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Supplement
Pilot´s Operating Handbook
for the
(Reims) Cessna (F) 172
N & P
Equipped with TAE 125-02-114
Installation

Issue 2
Revision 10

MODEL No. _____

SERIAL No. _____

REGISTER No. _____

This supplement must be attached to the EASA approved Pilot´s Operating Handbook when the TAE 125-02-114 installation has been installed in accordance with 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 10036563.

Doc.-No.: 20-0310-20122*

*The last digit of the document number describes the issue of the manual. All manuals with a lower last digit are previous issues of this version.

APPROVAL

The technical content of this document is approved under the authority of the DOA, ref. EASA.21J.010.

LOG OF REVISIONS

Revision	Section	Description	Date	Approved
2/0	all	new Issue	May 21, 2010	EASA STC 10014287
2/1	1	New oil, editorial changes	April 14, 2011	Revision No. 1 to AFM supplement ref. 20-0310-20122 is approved under the authority of DOA ref. EASA.21J.010. Date: April 14, 2011 Office of Airworthiness
	2	New oil, editorial changes		
	3	Procedures updated		
	4	Procedures updated		
	5	Editorial changes		
	6	Editorial changes		
	9	New Section		
2/2	1	New gearbox oil, editorial changes	Sept. 22, 2011	EASA AFM Approval 10036563
	2	New gearbox oil, Fuel capacity integral fuel tank		
	4	Procedures updated		
	5	Flight performance with integral fuel tanks		
	7	Editorial changes		

Revision	Section	Description	Date	Approved
2/3	1	New Fuel, new gearbox oil	March 16 2012	Revision No. 3 to AFM supplement ref. 20-0310-20122 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		
	5	Procedures updated		
	6	New fuel		
2/4	1	New gearbox oil	March 11, 2013	Revision No. 4 to AFM supplement ref. 20-0310-20122 is approved under the authority of DOA ref. EASA.21J.010. Date: March 11, 2013 Office of Airworthiness
	2	New gearbox oil		
	5	Procedures updated		
2/5	---	EASA STC / AFM numbers corrected on the cover	May 27, 2013	Revision No. 5 to AFM supplement ref. 20-0310-20122 is approved under the authority of DOA ref. EASA.21J.010. Date: May 27, 2013 Office of Airworthiness

Revision	Section	Description	Date	Approved
2/6	1	Safety Recommendation New fuel New gearbox oil Note fuel additive	03.09.2014	Revision No. 6 to AFM supplement ref. 20-0310-22122 is approved under the authority of DOA ref. EASA.21J.010, Date: september, 03, 2014 Office of Airworthiness
	2	Note added New fuel New gearbox oil Note fuel additive	03.09.2014	
	3	Description adapted wording	03.09.2014	
	4	Note added	03.09.2014	
	5	Wording	03.09.2014	
	6	Wording	03.09.2014	
	7	Wording	03.09.2014	
	8	Wording	03.09.2014	
	9	Wording	03.09.2014	
2/7	4	Procedure added	26.01.2015	Revision No. 7 to AFM supplement ref. 20-0310-20122 is approved under the authority of DOA ref. EASA.21J.010, Date: January 26, 2015 Office of Airworthiness

Revision	Section	Description	Date	Approved
2/8	1	New propeller	April 08, 2015	EASA STC 10014287, Rev. 8
	5	splitted due to new propeller specs		
	5a	New section		
	5b	New section		
2/9	1	Update Liquids	Jan. 22, 2018	Revision No. 9 to AFM supplement ref. 20-0310-20122 is approved under the authority of DOA ref. EASA.21J.010. Date: Jan. 22, 2018 Office of Airworthiness
	2	Update liquids Update Engine Instrument Markings		
	3	various minor corrections		
	4	Update FADEC Test above 5500ft		
2/10	all	Change of company name	Mar. 01, 2022	Office of Airworthiness
	1	Update liquids according to OM-02-02 (Rev. 5/3)		
	2	Update liquids according to OM-02-02 (Rev. 5/3), update Placards		
	6	Caution and Note deleted		

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

LIST OF EFFECTIVE SECTIONS

Sections	Issue/Revision	Date
1	2/9	Mar. 01, 2022
2	2/8	Mar. 01, 2022
3	2/7	Jan. 22, 2018
4	2/7	Jan. 22, 2018
5	2/7	April 08, 2015
5a	2/0	April 08, 2015
5b	2/0	April 08, 2015
6	2/7	Mar. 01, 2022
7	2/6	Sept. 03, 2014
8	2/6	Sept. 03, 2014
9	2/6	Sept. 03, 2014

GENERAL REMARK

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

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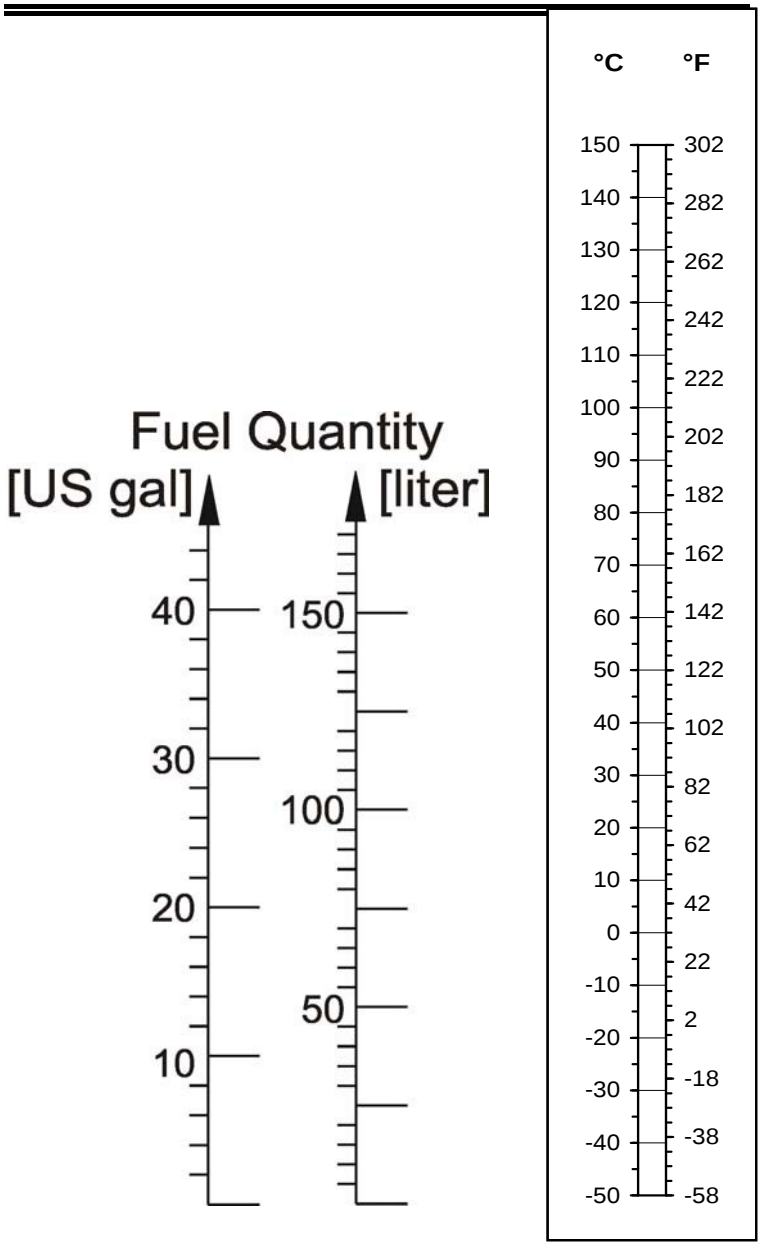
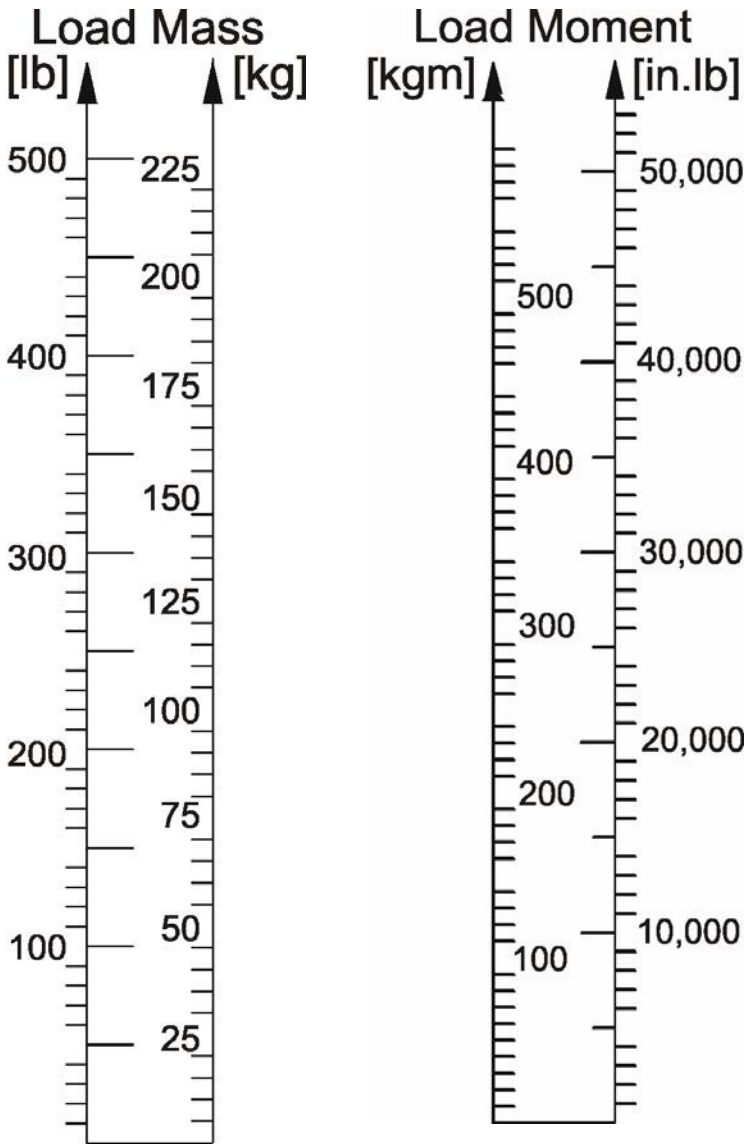
CONVERSION TABLES

