Thielert Aircraft Engines GmbH
Platenenstr. 14
D - 09350 Lichtenstein

Tel. +49-(0)37204/ 696-0
Fax +49-(0)37204/ 696-2912
www.centurion-engines.com
info@centurion-engines.com

Supplement
Pilot´s Operating Handbook
for the
(Reims) Cessna (F) 172
F,G,H,I,K,L,M
Equipped with
TAE 125-01 and TAE 125-02-99
Installation

Issue 3

MODEL No. _____

SERIAL No. _____

REGISTER No. _____

This supplement must be attached to the EASA approved Pilot´s Operating Handbook when the TAE 125-01 or TAE 125-02-99 installation has been installed in accordance with EASA STC A.S.01527 or EASA STC 10014287.

The information contained in this supplement supersede or add to the information published in the EASA approved Pilot´s Operating Handbook only as set forth herein.
For limitations, procedures, performance and loading information not contained in this supplement, consult the EASA approved Pilot´s Operating Handbook.

This supplement Pilot's Operating Handbook is approved with EASA AFM Approval 10031525.

TAE-Nr.: 20-0310-21023

This page intentionally left blank

APPROVAL

The content of approved chapters is approved by EASA. All other content is approved by TAE under the authority of EASA DOA No. EASA.21J.010 in accordance with Part 21.

LOG OF REVISIONS

Revision	Section	Description	Approved	
			Date	Endorsed
3/0	all	new Issue	23.08.2010	EASA AFM Approval 10031525
3/1	1	New oil, editorial changes	April 14, 2011	Revision No. 1 to AFM supplement ref. 20-0310-21023 is approved under the authority of DOA ref. EASA.21J.010. Date: April 14, 2011 Office of Airworthiness
	2	New oil		
	3	Procedures updated		
	4	Procedures updated		
	5	Editorial changes		
	6	Editorial changes		
	7	New section		

Revision	Section	Description	Approved	
			Date	Endorsed
3/2	1	New gearbox oil, editorial changes	June 30, 2011	Revision No. 2 to AFM supplement ref. 20-0310-21023 is approved under the authority of DOA ref. EASA.21J.010. Date: June 30, 2011 Office of Airworthiness
	2	New gearbox oil		
	4	Procedures updated		
	5	Editorial changes		
3/3	1	New fuel, new gearbox oil	March 16, 2012	Revision No. 3 to AFM supplement ref. 20-0310-21023 is approved under the authority of DOA ref. EASA.21J.010. Date: March 16, 2012 Office of Airworthiness
	2	New fuel, new gearbox oil		
	4	New fuel, Procedures updated		
	6	New fuel		
3/4	1	New fuel, new gearbox oil	March 11, 2013	Revision No.4 to AFM supplement ref. 20-0310-21023 is approved under the authority of DOA ref. EASA.21J.010. Date March 11, 2013 Office of Airworthiness
	2	New fuel, new gearbox oil		
	5	Editorial changes		

Revision	Section	Description	Approved	
			Date	Endorsed
3/5	---	EASA STC / AFM numbers corrected on the cover	May 27, 2013	Revision No.5 to AFM supplement ref. 20-0310-21023 is approved under the authority of DOA ref. EASA.21J.010. Date May 27, 2013. Office of Airworthiness

Remark: The parts of the text which changed are marked with a vertical line on the margin of the page.

LIST OF APPLICABLE CHAPTERS

Sections	Issue/Revision	Date
1	3/4	March 2013
2	3/4	March 2013
3	3/1	April 2011
4	3/3	March 2012
5	3/3	March 2013
6	3/2	March 2012
7	3/0	April 2011

General remark

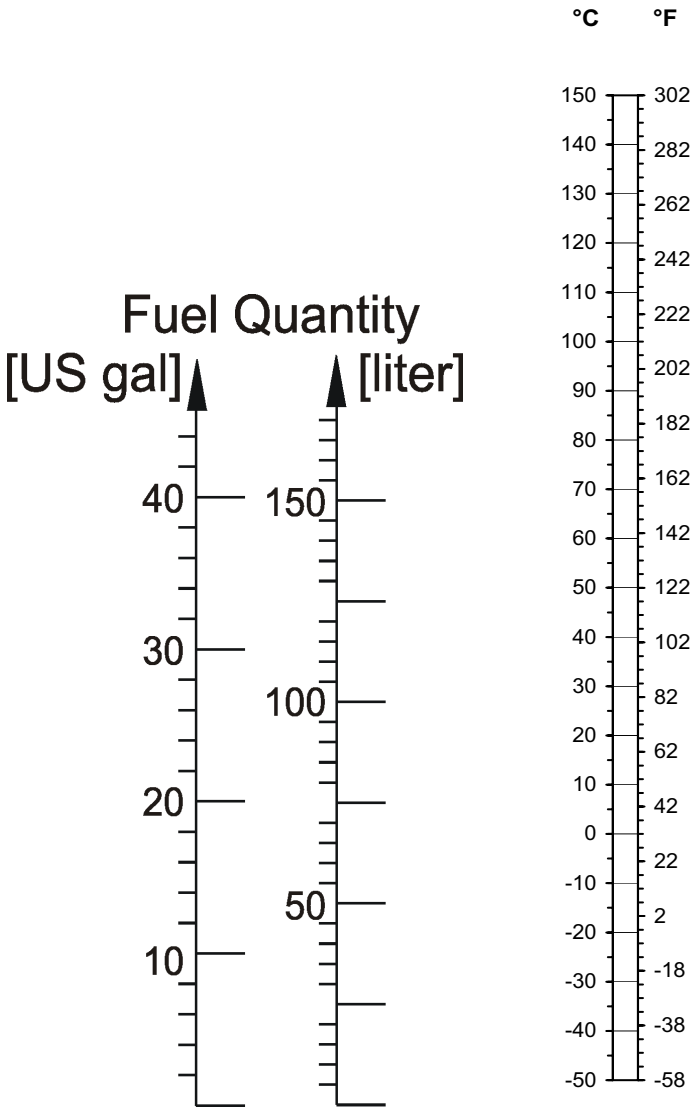
The content of this POH supplement is developed on basis of the EASA-approved POH.

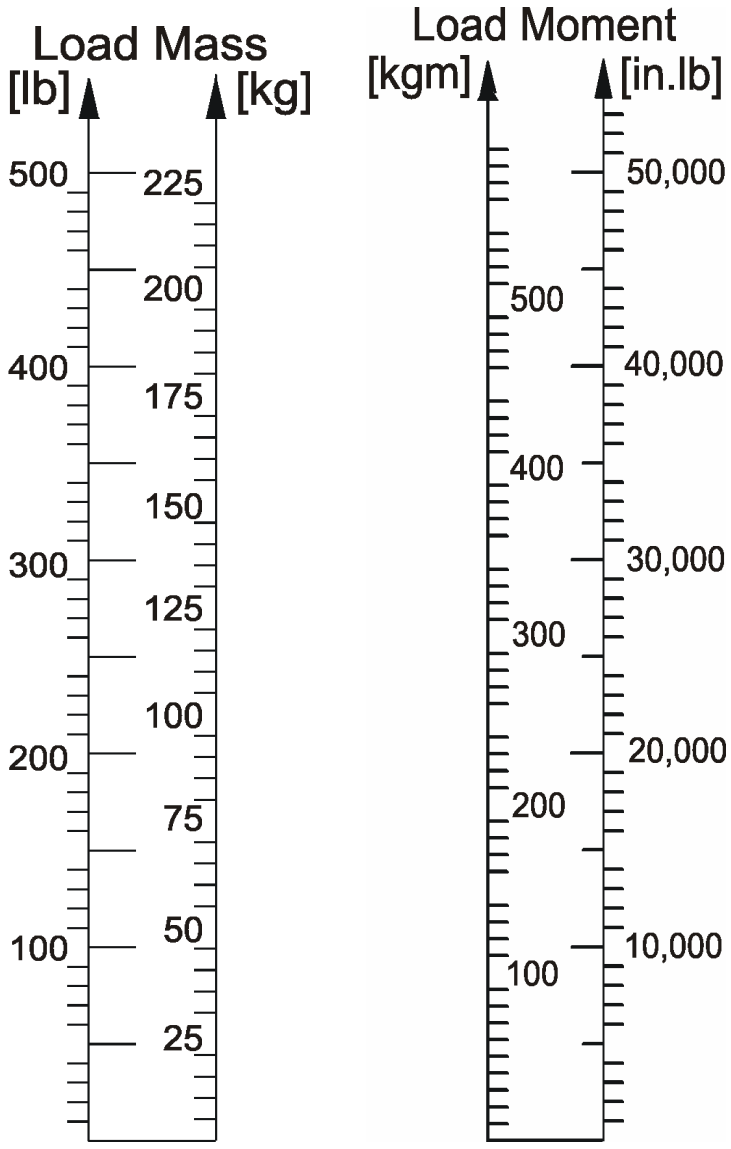
TABLE OF CONTENTS

CONVERSION TABLES

VOLUME		
Unit [Abbr.]	Conversion factor SI to US / Imperial	Conversion factor US / Imperial to Si
Liter [l] US gallon [US gal] US quart [US qt] Imperial gallon [Imp gal] Cubic inch [in³]	[l] / 3.7854 = [US gal] [l] / 0.9464 = [US qt] [l] / 4.5459 = [[Imp gal] [l] x 61.024 = [in³]	 [US gal] x 3.7854 = [l] [[US qt] x 0.9464 = [l] [[Imp gal] x 4.5459 = [l] [in³] / 61.024 = [l]
TORQUE		
Unit [Abbr.]	Conversion factor SI to US / Imperial	Conversion factor US / Imperial to Si
Kilopondmeter [kpm] Foot pound [ft.lb] Inch pound [in.lb]	[kpm] x 7.2331 = [ft.lb] [kpm] x 86.7962 = [in.lb]	 [ft.lb] / 7.2331 = [kpm] [in.lb] / 86.7962 = [kpm]
TEMPERATURE		
Unit [Abbr.]	Conversion factor SI to US / Imperial	Conversion factor US / Imperial to Si
Degree Celsius [ºC] Degree Fahrenheit [ºF]	[ºC] x 1.8 + 32 = [ºF]	 ([ºF] - 32) / 1.8 = [ºC]
SPEED		
Unit [Abbr.]	Conversion factor SI to US / Imperial	Conversion factor US / Imperial to Si
Kilometers per hour [km/h] Meters per second [m/s] Miles per hour [mph] Knots [kts] Feet per minute [fpm]	[km/h] / 1.852 = [kts] [km/h] / 1.609 = [mph] [m/s] x 196.85 = [fpm]	 [mph] x 1.609 = [km/h] [kts] x 1.852 = [km/h] [fpm] / 196.85 = [m/s]

PRESSURE		
Unit [Abbr.]	Conversion factor SI to US / Imperial	Conversion factor US / Imperial to Si
Bar [bar] Hectopascal [hpa] =Millibar [mbar] Pounds per square inch [psi] inches of mercury column [inHg]	[bar] x 14.5038 = [psi] [hpa] / 33.864= [inHg] [mbar] / 33.864 = [inHg]	 psi] / 14.5038 = [bar] [inHg] x 33.864 = [hPa] [inHg] x 33.864 = [mbar]
MASS		
Unit [Abbr.]	Conversion factor SI to US / Imperial	Conversion factor US / Imperial to Si
Kilogramm [kg] Pound [lb]	[kg] / 0.45359 = [lb]	 [lb] x 0.45359 = [kg]
LENGTH		
Unit [Abbr.]	Conversion factor SI to US / Imperial	Conversion factor US / Imperial to Si
Meter [m] Millimeter [mm] Kilometer [km] Inch [in] Foot [ft] Nautical mile [nm] Statute mile [sm]	[m] / = 0.3048 [ft] [mm] / = 25.4 [in] [km] / = 1.852 [nm] [km] / = 1.609 [sm]	 [in] x 25.4 = [mm] [ft] x 0.3048 = [m] [nm] x 1.852 = [km] [sm] x 1.609 = [km]
FORCE		
Unit [Abbr.]	Conversion factor SI to US / Imperial	Conversion factor US / Imperial to Si
Newton [N] Decanewton [daN] Pound [lb]	[N] / 4.448 = [lb] [daN] / 0.4448 = [lb]	 [lb] x 4.448 = [N] [lb] x 0.4448 = [daN]


°C
°F
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
-20
-30
-40
-50
302
282
262
242
222
202
182
162
142
122
102
82
62
42
22
2
-18
-38
-58
Fuel Quantity
[US gal]
[liter]
40
30
20
10
150
100
50


Load Mass
[lb]
[kg]
500
400
300
200
100
225
200
175
150
125
100
75
50
25
Load Moment
[kgm]
[in.lb]
500
400
300
200
100
50,000
40,000
30,000
20,000
10,000

ABBREVIATIONS

TAE	Thielert Aircraft Engines GmbH, developing and manufacturing company of the TAE 125 engine
FADEC	Full Authority Digital Engine Control
CED 125	Compact Engine Display Multifunctional instrument for indication of engine data of the TAE 125
AED 125	Auxiliary Engine Display Multifunctional instrument for indication of engine and airplane data

SECTION 1
GENERAL

CONVENTIONS IN THIS HANDBOOK

This manual contains following conventions and warnings. They should be strictly followed to rule out personal injury, property damage, impairment to the aircraft's operating safety or damage to it as a result of improper functioning.

▲ **WARNING:** Non-compliance with these safety rules could lead to injury or even death.

■ CAUTION: Non-compliance with these special notes and safety measures could cause damage to the engine or to the other components.

◆ Note: Information added for a better understanding of an instruction.

UPDATE AND REVISION OF THE MANUAL

▲ **WARNING:** A safe operation is only assured with an up to date POH supplement. Information about actual POH supplement issues and revisions are published in the TAE Service Bulletin TM TAE 000-0004.

◆ Note: The TAE-No of this POH supplement is published on the cover sheet of this supplement.

ENGINE

Engine manufacturer:..... Thielert Aircraft Engines GmbH
Engine model:..... TAE 125-01 or TAE 125-02-99

The TAE 125-02-99 is the successor of the 125-01. Both engine variants have the same power output and the same propeller speeds but different displacement. While the TAE 125-01 has 1689 ccm, the TAE 125-02-99 has 1991 ccm. Both TAE 125 engine variants are liquid cooled in-line four-stroke 4-cylinder motors with DOHC (double overhead camshaft) and are direct Diesel injection engines with common-rail technology and turbocharging. Both engine variants are controlled by a FADEC system. The propeller is driven by a built-in-gearbox (i=1.69) with mechanical vibration damping and overload release. The engine variants have an electrical self starter and an alternator.

▲ **WARNING:** The engine requires an electrical power source for operation. If the main battery and alternator fail simultaneously, the engine will only operate for a maximum of 30 minutes on FADEC backup battery power. Therefore, it is important to pay attention to indications of alternator failure.

Due to this specific characteristic, all of the information from the flight manual recognized by EASA are no longer valid with reference to:

- carburetor and carburetor pre-heating
- ignition magnetos and spark plugs, and
- mixture control and priming system

PROPELLER

Manufacturer:.....MT Propeller Entwicklung GmbH
Model: MTV-6-A/187-129
Number of blades:.....3
Diameter: ..... 1.87 m
Type:.....constant speed

FUELS and LIQUIDS

■ CAUTION: Use of unapproved fuels may result in damage to the engine and fuel system components, resulting in possible engine failure.

Fuel: .....JET A-1/JET-A (ASTM 1655)
Alternative: ..... Diesel (**DIN** EN 590)
.....Fuel No.3 (GB 6537-2006)
..... JP-8, JP-8+100 (MIL-DTL-83133E)
Only TAE 125-02-99 (C2.0):
..... TS-1 (GOST 10227-86)
.....TS-1 (GSTU 320.00149943.011-99)

Engine oil: ..... AeroShell Oil Diesel Ultra
..... AeroShell Oil Diesel 10W-40
.....Shell Helix Ultra 5W-30
.....Shell Helix Ultra 5W-40

Gearbox oil: ..... Shell Getriebeöl EP 75W-90 API GL-4
..... Shell Spirax EP 75W-90
.....Shell Spirax GSX 75W-80 GL-4
.....Shell Spirax S4 G 75W-90
..... Shell Spirax S6 GXME 75W-80
Only TAE 125-02-99 (C2.0):
..... Shell Spirax S6 ATF ZM

■ CAUTION: Use approved oil with exact declaration only!

Coolant:.....Water/Radiator Protection at a ratio of 50:50
Radiator Protection: ..... BASF Glysantin Protect Plus/G48
..... Mobil Antifreeze Extra/G48
.....ESSO Antifreeze Extra/G48
Comma Xstream Green - Concentrate/G48
..... Zerex Glysantin G 48

▲ **WARNING:** The engine must not be started under any circumstances if the level is too low.

■ CAUTION: Normally it is not necessary to fill the cooling liquid or gearbox oil between maintenance intervals. If the level is too low, please notify the service department immediately.

◆ Note: The freezing point of the coolant is -36°C.

INSTRUMENT PANEL

Components of the new installation can be seen as example in the following Figure.

Some installations are equipped with a key switch for the starter instead of the push button and the switch "Engine Master" is designated "IGN". For these installations, the appropriate note in brackets (Switch resp.), ("IGN" resp.) is added subsequently throughout the entire supplement for the Pilot´s Operating Handbook.

