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I. General

1. Type/Models:

Type: TP400-D6

Models:

TP400-D6

The TP400-D6 engine is approved for use on multi-engined civil aircraft 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:

EPI Europrop International GmbH
Dachauer Strasse 655
80995 München
Germany

EASA Design Organisation Approval No: EASA.21J.076

3. Manufacturer:

MTU GmbH under license of Europrop International GmbH

EASA Production Organisation Approval DE.21G.0053

4. Certification Application Date: 5 June 2003

5. Certification Reference Date: 17 December 2009

6. EASA Certification Date: 06 May 2011

II. Certification Basis :

1. Certification Specifications and Environmental Protection Requirements:

- CS-E, Amendment 1 dated 10 December 2007
- FAR33.90 – Initial Maintenance Inspection
- CS-34.2 Engine Emissions
- CS-34.1 Fuel Venting

2. Special Conditions: none
3. Equivalent Safety Findings: none
4. Deviations: none

III. Technical Characteristics:

1. Type Design Definition:

The Engine Type Design is defined in the following Drawing Introduction Sheet (DIS):

DIS 1002, Issue 1, Revision G or later approved issues

2. Description:

Three spool axial flow Turbopropeller engine consisting of a Propeller Reduction Gearbox, a five stage axial-flow intermediate pressure compressor, a six stage axial-flow high pressure compressor, an annular combustion chamber, a single stage axial-flow high pressure turbine, a single stage axial-flow intermediate pressure turbine, a three stage axial-flow low pressure turbine, an accessory gearbox and a Full Authority Digital Engine Control (FADEC).

3. Equipment:

Engine equipment and engine-mounted aircraft equipment is specified in the Installation Manual.

4. Dimensions:

- Overall Length: 4180 mm (front of PGB to rear of primary nozzle)
- Maximum Diameter (radius): 1218 mm (radius from centre line measured at lowest point)

5. Dry Weight:

The engine weight including complete engine accessory equipment but without fluid and instrumentation (tolerance is +/- 11 kg):

- 1903 kg, for baseline engine (propeller CW)
- 1930 kg, for handed engine (propeller CCW)

6. Ratings (maximum propeller shaft power):

- Uprated Take-off (5 minutes): 8251 kW
- Normal Take-off (5 minutes): 7971 kW
- Maximum Continuous: 7971 kW

See Note 7.

7. Control System:

The engine is equipped with a Full Authority Digital Engine Control (FADEC) system Engine Control Unit P/N TP522062 and Application Software P/N EPI5923S7FFS131, or later approved standards. Protection functionality is provided by the EPMU P/N 23H600000XX0303, or later approved standards.

8. Fluids

Approved fuels, additives and oils are listed in the Operating Instructions

9. Aircraft Accessory Drives:

	Variable Frequency Generator Pad "75 kVA"	Hydraulic Pump Pad
Pad Specification	AS971A	AS469B
Spline Lubrication	wet	wet
Rotation (1)	CCW	CCW
Speed Range [min⁻¹]	14448 to 18121	3839 to 4816
Max. accessory wet weight [kg]	46	22,3
Max. overhung static moment [Nm]	135	40
Max. continuous mechanical extraction [Nm]	41	121
Overload	(2)	(3)
Shear Torque [Nm] (4)	420	560

(1) Rotation is defined facing the AGB pad

(2) VFG Overload definition:

- 116 kW during 5 minutes cumulated within the whole AGB lifetime
- 160 kW during 5 seconds cumulated within the whole AGB lifetime

(3) Hydraulic Pump Overload definition:

- 140 Nm during 15 minutes cumulated within the whole AGB lifetime

(4) Maximum buyer furnished equipment fuse shear torque must provide assurance that the torque capability of the gearbox drive is not exceeded to comply to CS-E80(a) requirement.