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

ABBREVIATIONS

FADEC	Full Authority Digital Engine Control
CED 125	Compact Engine Display Multifunctional instrument for indication of engine data of the TAE 125-02-114
AED 125	Auxiliary Engine Display Multifunctional instrument for indication of engine and airplane data

SECTION 1
GENERAL

Safety Recommendations

The following symbols and warnings are used in this manual. They must be heeded strictly to prevent personal injury and material damage, to avoid impairment of the operational safety of the aircraft and to rule out any damage to the aircraft as a consequence of improper handling.

⚠	**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 Service Bulletin TM TAE 000-0004.
⚠	Note:	The Doc.-No of this POH supplement is published on the cover sheet of this supplement.

ENGINE

⚠	**WARNING:**	The engine requires an electrical power source for operation. If the main battery and alternator fail, 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.

Engine manufacturer: Continental Aerospace Technologies GmbH
Engine model: .....TAE 125-02-114

The TAE 125-02-114 is a liquid cooled in-line four-stroke 4-cylinder turbocharged engine with DOHC (double overhead camshaft), direct fuel injection and common-rail technology. It has a displacement of 1991 ccm (121.5 in^3). The engine is controlled by a FADEC system. The propeller is driven by a built-in gearbox (i = 1.69) with mechanical vibration dampening and overload release. The engine has an electrical self starter and an alternator.

⚠	**WARNING:**	The engine requires an electrical power source for operation. If the main battery and alternator fail, 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 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
..... MTV-6-A/190-69
Number of blades:.....3
Diameter: ..... 1.87 m (MTV-6-A/187-129
..... 1.90 m (MTV-6-A/190-69)
Type: .....constant speed

FUELS and LIQUIDS

☒	**WARNING:**	The engine must not be started under any circumstances if any fluid level is too low.
☒	CAUTION:	Use of unapproved fuels may result in damage to the engine and fuel system components, resulting in possible engine failure.
☒	CAUTION:	Use approved oil with exact designation only!
☒	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 center immediately.

Fuel: .....JET A-1 (ASTM 1655)
.....JET A (ASTM 1655)
..... Jet Fuel No.3 (GB 6537-2006)
.....JP-8 (MIL-DTL-83133E)
.....JP-8+100 (MIL-DTL-83133E)
..... TS-1 (GOST 10227-86)
.....TS-1 (GSTU 320.00149943.011-99
Alternative: ..... Diesel (**DIN** EN 590)
.....SASOL GTL Diesel

Note:	The additive Biobor JF can be used in jet and diesel fuel systems to prevent microbial contamination and ensure fuel quality. The recommended dosage is 1 gal per 9.5 gal fuel. Drain water bottoms prior application. For further information refer to manufacturer specifications especially in the case of an already contaminated fuel system.

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

Gearbox oil: .....Centurion Gearbox Oil N1
..... Shell Spirax S6 ATF ZM
..... Shell Spirax S6 GXME 75W-80, API GL-4
..... Shell Spirax S4 G 75W-90, API GL-4

Coolant:..... Use of Ready Mix ratio 50:50 is recommended

Note:	If Ready Mix is not available please use concentrate and distilled water in a ratio of 50:50 to ensure an ice flocculation point at -38°C +/-2°C.

Radiator Protection: .....BASF Glysantin / G48
..... Valvoline/Zerex Glysantin / G48
..... Mobil Antifreeze Extra / G48
..... Comma Xstream Green - Concentrate / G48
..... BASF Glysantin Protect / G05
..... Valvoline/Zerex Glysantin / G05

CAUTION:	G05 and G48 must not be mixed with each other.

INSTRUMENT PANEL

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

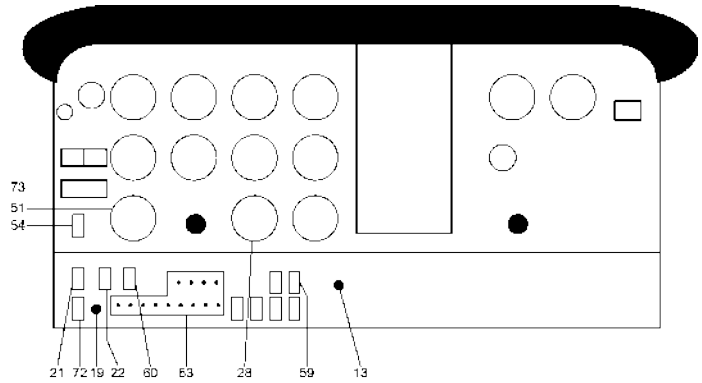


Figure 1-1 Example of Instrument panel

13. "Alt. Air Door" Alternate Air Door
    (Carburetor Heat Button **N/A**)
19. "Starter"-Push Button for Starter
21. "BAT"-Switch for Battery
22. "MAIN"-Switch for Main Bus
28. 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.
51. AED 125 SR (Voltmeter, Ammeter) with indication of Fuel-Temperature,
    Voltage and a caution light "Water Level" (amber) for low coolant level
54. "Force B"-Switch for manually switching the FADEC
59. "Fuel Pump"-Switch for the Electric Fuel Pump
60. "ALT"-Switch for Alternator
62. Fuse Electric Fuel Pump

63. Fuses, among other for Alternator Warning light, Starter, FADEC and Main Bus

72. "Engine Master"-Switch
electrical supply FADEC

73. 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)

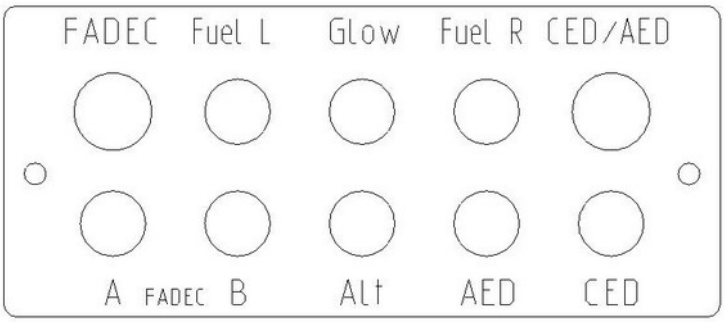


Figure 1-2 Lightpanel

FUEL SYSTEM (Left, Right, Both)

The fuel system of the engine 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. Fuel can be shut off by the separate shut-off valve. 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 fuel cooler and 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. The fuel cooler reduces the fuel temperature in the return line.
The fuel cooler receives its cooling air through an inlet in the air duct to the heating radiator. This inlet is closed with a baffle, which must be removed at high outside air temperatures (OAT higher than 20 °C (68 °F), see also Section 4).
Figure 1-3Since 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 Capacity			
Tanks	Total Capacity	Total Unusable Fuel	Total Usable Fuel
2 Standard-Tanks: each 69.4l (18.30 US gal)	138.8 l (36.6 US gal)	11.4 l (3 US gal)	127.4 l (33.6 US gal)
2 Long-Range Tanks: each 86.8l (22.95 US gal)	173.6 l (45.9 US gal)	15.1 l (4 US gal)	158.6 l (41.9 US gal)
2 Integral Tanks (normal category): each 119.8 l (29 US gal)	219.6 l (58 US gal)	22.8 l (6 US Gal)	196.8 l (52 US gal)
2 Integral Tanks (utility category): each 90.7 l (23.95 US gal)	181.4 l (47.9 US gal)	22.8 l (6 US Gal)	158.6 l (41.9 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 BOTH position.

