation speed (rpm)	过载时最大扭矩 Maximum Torque in overload (daN.m)	最大静悬吊 Maximum static overhang (daN.m)	保险轴分离扭矩Fuse shaft breakaway torque (daN.m)	最大持续轴扭矩Maximum Permanent Shaft Power (kw)
起动发电机 Starter generator	CW	11 330	5	2.5	9.5	7.5

注释/Notes:

—CW: 顺时针/clockwise,

—CCW: 逆时针/counter clockwise,

—从动力传动装置的外侧看指示附件传动装置的旋转方向

The rotation direction of the power drives for the accessories is indicated considering the power drive seen from the outside.

—从发动机的后部看指示发动机转子的旋转方向

The rotation direction of the engine rotors is indicated with respect to viewing the engine from its rear end. For further details see Installation Manual.

10 引气/Bleed Extraction

对于航空器使用的P3引气，在标准海平面条件下的最大气流为

P3 air bleed for aircraft use, Maximum flow rate at standard sea level conditions:

—起飞额定值在100 g/s / 100 g/s at Take off rating,

—最大持续额定值在98 g/sec / 98 g/sec at Maximum Continuous rating.

对于更多的详细情况，见安装手册 / For further detail, see Installation Manual.

III 使用限制/Operational Limitations

1. 温度限制/Temperature limits:

1. 1 燃起发生器排气温度 (T45) 限制/Gas generator exhaust temperature (T45) limits

起动/on start-up:

无限制时间/For an unlimited duration	750°C
最大超温/Maximum over temperature (<10 s)	865°C

飞行中/in flight:

Take off	915°C
Max continuous	849°C
Max transient(<20s)	941°C

1. 2 燃油温度/Fuel temperature

最大温度/Maximum temperature: 一般燃油/normal fuels: 50°C

JP4: 43°C

限制使用燃油/restricted use fuels: 25°C

发动机起动时的最低温度/Minimum temperature for engine starting: 见安装手册/see Installation Manual

—使用防冰添加剂的燃油温度/Use of anti-icing additive for fuel temperature: 小于-20°C / < -20°C

1. 3 滑油温度/Oil temperature

发动机起动时最低滑油温度/Minimum oil temperature for engine starting:

中国民用航空总局
GENERAL ADMINISTRATION OF CIVIL AVIATION OF CHINA

-30℃ for oil with a $5 \times 10^{-6} \text{ m}^2/\text{s}$ cinematic viscosity
-45℃ for oil with a 3 to $3.9 \times 10^{-6} \text{ m}^2/\text{s}$ cinematic viscosity
加速时的最低滑油温度/ Minimum oil temperature for power-up:
-0℃ for oil with a $5 \times 10^{-6} \text{ m}^2/\text{s}$ cinematic viscosity
-10℃ for oil with a 3 to $3.9 \times 10^{-6} \text{ m}^2/\text{s}$ cinematic viscosity

最大滑油温度/Maximum oil temperature: 115℃

2. 最大/最小转速 Maximum / Minimum Speeds:

2.1 燃气发生器转速 (N1) /Gas generator speed (N1) : 100% N1=52110 rpm

-慢车模式转速范围/ IDLE mode speed range: 67% to 68% (34 914 to 35 435 rpm)

起飞/Take off: 101.24%(52 756 rpm)

最大持续/Max Continuous: 92.24%(50 672 rpm)

最大超速/Max overspeed (<20s) : 102.3%(53 312 rpm)

飞行模式最小稳定/ Minimum stabilized in Flight mode: 62%(32308rpm)

(人工控制模式)/ (manual control mode)

2.2 自由涡轮转速 (N2) /Power turbine speed (N2)

100% N2 =39 095 rpm

除起动和慢车限制值 (FLIGHT 模式) /Limit values other than during starting and idle (FLIGHT mode):

稳态最小/ Minimum stabilized: power off: 85% (33230 rpm)

power on: 90.5% (35 381 rpm)

稳态最大/Maximum stabilized: 108.5% (42 418 rpm)

瞬态最小/Minimum transient (<20 s): 68% (26584 rpm)

瞬态最大 /Maximum transient (<20 s): power off: 121% (47305 rpm)

power on: 109% (42 613 rpm)

培训模式中的退出异常的自动辅助备份模式:

最大/Maximum (2B1) : 115%(44960 rpm)

最大/Maximum (2B1A) : 103.19%(40342 rpm)

最小/Minimum (2B1A) : 96.71%(37809 rpm)

地面开车时避免在 87% to 90.5% (34012 to 35381 rpm)范围内连续运转

During ground run avoid continuous operation in the range 87% to 90.5% (34012 to 35381 rpm)

3. 推力 /扭矩限制 Thrust / Torque Limits:

运行中轴上的最大扭矩/maximum torque on shaft during operation :

额定值/Rating	扭矩/torque (daN.m)		
	Arriel 2B	Arriel 2B1	Arriel 2B1A
Take off	91.3	91.3	91.3
Max Continuous	91.3	91.3	91.3

注 1: 上述声明的扭矩相当于最小稳定 N2 时在生效的发动机扭矩限制和 EECU 原理扭矩限制之间最先达到的扭矩限制。

Note 1: Torque declared above correspond to the first reached torque limit between the validated engine torque limit and EECU torque law limit at minimum N2 stabilized.