10. PGB accessory drive capacities:

	HP Propeller Pump Drive	PCM Mounting Pad	AFP Mounting Pad
Pad Definition	EPIX600237 (LH PGB) EPIX600239 (RH PGB)	EPIX600243	EPIX600235
Spline Lubrication	Wet (PGB Oil from accessory)	N/A	N/A
Rotation ¹	CW (LH PGB) CCW (RH PGB)	N/A	N/A
Pad Face Material	A357 Al	A357 Al	A357 Al
Gear Ratio to LP Spool ²	8360:5418=1,543	N/A	N/A
Max. Accessory Weight	5,0kg	10,2kg	9,5kg
Max. stat. Overhung Moment (1g)	2,3Nm	9,7Nm	12,4Nm
Pad Rating	12,0kW @ 5418 rpm	N/A	N/A
Normal continuous Operating Torque	22,6Nm	N/A	N/A
Overload Torque	14,5kW @ 6165 rpm (shear neck on quill shaft)	N/A	N/A

¹ Rotation is defined facing the pad

² 100%LP Speed: 8360 rpm

IV. Operating Limitations:

1. Temperature Limits:

Gas Temperatures TGT (trimmed):

- Maximum prior to Ground Start: 150°C
- Starting on Ground: 700°C
- Starting in Flight: 997°C
- Maximum Take-off: 997°C
- Maximum Continuous: 997°C
- Maximum Overtemperature (20 seconds): 1015°C
- Maximum during NL/NP overspeed: 725°C

Fuel Temperatures:

Ambient Temperature	LP Pump Fuel Inlet Temperature	Maximum Altitude
Up to ISA+15	Up to 55°C	35000 ft
Between ISA+15 and ISA+25	Up to 42,5°C	25000 ft
Between ISA+15 and ISA+25°C	Between 42,5°C and 55°C	10000 ft
Above ISA+25°C	Any temperature	Flight not authorized

Oil Temperatures:

- Minimum for Starting: EOT and GOT minus 30°C
 - Minimum before accelerating above idle: +50°C EOT and +42°C GOT
 - Maximum: +160°C EOT or +150°C GOT
- EOT: Engine Oil Temperature GOT: Gearbox Oil Temperature

2. Permissible Rotational Speeds

Rating	Rotor Speed		
	NH	NI	NP
Up-rated Take-off [min^{-1}]	18396 (102,2%)	10390 (103,9%)	864 (102,6%)
Normal Take-off [min^{-1}]	18396 (102,2%)	10390 (103,9%)	864 (102,6%)
Max. Continuous [min^{-1}]	18396 (102,2%)	10390 (103,9%)	864 (102,6%)
Transient (max. 20 sec.) [min^{-1}]	18430 (102,4%)	10464 (104,6%)	948 (112,6%)

NH→HP spool speed, NI→IP spool speed, NP→propeller speed, PGB transmission ratio=9,929:1

3. Pressure Limits

Fuel Pressures:

The Fuel Pressure at the engine LP Pump inlet must be kept 34 kPa above the true vapour pressure of the fuel with a vapour/liquid ratio equal to zero, but below 207 kPa gauge under normal operating conditions.

The maximum allowable pressure at the engine LP fuel pump inlet after shutdown is 345 kPa gauge.

Oil Pressures:

Minimum EOP: 350 kPa
Minimum GOP: 250 kPa

4. Maximum Permissible Air Bleed Extraction:

Number of available engines for aircraft bleed selection	3 (or less)	3	4	4
Full anti icing bleed selection (NAI&WAI)	no	yes	no	yes
OBIGGS allowed	yes	no	yes	Yes
OBOGS allowed?	yes	no	yes	yes
ECS bleed selection	"Normal"	"Economy"	"Maximum"	"Normal"
Bleed combination	33 ¹	32 ¹	44 ¹	43 ¹
Altitude [ft]	Absolute bleed flow per engine [kg/sec]	Absolute bleed flow per engine [kg/sec]	Absolute bleed flow per engine [kg/sec]	Absolute bleed flow per engine [kg/sec]
-2000	0,59	1,47	0,54	1,40
0	0,59	1,46	0,54	1,40
5000	0,58	1,37	0,53	1,31
8000	0,57	1,32	0,51	1,27
10000	0,56	1,29	0,51	1,23
15000	0,53	1,20	0,49	1,16
20000	0,51	1,13	0,47	1,08
25000	0,50	1,03	0,45	0,99
26000	0,49	1,02	0,45	0,98
30000	0,48	0,96	0,44	0,92
31000	0,48	0,95	0,43	0,91
35000	0,47	0,54	0,43	0,51