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

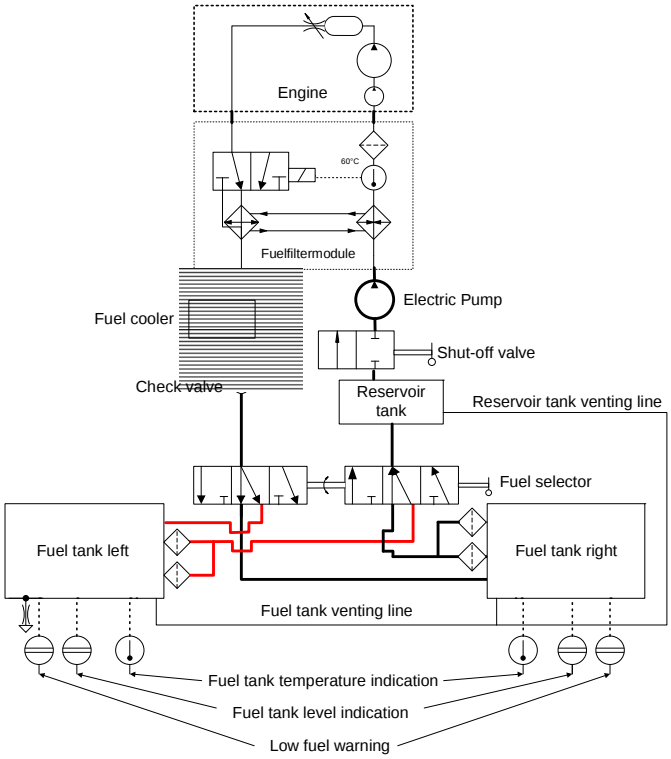


Figure 1-4 Scheme of the Fuel System (Left, Right, Both)

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

ELECTRICAL SYSTEM

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

1. "Main Bus" Switch
   This switch controls the Main Bus. The Main Bus is required to be able to run FADEC and engine with the Battery/Alternator in the event of electrical system malfunctions. In normal operation Alternator, Main Bus and Battery must be ON.

2. "Alternator" Switch
   Controls the alternator. Must be ON in normal operation.

3. "Battery" Switch
   Controls the battery.

4. "Starter" Push Button
   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. "Alternator" Warning light
   Illuminates when the power output of the alternator is too low or the alternator switch is switched off. Normally, this warning light always illuminates when the "Engine Master" is switched on without revolution and extinguishes immediately after starting the engine.

7. "Fuel Pump" Switch
   Controls the electric fuel pump.

8. Engine Master" Switch
   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. "Force B" Switch
   If the FADEC does not automatically switch from A-FADEC to B-FADEC in an emergency, this switch allows to manually switch 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 the battery and alternator fail or are disconnected. 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.

The basic wiring of the installation is available in 14V as well as 28V versions.

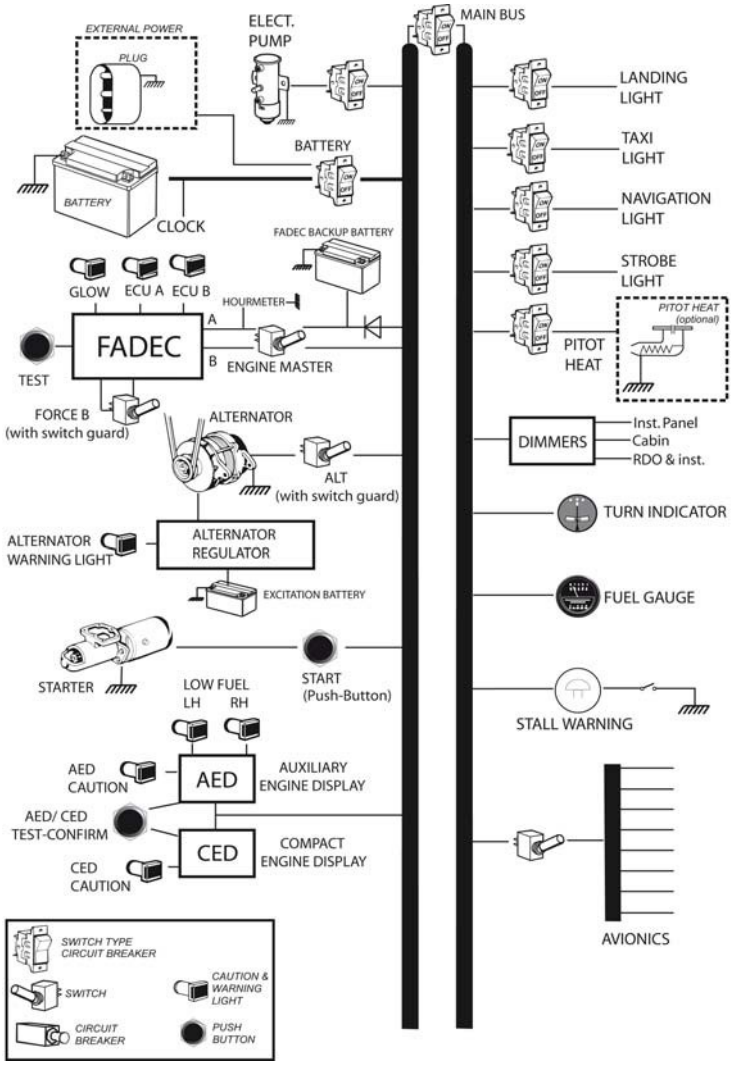


Figure 1-5 Basic Wiring of the Electrical System

FADEC-RESET

In case of a FADEC warning, one or both FADEC warning lights are flashing. If 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 possible, 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-02-02 for additional information.

COOLING

The installation is fitted with a fluid-cooling system, whose three-way thermostat regulates the flow of coolant between the large and small cooling circuit.
At a coolant temperature of up to 84°C (183°F) the coolant flows exclusively through the small circuit, between 84°C (183°F) and 94°C (201°F) through the small and the large circuit simultaneously.
If the cooling water temperature rises above 94°C (201°F), the complete volume of coolant flows through the large circuit and therefore through the radiator. This ensures a maximum cooling water temperature of 105°C (221°F).
There is a sensor in the expansion reservoir, which sends a signal to the warning light "Water level" on the AED 125 in the instrument panel if the coolant level is low.
The cooling water temperature is measured in the cylinder head near 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 1-5.
The supply of warm air into the cabin is controlled through the cabin heat control knob. In normal operation, the cabin heat control knob must be in the OPEN position.
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.

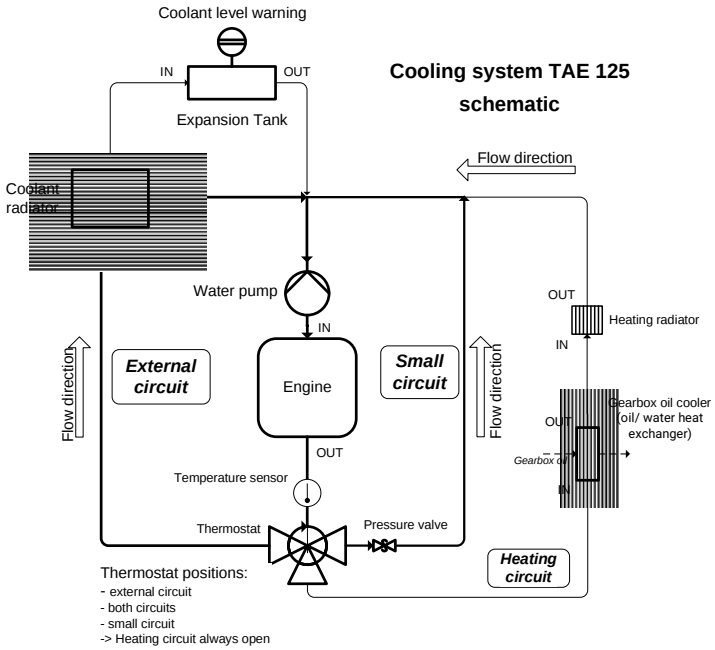


Figure 1-5 Cooling system

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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.

Normal Category Cessna 172 N:

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

Utility Category Cessna 172 N:

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

Normal Category Cessna 172 P:

Maximum Ramp Weight: ..... 1090 kg (2402 lbs)
Maximum Takeoff Weight: ..... 1089 kg (2400 lbs)
Maximum Landing Weight ..... 1089 kg (2400 lbs)

Utility Category Cessna 172 P:

Maximum Ramp Weight: ..... 954 kg (2102 lbs)
Maximum Takeoff Weight: ..... 953 kg (2100 lbs)
Maximum Landing Weight ..... 953 kg (2100 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: Continental Aerospace Technologies GmbH

Engine model: .....TAE 125-02-114

Take-off and Max. continuous power:..... 114 kw (155 HP)

Take-off and Max. continuous RPM:..... 2300 min^{-1}

Max. recommended cruise.....85%

☒	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 18,000 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 fuel temperature in the fuel tank before Take-off	Minimum fuel temperature in the fuel tank during the flight
JET A-1, JET A, Fuel No.3 JP-8, JP-8+100 TS-1	-30°C	-35°C
Diesel Sasol GTL Diesel	0°C	-5°C

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

WARNING: The fuel temperature of the fuel tank not used should be monitored 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 monitored. If there is uncertainty about which fuel is in the tank, the assumption should be made that it is Diesel.