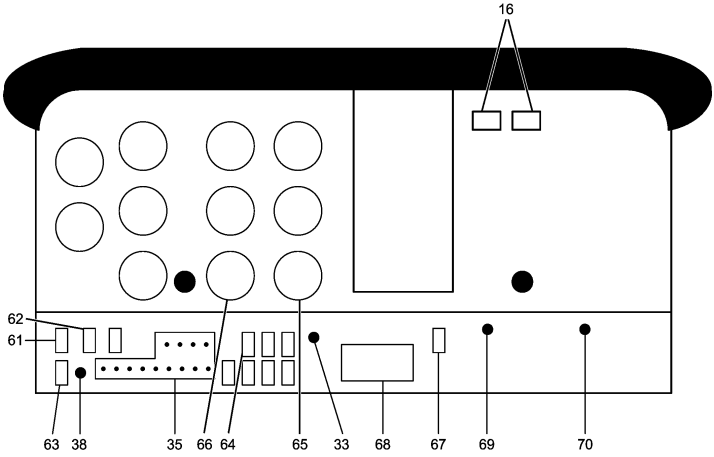


Figure 1-1 Example of Instrument panel with TAE 125 installation

16. Fuel Quantity Gauges (Oil Temperature and Oil Pressure Gauge **N**/**A**)
33. "Alt. Air Door" Alternate Air Door (Carburetor Heat Button **N**/**A**)
35. Circuit Breakers
38. "Starter"- Push Button (Switch resp.) for Starter
60. "ALT" - Switch or Circuit Breaker for Alternator
61. "BAT" - Switch for Battery
62. "MAIN" - Switch for Main Bus

63. "Engine Master" ("IGN" resp.) - Switch electrical supply FADEC
64. "Fuel Pump" - Switch for the Electrical Fuel Pump
65. AED 125 SR with indication of Fuel Flow, Fuel Temperature, Voltage and a warning light "Water Level" (yellow) for low coolant level
66. CED 125 (Tachometer **N**/**A**)
    The Compact Engine Display contains indication of Propeller Rotary Speed, Oil Pressure, Oil Temperature, Coolant Temperature, Gearbox Temperature and Load.
67. "Force B" - Switch for manually switching the FADEC
68. Lightpanel with:
    "FADEC" Test Knob
    "A FADEC B" Warning lights for FADEC A and B (red)
    "Alt" Alternator Warning light (red)
    "AED" Caution Light (amber) for AED 125
    "CED" Caution Light (amber) for CED 125
    "CED/AED" - Test/Confirm Knob for CED 125, AED 125 and Caution Lights (amber)
    "Fuel L";"Fuel R" Caution Lights for low fuel level (amber)
    "Glow" Glow Control Light (amber)

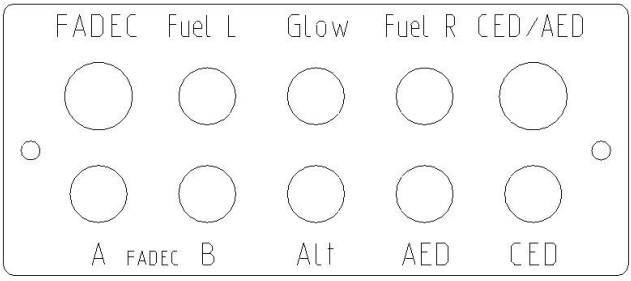


Figure 1-2 Lightpanel

69. “Shut-off Cabin Heat“ control knob to close cabin heat in case emergency (Push for shut-off)
70. “Cabin Heat“ Cabin heat control

FUEL SYSTEM (Left, Right)

The fuel system of both TAE 125 installations includes the original standard or long-range tanks of the Cessna 172. Additional sensors for Fuel Temperature and "Low Level" Warning are installed.
The fuel flows out of the tanks to the Fuel Selector Valve with the positions LEFT, RIGHT and OFF, through a reservoir tank to the fuel shut-off valve and then via the electrically driven Fuel Pump to the fuel filter. There is no BOTH position.
The electrically driven Fuel Pump supports the fuel flow to the Filter Module if required. Upstream to the Fuel Filter Module a thermostat-controlled Fuel Pre-heater is installed. Then, the engine-driven feed pump and the high-pressure pump supply the rail, from where the fuel is injected into the cylinders depending upon the position of the thrust lever and regulation by the FADEC.
Surplus fuel flows to the Filter Module and then through the Fuel Selector Valve back into the pre-selected tank. A temperature sensor in the Filter Module controls the heat exchange between the fuel feed and return.
Since the desity of diesel and jetfuel (0.84kg/l) is higher than of AVGAS (0.715kg/l), the usable fuel capacity was reduced by this factor through the fuel filler neck, to stay within the approved wing load.

Fuel Capacitiy				
	Tanks	Total Capacity	Total Unusable Fuel	Total Usable Fuel
F,G,H	2 Standard-Tanks: each 62.85 l (16.60 US gal)	125.7 l (33.2 US gal)	11.4 l (3 US gal)	114.3 l (30.2 US gal)
I,K,L,M	2 Standard-Tanks each 68.55 l (17.85 US gal)	135.1 l (35.7 US gal)	15.1 l (4 US gal)	120.0 l (31.7 US gal)
F-M	2 Long-Range-Tanks: each 83.65 l (22.10 US gal)	167.3 l (44.2 US gal)	15.1 l (4 US gal)	152.2 l (40.2 US gal)

FUEL SYSTEM (Left, Right)

■ CAUTION: In flight conditions with downward pointing wing, switch the fuel selector to the upper fuel tank.

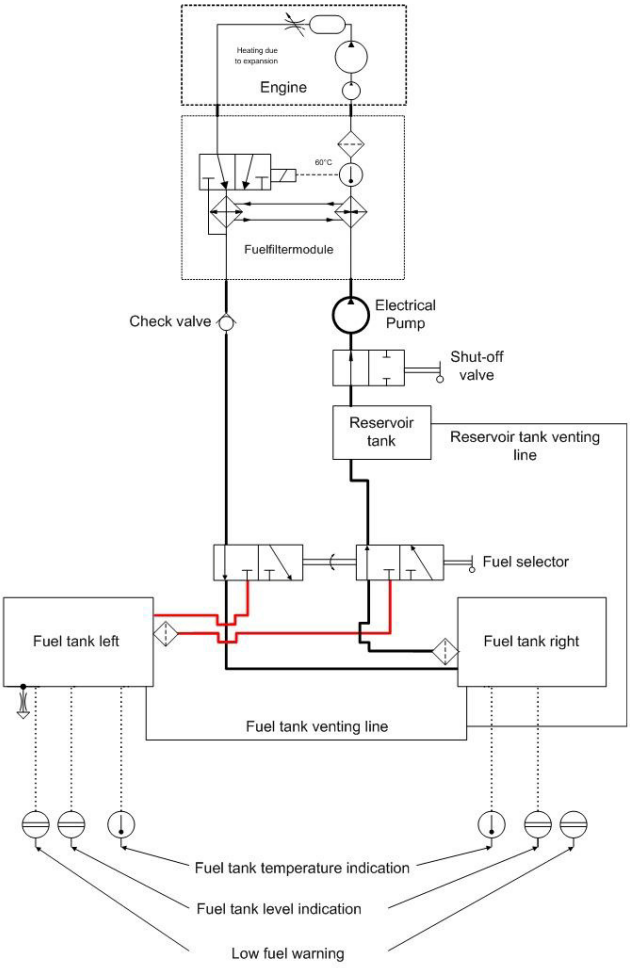


Figure 1-3a Scheme of the Fuel System (Left, Right)

FUEL SYSTEM (Left, Right, Both)

The fuel system of both TAE 125 installations includes the original standard or long-range tanks of the Cessna 172. Additional sensors for Fuel Temperature and "Low Level" Warning are installed.
The fuel flows out of the tanks to the Fuel Selector Valve with the positions LEFT, RIGHT and BOTH, through a reservoir tank to the fuel shut-off valve and then via the electrically driven Fuel Pump to the fuel filter.
The electrically driven Fuel Pump supports the fuel flow to the Filter Module if required. Upstream to the Fuel Filter Module a thermostat-controlled Fuel Pre-heater is installed.Fuel can be shut off by the seperate shutoff valve. Then, the engine-driven feed pump and the high-pressure pump supply the rail, from where the fuel is injected into the cylinders depending upon the position of the thrust lever and regulation by the FADEC.
Surplus fuel flows to the Filter Module and then through the Fuel Selector Valve back into the pre-selected tank, if BOTH is selected the fuel returns to both tanks. A temperature sensor in the Filter Module controls the heat exchange between the fuel feed and return.
Since the density of diesel and jet fuel (0.84 kg/l) is higher than AVGAS (0.715 kg/l), the usable fuel capacity was reduced by this factor through the fuel filler neck, to stay within the approved wing load.

Fuel Capacitiy				
Tanks		Total Capacity	Total Unusable Fuel	Total Usable Fuel
F,G,H	2 Standard-Tanks: each 62.85 l (16.60 US gal)	125.7 l (33.2 US gal)	11.4 l (3 US gal)	114.3 l (30.2 US gal)
I,K,L,M	2 Standard-Tanks each 68.55 l (17.85 US gal)	135.1 l (35.7 US gal)	15.1 l (4 US gal)	120.0 l (31.7 US gal)
F-M	2 Long-Range-Tanks: each 83.65 l (22.10 US gal)	167.3 l (44.2 US gal)	15.1 l (4 US gal)	152.2 l (40.2 US gal)

FUEL SYSTEM (Left, Right, Both)

■ CAUTION In flight conditions with downward pointing wing, switch the fuel selector to the upper fuel tank or to the position BOTH

■ CAUTION In turbulent air it is strongly recommended to use the BOTH position.

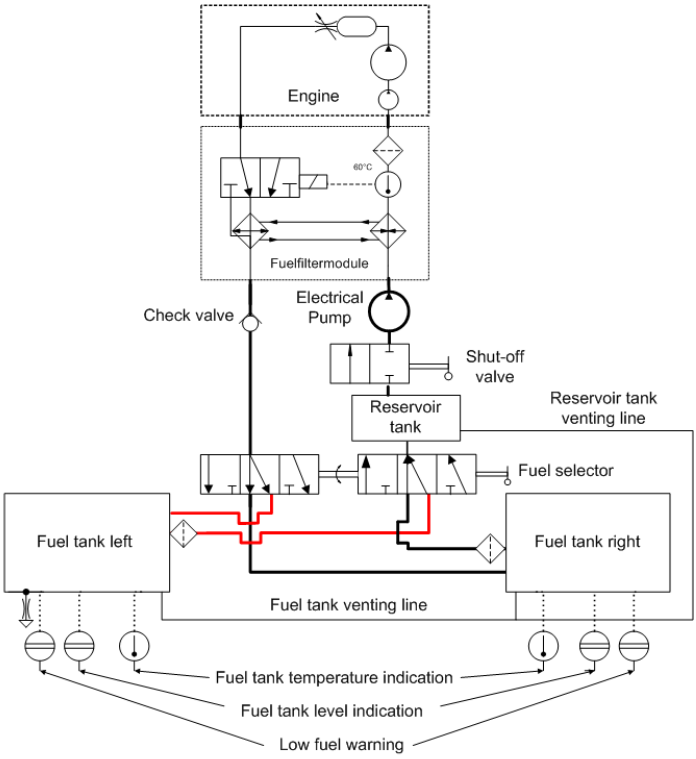


Figure 1-3b Scheme of the Fuel System (Left, Right, Both)

◆ Note The handling of the fuel selector positions left, right and both are described in the original POH

ELECTRICAL SYSTEM

The electrical system of both TAE125 installation differs from the previous installation and is equipped with the following operating and display elements:

1. Switch "Main Bus"
   This switch controls the Main Bus. The Main Bus is necessary to be able to run FADEC and engine with Battery/Alternator without disturbance in the event of onboard electrical system malfunctions. Normally, Alternator, Main Bus and Battery have to be switched on simultaneously.

2. Circuit Breaker (Switch resp.) "Alternator"
   Controls the alternator. Must be ON in normal operation.

3. Switch "Battery"
   Controls the Battery.

4. Push Button (Switch resp.) "Starter"
   Controls the magneto switch of the starter.

5. Ammeter
   The Ammeter shows the alternator current. In case of battery discharge if alternator inoperative the alternator warning light will illuminate.

6. Warning Light "Alternator"
   Illuminates when the power output of the alternator is too low or the Circuit Breaker "Alternator" (Switch resp.) is switched off. Normally, this warning light always illuminates when the "Engine Master" ("IGN" resp.) is switched on without revolution and extinguishes immediately after starting the engine.

7. Switch "Fuel Pump"
   This switch controls the electrical fuel pump.

8. Switch "Engine Master" ("IGN" resp.)
   Controls the two redundant FADEC components and the Alternator Excitation Battery with two independent contacts. The Alternator Excitation Battery is used to ensure that the Alternator continues to function properly even if the main battery fails.

▲ **WARNING:** If the "Engine Master" is switched off, the power supply to the FADEC is interrupted and the engine will shut down.

9. Switch "Force B"
   If the FADEC does not automatically switch from A-FADEC to the B-FADEC in case of an emergency despite of obvious necessity, this switch allows to switch manually to the B-FADEC.

▲ **WARNING:** When operating on FADEC backup battery only, the "Force B" switch must not be activated. This will shut down the engine.

10. FADEC Backup Battery
    The electrical system includes a FADEC backup battery to ensure power supply to A-FADEC in case that supply from both battery and alternator is interrupted. The engine can be operated for a maximum of 30 minutes when powered by the FADEC backup battery only. Only A-FADEC is connected to the backup battery.

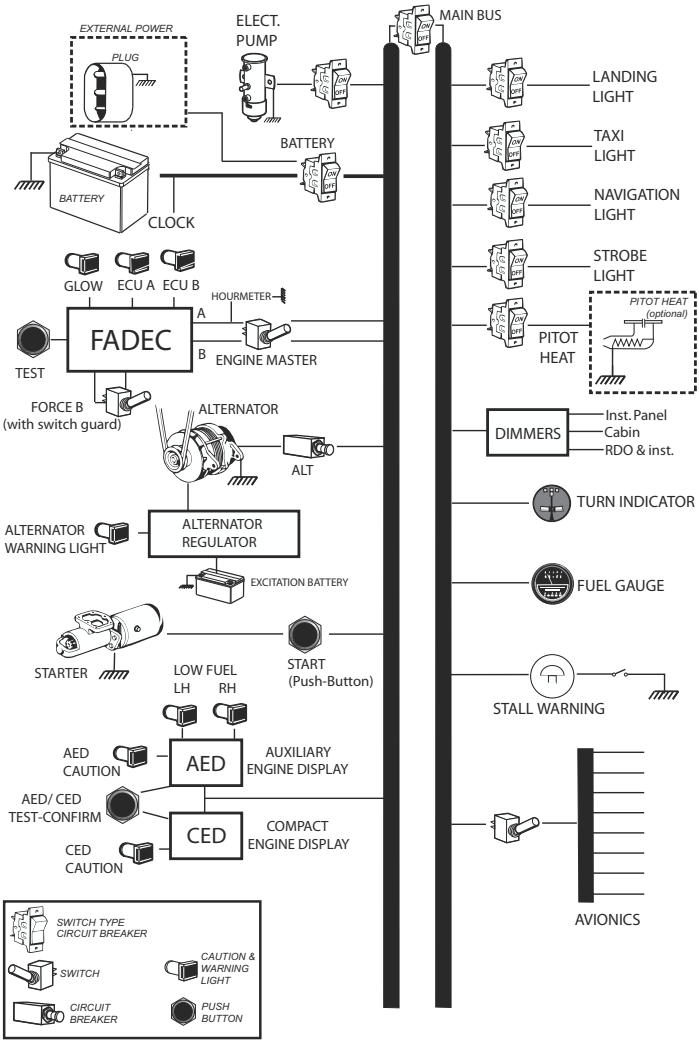


Figure 1-4a Basic wiring of the electrical system with alternator circuit breaker, without FADEC backup battery

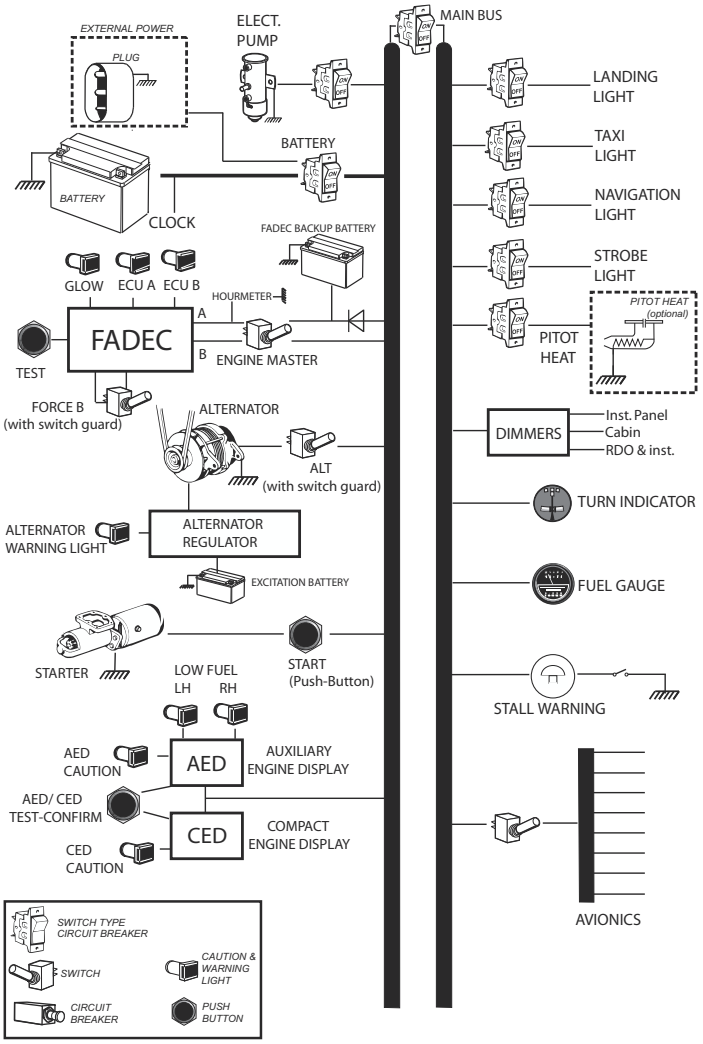


Figure 1-4b Basic wiring of the electrical system with alternator switch and FADEC backup battery

FADEC-RESET

In case of a FADEC-warning, one or both FADEC warning lights are flashing. If then the "FADEC" Test Knob is pressed for at least 2 seconds,

a) the active warning lights will extinguish if it was a LOW category warning.

b) the active warning lights will be illuminated steady if it was a HIGH category warning.