OBIGGS- Onboard Inert Gas Generating System OBOGS – Onboard Oxygen Generating System

¹XY → X number of engines available for bleed extraction

Y amount of bleed extracted (0 no ECS bleed, 1 1 Pack ECS bleed, 2 "Economy" (ECO) bleed, 3 Normal ECS bleed, 4 Maximum ECS bleed)

5. AGB Power Extraction Limits:

Engine Power Setting	Combined VFG electrical load and Hydraulic Pump load	Combined mechanical power extraction of VFG and Hydraulic Pump at the AGB load pad
MCL and below (Within the entire envelope: -2000ft<altitude<35000ft)	49kW	58kW
Between MCL and MCT (Outside the Take-off envelope: 11000ft<altitude<35000ft)	92kW	109kW
Between MCL and Take-off (Within the Take-off envelope: -2000ft<altitude<11000ft)	126,8kW	149kW

MCL→Max. Climb

MCT→Max. Continuous

Note: A mechanical efficiency of 85% of both, VFG and EDP has been used to convert the electrical and mechanical power extraction from VFG and EDP to the mechanical power.

6. Installation Assumptions:

Refer to Installation Manuals for details.

7. Time Limited Dispatch:

Information on engine operation with FADEC system dispatch limitations is contained in the respective Time Limits Manual.

V. Operating and Service Instructions:

Installation Manual:	D6.0020.02 Issue 03 or later approved issues
Operating Instructions Manual:	D6.0020.03 Issue 02 or later approved issues
Maintenance Manual:	D6.0025.01 Identification of Manuals Issue 01 or later approved issue
Engine Manual:	D6.0025.01 Identification of Manuals Issue 01 or later approved issue
Time Limits Manual:	D6.0025.03 Airworthiness Limitations Issue 0 or later approved issue
Service Bulletins:	As issued by Europrop International

VI. Notes

1. Life Limited Critical Parts and Airworthiness Limitations are included in the respective Time Limits Manual.
2. The EECS software has been developed and verified in accordance with RTCA/DO-178B respectively ED-12B, Level A
3. Information on lightning protection and electromagnetic compatibility is contained in the Installation Manual.
4. The TP400-D6 engine is currently not approved for Time Limited Dispatch operation.
5. The TP400-D6 engine must be installed with the Nacelle Air Intake Standard: Lower Duct K12947160E001-993; Upper Duct: K12947160E002-993
6. Propellers to be used with the TP400-D6 engine must have mounting and functioning characteristics which are compatible with the engine and its control system. The TP400-D6 engine and control system has been designed and tested to be compatible with the Ratier-Figeac propeller P/Ns FH385/386.
7. The ratings shown under III.6. are achieved at sea level and ISA standard day conditions using a defined test bed configuration for the air intake and exhaust system with all optional bleeds closed and the aircraft service equipment drives unloaded, at a lower fuel heating value of 42798 kJ/kg.
8. Operation in freezing fog conditions below minus 11°C is prohibited. The maximum continuous ground running time in freezing fog conditions to ambient temperatures down to minus 11°C is 30 minutes.
9. There are two configurations of the PGB. Baseline, turning the propeller CW (P/N ER 1006) when viewed from the rear of the engine and CCW (P/N EL 1006), turning the propeller anticlockwise when viewed from the rear of the engine.
10. The maximum allowed ceiling pressure altitude for aircraft take-off is 11,000ft.
11. Operation of the engine is limited to a maximum altitude of 35,000ft
12. The duration of negative or zero 'g' must not exceed a period of 20 seconds