Oil Pressure

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 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.

Note: "Load" describes the available percentage of maximum engine power.

Instrument AED/CED		Red range	Amber range	Green range	Amber range	Red range
Tachometer	[RPM]	--------	--------	0-2300	--------	> 2300
Oil pressure	[bar]	0 - 1.1	1.2 - 2.2	2.3 - 5.1	5.2 - 6.5	> 6.5
	[psi]	0 - 16	17.4 - 32	33.4 - 74	75.4 - 87.0	> 87.0
Coolant temperature	[°C]	< -32	-32...+59	60 - 100	101 - 105	> 105
Oil temperature	[°C]	< -32	-32...+49	50 - 129	130 - 140	> 140
Gearbox temperature	[°C]	--------	--------	< 115	115 - 120	> 120
Load	[%]	--------	--------	0 - 100	--------	--------
Fuel Temperature (left and right)	[°C]	< -30	-30...-1	0 - 69	70 - 75	> 75
Alternator Current (14V)	[A]	--------	--------	0 - 84	85 - 90	>90
Alternator Current (28V)	[A]	--------	--------	0 - 52.4	52.5 - 60	>60
Electrical System Voltage (14V)	[V]	0 - 10	11 - 12.5	12.6 - 14.0	15.0	>15.0
Electrical System Voltage (28V)	[V]	0 - 21	22 - 24	25 - 29.4	29.5 - 30	>30

Table 2-2 Markings of the engine instruments

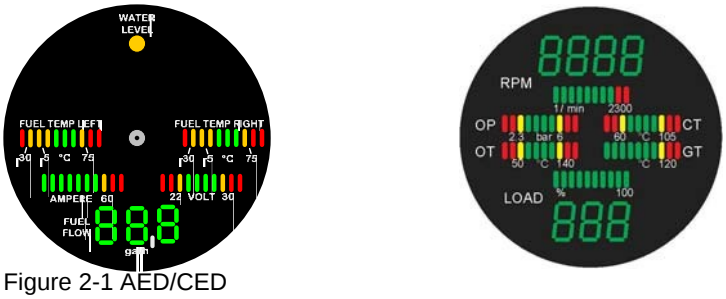

Figure 2-1 AED/CED

☒	Note:	The AED/CED caution lamp is switched on if an engine reading is in the amber or red range. The AED/CED caution lamp remains on even when the parameter returns to the green/normal operating range and must be confirmed by pressing the Confirm/Test knob. After being confirmed, the AED/CED caution lamp will switch on again whenever another parameter enters amber/red range. Pressing the Confirm/Test knob longer than one second will initiate the power-up test sequence.

PERMISSIBLE FUEL GRADES

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

Fuel: .....JET A-1 (ASTM 1655)
.....JET A (ASTM 1655)
..... Jet Fuel No.3 (GB 6537-2006)
.....JP-8 (MIL-DTL-83133E)
.....JP-8+100 (MIL-DTL-83133E)
..... TS-1 (GOST 10227-86)
.....TS-1 (GSTU 320.00149943.011-99

Alternative: ..... Diesel (**DIN** EN 590)
.....SASOL GTL Diesel

Note: The additive Biobor JF can be used in jet and diesel fuel systems to prevent microbial contamination and ensure fuel quality. The recommended dosage is 1 gal per 9.5 gal fuel. Drain water bottoms prior application. For further information refer to manufacturer specifications especially in the case of an already contaminated fuel system.

MAXIMUM FUEL QUANTITIES

Due to the higher specific density of Kerosene in comparison to Aviation Gasoline (AVGAS) the permissible tank capacity has been reduced.

Fuel Capacity			
Tanks	Total Capacity	Total Unusable Fuel	Total Usable Fuel
2 Standard-Tanks: each 69.4l (18.30 US gal)	138.8 l (36.6 US gal)	11.4 l (3 US gal)	127.4 l (33.6 US gal)
2 Long-Range Tanks: each 86.8 l (22.95 US gal)	173.6 l (45.9 US gal)	15.1 l (4 US gal)	158.6 l (41.9 US gal)
2 Integral Tanks (normal category): each 119.8 l (29 US gal)	219.6 l (58 US gal)	22.8 l (6 US gal)	196.8 l (52 US gal)
2 Integral Tanks (utility category): each 90.7 l (23.95 US gal)	181.4 l (47.9 US gal)	22.8 l (6 US gal)	158.6 l (41.9 US gal)

⚠	CAUTION:	To prevent air from penetrating into the fuel system avoid running one tank dry. As soon as the "Low Level" caution light illuminates, switch to the tank with sufficient fuel or land as soon as possible.

⚠	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 sensor. If the fuel level is below 10 l (2.6 US gal) usable fuel per tank, the "Fuel L" or "Fuel R" Caution 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: .....Centurion Gearbox Oil N1
..... Shell Spirax S6 ATF ZM
..... Shell Spirax S6 GXME 75W-80, API GL-4
..... Shell Spirax S4 G 75W-90, API GL-4

⚠	CAUTION:	Use approved oil with exact designation only!

PERMISSIBLE COOLING LIQUID

Coolant:..... Use of Ready Mix ratio 50:50 is recommended

⚠	Note:	If Ready Mix is not available please use concentrate and distilled water in a ratio of 50:50 to ensure an ice flocculation point at -38°C +/-2°C.

Radiator Protection: .....BASF Glysantin / G48
..... Valvoline/Zerex Glysantin / G48
..... Mobil Antifreeze Extra / G48
..... Comma Xstream Green - Concentrate / G48
..... BASF Glysantin Protect / G05
..... Valvoline/Zerex Glysantin / G05

⚠	CAUTION:	G05 and G48 must not be mixed with each other.

PLACARDS

Near the fuel tank caps:

With standard tanks:

JET FUEL ONLY
JET A-1 / DIESEL
CAP. 63.7 LITER (16.8 U.S. GAL.)
USABLE TO BOTTOM OF FILLER INDICATOR TAB

With long-range tanks:

JET FUEL ONLY
JET A-1 / DIESEL
CAP. 79.3 LITER (20.9 U.S. GAL.)
USABLE TO BOTTOM OF FILLER INDICATOR TAB

Normal category aircraft with integral fuel tanks:

JET FUEL ONLY
JET A-1/ DIESEL
CAP. 98.4 LITER (26 U.S. GAL.)
USABLE TO BOTTOM OF FILLER INDICATOR TAB

At the fuel selector valve:

With standard tanks:

Left and Right position: 63.7 Ltr/ 16.8 gal
Both position: 127.4 Ltr/ 33.6 gal

With long-range tanks:

Left and Right position: 79.3 Ltr/ 20.9 gal
Both position: 158.6 Ltr/ 41.9 gal

Normal category aircraft with integral fuel tanks:

Left and Right position: 98.4 Ltr/ 26 gal
Both position: 196.8 Ltr/ 52 gal

Utility category aircraft with integral fuel tanks:

Left and Right position: 79.3 Ltr/ 20.9 gal
Both position: 158.6 Ltr/ 41.9 gal

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

Figure 2-2

Drain Valve Fuel filter

The decal is attached to the drain valve of the fuel filter.

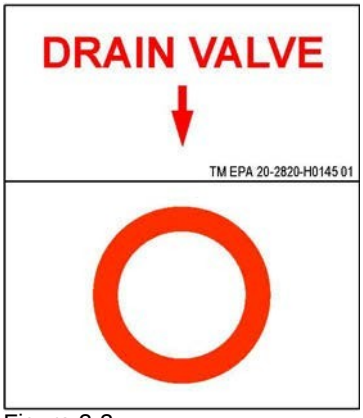

Figure 2-3

Expansion Tank: Coolant

The decal is attached to the expansion tank.

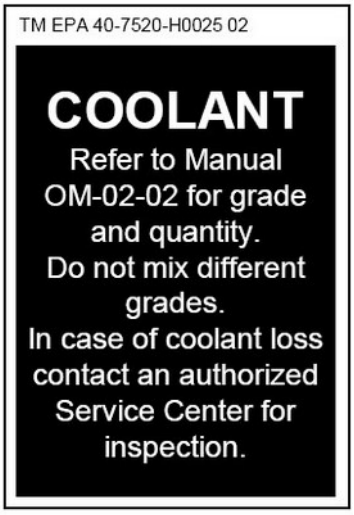

Figure 2.4

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

"ATTENTION 12 V DC OBSERVE CORRECT POLARITY"
OR
"ATTENTION 24 V DC OBSERVE CORRECT POLARITY“

All further placards contained in this section remain valid.

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SECTION 3
EMERGENCY PROCEDURES

INDEX OF CHECKLISTS

GENERAL

In addition to the original AFM/POH, the following applies:

	WARNING:	Due to failures indicated by the FADEC warning lights there might be a loss propeller valve current which leads in a low pitch setting of the propeller. This might result in overspeed. Airspeeds below 100 KIAS are suitable to avoid overspeed in failure case. If the propeller speed control fails, climbs can be performed at 65 KIAS and a powersetting of 100%.