■ CAUTION: If a FADEC-warning occurred, contact your service center.

When a high category warning occurs the pilot should land as soon as practical, since the affected FADEC ECU has diagnosed a severe fault. A low category fault has no significant impact on engine operation.
Refer also to the engine OM-02-01 or OM-02-02 for additional information.

COOLING

The TAE 125 variants are fitted with a fluid-cooling system whose three-way thermostat regulates the flow of coolant between the large and small cooling circuit.
The coolant exclusively flows through the small circuit up to a cooling water temperature of 84°C and then between 84 and 94°C both through the small and the large circuit.
If the cooling water temperature rises above 94°C, the complete volume of coolant flows through the large circuit and therefore through the radiator. This allows a maximum cooling water temperature of 105°C.
There is a sensor in the expansion reservoir which sends a signal to the warning light "Water level" on the instrument panel if the coolant level is low.
The cooling water temperature is measured in the housing of the thermostat and passed on to the FADEC and CED 125.
The connection to the heat exchanger for cabin heating is always open; the warm air supply is regulated by the pilot over the heating valve. See Figure 1-5a.

In normal operation the control knob "Shut-off Cabin Heat" must be OPEN, with the control knob "Cabin Heat" the supply of warm air into the cabin can be controlled.
In case of certain emergencies (refer to section 3), the control knob "Shut-off Cabin Heat" has to be closed according to the appropriate procedures.
Aircraft having a TAE 125-02-99 engine installation, can be equipped with a gearbox oil cooler that is connected to the coolant circuit.

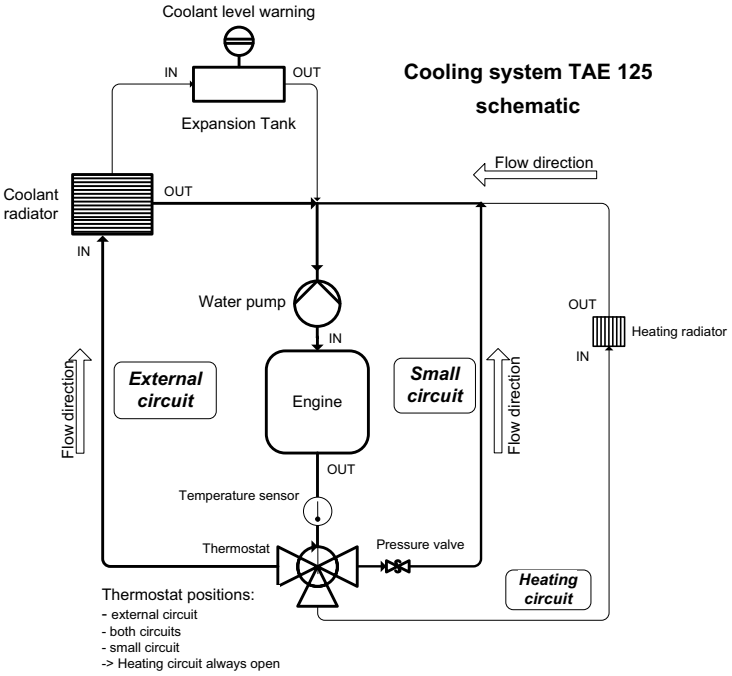


Figure 1-5a Cooling system TAE 125-01 & TAE 125-02-99

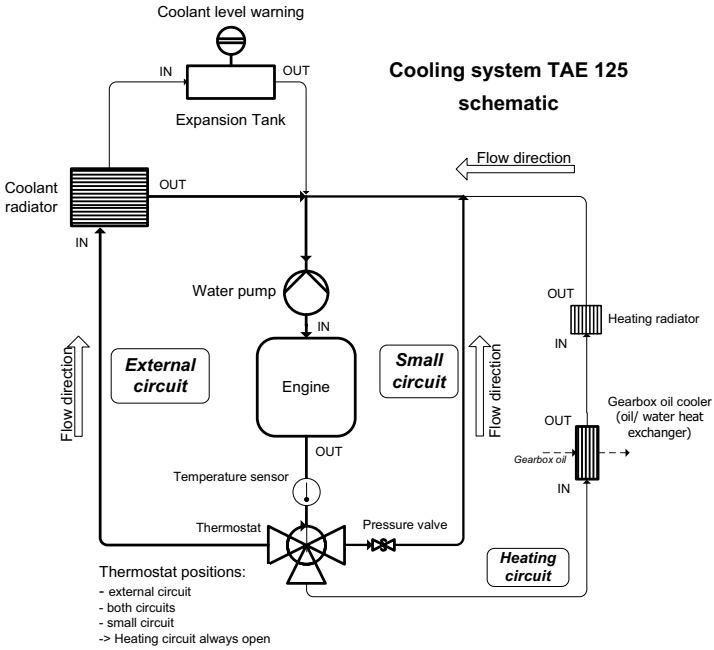


Figure 1-5b Cooling system TAE 125-02-99 with Gearbox Oil Cooler

SECTION 2
LIMITATIONS

▲ **WARNING:** It is not allowed to start up the engine using external power. If starting the engine is not possible using battery power, the condition of the battery must be verified before flight.

WEIGHT LIMITS

Normal Category:

Maximum Ramp Weight: .....1044 kg (2302 lbs)
Maximum Takeoff Weight:.....1043 kg (2300 lbs)
Maximum Landing Weight.....1043 kg (2300 lbs)

Utility Category:

Maximum Ramp Weight: .....908 kg (2002 lbs)
Maximum Takeoff Weight:.....907 kg (2000 lbs)
Maximum Landing Weight.....907 kg (2000 lbs)

MANEUVER LIMITS

■ CAUTION: Intentionally initiating negative G maneuvers is prohibited

Normal Category: No change

Utility Category: Intentionally initiating spins is prohibited

FLIGHT LOAD FACTORS

No change

■ CAUTION Avoid extended negative g-loads duration. Extended negative g-loads can cause propeller control and engine problems.

◆ Note: The load factor limits for the engine must also be observed. Refer to the Operation & Maintenance Manual for the engine.

ENGINE OPERATING LIMITS

Engine manufacturer:..... Thielert Aircraft Engines GmbH
Engine model:..... TAE 125-01 or TAE 125-02-99
Take-off and Max. continuous power:..... 99 kW (135 HP)
Take-off and Max. continuous RPM:..... 2300 min^{-1}

◆ Note: In the absence of any other explicit statements, all of the information on RPM in this supplement to the Pilot´s Operating Handbook are propeller RPM.

◆ Note: This change of the original aircraft is certified up to an altitude of 17,500 ft.

Engine operating limits for take-off and continuous operation**:**

▲ **WARNING:** It is not allowed to start the engine outside of these temperature limits.

◆ Note: The operating limit temperature is a temperature limit below which the engine may be started, but not operated at the Take-off RPM. The warm-up RPM to be selected can be found in Section 4 of this supplement.

Oil temperature:
Minimum engine starting temperature:..... -32 °C
Minimum operating limit temperature: .....50 °C
Maximum operating limit temperature: .....140 °C

Coolant temperature:
Minimum engine starting temperature:..... -32 °C
Minimum operating limit temperature: .....60 °C
Maximum operating limit temperature: .....105 °C

Gearbox temperature:

Mininum operating limit temperature: ..... -30 °C
Maximum operating limit temperature: .....120 °C
Min. fuel temperature limits in the fuel tank:

Fuel	Minimum permissible fuel temperature in the fuel tank before Take-off	Minimum permissible fuel temperature in the fuel tank during the flight
JET A-1, JET A, Fuel No.3 JP-8, JP-8+100, TS-1 (only C2.0)	-30°	-35°
Diesel	greater than 0°	-5°

Table 2-3a Minimum fuel temperature limits in the fuel tank

▲ **WARNING:** The fuel temperature of the fuel tank not used should be observed if its later use is intended.

▲ **WARNING:** The following applies to Diesel and JET fuel mixtures in the tank:
As soon as the proportion of Diesel in the tank is more than 10% Diesel, the fuel temperature limits for Diesel operation must be observed. If there is uncertainty about which fuel is in the tank, the assumption should be made that it is Diesel.

Minimum oil pressure: .....1.2 bar
Minimum oil pressure (at Take-off power) .....2.3 bar
Minimum oil pressure (in flight) .....2.3 bar
Maximum oil pressure.....6.0 bar
Maximum oil pressure (cold start < 20 sec.): .....6.5 bar
Maximum oil consumption: .....0.1 l/h (0.1 quart/h)

ENGINE INSTRUMENT MARKINGS

The engine data of the TAE 125 installation to be monitored are integrated in the combined engine instrument CED-125.

The ranges of the individual engine monitoring parameters are shown in the following table.

Instrument		Red range	Amber range	Green range	Amber range	Red range
Tachometer	[RPM]	----------	----------	0-2300	-------	> 2300
Oil pressure	[bar]	0-1.2	1.2-2.3	2.3-5.2	5.2-6.0	> 6.0
Coolant temperature	[°C]	< -32	-32 ...+60	60-101	101-105	> 105
Oil temperature	[°C]	< -32	-32 ...+50	50-125	125-140	> 140
Gearbox temperature	[°C]	----------	----------	< 115	115-120	> 120
Load	[%]	---------	----------	0-100	----------	----------

Table. 2-3b Markings of the engine instruments

◆ Note: If an engine reading is in the yellow or red range, the "Caution" light is activated. It only extinguishes when the "CED-Test/ Confirm" button is pressed. If this button is pressed longer than a second, a selftest of the instrument is initiated.

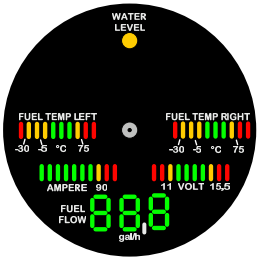


Figure 2-1a AED 125

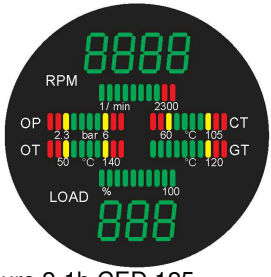


Figure 2-1b CED 125

PERMISSIBLE FUEL GRADES

■ CAUTION: Using non-approved fuels and additives can lead to dangerous engine malfunctions.

Fuel: .....JET A-1 (ASTM 1655)
Alternative: .....JET-A (ASTM D 1655)
.....Fuel No.3 (GB 6537-2006)
.....JP-8 (MIL-DTL-83133E)
.....JP-8+100 (MIL-DTL-83133E)
..... Diesel (**DIN** EN 590)
Only TAE 125-02-99 (C2.0):
..... TS-1 (GOST 10227-86)
.....TS-1 (GSTU 320.00149943.011-99)

MAXIMUM FUEL QUANTITIES

Due to the higher specific density of Kerosene and Diesel in comparison to Aviation Gasoline (AVGAS) with the TAE 125 installation the permissible tank capacity has been reduced.

Fuel Capacitiy				
Tanks		Total Capacity	Total Unusable Fuel	Total Usable Fuel
F,G,H	2 Standard-Tanks: each 62.85 l (16.60 US gal)	125.7 l (33.2 US gal)	11.4 l (3 US gal)	114.3 l (30.2 US gal)
I,K,L,M	2 Standard-Tanks each 68.55 l (17.85 US gal)	135.1 l (35.7 US gal)	15.1 l (4 US gal)	120.0 l (31.7 US gal)
F-M	2 Long-Range-Tanks: each 83.65 l (22.10 US gal)	167.3 l (44.2 US gal)	15.1 l (4 US gal)	152.2 l (40.2 US gal)

■ CAUTION: To prevent air from penetrating into the fuel system avoid flying the tanks dry. As soon as the "Low Level" Warning Light illuminates, switch to a tank with sufficient fuel or land.

■ CAUTION With ¼ tank or less, prolonged uncoordinated flight is prohibited when operating on either left or right tank.

■ CAUTION In turbulent air it is strongly recommended to use the BOTH position.

◆ Note The tanks are equipped with a Low Fuel Warning. If the fuel level is below 10 l (2.6 US gal) usable fuel, the "Fuel L" or "Fuel R" Warning Light illuminates respectively.

PERMISSIBLE OIL TYPES

Engine oil: ..... AeroShell Oil Diesel Ultra
..... AeroShell Oil Diesel 10W-40
..... Shell Helix Ultra 5W-30
..... Shell Helix Ultra 5W-40
Gearbox oil: ..... Shell Getriebeöl EP 75W-90 API GL-4
..... Shell Spirax EP 75W-90
..... Shell Spirax GSX 75W-80 GL-4
..... Shell Spirax S4 G 75W-90
..... Shell Spirax S6 GXME 75W-80
Only TAE 125-02-99 (C2.0):
..... Shell Spirax S6 ATF ZM

■ CAUTION: Use approved oil with exact designation only!

PERMISSIBLE COOLING LIQUID

Coolant: ..... Water/Radiator Protection at a ratio of 50:50
Radiator Protection: ..... BASF Glysantin Protect Plus/G48
..... Mobil Antifreeze Extra/G48
..... ESSO Antifreeze Extra/G48
... Comma Xstream Green - Concentrate/G48
.....Zerex Glysantin G 48

PLACARDS

Near the fuel tank caps:

Cessna 172 F,G,H (With standard tanks):

JET FUEL ONLY
JET A-1/ DIESEL
CAP. 57.2 LITER (15.1 U.S. GAL.)
USABLE TO BOTTOM OF FILLER INDICATOR TAB

Cessna 172 I,K,L,M (With standard tanks):

JET FUEL ONLY
JET A-1/ DIESEL
CAP. 60.0 LITER (15.85 U.S. GAL.)
USABLE TO BOTTOM OF FILLER INDICATOR TAB

Cessna 172 F-M (With long-range tanks):

JET FUEL ONLY
JET A-1/ DIESEL
CAP. 76.1 LITER (20.1 U.S. GAL.)
USABLE TO BOTTOM OF FILLER INDICATOR TAB

At the fuel selector valve:

With standard tanks F,G,H:

Left and Right position: 57.2 Ltr./ 15.1 gal
Both position: 114.4 Ltr./ 30.2 gal

With standard tanks I,K,L,M:

Left and Right position: 60 Ltr./ 15.85 gal
Both position: 120 Ltr./ 31.7 gal

With long-range tanks F-M:

Left and Right position: 76.1 Ltr./ 20.1 gal
Both position: 152.2 Ltr./ 40.2 gal

On the oil funnel or at the flap of the engine cowling:

"Oil, see POH supplement"

If installed, at the flap of the engine cowling to the External Power Receptacle**:**

"ATTENTION 12 V DC OBSERVE CORRECT POLARITY"

All further placards contained in this section of the EASA-approved POH remain valid.

This page intentionally left blank

SECTION 3
EMERGENCY PROCEDURES

INDEX OF CHECKLISTS

GENERAL

▲ **WARNING:** Due to an engine shut-off or a FADEC diagnosed failure there might be a loss propeller valve currency which leads in a low pitch setting of the propeller. This might result in overspeed.
Airspeeds below 100 KIAS/ 115 mph are suitable to avoid overspeed in failure case.
If the propeller speed control fails, climbs can be performed at 65 KIAS/ 75 mph and a powersetting of 100%.

ENGINE MALFUNCTION

DURING TAKE-OFF (WITH SUFFICENT RUNWAY AHEAD)

(1) Thrust Lever - IDLE
(2) Brakes - APPLY
(3) Wing flaps (if extended) - RETRACT to increase the braking effect on the runway
(4) Engine Master (“IGN“ resp.) - OFF
(5) Circuit Breaker (Switch resp.) “Alternator“ and Switches "Main Bus" and "Battery" - OFF

IMMEDIATELY AFTER TAKE-OFF

If there is an engine malfunction after take-off, at first lower the nose to keep the airspeed and attain gliding attitude. In most cases, landing should be executed straight ahead with only small corrections in direction to avoid obstacles.

▲ **WARNING:** Altitude and airspeed are seldom sufficient for a return to the airfield with a 180° turn while gliding.