最大超扭/Max over-torque (<20 s): 132.2 daN.m

培训模式中的退出异常的自动辅助备份模式:

2B1: 92.5daN.m

2B1A: 71.4 daN.m

4. 压力限制/Pressure Limits:

4.1 滑油压力 Oil pressure

中国民用航空总局
GENERAL ADMINISTRATION OF CIVIL AVIATION OF CHINA

最小滑油压力/Minimum oil pressure:: 110 kPa

最大滑油压力 /Maximum oil pressure: 600 kPa

正常工作范围/Normal operating range: 200 to 600 kPa

4.2 燃油压力 Fuel pressure

最小燃油压力/Minimum fuel pressure:

— 正常工作不包括起动阶段，下列条件的最大值规定了最小绝对压力

Normal operation , i.e. excluding starting phase, the minimum (absolute) pressure is defined by the highest of the following conditions:

20 kPa 绝对压力

35% 的大气压力

使用燃油的蒸汽压上 7 kPa

对应于蒸气体积与液体体积之比大于 0.3 的燃油压力

20 kPa absolute,

35% of atmospheric pressure,

7 kPa above the vapour pressure of the fuel used,

Fuel pressure corresponding to a Vapour volume over Liquid volume ratio of 0.30.

一起动阶段或再起动（相关压力）/During starting phase or at relight (relative pressure): 25kPa

最大燃油压力/Maximum fuel pressure:

在所有的运行阶段小于或等于 150 kPa (相关压力)/Less than or equal to 150 kPa (relative pressure), in all operating phase

5. 安装保证/Installation Assumptions: 见安装手册 /see Installation Manual

6. 派遣限制 Dispatch Limitation:

所有的设备和发动机系统在航空器起飞之前必须功能正常。飞行中发生失效的所有设备和发动机系统在下次起飞前应更换或修理。

All engine system and equipment must be functional prior to aircraft take-off. Any engine system or equipment the failure of which occur in flight shall be replaced or repair prior to commencement of next flight.

IV 操作和服务说明/Operational and Service Instructions

文件/ Document			
安装图纸和手册/ Installation Drawing and Manual	X 292 M0 001 2	X 292 N5 001 2	X 292 P4 001 2
安装手册第 15 章提供了操作说明/Operating Instructions are provided in Installation Manual Chapter 15	X 292 M0 001 2	X 292 N5 001 2	X 292 P4 001 2
性能手册/ Performance Brochure	X 292 M5 001 9	X 292 N5 002 9	X 292 P4 001 9
维护手册/Maintenance Manual	X 292 M5 450 2	X 292 N5 450 2	X 292 P4 450 2
维修手册/Repair Manual	X 292 M5 300 2	X 292 N5 500 1	X 292 P4 500 1
服务信件和服务通报/Service letters and Service Bulletins	参考 SB 和 SL 指南/Refer to SB and SL directory		

V 注释/Notes

Note 1: 发动机抵抗外物吸入的能力没有被完全评估[JAR-E 790 (a) and JAR-E 800(a)(3)], 除了雨, 发动机防止外物打击的保护由航空器上动力装置的安装保证。

The engine capability against ingestion of foreign matter has not been fully assessed [JAR-E 790 (a) and JAR-E 800(a)(3)]. The protection of the engine against strike / ingestion of foreign matter other than rain is to be ensured by the powerplant installation on

中国民用航空总局
GENERAL ADMINISTRATION OF CIVIL AVIATION OF CHINA

the aircraft.

Note 2: 电子控制单元不能被安装在指定火区，安装条件规定在安装手册中。

The electronic control unit must not be installed in a dedicated fire zone. The installation conditions are defined in the Installation Manual.

Note 3: 已经生效的EECU软件依据DO 178 A, level 1，对于Ariel 2C系列的各种发动机，被鉴定的构型包括版本5.01和以后批准的版本。

The software of the EECU has been validated according to DO 178 A, level 1. For Ariel 2C variant, certified configuration includes software version 5.01 or latter approved version.

Note 4: 在安装手册中提供了使用和启动包线。

The operating / starting envelope is provided in the Installation Manual.

Note 5: 电磁干扰/闪电（详细参考安装手册）EMI / lighting (Refer to Installation Manual for details.)

根据下列规范检验了已认可的级别 / Validated levels has been tested according to the following standards:

-感应信号的敏感性/Induced signal susceptibility: DO-160C section 19, Category Z

-无线电频率的敏感性/Radio Frequency Susceptibility (BCI):

DO-160C section 20.4, Category Y;

MIL STD 461C- CS01, CS02, CS06, RS02, RS03.

-发射无线电频率的能量/Emission of Radio Frequency Energy:

DO-160C section 21, Category Z;

MIL STD 461C- CE01, CE03, CE07, RE02.

-闪电感应的瞬时敏感性/Lightning induced transient susceptibility : DO-160 section 22.

Note 8: Ariel 2B1A 型发动机在结冰条件下（JAR E 780）使用的能力仅当装配在直升机进气口时，参考Z11 MB1-6860-0 进气道和 Z11 MB1-6850-30 进气罩 而予以说明。

The Ariel 2B1A version capability to operate in icing conditions (JAR E 780) has been addressed only when fitted with helicopter air intake reference Z 11 MB1-6860-0 for the inlet duct and Z11 MB1-6850-30 for the inlet screen.

Note 7: 该发动机在结冰状态下没有被 Eurocopter AS 350 B3/EC 130 砂滤器 P/N 704 A 41 650 010批准应用

The engine is not approved for operation in icing conditions with Eurocopter AS 350 B3 / EC130 sand filter P/N 704 A 41 650 010.

Note 9: 发动机安装仅限单发使用。

Engine installation is approved for single engine applications only.

---结束---

---END---