EMERGENCY PROCEDURES CHECK LIST

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 - OFF
(5) AlternatorMain Bus and Battery switch - 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 (wing flaps retracted)
.....60 KIAS (wing flaps extended)
(2) Fuel Shut-off Valve - CLOSED
(3) Engine Master - OFF
(4) Wing flaps - as required (full down recommended)
(5) Alternator Main Bus and Battery switch - OFF

DURING FLIGHT

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

In case that one fuel tank was flown empty, 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 BOTH position
(3) Electric 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 possible.

	WARNING:	The high-pressure pump must be checked by an authorized service center 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
(2) Glide below 13,000 ft
(3) Fuel Shut-off Valve - OPEN (push full in)
(4) Fuel Selector switch toBOTH position
(5) Electric Fuel Pump - ON
(6) Thrust Lever - IDLE
(7) Engine Master 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. Should the propeller stop at an airspeed of more than 65 KIAS 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 WARNING

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

a) 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 test knob at least 2 seconds
2. FADEC Lights extinguished (LOW category warning):
   a) Continue flight normally
   b) Inform service center after landing
3. Steady FADEC Lights (HIGH category warning):
   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 fuel tank was flown empty, proceed at the first signs of insufficient fuel feed as follows:
   a) Immediately switch the Fuel Selector to BOTH
   b) Electric 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 possible.

☒	**WARNING:**	The high-pressure pump must be checked by an authorized service center before the next flight.

ABNORMAL ENGINE BEHAVIOR

If the engine acts abnormal 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 possible

iii) Be prepared for an emergency landing

FIRES

ENGINE FIRE WHEN STARTING ENGINE ON GROUND

(1) Engine Master - OFF
(2) Fuel Shut-off Valve - CLOSED
(3) Electric Fuel Pump - OFF
(4) Battery Switch - OFF
(5) Extinguish the flames with a fire extinguisher, wool blankets or sand.
(6) Inform service center after landing for examination of fire damages.

ENGINE FIRE DURING TAKE-OFF (ON GROUND)

(1) Engine Master - OFF
(2) Fuel Shut-off Valve - CLOSED
(3) Electric Fuel Pump - OFF
(4) Battery switch - OFF
(5) Extinguish the flames with a fire extinguisher, wool blankets or sand.
(6) Inform service center after landing for examination of fire damages.

ENGINE FIRE IN FLIGHT

(1) Engine Master - OFF
(2) Fuel Shut-off Valve - CLOSED
(3) Select an airspeed to avoid engine overspeed
(4) Electric Fuel Pump - OFF
(5) Cabin heat and ventilation OFF resp. CLOSE (except the fresh air nozzles on the ceiling)
(6) 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 an unmistakable sharp, acrid smell. As the fire grows, electrical load might be higher than normal or circuit breakers start to trip. 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 both alternator and main battery are turned OFF, 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.

(7) Fresh Air Nozzles, Cabin Heat and Ventilation - ON (open)
(8) Check Circuit Breakers, 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 possible. Switch circuit breakers 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 - OFF
(3) Fuel Shut-off Valve - CLOSED
(4) Electric Fuel Pump - OFF
(5) If the propeller also has to be stopped (for instance, due to excessive vibrations)
    i) Reduce airspeed below 55 KIAS
    ii) When the propeller is stopped, continue to glide at 65 KIAS

EMERGENCY LANDING

EMERGENCY LANDING WITH ENGINE OUT

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

(1) Airspeed
    i) 65 KIAS (flaps retracted)
    ii) 60 KIAS (flaps extended)
(2) Fuel Shut-off Valve - CLOSED,
(3) Engine Master - OFF
(4) Wing Flaps - as required (full down recommended)
(5) AlternatorMain Bus and Battery switch - OFF
(6) Cabin Doors - unlock before touch-down
(7) Touch-down - slightly nose up attitude
(8) Brake firmly

Note:		Gliding Distance. Refer to "Maximum Glide" in the approved Pilot´s Operating Handbook“

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 site.
(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) Perform a landing approach using a forward slip, if necessary, for improved visibility.
(10) Approach at 65 to 75 KIAS depending upon the amount of the accumulation.
(11) 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 80 KIAS.
(4) Adjust the elevator trim control to maintain an 80 KIAS 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

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 as soon as possible
- do not switch the FORCE-B switch, this will shut down the engine

CAUTION: The TAE 125-02-114 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:

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.

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

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

ALTERNATOR WARNING DURING NORMAL ENGINE OPERATION

(1) Ammeter - CHECK
(2) Alternator switch 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:

iii) Fuel Pump – OFF

iv) Landing Light – OFF (use as required for landing)

v) Taxi Light – OFF

vi) Strobe Light – OFF

vii) Nav Lights – OFF

viii) Beacon – OFF

ix) Interior Lights – OFF

x) Intercom – OFF

xi) Pitot Heat – OFF (use as required)

xii) Autopilot – OFF

xiii) Non-essential equipment – OFF

(5) The pilot should:

i) Land as soon as possible.

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

(1) Ammeter - CHECK
(2) Alternator switch 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 possible
    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 activate the FORCE-B switch, this will shut down the engine.

(1) Alternator switch 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 BOTH position
(3) Electric Fuel Pump - ON
(4) Reduce airspeed to 65-85 KIAS/75-98 mph (best glide recommended), (max. 100 KIAS/115 mph)
(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 possible
ii) Be prepared for an emergency landing
iii) Expect an engine failure

WARNING: The high pressure pump must be checked by an authorized service center 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 -

iv)

OIL PRESSURE TOO LOW (< 2.3 BAR IN CRUISE (AMBER 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 long climbs at low airspeed engine temperatures could rise into the amber range and trigger the "Caution" light. This indication 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 approach the red range

OIL TEMPERATURE 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 possible

COOLANT TEMPERATURE TOO HIGH (RED RANGE)**:**

(1) Increase airspeed and reduce power as quickly as possible
(2) Cabin Heat - COLD
(3) If coolant temperature reduces rapidly to normal range, continue to fly normally and monitor coolant temperature, Cabin Heat.
(4) If coolant temperature does not decrease,
    i) Land as soon as possible
    ii) Be prepared for an emergency landing
    iii) Expect an engine failure

"WATER LEVEL" LIGHT 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) If coolant temperature and/or oil temperature are rising into amber or red range,
    i) Land as soon as possible
    ii) Be prepared for an emergency landing
    iii) Expect an engine failure

GEARBOX TEMPERATURE TOO HIGH (RED RANGE)**:**

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

FUEL TEMPERATURE TOO HIGH:

(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):

(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

	Note:	Low fuel temperature may be caused when flying in cold weather with fuel cooler in operation (baffle removed).

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 possible.

	Note:	If the propeller speed control fails, climbs be performed at 65 KIAS 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 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 and land as soon as possible.

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SECTION 4
NORMAL PROCEDURES

PREFLIGHT INSPECTION

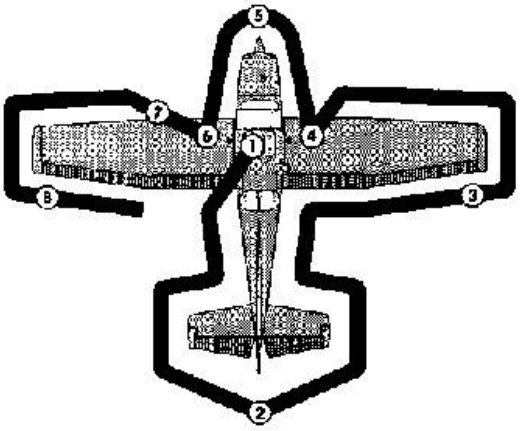

Figure 4-1 Preflight Inspection

	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" - 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 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 - BOTH
(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) from valve to check for water, sediment and proper fuel grade (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 point. Take repeated samples until all contamination has been removed.

	Note:	The reservoir tank drain is located in the fuselage on the co-pilot side of the aircraft.

(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.

	Note:	The fuel strainer drain is located on the left-hand side of the firewall (flight direction).

(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 blockage

(10) Fuel cooler baffle - CHECK

- REMOVE, if OAT on ground is higher than 20°C (68°F)
- INSTALL, if OAT on ground is lower than 20°C (68°F)

(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 blockage

(2) Fuel Tank Vent Opening - CHECK for blockage

(3) Stall Warning Opening - CHECK for blockage
To check the system, place a clean handkerchief over the vent opening and apply suction; a sound from the warning horn will confirm system operation.

(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

(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 - CHECK IN

(6) Alternator Switch - CHECK ON

(7) Battery 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.

(8) Fuel Quantity and Temperature - CHECK

(9) Fuel Selector Valve - SET to BOTH position.The fuel temperature limitations must be observed.