(1) Airspeed..... 65 KIAS/ 75 mph (wing flaps retracted)
.....60 KIAS/ 69 mph (wing flaps extended)
(2) Fuel Shut-off Valve - CLOSED
(3) Engine Master (“IGN“ resp.) - OFF
(4) Wing flaps - as required (Full down recommended)
(5) Circuit Breaker (Switch resp.) “Alternator“ and Switches "Main Bus" and "Battery" - OFF

DURING FLIGHT

◆ Note: Flying a tank dry activates both FADEC warning lights flashing.

In case that one tank was flown dry, at the first signs of insufficient fuel feed proceed as follows:

(1) Fuel Shut-off Valve - OPEN (push full in)
(2) Immediately switch the Fuel Selector to tank with sufficientfuel quantity, if the BOTH option is installed, select the fuel selector position BOTH position
(3) Electrical Fuel Pump - ON
(4) Check the engine (engine parameters, airspeed/altitude change, whether the engine responds to changes in the Thrust Lever position).
(5) If the engine acts normally, continue the flight and land as soon as practical..

▲ **WARNING:** The high-pressure pump must be checked before the next flight.

RESTART AFTER ENGINE FAILURE

Whilst gliding to a suitable landing strip, try to determine the reason for the engine malfunction . If time permits and a restart of the engine is possible, proceed as follows:

(1) Airspeed between 65 and 85 KIAS/ 75 and 98 mph
(2) Glide below 13,000 ft
(3) Fuel Shut-off Valve - OPEN (push full in)
(4) Fuel Selector switch to tank with sufficientfuel quantity, if the BOTH option is installed, select the fuel selector position BOTH position
(5) Electrical Fuel Pump - ON
(6) Thrust Lever - IDLE
(7) Engine Master ("IGN" resp.) OFF and then ON
(if the propeller does not turn, then additionally Starter ON)

◆ Note: The propeller will normally continue to turn as long as the airspeed is above 65 KIAS/ 75 mph. Should the propeller stop at an airspeed of more than 65 KIAS/ 75 mph or more, the reason for this should be found out before attempting a restart.
If it is obvious that the engine or propeller is blocked, do not use the Starter.

◆ Note: If the Engine Master is in position OFF, the Load Display shows no value even if the propeller is turning.

(8) Check the engine power: Thrust lever 100%, engine parameters, check altitude and airspeed

FADEC MALFUNCTION IN FLIGHT

◆ Note: The FADEC consists of two components that are independent of each other: FADEC A and FADEC B. In case of malfunctions in the active FADEC, it automatically switches to the other.

a) One FADEC Light is flashing

1. Press FADEC-Testknob at least 2 seconds
2. FADEC light extinguished (LOW warning category):
   a) Continue flight normally,
   b) Inform service center after landing.
3. FADEC light steady illuminated (HIGH warning category)
   a) Observe the other FADEC light.
   b) Land as soon as practical.
   c) Select an airspeed to avoid engine overspeed.
   d) Inform service center after landing.

b) Both FADEC Lights are flashing

◆ Note: CED load display should be considered unreliable with both FADEC lights illuminated. Use other indications to assess engine condition.

1. Press FADEC-Testknob at least 2 seconds
2. FADEC Lights extinguished (LOW warning category):
   a) Continue flight normally,
   b) Inform service center after landing.
3. FADEC Lights steady illuminated (HIGH warning category):
   a) Check the available engine power,
   b) Expect engine failure.
   c) Flight can be continued, however the pilot should
      i) Select an appropriate airspeed to avoid engine overspeed.
      ii) Land as soon as possible.
      iii) Be prepared for an emergency landing.
   d) Inform service center after landing.
4. In case a tank was flown empty, proceed at the first signs of insufficient fuel feed as follows:
   a) Immediately switch the Fuel Selector to tank with sufficientfuel quantity, if the BOTH option is installed, select the fuel selector position BOTH
   b) Electrical Fuel Pump - ON
   c) Select an airspeed to avoid engine overspeed.
   d) Check the engine (engine parameters, airspeed/altitude change, whether the engine responds to changes in the Thrust Lever position).
   e) If the engine acts normally, continue the flight and land as soon as practical.

▲ **WARNING:** The high-pressure pump must be checked before the next flight.

ABNORMAL ENGINE BEHAVIOR

If the engine acts abnormally during flight and the system does not automatically switch to the B-FADEC, it is possible switch to the B-FADEC manually.

▲ **WARNING:** It is only possible to switch from the automatic position to B-FADEC (A-FADEC is active in normal operation, B-FADEC is active in case of malfunction). This only becomes necessary when no automatic switching occurred in case of abnormal engine behavior.

(1) Select an appropriate airspeed to avoid engine overspeed

▲ **WARNING:** When operating on FADEC backup battery only, the "Force B" switch must not be activated. This will shut down the engine.

(2) "Force-B" switch to B-FADEC

(3) Flight may be continued, but the pilot should:

i) Select an airspeed to avoid engine overspeed

ii) Land as soon as practical

iii) Be prepared for an emergency landing

FIRES

ENGINE FIRE WHEN STARTING ENGINE ON GROUND

(1) Engine Master (“IGN“ resp.) - OFF
(2) Fuel Shut-off Valve - CLOSED
(3) Electrical Fuel Pump - OFF
(4) Switch "Battery" - OFF
(5) Extinguish the flames with a fire extinguisher, wool blankets or sand.
(6) Examine the fire damages thoroughly and repair or replace the damaged parts before the next flight

ENGINE FIRE IN FLIGHT

(1) Engine Master - OFF
(2) Fuel Shut-off Valve - CLOSED
(3) Electrical Fuel Pump - OFF (if in use)
(4) Switch "Main Bus" - OFF
(5) Cabin heat and ventilation OFF (closed) except the fresh air nozzles on the ceiling
(6) Establish Best Glide Speed
(7) Perform emergency landing (as described in the procedure "Emergency Landing With Engine Out")

ELECTRICAL FIRE IN FLIGHT

The first sign of an electrical fire is the smell of burned cable insulation. In this event proceed as follows:

(1) Main Bus - OFF
(2) Avionics Master - OFF
(3) Fresh Air Nozzles, Cabin Heat and Ventilation - OFF (closed)
(4) Fire Extinguisher - Activate (if available)
(5) All electrical consumers - Switch OFF, leave Alternator, Battery and Engine Master ON

▲ **WARNING:** After the fire extinguisher has been used, make sure that the fire is extinguished before exterior air is used to remove smoke from the cabin.

(6) If there is evidence of continued electrical fire, consider turning off Battery and Alternator.

▲ **WARNING:** If the FADEC Backup battery is not installed this will shut down the engine and require an emergency landing (refer to "EMERGENCY LANDING WITH ENGINE OUT"). The engine has been demonstrated to continue operating for a maximum of 30 minutes when powered by the FADEC Backup battery only.

(7) Fresh Air Nozzles, Cabin Heat and Ventilation - ON (open)
(8) Check Circuit Breaker, do not reset if open

If the fire has been extinguished:

(9) Main Bus - ON
(10) Avionics Master - ON

▲ **WARNING:** Turn on electrical equipment required to continue flight depending on the situation and land as soon as practical. Do only switch ON one at a time, with delay after each.

ENGINE SHUT DOWN IN FLIGHT

If it is necessary to shut down the engine in flight (for instance, abnormal engine behavior does not allow continued flight or there is a fuel leak, etc.), proceed as follows:

(1) Select an airspeed to avoid engine overspeed (best glide recommended)
(2) Engine Master (“IGN“ resp.) - OFF
(3) Fuel Shut-off Valve - CLOSED
(4) Electrical Fuel Pump - OFF (if in use)
(5) If the propeller also has to be stopped (for instance, due to excessive vibrations)
    i) Reduce airspeed below 55 KIAS/ 63 mph
    ii) When the propeller is stopped, continue to glide at 65 KIAS/ 75 mph

EMERGENCY LANDING

EMERGENCY LANDING WITH ENGINE OUT

If all attempts to restart the engine fail and an emergency landing is imminent, select suitable site and proceed as follows:

(1) Airspeed
    i) 65 KIAS/ 75 mph (flaps retracted)
    ii) 60 KIAS/ 69 mph (flaps extended)
(2) Fuel Shut-off Valve - CLOSED
(3) Engine Master (“IGN“ resp.) - OFF
(4) Wing Flaps - as required (Full down recommended)
(5) Circuit Breaker (Switch resp.) “Alternator“ and Switches "Main Bus" and "Battery" - OFF
(6) Cabin Doors - unlock before touch-down
(7) Touch-down - slightly nose up attitude
(8) Brake firmly

◆ Note: Gliding Distance. Refer to Figure 5-4 "Maximum Glide" Section 5 of this supplement.

FLIGHT IN ICING CONDITIONS

▲ **WARNING:** It is prohibited to fly in known icing conditions.

In case of inadvertent icing encounter proceed as follows:

(1) Pitot Heat switch - ON (if installed)
(2) Turn back or change the altitude to obtain an outside air temperature that is less conducive to icing.
(3) Pull the cabin heat control full out and open defroster outlets to obtain maximum windshield defroster airflow. Adjust cabin air control to get maximum defroster heat and airflow.
(4) Advance the Thrust Lever to increase the propeller speed and keep ice accumulation on the propeller blades as low as possible.
(5) Watch for signs of air filter icing and pull the "Alternate Air Door" control if necessary. An unexplaned loss in engine power could be caused by ice blocking the air intake filter. Opening the "Alternate Air Door" allows preheated air from the engine compartment to be aspirated.
(6) Plan a landing at the nearest airfield. With an extremely rapid ice build up, select a suitable "off airfield" landing side.
(7) With an ice accumulation of 0.5 cm or more on the wing leading edges, a significantly higher stall speed should be expected.
(8) Leave wing flaps retracted. With a severe ice build up on the horizontal tail, the change in wing wake airflow direction caused by wing flap extension could result in a loss of elevator effectiveness.
(9) Open left window, if practical, scrape ice from a portion of the windshield for visibility in the landing approach.
(10) Perform a landing approach using a forward slip, if necessary, for improved visibility.
(11) Approach at 65 to 75 KIAS/ 75 to 85 mph depending upon the amount of the accumulation.
(12) Perform a landing in level attitude.

RECOVERY FROM SPIRAL DIVE

If a spiral is encountered in the clouds, proceed as follows:

(1) Retard Thrust Lever to idle position
(2) Stop the turn by using coordinated aileron and rudder control to align the symbolic airplane in the turn coordinator with the horizontal reference line.
(3) Cautiously apply elevator back pressure to slowly reduce the airspeed to 70 KIAS/ 80 mph.
(4) Adjust the elevator trim control to maintain an 70 KIAS/ 80 mph glide.
(5) Keep hands off the control wheel, using rudder control to hold a straight heading.
(6) Readjust the rudder trim (if installed) to relieve the rudder of asymmetric forces.
(7) Clear the engine occasionally, but avoid using enough power to disturb the trimmed glide.
(8) Upon breaking out of clouds, resume normal cruising flight and continue the flight.

ELECTRICAL POWER SUPPLY SYSTEM MALFUNCTIONS

■ CAUTION: The TAE 125 requires an electrical power source for its operation. If the alternator fails, continued engine operation time is dependent upon the remaining capacity of the main battery, the FADEC backup battery and equipment powered.
The engine has been demonstrated to continue operating for approximately 120 minutes based upon the following assumptions:

Equipment		Time switched on	
		in [min]	in [%]
NAV/COM 1 receiving	ON	120	100
NAV/COM 1 transmitting	ON	12	10
NAV/COM 2 receiving	OFF	0	0
NAV/COM 2 transmitting	OFF	0	0
GPS	ON	60	50
Transponder	ON	120	100
Fuel Pump	OFF	0	0
AED-125	ON	120	100
Battery	ON	120	100
CED-125	ON	120	100
Landing Light	ON	12	10
Flood Light	ON	1.2	1
Pitot Heat	ON	24	20
Wing Flaps	ON	1.2	1
Interior Lighting	OFF	0	0
Nav Lights	OFF	0	0
Beacon	OFF	0	0
Strobes	OFF	0	0
ADF	OFF	0	0
Intercom	OFF	0	0
Engine Control	ON	120	100

Table 3-1a

▲ **WARNING** If the power supply from both alternator and main battery is interrupted, continued engine operation is dependent on the remaining capacity of the FADEC backup battery. The engine has been demonstrated to continue operating for a maximum of 30 minutes when powered by the FADEC backup battery only. In this case, all electrical equipment will not operate:

- land immidiately
- do not switch the „FORCE-B“ switch, this will shut down the engine

■ CAUTION: This table only gives a reference point. The pilot should turn off all nonessential items and supply power only to equipment which is absolutely necessary for continued flight depending upon the situation.

If deviated from this recommendation, the remaining engine operating time may change.

ALTERNATOR WARNING LIGHT ILLUMINATES DURING NORMAL ENGINE OPERATION.

(1) Ammeter - CHECK.
(2) Circuit Breaker (Switch resp.) “Alternator“ CHECK - ON
(3) Battery Switch CHECK -ON

■ CAUTION If the FADEC was supplied by battery only until this point, the RPM can momentarily drop, when the alternator will be switched on. In any case: leave the alternator switched ON!

(4) Electrical load - REDUCE IMMEDIATELY as follows:
   i) NAV/ COM 2 – OFF
   ii) Fuel Pump – OFF
   iii) Landing Light – OFF (use as required for landing)
   iv) Taxi Light – OFF
   v) Strobe Light – OFF
   vi) Nav Lights – OFF
   vii) Beacon – OFF
   viii) Interior Lights – OFF
   ix) Intercom – OFF
   x) Pitot Heat – OFF (use as required)
   xi) Autopilot – OFF
   xii) Non-essential equipment – OFF
(5) The pilot should:
   i) Land as soon as practical.
   ii) Be prepared for an emergency landing.
   iii) Expect an engine failure

AMMETER SHOWS BATTERY DISCHARGE DURING NORMAL ENGINE OPERATION FOR MORE THAN 5 MINUTES

◆ Note: When the AED Ammeter indication is illuminated at the outer left side and the voltage indication is decreasing simultaneously, the battery is being discharged.

(1) Circuit Breaker (Switch resp.) "Alternator" CHECK - ON
(2) Battery Switch CHECK -ON

■ CAUTION If the FADEC was supplied by battery only until this point, the RPM can momentarily drop, when the alternator will be switched on. In any case: leave the alternator switched ON!

(3) Electrical load - REDUCE IMMEDIATELY as follows:
- i) NAV/ COM 2 – OFF
- ii) Fuel Pump – OFF
- iii) Landing Light – OFF (use as required for landing)
- iv) Taxi Light – OFF
- v) Strobe Light – OFF
- vi) Nav Lights – OFF
- vii) Beacon – OFF
- viii) Interior Lights – OFF
- ix) Intercom – OFF
- x) Pitot Heat – OFF (use as required)
- xi) Autopilot – OFF
- xii) Non-essential equipment – OFF

(4) The pilot should:
- i) Land as soon as practical
- ii) Be prepared for an emergency landing
- iii) Expect an engine failure

TOTAL ELECTRICAL FAILURE
(all equipment inoperative, except engine)

▲ **WARNING:** If the power supply from both alternator and main battery is interrupted simultaneously, continued engine operation is dependent on the remaining capacity of the FADEC backup battery. The engine has been demonstrated to continue operating for a maximum of 30 minutes when powered by the FADEC backup battery only. In this case, all other electrical equipment will not operate.

▲ **WARNING:** If the aircraft was operated on battery power only until this point (alternator warning light illuminated), the remaining engine operating time may be less than 30 minutes.

▲ **WARNING:** Do not active the FORCE-B switch, this will shut down the engine.

(1) Circuit Breaker (Switch resp.) “Alternator“ CHECK - ON
(2) Battery Switch CHECK – ON
(3) Land as soon as possible
    i) Be prepared for an emergency landing
    ii) Expect an engine failure

ROUGH ENGINE OPERATION OR LOSS OF POWER

DECREASE IN POWER

(1) Push Thrust Lever full forward (Take-off position)
(2) Fuel Selector to tank with sufficient fuel quantity and temperature, if the BOTH option is installed, select the fuel selector BOTH position.
(3) Electrical Fuel Pump - ON
(4) Reduce airspeed to 65-85 KIAS/ 75-98 mph (best glide recommended), (max. 100 KIAS)
(5) Check engine parameters (FADEC lights, oil pressure and temperature, fuel quantity)

If normal engine power is not achieved, the pilot should:

i) Land as soon as practical
ii) Be prepared for an emergency landing
iii) Expect an engine failure

▲ **WARNING:** The high presure pump must be checked before the next flight.

ICE FORMATION IN THE CARBURETOR

- N/A, since this is a Diesel engine -

SOILED SPARK PLUGS

- N/A, since this is a Diesel engine -

IGNITION MAGNET MALFUNCTIONS

- N/A, since this is a Diesel engine -

OIL PRESSURE TOO LOW (< 2.3 BAR IN CRUISE (YELLOW RANGE) OR < 1.2 BAR AT IDLE (RED RANGE)):

(1) Reduce power as quickly as possible
(2) Check oil temperature: If the oil temperature is high or near operating limits,
    i) Land as soon as possible
    ii) Be prepared for an emergency landing
    iii) Expect an engine failure

◆ Note: During warm-weather operation or longer climbouts at low airspeed engine temperatures could rise into the yellow range and trigger the "Caution" light. This warning allows the pilot to avoid overheating of the engine as follows:

(3) Increase the climbing airspeed, reduce angle of climb
(4) Reduce power, if the engine temperatures approache the red range

OIL TEMPERATURE "OT" TOO HIGH (RED RANGE):

(1) Increase airspeed and reduce power as quickly as possible
(2) Check oil pressure: if the oil pressure is lower than normal (< 2.3 bar in cruise or < 1.2 bar at idle),
    i) Land as soon as possible
    ii) Be prepared for an emergency landing
    iii) Expect an engine failure
(3) If the oil pressure is in the normal range:
    i) Land as soon as practical

COOLANT TEMPERATURE "CT" TOO HIGH (RED RANGE):

(1) Increase airspeed and reduce power as quickly as possible
(2) Cabin Heat - COLD (push Lever “Cabin Heat“)
(3) If this reduces the coolant temperature to within the normal operating range quickly, continue to fly normally and observe coolant temperature. Cabin heat as required.
(4) As far as this does not cause the coolant temperature to drop,
    i) Land as soon as practical
    ii) Be prepared for an emergency landing
    iii) Expect an engine failure

LIGHT "WATER LEVEL" ILLUMINATES

(1) Increase airspeed and reduce power as quickly as possible
(2) Coolant temperature "CT" check and observe
(3) Oil temperature "OT" check and observe
(4) As far as coolant temperature and/or oil temperature are rising into yellow or red range,
    i) Land as soon as practical
    ii) Be prepared for an emergency landing
    iii) Expect an engine failure

GEARBOX TEMPERATURE "GT" TOO HIGH (RED RANGE):

(1) Reduce power to 55% - 75% as quickly as possible
(2) Land as soon as practical.

FUEL TEMPERATURE TOO HIGH (RED RANGE):

(1) Switch to fuel tank with lower fuel temperature, if this contains sufficient fuel
(2) Reduce engine power, if possible
(3) If fuel temperature remains in Red Range, land as soon as possible

FUEL TEMPERATURE TOO LOW (AMBER RANGE for Diesel Operation, RED RANGE for Kerosine Operation):

The fuel in the selected tank will be heated by the return flow, the temperature in the non-active tank must be monitored.

(1) Switch to fuel tank with higher fuel temperature, if this contains sufficient fuel
(2) Change to altitude with higher outside air temperature
(3) If use of the non-active tank is intended, switch fuel selector to BOTH when installed

PROPELLER RPM TOO HIGH:

With propeller RPM between 2,400 and 2,500 for more than 10 seconds or over 2,500:

(1) Reduce power
(2) Reduce airspeed below 100 KIAS or as appropriate to prevent propeller overspeed
(3) Set power as required to maintain altitude and land as soon as practical.

◆ Note: If the propeller speed control fails, climbs be performed at 65 KIAS/ 75 mph and a power setting of 100%.
In case of overspeed the FADEC will reduce the engine power at higher airspeeds to avoid propeller speeds above 2500 rpm.

FLUCTUATIONS IN PROPELLER RPM:

If the propeller RPM fluctuates by more than + / - 100 RPM with a constant Thrust Lever position:

(1) Change the power setting and attempt to find a power setting where the propeller RPM no longer fluctuates.
(2) If this does not work, set the maximum power at an airspeed < 100 KIAS/ 115 mph until the propeller speed stabilizes.
(3) If the problem is resolved, continue the flight
(4) If the problem continues, select a power setting where the propeller RPM fluctuations are minimum. Fly at an airspeed below 100 KIAS/ 115 mph and land as soon as practical.

SECTION 4
NORMAL PROCEDURES

PREFLIGHT INSPECTION

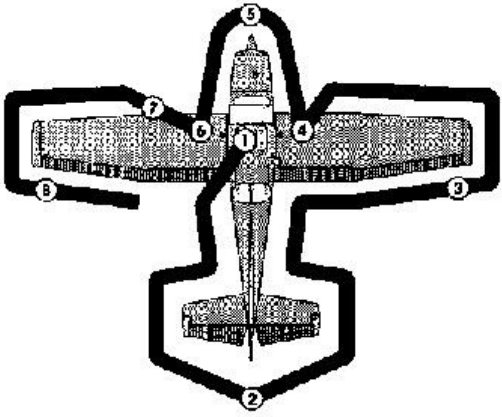


Figure 4-1a Preflight Inspection

◆ Note: Visually check airplane for general condition during walk around inspection. In cold weather, remove even small accumulations of frost, ice or snow from wing, tail and control surfaces. Also, make sure that control surfaces contain no internal accumulations of ice or debris. Prior to flight, check that pitot heater (if installed) is warm to touch within 30 seconds with battery and pitot heat switches on. If a night flight is planned, check operation of all lights, and make sure a flashlight is available.

(1) CABIN

(1) Pilot´s Operating Handbook - AVAILABLE IN THE AIRPLANE
(2) Airplane Weight and Balance - CHECKED
(3) Parking Brake - SET
(4) Control Wheel Lock - REMOVE
(5) "Engine Master" ("IGN" resp.)- OFF
(6) Avionics Power Switch - OFF.
(7) "Shut-off Cabin Heat" - OFF (Push Full Forward)

▲ **WARNING:** When turning on the Battery switch, using an external power source, or pulling the propeller through by hand, treat the propeller as if the Engine Master ("IGN" resp.) was on.

(8) Battery and Main Bus switches - ON
(9) Fuel Quantity Indicators and Fuel Temperature CHECK
(10) Light "Water Level" - CHECK OFF
(11) Battery and Main Bus switches - OFF
(12) Entry in log-book concerning type of fuel filled - CHECK
(13) Static Pressure Alternate Source Valve - CHECK
(14) Fuel Selector Valve - tank with sufficient fuel quantity
(15) Fuel Shut-off Valve - ON (Push Full In)
(16) Baggage Door - CHECK, lock with key if the child's seat is supposed to be occupied.

(2) EMPENNAGE

(1) Rudder Gust Lock (if attached) - REMOVE
(2) Tail Tie - Down - DISCONNECT
(3) Control Surfaces - CHECK freedom of movement and security

(3) RIGHT WING Trailing Edge

(1) Aileron - CHECK freedom of movement and security

(2) Flap - CHECK for security and condition

(4) RIGHT WING

(1) Wing Tie-Down - DISCONNECT

(2) Main Wheel Tire - CHECK for proper inflation and general condition (weather checks, tread depth and wear, etc.)

▲ **WARNING** If, after repeated sampling, evidence of contamination still exists, the airplane should not be flown. Tanks should be drained and system purged by qualified maintenance personnel. All evidence of contamination must be removed before further flight.

(3) Fuel Tank Sump Quick Drain Valves - DRAIN at least a cupful of fuel (using sampler cup) from each sump location to check for water, sediment and the right type of fuel (Diesel or JET-A1) before each flight and after each refueling. If water is observed, take further samples until clear and then gently rock wings and lower tail to the ground to move any additional contaminants to the sampling points. Take repeated samples from all fuel drain points until all contamination has been removed. If contaminants are still present, refer to above WARNING and do not fly airplane.

(4) Fuel Quantity - CHECK VISUALLY for desired level not above marking in fuel filler.

(5) Fuel Filler Cap - SECURE

(5) NOSE

(1) Reservoir-tank Quick Drain Valve - DRAIN at least a cupful of fuel (using sampler cup) form valve to check for water, sediment and proper fuel grade (Diesel or JET-A1) before each flight and after each refueling. If water is ovserved, take further samples until clear and then gently rock wings and lower tail to the ground to move any additional contaminants to the sampling point. Take repeated samples until all contamination has been removed.

(2) Before first flight of the day and after each refueling - DRAIN the Fuel Strainer Quick Drain Valve with the sampler cup to remove water and sediment from the screen. Ensure that the screen drain is properly closed again. If water is discovered, there might be even more water in the fuel system. Therefore, take further samples from Fuel Strainer and the Tank Sumps.

(3) Engine Oil Dipstick/Filler Cap

a) Oil level - CHECK

b) Dipstick/filler cap - SECURE.

Do not operate below the minimum dipstick indication.

(4) Engine Air and Cooling Inlets - CLEAR of obstructions.

(5) Landing Light - CHECK for condition and cleanliness

(6) Propeller and Spinner - CHECK for nicks and security.

(7) Gearbox Oil Level - CHECK the oil has to cover at least half of the inspection glass

(8) Nose Wheel Strut and Tire- CHECK for proper inflation of strut and general condition (weather checks, tread depth and wear, etc.) of tire.

(9) Left Static Source Opening - CHECK for stoppage

(6) LEFT WING

(1) Fuel Quantity - CHECK VISUALLY for desired level not above marking in fuel filler.

(2) Fuel Filler Cap - SECURE

(3) Fuel Tank Sump Quick Drain Valves - DRAIN at least a cupful of fuel (using sampler cup) from each sump location to check for water, sediment and the right type of fuel (Diesel or JET-A1) before each flight and after each refueling. If water is observed, take further samples until clear and then gently rock wings and lower tail to the ground to move any additional contaminants to the sampling points. Take repeated samples from all fuel drain points until all contamination has been removed. If contaminants are still present, refer to previous WARNING (see right wing) and do not fly airplane.

(4) Main Wheel Tire- CHECK for proper inflation and general condition (weather checks, tread depth and wear, etc.)

(7) LEFT WING Leading Edge

(1) Pitot Tube Cover (if mounted) - REMOVE and CHECK for pitot stoppage

(2) Fuel Tank Vent Opening - CHECK for stoppage

(3) Stall Warning Opening - CHECK for stoppage.

(4) Wing Tie-Down - DISCONNECT

(8) LEFT WING Trailing Edge

(1) Aileron - CHECK freedom of movement and security.

(2) Flap - Check for security and conditions

BEFORE STARTING ENGINE

(1) Preflight Inspection - COMPLETE
(2) Seats and Seat Belts - ADJUST and LOCK.
(3) Brakes - TEST and SET., Parking Brake - SET
(4) Avionics Power Switch, Autopilot (if installed) and Electrical Equipment - OFF.

■ CAUTION: The Avionics Power Switch must be off during engine start to prevent possible damage to avionics.

(5) Circuit Breakers (including CB Alternator, if installed) - CHECK IN
(6) Battery, Alternator (if Switch installed) and Main Bus Switches - ON

■ CAUTION: The electronic engine control needs an electrical power source for its operation. For normal operation Battery, Alternator and Main Bus have to be switched on. Separate switching is only allowed for tests and in the event of emergencies.

(7) Fuel Quantity and Temperature - CHECK
(8) Fuel Selector Valve - SET to tank with sufficient fuel quantity or to BOTH position if this option is installed.The fuel temperature limitations must be observed.

◆ Note: If the optional LEFT,RIGHT, BOTH fuel selector is installed it is recommenced to select the BOTH position

(9) Fuel Shut-off Valve -OPEN (Push Full In)
(10) Alternate Air Door - CLOSED
(11) Thrust Lever - CHECK for freedom of movement
(12) Load Display - CHECK 0% at Propeller RPM 0

STARTING ENGINE

▲ **WARNING:** Do not use ground power unit for engine starts. It is not allowed to start up the engine using external power. If starting the engine is not possible using battery power, the condition of the battery must be verified before flight.

(1) Electrical Fuel Pump- ON
(2) Thrust Lever - IDLE
(3) Area Aircraft / Propeller - CLEAR
(4) "Engine Master" ("IGN" resp.) - ON , wait until the Glow Control light extinguishes
(5) Starter - ON
Release when engine starts, leave Thrust Lever in idle
(6) Oil Pressure - CHECK

■ CAUTION: If after 3 seconds the minimum oil pressure of 1 bar is not indicated:
shut down the engine immediately!

(7) CED-Test Knob - PRESS (to delete Caution light)
(8) Ammeter - CHECK for positive charging current
(9) Voltmeter - CHECK for green range
(10) FADEC Backup Battery test
a) Alternator - OFF, engine must operate normally
b) Battery - OFF, for min. 10 seconds;
engine must operate normally, the red FADEC lamps must not be illuminated
c) Battery - ON
d) Alternator - ON

▲ **WARNING:** It must be ensured that both battery and alternator are ON!

(11) Navigation Lights and Flashing Beacon- ON (as required).
(12) Master Switch - ON

(13) Radios- ON
(14) Ammeter – Check positive charge, alternator warning light must be OFF
(15) Voltmeter – Check in green range
(16) Electrical Fuel Pump - OFF
(17) Flaps - RETRACT

WARM UP

(1) Let the engine warm up about 2 minutes at 890 RPM.
(2) Increase RPM to 1,400 until Oil Temperature 50°C, Coolant Temperature 60°C.

BEFORE TAKE-OFF

(1) Parking Brake - SET
(2) Cabin Doors and Windows - CLOSED and LOCKED
(3) Flight Controls - FREE and CORRECT
(4) Flight Instruments - CHECK and SET
(5) Fuel quantity - CHECK
(6) Fuel Selector Valve - SET to tank with sufficient fuel quantity or to the BOTH position if this option is installed.The fuel temperature limitations must be observed.

◆ Note If the optional LEFT, RIGHT, BOTH, fuel selector is installed it is recommended to select the BOTH position

(7) Elevator Trim and Rudder Trim (if installed) - SET for Takeoff
(8) FADEC and propeller adjustment function check:
    a) Thrust Lever - IDLE (both FADEC lights should be OFF).
    b) FADEC Test Button - PRESS and HOLD button for entire test.
    c) Both FADEC lights - ON, RPM increases

▲ **WARNING:** If the FADEC lights do not come on at this point, it means that the test procedure has failed and take off should not be attempted.

d) The FADEC automatically switches to B-component (only FADEC B light is ON)
e) The propeller control is excited, RPM decreases
f) The FADEC automatically switches to channel A (only FADEC A light is ON), RPM increases
g) The propeller control is excited, RPM decreases
h) FADEC A light goes OFF, idle RPM is reached, the test is completed.
i) FADEC Test Button - RELEASE.

▲ **WARNING:** If there are prolonged engine misfires or the engine shuts down during the test, take off may not be attempted.

▲ **WARNING:** The whole test procedure has to be performed without any failure. In case the engine shuts down or the FADEC lights are flashing, take off is prohibited. This applies even if the engine seems to run without failure after the test.

◆ Note: If the test button is released before the self test is over, the FADEC immediately switches over to normal operation.

◆ Note: While switching from one FADEC to another, it is normal to hear and feel a momentary surge in the engine.

(9) Thrust Lever - FULL FORWARD, load display min. 94%, RPM 2240 - 2300
(10) Thrust Lever - IDLE

(11) Engine Instruments and Ammeter - CHECK
(12) Suction gage - CHECK
(13) Wing Flaps - SET for Take-off (0° or 10°).
(14) Electrical Fuel Pump - ON
(15) Strobe Lights - AS DESIRED
(16) Radios and Avionics - ON and SET
(17) Autopilot (if installed) - OFF
(18) Air Conditioning (if installed) - OFF
(19) Thrust Lever Friction Control - ADJUS
(20) Brakes - RELEASE

TAKE-OFF

NORMAL TAKEOFF

(1) Wing Flaps - 0° or 10°
(2) Thrust Lever - FULL FORWARD
(3) Elevator Control - LIFT NOSE WHEEL at 55 KIAS/ 63 mph.
(4) Climb Speed - 65 to 80 KIAS/ 75 to 92 mph

SHORT FIELD TAKEOFF

(1) Wing Flaps - 10°
(2) Brakes - APPLY
(3) Thrust Lever - FULL FORWARD
(4) Brakes - RELEASE
(5) Airplane Attitude - SLIGHTLY TAIL LOW
(6) Elevator Control - LIFT NOSE WHEEL at 44 KIAS/ 51 mph
(7) Climb Speed - 58 KIAS/ 67 mph (until all obstacles are cleared)

AFTER TAKEOFF

(1) Altitude about 300 ft, Airspeed more than 65 KIAS/ 75 mph - Wing Flaps - RETRACT
(2) Electrical Fuel Pump - OFF

CLIMB

(1) Airspeed - 70 to 85 KIAS/ 80 to 98 mph.

◆ Note: If a maximum performance climb is necessary, use speeds shown in the "Maximum Rate Of Climb" chart in Section 5. In case that Oil Temperature and/or Coolant Temperature are approaching the upper limit, continue at a lower climb angle for better cooling if possible.

◆ Note If the optional LEFT, RIGHT, BOTH, fuel selector valve is installed it is recommended to select the BOTH position. The fuel temperatures have to be monitored.

(2) Thrust Lever - FULL FORWARD

CRUISE

(1) Power - maximum load 100% (maximum continuous power), 75% or less is recommended.

(2) Elevator trim and Rudder trim (if installed) - ADJUST

(3) Compliance with Limits for Oil Pressure, Oil Temperature, Coolant Temperature and Gearbox Temperature (CED 125 and Caution light) - MONITOR constantly

(4) Fuel Quantity and Temperature (Display and LOW LEVEL warning lights) - MONITOR.
Whenever possible, the airplane should be flown with the fuel selector in the BOTH position to empty and heat both fuel tanks evenly. However, operation in the LEFT or RIGHT position may be desirable to correct a fuel quantity imbalance or during periods of intentional uncoordinated flight maneuvres. During prolonged operation with the fuel selector in either the LEFT or RIGHT position the fuel balance and temperatures should be closely monitored.

■ CAUTION: Do not use any fuel tank below the minimum permissible fuel temperature!

■ CAUTION In turbulent air it is strongly recommended to use the BOTH position.

■ CAUTION With ¼ tank or less prolonged or uncoordinated flight is prohibited when operating on either the left or right tank.