(10) Fuel Shut-off Valve - OPEN (Push Full In)

(11) Alternate Air Door - CLOSED

(12) Thrust Lever - CHECK for freedom of movement

(13) Load Display - CHECK 0% at Propeller RPM 0

PROCEDURES UP TO 5500ft AIRFIELD ELEVATION

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) Electric Fuel Pump - ON
(2) Navigation Lights and Flashing Beacon - ON (as required).
(3) Thrust Lever - IDLE
(4) Area Aircraft / Propeller - CLEAR
(5) "Engine Master" - ON , wait until the Glow Control light extinguishes
(6) Starter - ON, keep starter engaged until min. 500rpm
Release when engine starts, leave Thrust Lever in idle

☒	CAUTION:	Do not overheat the starter motor. Do not operate the starter motor for more than 10 seconds. After operating the starter motor, let it cool off for 20 seconds. After 6 attempts to start the engine, let the starter cool off for half an hour.

(7) Oil Pressure - CHECK

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

(8) CED 125 Test Knob - PRESS (to delete Caution light)
(9) Ammeter - CHECK for positive charging current
(10) Voltmeter - CHECK for green range
(11) 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! If the guarded alternator switch is installed, the switch guard muts be closed.

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

WARM UP

(1) Let the engine warm up about 2 minutes at IDLE (890 RPM).
(2) Increase RPM to max. 1,400 RPM until oil temperature 50°C (122°F), coolant temperature 60°C (140°F).

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 BOTH
(7) Elevator Trim and Rudder Trim (if installed) - SET for take-off
(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

(9) Force B Switch - switch to FADEC B

(10) Engine - check running without a change

(11) Force B Switch - switch back to Automatic

☒	**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.

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

(13) Thrust Lever - IDLE

(14) Engine Instruments and Ammeter - CHECK

(15) Suction gage - CHECK

(16) Wing Flaps - SET for Take-off (0° or 10°).

(17) Electric Fuel Pump - ON

(18) Strobe Lights - AS DESIRED

(19) Radios and Avionics - ON and SET

(20) Autopilot (if installed) - OFF

(21) Air Conditioning (if installed) - OFF

(22) Thrust Lever Friction Control - ADJUST

(23) Brakes - RELEASE

PROCEDURES OVER 5500ft AIRFIELD ELEVATION

Note:	Due to the increase of the idle speed with increasing pressure altitudes, the FADEC test is only possible to a limited extent from an airfield elevation of approximately 5500ft. Over 5500ft, the FADEC test is only possible if the load selector lever remains in the idle position after engine start until the FADEC test is starting. If the load selector lever is moved from the idle position, a FADEC test is no longer possible at pressure altitudes above 5500ft. For this purpose, the engine has to be stopped and re-started to perform the FADEC test.

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) Electric Fuel Pump – ON
(2) Navigation Lights and Flashing Beacon - ON (as required)
(3) Thrust Lever – IDLE
(4) Area Aircraft / Propeller – CLEAR
(5) "Engine Master" – ON, wait until the Glow Control light extinguishes
(6) Starter – ON, keep starter engaged until min. 500rpm
Release when engine starts, leave Thrust Lever in idle

☒	CAUTION:	Do not overheat the starter motor. Do not operate the starter motor for more than 10 seconds. After operating the starter motor, let it cool off for 20 seconds. After 6 attempts to start the engine, let the starter cool off for half an hour.

(7) Oil Pressure – CHECK

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

(8) CED-Test Knob – PRESS (to delete Caution light)

(9) Ammeter – CHECK for positive charging current

(10) Voltmeter – CHECK for green range

(11) 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! If the guarded alternator switch is installed, the switch guard must be closed.

(12) Ammeter – Check positive charge, alternator warning light must be OFF

(13) Voltmeter – Check in green range

(14) Flaps – RETRACT

WARM UP AND FADEC-TEST

(1) Let the engine warm up about 2 minutes at IDLE (890 RPM).
(2) Increase RPM to max. 1,400 RPM until Oil Temperature 50°C, Coolant Temperature 60°C.
(3) Thrust Lever - IDLE
(4) "Engine Master" - OFF
(5) Area Aircraft / Propeller - CLEAR
(6) "Engine Master" - ON, wait until the Glow Control light extinguishes
(7) Starter - ON, keep starter engaged until min. 500rpm Release when engine starts, leave Thrust Lever in idle
(8) Ammeter - CHECK for positive charging current
(9) Voltmeter - CHECK for green range
(10) 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
(11) Force B Switch - switch to FADEC B
(12) Engine - check running without a change
(13) Force B Switch - switch back to Automatic

☒	**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.

(14) Avionic Switch – ON
(15) Radios – ON
(16) Electric Fuel Pump – OFF

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 BOTH position
(7) Elevator Trim and Rudder Trim (if installed) – SET for Takeoff
(8) Thrust Lever – FULL FORWARD, load display min. 94%, RPM 2240 - 2300
(9) Thrust Lever – IDLE
(10) Engine Instruments and Ammeter – CHECK
(11) Suction gage – CHECK
(12) Wing Flaps – SET for Take-off (0° or 10°).
(13) Electric Fuel Pump – ON
(14) Strobe Lights – AS DESIRED
(15) Radios and Avionics – ON and SET
(16) Autopilot (if installed) – OFF
(17) Air Conditioning (if installed) – OFF
(18) Thrust Lever Friction Control – ADJUST
(19) Brakes – RELEASE

TAKE-OFF

NORMAL TAKE-OFF

(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 TAKE-OFF

(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
(7) Climb Speed - 58 KIAS67mph(until all obstacles are cleared)

AFTER TAKE-OFF

(1) Altitude about 300 ft, Airspeed more than 65 KIAS/75 mph - Wing Flaps - RETRACT
(2) Electric 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:	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.
For economic cruise set load 70% or less.

(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 caution 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 maneuvers. 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
(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
(4) Electric 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 DESIRED (0°-10° below 110 KIAS/126 mph; 10°-below 85 KIAS/98 mph)
(3) Airspeed in Final Approach:
    - wing flaps 20°: 63 KIAS/72 mph
    - wing flaps 30°: 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 - FULL DOWN
(3) Airspeed in 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/67 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) Electric 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" - 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 125-02-114is 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.
If the engine master is switched ON, the preheating relay is actuated by the FADEC and the glow plugs are supplied with power. The glow duration depends on the engine temperature.
If the engine master is switched OFF, the injection valves are not supplied with power and remain 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 to maintain directional control and balance.
The alternate air door should always be 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 IDLE (890 RPM).
Let the engine run at propeller RPM of max. 1,400 RPM until it reaches an engine oil temperature of 50°C (122°F) (green range) and a coolant temperature of 60°C (140°F) (green range to ensure normal operation).

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 run-up (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 take-off 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 run-up 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 take-offs. Using 10° wing flaps reduces the ground roll and total distance over a 15 m/50 ft 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 69 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 Section 5.

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 also to Section 2 "Limitations").

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	-30°C (-22°F)	-35°C (-31°F)
Diesel Sasol GTL Diesel	0°C	-5°C

Figure 4-1 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 for Diesel operation must be monitored. If there is uncertainty about which fuel is 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.

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 amber range and activate the "Caution" light when operating in hot weather or longer climbs 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 amber or red range, switch to the other tank or to the BOTH position

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 ..... 127.4 l (33.6 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 5-1a ff (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 1043 kg, pressure altitude of 1000 ft and a temperature of 30°C should be used and results in the following:

Ground Roll.....263 m (863 ft)

Total Distance to clear a 15 m obstacle.....451 m (1478 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 ..... 263 m (863 ft)
Decrease at 12 Knot Headwind (263m x 13%)=- 34 m (112 ft)
Corrected Ground Roll ..... 229 m (751 ft)

Total Distance to clear a 15 m obstacle,
zero wind..... 451 m (1478 ft)
Decrease at 12 Knot Headwind (451 m x 13%)= - 58 m (192 ft)
Corrected Total Distance to clear a ..... 393 m (1286 ft)
15 m obstacle

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 5-4a shows a range of 567 NM at zero wind, a power setting of 70% and altitude of 6000 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) ..... 567 NM

Reduction due to Headwind..... (4.5 h x 10 Knots) = - 45NM

Corrected Range..... 522 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 5-4a 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: .....120 kt + 2% = 122 kt
Fuel Consumption in cruise: ..... 22.1 l/h (5.8 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 1000 ft to 6,000 ft requires 3.3 l (0.9 US gal) of fuel. The corresponding distance during the climb is 7.6 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 5-3a. 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:
3.3 l (0.9 US gal)

Increase due to non-standard temperature:
3.3 l (0.9 US gal) x 20.0% = 0.7 l (0.2 US gal)

Corrected fuel to climb:
4.0 l (1.1 US gal)

Using a similar procedure for the distance to climb results in 9.1 NM.