(5) FADEC and Alternator Warning Lights - MONITOR

DESCENT

(1) Fuel Selector Valve - SELECT BOTH position (if installed) or SET to tank with sufficient fuel quantity (LEFT or RIGHT)

◆ Note — If the optional LEFT, RIGHT, BOTH, fuel selector valve is installed it is recommended to select the BOTH position. The fuel temperatures have to be monitored.

(2) Power - AS DESIRED

BEFORE LANDING

(1) Pilot and Passenger Seat Backs - MOST UPRIGHT POSITION
(2) Seats and Seat Belts - SECURED and LOCKED
(3) Fuel Selector Valve - SELECT BOTH position (if installed) or SET to tank with sufficient fuel quantity (LEFT or RIGHT)

◆ Note — If the optional LEFT, RIGHT, BOTH, fuel selector valve is installed it is recommended to select the BOTH position.The fuel temperatures have to be monitored.

(4) Electrical Fuel Pump - ON
(5) Landing / Taxi Lights - ON
(6) Autopilot (if installed) - OFF
(7) Air Conditioning (if installed) - OFF

LANDING

NORMAL LANDING

(1) Airspeed - 69 to 80 KIAS/ 80 to 92 mph (wing flaps UP)
(2) Wing Flaps - AS REQUIRED (0°-10° below 110 KIAS/ 126 mph; 10°- 40° below 85 KIAS/ 98 mph)
(3) Airspeed in Final Approach:
    - wing flaps 20°: 63 KIAS/ 72 mph
    - wing flaps 40°: 60 KIAS/ 69 mph
(4) Touchdown - MAIN WHEELS FIRST
(5) Landing Roll - LOWER NOSE WHEEL GENTLY
(6) Brakes - MINIMUM REQUIRED

SHORT FIELD LANDING

(1) Airspeed - 69 to 80 KIAS/ 80 to 92 mph (Flaps UP)
(2) Wing Flaps - 40°
(3) Airspeed in the Final Approach - 60 KIAS/ 69 mph (until flare)
(4) Power - REDUCE to idle after clearing obstacles.
(5) Touchdown - MAIN WHEELS FIRST
(6) Brakes - APPLY HEAVILY
(7) Wing Flaps - RETRACT

BALKED LANDING

(1) Thrust Lever - FULL FORWARD
(2) Wing Flaps - RETRACT TO 20° (immediately after Thrust Lever FULL FORWARD)
(3) Climb Speed - 58 KIAS/ 68 mph
(4) Wing Flaps - 10° (until all obstacles are cleared)
(5) Wing Flaps - RETRACT after reaching a safe altitude and 65 KIAS/ 75 mph

AFTER LANDING

(1) Wing Flaps - RETRACT
(2) Electrical Fuel Pump - OFF

SECURING AIRPLANE

(1) Parking Brake - SET
(2) Thrust Lever - IDLE
(3) Avionics Power Switch, Electrical Equipment, Autopilot (if installed) - OFF
(4) Main Bus switch - OFF
(5) "Engine Master" ("IGN" resp.) - OFF
(6) Switch Battery - OFF
(7) Control Lock - INSTALL
(8) Fuel Selector Valve - LEFT or RIGHT (to prevent crossfeeding between tanks)

AMPLIFIED PROCEDURES

STARTING ENGINE

The TAE 125 is a direct Diesel injection engine with common-rail technology and a turbocharger. It is controlled automatically by the FADEC, which makes a proper performance of the FADEC test important for safe flight operation.
All information relating to the engine are compiled in the CED 125 multifunction instrument.
Potentiometers within the Thrust Lever transmit the load value selected by the pilot to the FADEC.
With the Engine Master ("IGN" resp.) in position ON the glow relay is triggered by the FADEC and the Glow Plugs are supplied with electrical power, in position OFF the Injection Valves are not supplied by the FADEC and stay closed.
The switch/push button "Starter" controls the Starter.

EXTERNAL POWER

External power may be used to charge the battery or for maintenance purposes. To charge the battery with external power the battery switch must be ON.

When using an External Power Source, the Battery Switch must be in the OFF position before connecting the External Power Source to the airplane receptacle.

It is not allowed to start up the engine using external power. If starting the engine is not possible using battery power, the condition of the battery must be verified before flight.

TAXIING

When taxiing, it is important that speed and use of brakes be held to a minimum and that all controls be utilized (Refer to Figure 4-2, Taxiing Diagram) to maintain directional control and balance.
The Alternate Air Door Control should be always pushed for ground operation to ensure that no unfiltered air is sucked in.
Taxiing over loose gravel or cinders should be done at low engine speed to avoid abrasion and stone damage to the propeller tips.

BEFORE TAKE-OFF

WARM UP

To warm up the engine, operate the engine for about 2 minutes at 890 RPM.
Let the engine run at propeller RPM of 1,400 to ensure normal operation of the TAE 125 until it reaches an Engine Oil Temperature of 50°C (green range) and a Coolant Temperature of 60°C (green range).

MAGNETO CHECK

N/A since this is a Diesel engine.

ALTERNATOR CHECK

Prior to flights where verification of proper alternator and alternator control unit operation is essential (such as night and instrument flights), a positive verification can be made by loading the electrical system momentarily (3 to 5 seconds) with the landing light or by operating the wing flaps during the engine runup (20% load). The ammeter will remain within a needle width of zero if the alternator and alternator control unit are operating properly.

BATTERY CHECK

If there is doubt regarding the battery conditions or functionality the battery has to be checked after warm-up as follows:

Switch-off the alternator while the engine is running (battery remains "ON").

Perform a 10 sec. engine run. The voltmeter must remain in the green range. If not, the battery has to be charged or, if necessary, exchanged.

After this test the alternator has to be switched on again.

TAKE-OFF

POWER CHECK

It is important to check full load engine operation early in the takeoff roll. Any signs of rough engine operation or sluggish engine acceleration is good cause for discontinuing the take-off. If this occurs, you are justified in making a thorough full load static runup before another take-off is attempted.
After full load is applied, adjust the Thrust Lever Friction Control to prevent the Thrust Lever from creeping back from a maximum power position. Similar friction lock adjustments should be made as required in other flight conditions to maintain a fixed Thrust Lever setting.

WING FLAP SETTINGS

Flap deflections greater than 10° are not approved for normal and short field takeoffs. Using 10° wing flaps reduces the ground roll and total distance over a 15 m obstacle by approximately 10%.

CLIMB

Normal climbs are performed with flaps up and full load and at speeds 5 to 10 knots/ 7 to 12 mph higher than best rate-of-climb speeds for the best combination of engine cooling, climb speed and visibility. The speed for best climb is about 70 KIAS/ . If an obstruction dictates the use of a steep climb angle, climb at 62 KIAS/ 71 mph and flaps up.

◆ Note: Climbs at low speeds should be of short duration to improve engine cooling.

CRUISE

As guidance for calculation of the optimum altitude and power setting for a given flight use the tables in chapter 5. Observe the various rates of consumption with Diesel or Jet A-1-operation.

LANDING

NORMAL LANDING

Remarks in Pilot´s Operating Handbook concerning carburetor pre-heating are **N/A**

BALKED LANDING

In a balked landing (go around) climb, reduce the flap setting to 20° immediately after full power is applied. If obstacles must be cleared during the go-around climb, reduce wing flap setting to 10° and maintain a safe airspeed until the obstacles are cleared. After clearing any obstacles, the flaps may be retracted as the airplane accelerates to the normal flaps up climb speed.

CARBURETOR ICING

N/A since this is a Diesel engine.

FLIGHT IN HEAVY RAIN

N/A since no special procedures are necessary for heavy rain.

COLD WEATHER OPERATION

Special attention should be paid to operation of the aircraft and the fuel system in winter or before any flight at low temperatures. Correct preflight draining of the fuel system is particularly important and will prevent the accumulation of water.
The following limitations for cold weather operation are established due to temperature. “Operating limits“.
(Refer Section 2 "Limitations" also)

Fuel	Minimum permissible fuel temperature in the fuel tank before Take-off	Minimum permissible fuel temperature in the fuel tank during the flight
JET A-1, JET-A, Fuel No.3 JP-8 JP8+100 TS-1 (only C2.0)	-30°	-35°
Diesel	greater than 0°	-5°

Figure 4-1a Minimum fuel temperature limits in the fuel tank

▲ **WARNING:** The fuel temperature of the fuel tank not in use should be observed if it is intended for later use.

▲ **WARNING:** The following applies to Diesel and JET fuel mixtures in the tank:
As soon as the proportion of Diesel in the tank is more than 10% Diesel, the fuel temperature limits have to be observed for Diesel operation. If there is uncertainty about the type of fuel in the tank, the assumption should be made that it is Diesel.

◆ Note: It is advisable to refuel before each flight and to enter the type of fuel filled and the additives used in the log-book of the airplane.

Cold weather often causes conditions which require special care during airplane operations. Even small accumulations of frost, ice or snow must be removed, particularly from wing, tail and all control surfaces to assure satisfactory flight performance and handling. Also, control surfaces must be free of any internal accumulations of ice or snow.

If snow or slush covers the take-off surface, allowance must be made for take-off distances which will be increasingly extended as snow or slush depth increases. The depth and consistency of this cover can, in fact, prevent take-off in many instances.

Cold weather starting procedures are the same as the normal starting procedures. Use caution to prevent inadvertent forward movement of the airplane during starting when parked on snow or ice.

HOT WEATHER OPERATION

Engine temperatures may rise into the yellow range and activate the "Caution" Light when operating in hot weather or longer climbouts at low speed. This warning gives the pilot the opportunity to keep the engine from possibly overheating by doing the following:

i) decrease rate of climb

ii) increase airspeed

iii) reduce power, if the engine temperatures approach the red range.

Should the seldom case occur that the fuel temperature is rising into the yellow or red range, switch to the other tank or to the BOTH position, if installed.

SECTION 5
PERFORMANCE

SAMPLE PROBLEM

The following sample flight problem utilizes information from the various tables and diagrams of this section to determine the predicted performance data for a typical flight.
Assume the following information has already been determined:

AIRPLANE CONFIGURATION

Takeoff Weight ..... 1043 kg
Usable Fuel ..... 120.0 l (31.7 US gal)

TAKEOFF CONDITIONS

Field Pressure Altitude ..... 1000 ft
Temperature ..... 28°C (ISA +15°C)
Wind Component along Runway ... 12 Knot Headwind
Field Length ..... 1067 m (3500 ft)

CRUISE CONDITIONS

Total Distance ..... 841 km (400 NM)
Pressure Altitude ..... 6000 ft
Temperature ..... 23°C (ISA + 20°C)
Expected Wind Enroute ..... 10 Knot Headwind

LANDING CONDITIONS

Field Pressure Altitude ..... 2000 ft
Temperature ..... 25°C
Field Length ..... 914 m (3000 ft)

GROUND ROLL AND TAKE-OFF

The ground roll and take-off distance chart, Figure 5-1c (Ground Roll and Take-off Distance), should be consulted, keeping in mind that distances shown are based on the short field technique. Conservative distances can be established by reading the chart at the next higher value of weight, temperature and altitude. For example, in this particular sample problem, the takeoff distance information presented for a weight of 1,043 kg, pressure altitude of 1000 ft and a temperature of 30°C should be used and results in the following:

Ground Roll.....283 m (927 ft)

Total Distance to clear a 15 m obstacle.....547 m (1793 ft)

These distances are well within the available takeoff field length. However, a correction for the effect of wind may be made based on Note 2 of the takeoff chart. The correction for a 12 Knot Headwind is:

$$\frac{12\ \text{Kt}}{9\ \text{Kt}} \times 10\ \% = 13\ \%\ \text{(Decrease)}$$

This results in the following distances, corrected for wind:

Ground Roll, zero wind	283 m (927 ft)
Decrease at 12 Knot Headwind (283m x 13%)=	- 37 m (121 ft)
Corrected Ground Roll	246 m (806 ft)

Total Distance to clear a 15 m obstacle, zero wind.....	547 m (1793 ft)
Decrease at 12 Knot Headwind (547 m x 13%)=	- 71 m (233 ft)
Corrected Total Distance to clear a 15 m obstacle	476 m (1560 ft)

CRUISE

The cruising altitude should be selected based on a consideration of trip length, winds aloft and the airplanes performance. A typical cruising altitude and the expected wind enroute have been given for this sample problem. However, the power setting selection for cruise must be determined based on several considerations. These include the cruise performance characteristics presented in Figures 5-4. Considerable fuel savings and longer range result when lower power settings are used.

Figure 5-4b shows a range of 548 NM at zero wind, a power setting of 70% and altitude of 6,000 ft.

With an expected headwind of 10 Knot at 6,000 ft altitude the range has to be corrected as follows:

Range at zero wind (standard tanks) ..... 548 NM
Reduction due to Headwind.....(5.1 h x 10 Knots) = - 51NM
Corrected Range..... 497 NM

This shows that the flight can be performed at a power setting of approximately 70% with full tanks without an intermediate fuel stop.

Figure 5-4b is based on ISA conditions. For a temperature of 20°C above ISA temperature, according to Note 3, true airspeed and maximum range are increased by 2 %.

The following values most nearly correspond to the planned altitude and expected temperature conditions. Engine Power setting chosen is 70%.

The resultants are:

Engine Power:.....70%
True Airspeed: .....102 kt + 2% = 104 kt
Fuel Consumption in cruise: .....18.6 l/h (4.9 US gal/h)

FUEL REQUIRED

The total fuel requirement for the flight may be estimated using the performance information in Figures 5-3 and 5-4. For this sample problem, Figure 5-3a shows that a climb from 1,000 ft to 6,000 ft requires 3.9 l (1.0 US gal) of fuel. The corresponding distance during the climb is 10.3 NM. These values are for a standard temperature and are sufficiently accurate for most flight planning purposes.
However, a further correction for the effect of temperature may be made as noted in Note 2 of the climb chart in Figure 5-3. An effect of 10°C above the standard temperature is to increase time and distance by 10%.

In this case, assuming a temperature 20°C above standard, the correction would be:

$$\frac{20\ °C}{10\ °C} \times 10\ \% = \quad 20\ \%\ \text{(Increase)}$$

With this factor included, the fuel estimate would be calculated as follows:

Fuel to climb, standard temperature:
3.9 l (1.0 US gal)

Increase due to non-standard temperature:
3.9 l (1.0 US gal) x 20.0% = 0.8 l (0.2 US gal)

Corrected fuel to climb:
4.7 l (1.2 US gal)

Using a similar procedure for the distance to climb results in 12.4 NM.

The resultant cruise distance is:

Total Distance	400.0 NM
Climbout Distance	- 12.4 NM
Cruise Distance	387.6 NM

With an expected 10 Knot headwind, the ground speed for cruise is predicted to be:

104 Knot
- 10 Knot
94 Knot

Therefore, the time required for the cruise portion of the trip is:

$$\frac{387.6 \text{ NM}}{94 \text{ Kt}} = 4.1 \text{ hrs}$$

The fuel required for cruise is:

4.1 h x 18.6 l/h = 76.2 l (20.1 US gal)

The total estimated fuel required is as follows:

Engine Start, Taxi and Takeoff	4.0 l (1.1 US gal)
Climb	+ 4.7 l (1.2 US gal)
Cruise	+ 76.2 l (20.1 US gal)
Total fuel required	84.9 l (22.4 US gal)

This gives with full tanks a reserve of:

120.0 l (31.7 US gal)
- 84.9 l (22.4 US gal)
35.1 l (9.3 US gal)

Once the flight is underway, ground speed checks will provide a more accurate basis for estimating the time enroute and the corresponding fuel required.

LANDING DISTANCE

Refer to Pilot´s Operating Handbook

GROUND ROLL AND TAKE-OFF DISTANCE
at 907 kg (2000 lbs)

SHORT FIELD TAKE-OFFS

Conditions:
Take-off weight 907 kg (2000 lbs)
Flaps 10°
Full Power Prior to Brake Release
Paved, level, dry runway
Zero Wind
Lift Off: .....44 KIAS/ 51 mph
Speed at 15 m / 50 ft: .....50 KIAS/ 58 mph

Notes:
1. Short field technique
2. Decrease distances 10% for each 9 Knot headwind. For operation with tailwinds up to 10 Knot increase distances by 10% for each 2 Knot.
3. For operation on dry, grass runway, increase distances by 15% of the "ground roll" figure.
4. Consider additionals for wet grass runway, softened ground or snow.