The resultant cruise distance is:

Total Distance	400.0 NM
Climbout Distance.....	- 9.1 NM
Cruise Distance.....	390.9 NM

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

122 Knot
- 10 Knot
112 Knot

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

$$\frac{390.9 \text{ NM}}{112 \text{ Kt}} = 3.5 \text{ hrs}$$

The fuel required for cruise is:

3.5 h x 22.1 l/h = 77.4 l (20.5 US gal)

The total estimated fuel required is as follows:

Engine Start, Taxi and Takeoff	4.0 l (1.1 US gal)
Climb.....	+ 4.0 l (1.1 US gal)
Cruise.....	+ 77.4 l (20.5 US gal)
Total fuel required	85.4 l (22.7 US gal)

This gives with full tanks a reserve of:

127.4 l (33.6 US gal)
- 85.4 l (22.7 US gal)
42.0 l (10.9 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

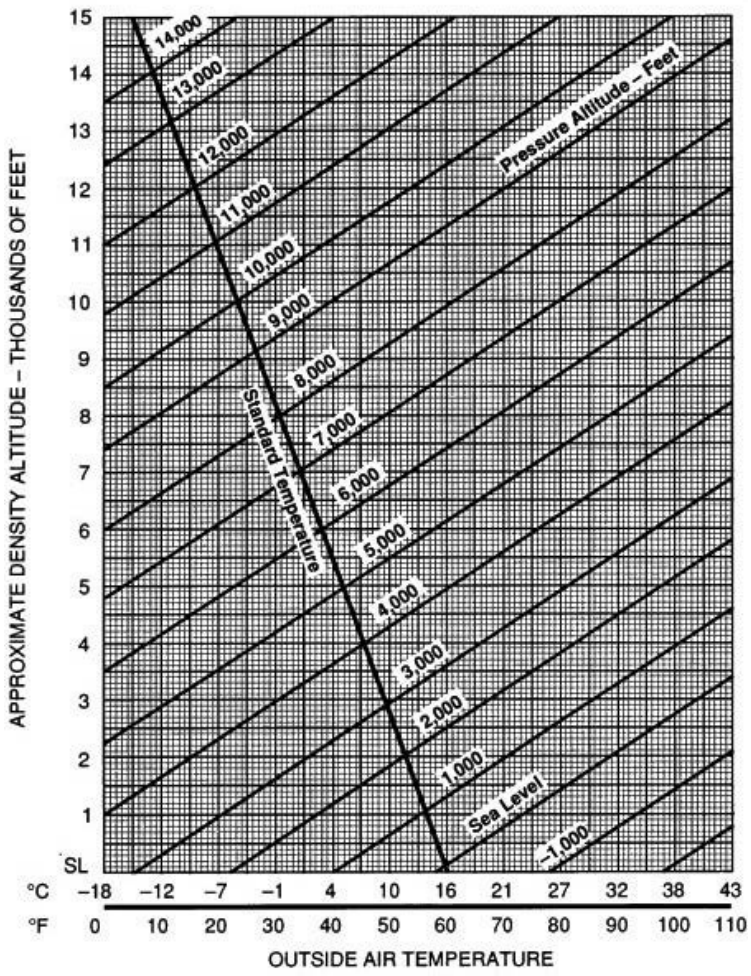

Figure 5-1 Density Altitude Chart

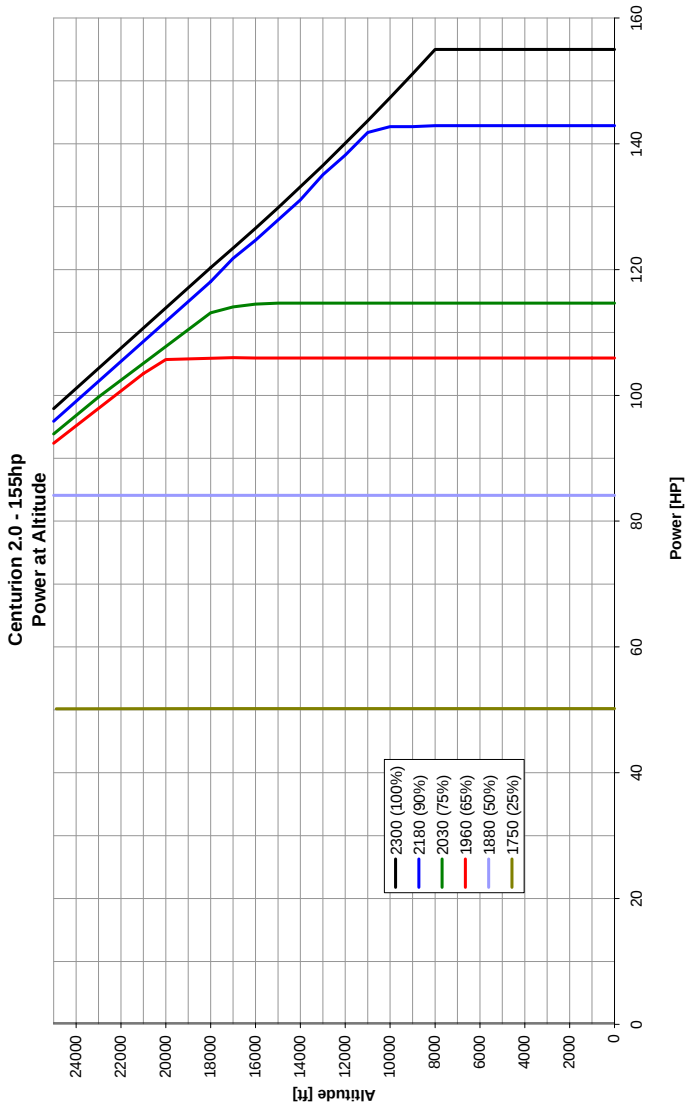

Figure 5-2 Engine Power Over Altitude

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SECTION 5a
PERFORMANCE

☒	Note:	This chapter applies to aircraft with propellers **MTV-6-A/187-129**. The correct propeller designation can be found on the blades.

☒	Note:	The chapter not relevant to the respective propeller can be omitted.

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 additional distances (min. 20%) 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	172	199	213	227	246	273	307
	50 ft (15 m) obstacle	294	340	364	388	421	469	530
1000	Gnd Roll	184	213	228	243	263	292	329
	50 ft (15 m) obstacle	315	364	390	416	451	502	568
2000	Gnd Roll	198	228	244	260	282	313	352
	50 ft (15 m) obstacle	338	391	418	446	483	538	609
3000	Gnd Roll	212	245	262	279	302	336	378
	50 ft (15 m) obstacle	363	419	448	478	518	577	653
4000	Gnd Roll	227	263	281	300	324	360	406
	50 ft (15 m) obstacle	389	449	481	513	556	619	701
5000	Gnd Roll	244	282	302	322	348	387	435
	50 ft (15 m) obstacle	418	482	516	550	597	665	752
6000	Gnd Roll	262	303	324	345	374	415	468
	50 ft (15 m) obstacle	448	518	554	591	641	714	808
7000	Gnd Roll	287	332	355	379	410	455	513
	50 ft (15 m) obstacle	492	568	608	648	703	783	886
8000	Gnd Roll	315	364	390	416	450	500	563
	50 ft (15 m) obstacle	540	624	667	711	771	859	972
9000	Gnd Roll	350	404	432	461	499	554	624
	50 ft (15 m) obstacle	599	692	741	790	856	954	1080
10000	Gnd Roll	389	449	480	512	555	616	694
	50 ft (15 m) obstacle	666	770	824	878	952	1061	1201

Figure 5-1a 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	564	652	697	744	805	894	1007
	50 ft (15 m) obstacle	966	1116	1194	1273	1380	1537	1740
1000	Gnd Roll	605	698	747	797	863	958	1079
	50 ft (15 m) obstacle	1035	1195	1279	1364	1478	1647	1864
2000	Gnd Roll	648	749	801	854	925	1027	1156
	50 ft (15 m) obstacle	1109	1281	1371	1462	1585	1765	1998
3000	Gnd Roll	695	803	859	916	992	1101	1240
	50 ft (15 m) obstacle	1189	1374	1470	1567	1699	1893	2142
4000	Gnd Roll	745	861	921	983	1064	1181	1330
	50 ft (15 m) obstacle	1276	1474	1577	1682	1823	2031	2299
5000	Gnd Roll	800	925	989	1055	1142	1268	1428
	50 ft (15 m) obstacle	1370	1582	1693	1805	1957	2180	2467
6000	Gnd Roll	859	993	1062	1133	1227	1362	1533
	50 ft (15 m) obstacle	1471	1700	1818	1939	2102	2341	2650
7000	Gnd Roll	942	1089	1165	1242	1345	1493	1681
	50 ft (15 m) obstacle	1613	1863	1993	2126	2304	2567	2905
8000	Gnd Roll	1034	1195	1278	1363	1476	1638	1845
	50 ft (15 m) obstacle	1770	2045	2187	2333	2529	2817	3189
9000	Gnd Roll	1148	1326	1418	1513	1638	1818	2048
	50 ft (15 m) obstacle	1966	2271	2429	2591	2809	3129	3541
10000	Gnd Roll	1275	1473	1576	1681	1820	2020	2275
	50 ft (15 m) obstacle	2186	2526	2701	2881	3123	3480	3938

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

GROUND ROLL AND TAKE-OFF DISTANCE at 1089 kg (2400 lbs) (Cessna 172P only)