Press. alt	Ground Roll and Take-Off Distance [m] Outside Air Temperature [°C]							
[ft]	---	-20°C	0°C	10°C	20°C	30°C	40°C	50°C
0	Gnd Roll	129	149	159	170	183	201	224
	50 ft (15 m)	249	288	308	329	355	389	436
1000	Gnd Roll	138	160	171	182	196	215	240
	50 ft (15 m)	267	308	330	353	380	417	467
2000	Gnd Roll	148	171	183	196	211	230	257
	50 ft (15 m)	286	331	354	378	407	447	500
3000	Gnd Roll	159	183	196	210	226	247	275
	50 ft (15 m)	307	354	379	405	437	479	536
4000	Gnd Roll	170	197	221	225	242	265	295
	50 ft (15 m)	329	380	407	435	468	514	576
5000	Gnd Roll	183	211	226	242	260	285	317
	50 ft (15 m)	353	408	437	467	503	552	618
6000	Gnd Roll	196	227	243	259	279	306	341
	50 ft (15 m)	379	438	469	501	540	593	663
7000	Gnd Roll	218	251	269	287	309	339	377
	50 ft (15 m)	421	486	520	556	599	657	736
8000	Gnd Roll	241	279	298	319	343	375	418
	50 ft (15 m)	467	539	577	617	665	729	816
9000	Gnd Roll	268	309	331	354	381	417	464
	50 ft (15 m)	519	600	641	685	739	810	907
10000	Gnd Roll	298	344	368	393	423	463	516
	50 ft (15 m)	577	667	714	763	822	902	1010

Figure 5-1a Ground Roll and Take-Off Distance [m] at take-off weight 907 kg (2000 lbs)

Press. alt	Ground Roll and Take-Off Distance [ft] Outside Air Temperature [°C]							
[ft]	---	-20°C	0°C	10°C	20°C	30°C	40°C	50°C
0	Gnd Roll	423	489	523	559	601	658	733
	50 ft (15 m)	817	944	1010	1079	1163	1276	1429
1000	Gnd Roll	453	524	560	599	644	705	786
	50 ft (15 m)	875	1011	1082	1156	1246	1367	1531
2000	Gnd Roll	486	561	600	642	691	756	842
	50 ft (15 m)	938	1084	1160	1239	1336	1466	1641
3000	Gnd Roll	521	602	644	688	741	810	903
	50 ft (15 m)	1006	1163	1244	1329	1432	1572	1759
4000	Gnd Roll	559	646	691	738	795	870	969
	50 ft (15 m)	1080	1247	1334	1426	1537	1686	1888
5000	Gnd Roll	600	693	741	792	853	933	1040
	50 ft (15 m)	1159	1339	1432	1531	1649	1810	2026
6000	Gnd Roll	644	744	796	851	916	1002	1117
	50 ft (15 m)	1244	1438	1538	1644	1771	1944	2176
7000	Gnd Roll	713	824	882	942	1015	1110	1237
	50 ft (15 m)	1380	1594	1705	1823	1964	2155	2413
8000	Gnd Roll	791	914	978	1045	1125	1231	1372
	50 ft (15 m)	1531	1769	1893	2023	2180	2392	2678
9000	Gnd Roll	878	1015	1086	1160	1249	1367	1523
	50 ft (15 m)	1702	1966	2103	2248	2422	2658	2976
10000	Gnd Roll	976	1128	1207	1290	1388	1519	1693
	50 ft (15 m)	1894	2188	2340	2501	2695	2958	3311

Figure 5-1b Ground Toll and Take-Off Distance [ft] at take-off weight 907 kg (2000 lbs)

GROUND ROLL AND TAKE-OFF DISTANCE at 1043 kg (2300 lbs)

SHORT FIELD TAKE-OFFS

Conditions:

Take-off weight 1043 kg (2300 lbs)
Flaps 10°
Full Power Prior to Brake Release
Paved, level, dry runway
Zero Wind

Lift Off: .....48 KIAS/ 55 mph

Speed at 15 m / 50 ft: .....54 KIAS/ 62 mph

Notes:

1. Short field technique
2. Decrease distances 10% for each 9 Knot headwind. For operation with tailwinds up to 10 Knot increase distances by 10% for each 2 Knot.
3. For operation on dry, grass runway, increase distances by 15% of the "ground roll" figure.
4. Consider additionals for wet grass runway, softened ground or snow.

Press. alt	Ground Roll and Take-Off Distance [m] Outside Air Temperature [°C]							
[ft]	---	-20°C	0°C	10°C	20°C	30°C	40°C	50°C
0	Gnd Roll	186	214	229	245	264	289	322
	50 ft (15 m)	359	414	443	474	510	560	627
1000	Gnd Roll	199	230	246	263	283	309	345
	50 ft (15 m)	384	444	475	507	547	600	672
2000	Gnd Roll	213	246	263	281	303	332	369
	50 ft (15 m)	412	476	509	544	586	643	720
3000	Gnd Roll	228	264	282	302	325	356	396
	50 ft (15 m)	441	510	546	583	628	690	772
4000	Gnd Roll	245	283	303	324	349	382	425
	50 ft (15 m)	474	547	585	626	674	740	828
5000	Gnd Roll	263	304	325	348	374	410	456
	50 ft (15 m)	508	587	628	672	724	794	889
6000	Gnd Roll	283	327	349	373	402	440	490
	50 ft (15 m)	546	631	675	721	777	853	955
7000	Gnd Roll	313	362	387	413	445	487	543
	50 ft (15 m)	605	699	748	800	862	946	1059
8000	Gnd Roll	347	401	429	458	494	540	602
	50 ft (15 m)	672	776	830	888	956	1050	1175
9000	Gnd Roll	385	445	476	509	548	600	668
	50 ft (15 m)	747	863	923	986	1063	1166	1306
10000	Gnd Roll	428	495	529	566	609	667	743
	50 ft (15 m)	831	960	1027	1097	1183	1283	1453

Figure 5-1c Ground Roll and Take-Off Distance [m] at take-off weight 1043 kg (2300 lbs)

Press. alt	Ground Roll and Take-Off Distance [ft] Outside Air Temperature [°C]							
[ft]	---	-20°C	0°C	10°C	20°C	30°C	40°C	50°C
0	Gnd Roll	609	703	752	804	866	947	1055
	50 ft (15 m)	1176	1359	1453	1553	1674	1837	2056
1000	Gnd Roll	652	753	806	861	927	1015	1131
	50 ft (15 m)	1260	1456	1557	1664	1793	1968	2203
2000	Gnd Roll	699	808	864	923	994	1088	1212
	50 ft (15 m)	1350	1560	1669	1784	1922	2109	2361
3000	Gnd Roll	749	866	926	990	1066	1166	1300
	50 ft (15 m)	1448	1673	1790	1913	2061	2262	2532
4000	Gnd Roll	804	929	994	1062	1143	1251	1394
	50 ft (15 m)	1554	1795	1920	2052	2211	2427	2717
5000	Gnd Roll	863	997	1067	1140	1227	1343	1497
	50 ft (15 m)	1668	1927	2061	2203	2374	2605	2916
6000	Gnd Roll	927	1071	1146	1225	1318	1443	1607
	50 ft (15 m)	1791	2069	2213	2366	2549	2797	3132
7000	Gnd Roll	1027	1186	1269	1356	1460	1598	1780
	50 ft (15 m)	1986	2294	2454	2623	2826	3101	3472
8000	Gnd Roll	1138	1315	1407	1504	1619	1772	1974
	50 ft (15 m)	2204	2546	2724	2911	3137	3442	3854
9000	Gnd Roll	1264	1460	1562	1670	1797	1967	2192
	50 ft (15 m)	2449	2830	3027	3235	3486	3826	4283
10000	Gnd Roll	1405	1623	1736	1856	1998	2186	2436
	50 ft (15 m)	2725	3149	3368	3600	3879	4257	4765

Figure 5-1d Ground Roll and Take-Off Distance [ft] at take-off weight 1043 kg (2300 lbs)

MAXIMUM RATE-OF-CLIMB at 1043 kg (2300 lbs)

Conditions:

Take-off weight 1043 kg (2300 lbs)
Climb speed v_y = 69 KIAS/ 79 mph
Flaps Up
Full Power

Notes:

1. For operation in air colder than this table provides, use coldest data shown.
2. For operation in air warmer than this table provides, use extreme caution.

PRESS ALT [FT]	Climb speed [KIAS]	Rate of Climb (ft/min) Temperature - °C				
		-20°C	0°C	+20°C	+40°C	+50°C
0	69	684	665	647	542	433
1000	69	675	656	638	532	422
2000	69	666	646	628	522	412
3000	69	656	636	618	511	401
4000	69	647	626	607	500	390
5000	69	637	616	596	489	379
6000	69	626	605	585	478	367
7000	69	592	570	550	444	335
8000	69	558	536	515	410	303
9000	69	523	500	479	376	271
10000	69	488	465	443	341	238
11000	69	453	429	407	306	205
12000	69	417	393	371	271	171
13000	69	381	357	334	236	138
14000	69	345	320	296	200	103
15000	69	308	283	259	163	69
16000	69	271	245	221	126	34
17000	69	234	207	182	89	-2
18000	69	196	169	143	51	-38

Figure 5-2b Maximum Rate of Climb ISA at take-off weight 1043 kg (2300 lbs)

TIME, FUEL AND DISTANCE TO CLIMB at 1043 kg (2300 lbs)

Conditions:

Take-off weight 1043 kg (2300 lbs)
Climb speed v_y = 69 KIAS/ 79 mph
Flaps Up
Full Power
Standard Temperature (ISA)

Notes :

1. Add 4 l (1.1 US gal) of fuel for engine start, taxi and takeoff allowance.
2. Increase time and distance by 10% for 10°C above standard temperature.
3. Distances shown are based on zero wind.
4. Time, distance and fuel required are only valid from the point where the airplane climbs at v_y = 69 KIAS.

Press. Alt. [ft]	OAT [°C]	Vy [KIAS]	ROC [FPM]	Time [MIN]	Distance [NM]	Fuel used [l]	Fuel used [US Gal]
0	15	69	653	0.0	0.0	0.0	0.0
1000	13	69	645	1.5	1.8	0.8	0.2
2000	11	69	637	3.1	3.7	1.5	0.4
3000	9	69	629	4.7	5.7	2.3	0.6
4000	7	69	621	6.3	7.7	3.1	0.8
5000	5	69	612	7.9	9.9	3.9	1.0
6000	3	69	603	9.5	12.1	4.7	1.2
7000	1	69	571	11.3	14.5	5.4	1.4
8000	-1	69	538	13.1	17.1	6.1	1.6
9000	-3	69	505	15.0	20.0	6.8	1.8
10000	-5	69	472	17.0	23.0	7.5	2.0
11000	-7	69	439	19.2	26.4	8.2	2.2
12000	-9	69	405	21.6	30.2	8.9	2.3
13000	-11	69	371	24.2	34.3	9.6	2.5
14000	-13	69	337	27.0	39.0	10.4	2.7
15000	-15	69	303	30.1	44.2	11.2	3.0
16000	-17	69	268	33.6	50.2	12.0	3.2
17000	-19	69	233	37.6	57.1	13.0	3.4
18000	-21	69	198	42.2	65.2	14.0	3.7

Figure 5-3a Time, Fuel and Distance to Climb at 1043 kg (2300 lbs)

CRUISE PERFORMANCE, RANGE AND ENDURANCE WITH STANDARD TANKS, Cessna 172 F,G,H at 1043 kg (2300 lbs)

Conditions:

Take-off weight 1043 kg (2300 lbs)
Flaps Up
Zero wind

Notes:

1. Endurance information is based on standard tanks with 114.3 l (30.2 US gal) usable fuel.
2. The table assumes 4 l for startup and taxi; time, fuel and distance to climb 45 min. reserve.
3. Increase true airspeed (KTAS/mph)) and maximum range (NM) by 1% per 10°C above ISA temperature.
4. Cruise Power above 85% not recommended. For economic cruise set load 70% or less.

Press. Alt.	Load	Speed		Fuel Flow		Distance	Endu-rance Time
[ft]	[%]	[KTAS]	[mph]	[l/h]	[US Gal/h]	[NM]	[Hrs]
SL	100	115	132	29.5	7.8	343	3.0
SL	90	110	126	25.3	6.7	396	3.6
SL	80	104	120	21.7	5.7	451	4.3
SL	70	98	113	18.6	4.9	507	5.2
SL	60	91	104	15.8	4.2	565	6.2
SL	50	82	95	13.0	3.4	637	7.7
2000	100	117	134	29.5	7.8	347	2.9
2000	90	111	128	25.3	6.7	399	3.5
2000	80	106	122	21.7	5.7	454	4.2
2000	70	99	114	18.6	4.9	510	5.0
2000	60	92	106	15.8	4.2	569	6.1
2000	50	83	96	13.0	3.4	639	7.6
4000	100	119	137	29.5	7.8	350	2.8
4000	90	113	130	25.3	6.7	403	3.4
4000	80	107	124	21.7	5.7	458	4.1
4000	70	101	116	16.6	4.9	514	4.9
4000	60	93	107	15.8	4.2	572	5.9
4000	50	84	97	13.0	3.4	641	7.4
6000	100	121	139	29.5	7.8	354	2.7
6000	90	115	133	25.3	6.7	406	3.3
6000	80	109	126	21.7	5.7	461	4.0
6000	70	102	118	18.6	4.9	517	4.8
6000	60	95	109	15.8	4.2	574	5.8
6000	50	85	98	13.0	3.4	642	7.2
8000	90	117	135	25.3	6.7	410	3.1
8000	80	111	128	21.7	5.7	465	3.8
8000	70	104	120	18.6	4.9	520	4.6
8000	60	96	111	15.8	4.2	577	5.6
8000	50	86	99	13.0	3.4	643	7.0

Press. Alt.	Load	Speed		Fuel Flow		Distance	Endu-rance Time
[ft]	[%]	[KTAS]	[mph]	[l/h]	[US Gal/h]	[NM]	[Hrs]
10000	90	119	137	25.3	6.7	414	3.0
10000	80	113	130	21.7	5.7	468	3.7
10000	70	106	122	18.6	4.9	523	4.5
10000	60	97	112	15.8	4.2	579	5.4
10000	50	87	101	13.0	3.4	643	6.8
12000	80	115	132	21.7	5.7	472	3.5
12000	70	107	124	18.6	4.9	526	4.3
12000	60	99	114	15.8	4.2	581	5.2
12000	50	88	102	13.0	3.4	642	6.6
14000	80	117	134	21.7	5.7	475	3.3
14000	70	109	126	18.6	4.9	529	4.1
14000	60	100	115	15.8	4.2	582	5.0
14000	50	89	102	13.0	3.4	641	6.4

Figure 5-4a Cruise Performance, Range and Endurance with standard tanks F,G,H; 1043 kg (2300 lbs)

CRUISE PERFORMANCE, RANGE AND ENDURANCE WITH STANDARD TANKS, Cessna 172 I,K,L,M at 1043 kg (2300 lbs)

Conditions:

Take-off weight 1043 kg (2300 lbs)
Flaps Up
Zero wind

Notes:

1. Endurance information is based on standard tanks with 120.0 l (31.7 US gal) usable fuel.
2. The table assumes 4 l for startup and taxi; time, fuel and distance to climb 45 min. reserve.
3. Increase true airspeed (KTAS/mph)) and maximum range (NM) by 1% per 10°C above ISA temperature.
4. Cruise Power above 85% not recommended. For economic cruise set load 70% or less.

Press. Alt.	Load	Speed		Fuel Flow		Distance	Endu-rance Time
[ft]	[%]	[KTAS]	[mph]	[l/h]	[US Gal/h]	[NM]	[Hrs]
SL	100	115	132	29.5	7.8	365	3.2
SL	90	110	126	25.3	6.7	421	3.8
SL	80	104	120	21.7	5.7	478	4.6
SL	70	98	113	18.6	4.9	537	5.5
SL	60	91	104	15.8	4.2	598	6.6
SL	50	82	95	13.0	3.4	673	8.2
2000	100	117	134	29.5	7.8	369	3.1
2000	90	111	128	25.3	6.7	425	3.7
2000	80	106	122	21.7	5.7	482	4.5
2000	70	99	114	18.6	4.9	541	5.4
2000	60	92	106	15.8	4.2	602	6.4
2000	50	83	96	13.0	3.4	675	8.0
4000	100	119	137	29.5	7.8	373	3.0
4000	90	113	130	25.3	6.7	429	3.6
4000	80	107	124	21.7	5.7	486	4.4
4000	70	101	116	18.6	4.9	545	5.2
4000	60	93	107	15.8	4.2	605	6.3
4000	50	84	97	13.0	3.4	678	7.8
6000	100	121	139	29.5	7.8	377	2.9
6000	90	115	133	25.3	6.7	432	3.5
6000	80	109	126	21.7	5.7	490	4.2
6000	70	102	118	18.6	4.9	548	5.1
6000	60	95	109	15.8	4.2	608	6.1
6000	50	85	98	13.0	3.4	679	7.7
8000	90	117	135	25.3	6.7	436	3.4
8000	80	111	128	21.7	5.7	494	4.1
8000	70	104	120	18.6	4.9	552	4.9
8000	60	96	111	15.8	4.2	611	6.0
8000	50	86	99	13.0	3.4	680	7.5

Press. Alt.	Load	Speed		Fuel Flow		Distance	Endu-rance Time
[ft]	[%]	[KTAS]	[mph]	[l/h]	[US Gal/h]	[NM]	[Hrs]
10000	90	119	137	25.3	6.7	440	3.2
10000	80	113	130	21.7	5.7	498	3.9
10000	70	106	122	18.6	4.9	555	4.8
10000	60	97	112	15.8	4.2	614	5.8
10000	50	87	101	13.0	3.4	681	7.3
12000	80	115	132	21.7	5.7	502	3.8
12000	70	107	124	18.6	4.9	559	4.6
12000	60	99	114	15.8	4.2	617	5.6
12000	50	88	102	13.0	3.4	681	7.1
14000	80	117	134	21.7	5.7	506	3.6
14000	70	109	126	18.6	4.9	562	4.4
14000	60	100	115	15.8	4.2	619	5.4
14000	50	89	102	13.0	3.4	680	6.8

Figure 5-4b Cruise Performance, Range and Endurance with standard tanks I,K,L,M; 1043 kg (2300 lbs)

CRUISE PERFORMANCE, RANGE AND ENDURANCE WITH LONG-RANGE TANKS Cessna 172 F-M at 1043 kg (2300 lbs)

Conditions:

Take-off weight 1043 kg (2300 lbs)
Flaps Up
Zero wind

Notes:

1. Endurance information is based on long-range tanks with 152.2 l (40.2 US gal) usable fuel.
2. The table assumes 4 l for startup and taxi; time, fuel and distance to climb 45 min. reserve.
3. Increase true airspeed (KTAS/mph)) and maximum range (NM) by 1% per 10°C above ISA temperature.
4. Cruise Power above 85% not recommended. For economic cruise set load 70% or less.

Press. Alt.	Load	Speed		Fuel Flow		Distance	Endu-rance Time
[ft]	[%]	[KTAS]	[mph]	[l/h]	[US Gal/h]	[NM]	[Hrs]
SL	100	115	132	29.5	7.8	492	4.3
SL	90	110	126	25.3	6.7	561	5.1
SL	80	104	120	21.7	5.7	634	6.1
SL	70	98	113	18.6	4.9	708	7.2
SL	60	91	104	15.8	4.2	785	8.6
SL	50	82	95	13.0	3.4	879	10.7
2000	100	117	134	29.5	7.8	498	4.2
2000	90	111	128	25.3	6.7	568	5.0
2000	80	106	122	21.7	5.7	640	6.0
2000	70	99	114	18.6	4.9	714	7.1
2000	60	92	106	15.8	4.2	791	8.5
2000	50	83	96	13.0	3.4	884	10.5
4000	100	119	137	29.5	7.8	504	4.1
4000	90	113	130	25.3	6.7	574	4.9
4000	80	107	124	21.7	5.7	647	5.8
4000	70	101	116	18.6	4.9	721	7.0
4000	60	93	107	15.8	4.2	797	8.4
4000	50	84	97	13.0	3.4	889	10.3
6000	100	121	139	29.5	7.8	510	4.0
6000	90	115	133	25.3	6.7	581	4.8
6000	80	109	126	21.7	5.7	654	5.7
6000	70	102	118	18.6	4.9	727	6.8
6000	60	95	109	15.8	4.2	803	8.2
6000	50	85	98	13.0	3.4	893	10.2
8000	90	117	135	25.3	6.7	587	4.7
8000	80	111	128	21.7	5.7	660	5.6
8000	70	104	120	18.6	4.9	734	6.7
8000	60	96	111	15.8	4.2	809	8.0
8000	50	86	99	13.0	3.4	896	10.0

Press. Alt.	Load	Speed		Fuel Flow		Distance	Endu-rance Time
[ft]	[%]	[KTAS]	[mph]	[l/h]	[US Gal/h]	[NM]	[Hrs]
10000	90	119	137	25.3	6.7	594	4.5
10000	80	113	130	21.7	5.7	667	5.4
10000	70	106	122	18.6	4.9	740	6.5
10000	60	97	112	15.8	4.2	815	7.9
10000	50	87	101	13.0	3.4	899	9.8
12000	80	115	132	21.7	5.7	674	5.3
12000	70	107	124	18.6	4.9	747	6.3
12000	60	99	114	15.8	4.2	820	7.7
12000	50	88	102	13.0	3.4	901	9.6
14000	80	117	134	21.7	5.7	680	5.1
14000	70	109	126	18.6	4.9	753	6.2
14000	60	100	115	15.8	4.2	825	7.5
14000	50	89	102	13.0	3.4	902	9.3

Figure 5-4c Cruise Performance, Range and Endurance with long range tanks, 1043 kg (2300 lbs)

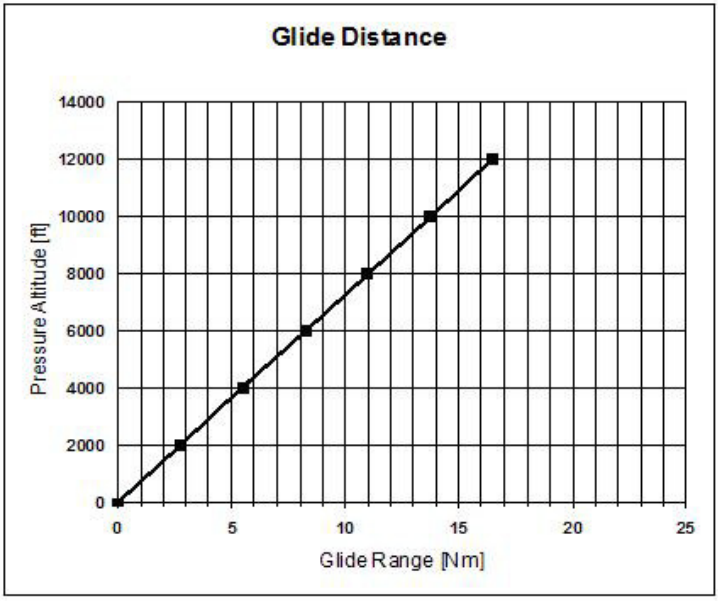


Figure 5-5 Maximum Glide at 73 KIAS/ 84 mph

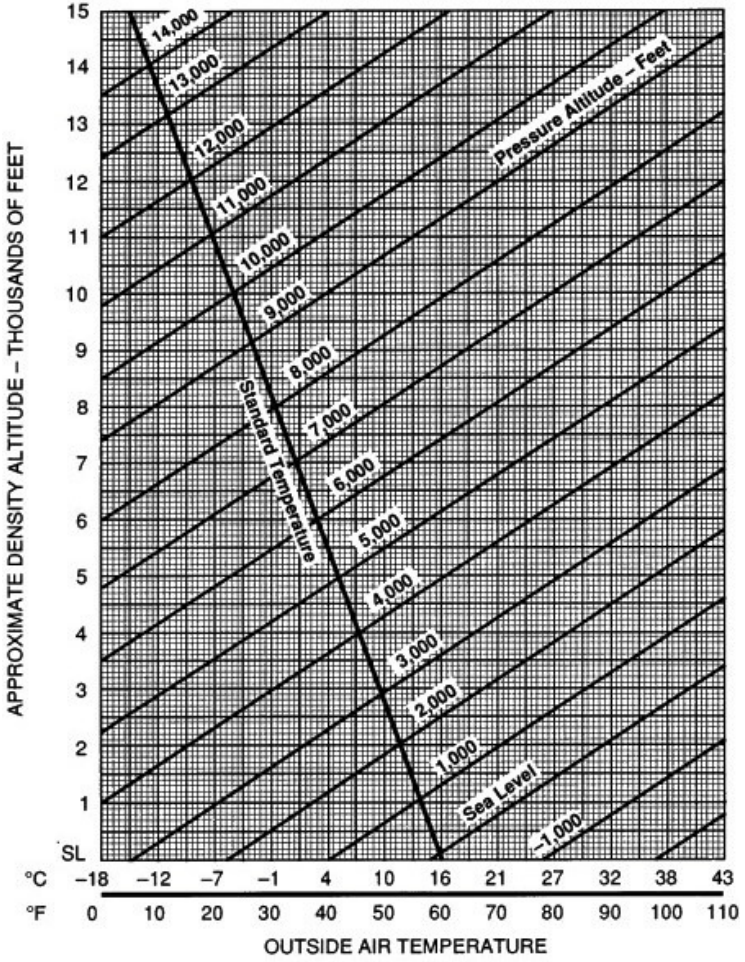


Figure 5-6 Density Altitude Chart

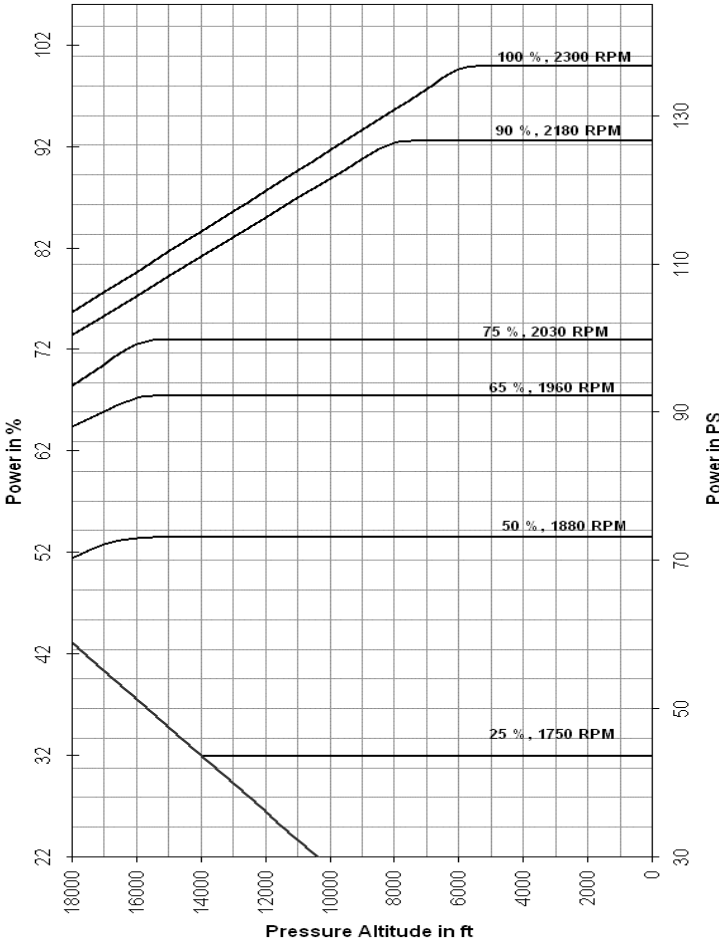


Figure 5-7 Engine Power Over Altitude

SECTION 6
APPENDIX

▲ **WARNING:** Do not start the engine in any case when filling levels are below the corresponding minimum marking.

■ CAUTION: Normally, a refill of coolant or gearbox oil between service intervals is not necessary. In case of low coolant or gearbox oil levels, inform the maintenance company immediately.

ENGINE OIL

Both TAE 125 engine variants are filled with 4.5 - 6 l engine oil (refer to section 1 of this supplement for specification).
A dip stick is used to check the oil level. It is accessible by a flap on the upper right-hand side of the engine cowling.
The drain screw is located on the lower left-hand outside of the oil pan, the oil filter is on the upper left-hand side of the housing.
The oil system has to be checked for sealing after the first 5 operating hours (visual inspection).
Checks and changes of oil and oil filter have to be performed regularly according to the engine Operation and Maintenance Manual. See OM-02-01 for the TAE 125-01 engine or OM-02-02 for the TAE 125-02 engine.
The Supplement of the Aircraft Maintenance Manual has to be considered as well. See AMM-20-01 for the TAE 125-01 engine or AMM-20-02 for the TAE 125-02 engine

GEARBOX OIL

To ensure the necessary propeller speed, both TAE 125 engine variants are equipped with a reduction gearbox filled with gearbox oil. (refer to section 1 of this supplement for specification)
The level can be checked through a viewing glass on the lower leading edge of the gearbox. To do so open the flap on the left front side of the engine cowling.
The drain screw is located at the lowest point of the gearbox. A filter is installed upstream of the pump, as well as microfilter in the Constant Speed Unit. Check the gearbox for sealing after the first 5 hours of operation (visual inspection). Regular checks as well as oil and filter changes have to be performed in according with the engine Operation and Maintenance Manual. See OM-02-01 for the TAE 125-01 engine or OM-02-02 for the TAE 125-02 engine.
The Supplement of the Aircraft Maintenance Manual has to be considered as well. See AMM-20-01 for the TAE 125-01 engine or AMM-20-02 for the TAE 125-02 engine.

▲ **WARNING:** It is not allowed to start the engine with low gearbox oil level.

■ CAUTION: Between scheduled maintenance topping up gearbox oil should not be necessary. If low gearbox oil level is detected, inform your service centre immediately.

FUEL

Both TAE 125 engine variants can be operated with kerosene (Jet A-1, Jet A, Fuel No. 3, JP-8, TS-1 (only C2.0)) or Diesel fuel.
Due to the higher specific density of engine fuel or Diesel in comparison to aviation gasoline (AVGAS) the permissible capacity for standard tanks was reduced as mentioned in Section 1.
Appropriate placards are attached near the fuel filler connections.
For temperature limitations refer to Section 2 "Limitations" and Section 4 "Normal Operation".

It is recommended to refuel before each flight and to enter the type of fuel into the log-book.

COOLANT

To cool the engine a liquid cooling system was installed with a water/approved radiator protection mixture at a ratio of 1:1.
A heat exchanger for cabin heating is part of the cooling system.
Check the cooling system for sealing after the first 5 hours of operation (visual inspection).
The coolant has to be changed in accordance with the engine Operation and Maintenance Manual. See OM-02-01 for the TAE 125-01 engine or OM-02-02 for the TAE 125-02 engine.
The Supplement of the Aircraft Maintenance Manual has to be considered as well. See AMM-20-01 for the TAE 125-01 engine or AMM-20-02 for the TAE 125-02 engine

▲ **WARNING:** It is not allowed to start the engine with low coolant level.

■ CAUTION: Between scheduled maintenance topping-up coolant should not be necessary. If low coolant level is detected, inform your service centre immediately.

■ CAUTION. The water has to satisfy the following requirements:

1. visual appearance: colorless, clear and no deposits allowed
2. pH-value: 6.5 to 8.5
3. maximum water hardness: 2.7 mmol/l
4. maximum hydrogen carbonate concentration: 100 mg/l
5. maximum chloride concentration: 100 mg/l
6. maximum sulfate concentration: 100 mg/l

◆ Note: The freezing point of the coolant is -36°C.

◆ Note: The waterworks also provide information. In general, tap water may be diluted with distilled water.Pure distilled water may not be used to mix with approved radiator protection.

WEIGHT & BALANCE

Item	Weight x Arm = Moment (kg)	(m)	(mkp)
Empty Weight			
plus Engine Oil (6 l to 0.9 kg/l)		-0.31	
plus Gearbox Oil (1 l to 0.9 kg/l)		-0.69	
plus unusable fuel standard tanks F,G,H (11.4 l to 0.84 kg/l) I,K,L,M (15.0 l to 0.84 kg/l)		1.17	
long-range tanks (15.0 l to 0.84 kg/l)		1.17	
plus Coolant (4.5 l to 1.0 kg/l)		-0.26	
Changes in Equipment			
Basic Empty Weight			

Figure 6-1 Calculating the Basic Empty Weight

		Your aircraft	
		Mass kg	Moment mkp
Calculation of the loaded condition	**1. Basic Empty Weight:** Use the values for your airplane with the present equipment. Unusable fuel, engine oil, gearbox oil and coolant are included.		
	2. Usable Fuel (at 0.84 kg/l), Standardtanks F,G,H (114.3 l max) Standardtanks I,K,L,M (120.0 l max) Long-range tanks (152.2 l max.)		
	3. Pilot and Front Passenger (Station 0.86 to 1.17 m)		
	4. Rear Passenger		
	5. *Baggage Area 1 or Passenger on the children's seat (Station 2.08 to 2.74; max.54kg)		
	6. *Baggage Area 2 (Station 2.74 to 3.61; max.23kg)		
	7. Ramp Weight and Moment		
	8. Fuel allowance for engine start, taxi and runup		
	9. Take-off Weight and Moment Shall not exceed the max. MTOW. (Subtract Step 8 from Step 7)		
	10.Locate this point in the weight and balance envelope in the original POH. Check if its within the envelope. *Maximum allowable combined weight capacity for Baggage Areas 1 and 2 is 54 kg.		

Figure 6-2 Calculating Weight and Moment

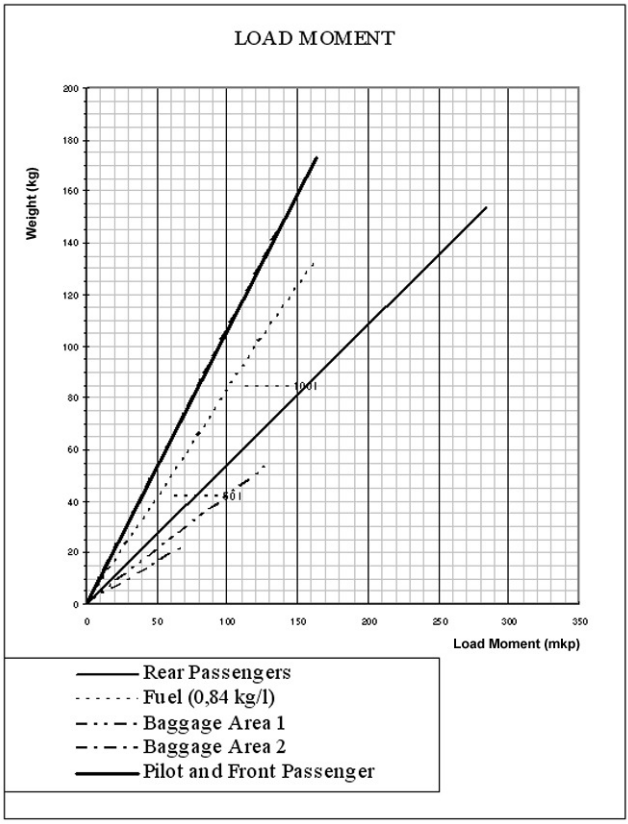


Figure 6-3 Load Moment

*max. usable Fuel standard tanks (I,K,L,M)
**max. usable Fuel long range tanks

This page intentionally left blank

SECTION 7
SUPPLEMENTS

TABLE OF CONTENTS

No supplements

This page intentionally left blank