SHORT FIELD TAKE-OFFS

Conditions:

Take-off weight 1089 kg (2400 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 additional distances (min. 20%) 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	192	222	238	254	275	305	343
	50 ft (15 m) obstacle	329	381	407	434	471	524	593
1000	Gnd Roll	206	238	255	272	294	327	368
	50 ft (15 m) obstacle	353	408	436	465	504	562	636
2000	Gnd Roll	221	255	273	291	315	350	394
	50 ft (15 m) obstacle	378	437	467	499	540	602	681
3000	Gnd Roll	237	274	293	312	338	375	423
	50 ft (15 m) obstacle	406	469	501	535	580	646	731
4000	Gnd Roll	254	294	314	335	363	403	454
	50 ft (15 m) obstacle	435	503	538	574	622	693	784
5000	Gnd Roll	273	315	337	360	390	432	487
	50 ft (15 m) obstacle	467	540	577	616	667	744	842
6000	Gnd Roll	293	339	362	386	418	464	523
	50 ft (15 m) obstacle	502	580	620	661	717	799	904
7000	Gnd Roll	321	371	397	424	459	509	573
	50 ft (15 m) obstacle	550	636	680	725	786	876	991
8000	Gnd Roll	353	408	436	465	503	559	629
	50 ft (15 m) obstacle	604	698	746	796	863	961	1088
9000	Gnd Roll	391	452	484	516	559	620	698
	50 ft (15 m) obstacle	670	775	829	884	958	1067	1208
10000	Gnd Roll	435	502	537	573	621	689	776
	50 ft (15 m) obstacle	746	861	921	983	1065	1187	1343

Figure 5-1c Take-Off Distance [m] at take-off weight 1089 kg (2400 lbs) (Cessna 172P only)

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	631	729	780	832	901	1000	1126
	50 ft (15 m) obstacle	1080	1248	1335	1424	1544	1720	1946
1000	Gnd Roll	676	781	836	892	965	1072	1207
	50 ft (15 m) obstacle	1158	1337	1431	1526	1654	1843	2085
2000	Gnd Roll	725	838	896	956	1035	1149	1293
	50 ft (15 m) obstacle	1241	1434	1533	1635	1773	1975	2235
3000	Gnd Roll	777	898	961	1025	1109	1232	1387
	50 ft (15 m) obstacle	1330	1537	1644	1753	1901	2118	2397
4000	Gnd Roll	834	964	1031	1099	1190	1321	1488
	50 ft (15 m) obstacle	1427	1649	1764	1881	2039	2272	2572
5000	Gnd Roll	895	1034	1106	1180	1278	1418	1597
	50 ft (15 m) obstacle	1532	1770	1894	2019	2189	2439	2760
6000	Gnd Roll	961	1111	1188	1267	1372	1523	1715
	50 ft (15 m) obstacle	1646	1901	2034	2169	2351	2619	2965
7000	Gnd Roll	1054	1218	1303	1390	1505	1670	1881
	50 ft (15 m) obstacle	1804	2085	2230	2378	2578	2872	3250
8000	Gnd Roll	1157	1337	1430	1525	1651	1833	2064
	50 ft (15 m) obstacle	1980	2288	2447	2610	2829	3152	3567
9000	Gnd Roll	1284	1483	1587	1692	1832	2034	2291
	50 ft (15 m) obstacle	2199	2541	2718	2898	3142	3501	3962
10000	Gnd Roll	1426	1648	1763	1880	2036	2260	2545
	50 ft (15 m) obstacle	2445	2826	3022	3223	3494	3893	4406

Figure 5-1d Take-Off Distance [ft] at take-off weight 1089 kg (2400 lbs) (Cessna 172P only)

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] Outside Air Temperature [°C]				
		-20°C	0°C	+20°C	+40°C	+50°C
0	69	879	865	851	706	576
1000	69	872	858	844	698	568
2000	69	865	851	837	691	561
3000	69	858	844	829	683	553
4000	69	851	836	822	675	545
5000	69	844	829	814	667	536
6000	69	836	821	806	658	528
7000	69	829	813	797	650	519
8000	69	821	805	789	641	510
9000	69	788	771	755	610	481
10000	69	755	738	721	578	452
11000	69	721	704	687	547	423
12000	69	688	670	653	515	393
13000	69	654	636	619	482	363
14000	69	620	601	584	450	333
15000	69	585	567	549	417	302
16000	69	551	531	513	384	271
17000	69	516	496	477	350	240
18000	69	480	461	441	317	209

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

MAXIMUM RATE-OF-CLIMB at 1089 kg (2400 lbs)
(Cessna 172P only)

Conditions:

Take-off weight 1089 kg (2400 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] Outside Air Temperature [°C]				
		-20°C	0°C	+20°C	+40°C	+50°C
0	69	819	804	790	650	525
1000	69	812	797	783	642	518
2000	69	805	790	776	635	510
3000	69	798	783	768	627	502
4000	69	790	775	760	619	493
5000	69	783	767	752	610	485
6000	69	775	759	744	602	476
7000	69	767	751	735	593	467
8000	69	759	743	727	584	458
9000	69	727	710	694	554	430
10000	69	695	678	661	523	401
11000	69	662	645	628	492	373
12000	69	630	612	594	461	344
13000	69	596	578	560	429	314
14000	69	563	544	526	397	285
15000	69	530	511	492	365	255
16000	69	496	476	458	333	224
17000	69	462	442	423	300	194
18000	69	427	407	387	267	163

Figure 5-2b Maximum Rate of Climb at take-off weight 1089 kg (2400 lbs) (Cessna 172P only)

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.	OAT	Vy	ROC	Time	Distance	Fuel used	
[ft]	[°C]	[KIAS]	[FPM]	[MIN]	[NM]	[l]	[US Gal]
0	15	69	855	0.0	0.0	0.0	0.0
1000	13	69	849	1.2	1.4	0.7	0.2
2000	11	69	843	2.4	2.8	1.3	0.3
3000	9	69	837	3.5	4.2	2.0	0.5
4000	7	69	831	4.7	5.8	2.6	0.7
5000	5	69	825	6.0	7.3	3.3	0.9
6000	3	69	818	7.2	9.0	4.0	1.1
7000	1	69	812	8.4	10.7	4.7	1.2
8000	-1	69	805	9.6	12.4	5.4	1.4
9000	-3	69	774	10.9	14.3	5.9	1.6
10000	-5	69	742	12.2	16.3	6.5	1.7
11000	-7	69	710	13.6	18.4	7.0	1.9
12000	-9	69	678	15.0	20.7	7.6	2.0
13000	-11	69	645	16.6	23.1	8.1	2.1
14000	-13	69	613	18.1	25.8	8.7	2.3
15000	-15	69	580	19.8	28.6	9.2	2.4
16000	-17	69	547	21.6	31.7	9.8	2.6
17000	-19	69	514	23.5	35.1	10.3	2.7
18000	-21	69	481	25.5	38.7	10.8	2.9

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

TIME, FUEL AND DISTANCE TO CLIMB at 1089 KG (Cessna 172P only)

Conditions:

Take-off weight 1089 kg (2400 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.	OAT	Vy	ROC	Time	Distance	Fuel used	
[ft]	[°C]	[KIAS]	[FPM]	[MIN]	[NM]	[l]	[US Gal]
0	15	69	794	0.0	0.0	0.0	0.0
1000	13	69	788	1.3	1.5	0.7	0.2
2000	11	69	782	2.5	3.0	1.4	0.4
3000	9	69	776	3.8	4.6	2.1	0.6
4000	7	69	770	5.1	6.2	2.9	0.8
5000	5	69	763	6.4	7.9	3.6	0.9
6000	3	69	757	7.7	9.7	4.3	1.1
7000	1	69	750	9.1	11.5	5.1	1.3
8000	-1	69	743	10.4	13.4	5.8	1.5
9000	-3	69	713	11.8	15.4	6.4	1.7
10000	-5	69	682	13.2	17.6	7.0	1.9
11000	-7	69	651	14.7	19.9	7.6	2.0
12000	-9	69	619	16.3	22.4	8.2	2.2
13000	-11	69	588	17.9	25.1	8.8	2.3
14000	-13	69	556	19.7	28.0	9.4	2.5
15000	-15	69	525	21.5	31.1	10.0	2.6
16000	-17	69	493	23.5	34.5	10.6	2.8
17000	-19	69	460	25.6	38.3	11.2	3.0
18000	-21	69	428	27.9	42.3	11.8	3.1

Figure 5-3b Time, Fuel and Distance to Climb at 1089 kg (2400 lbs) (Cessna 172P only)

CRUISE PERFORMANCE, RANGE AND ENDURANCE with standard tanks 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 127.4 l (33.6 US gal) usable fuel.
2. The table assumes 4 l (1.1 US gal) for startup and taxi; time, fuel and distance to climb and 45 min. reserve.
3. Increase true airspeed (KTAS) and maximum range (NM) by 1% per 10°C above ISA temperature.
4. Cruise Power above 75% 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	131	151	33.6	8.9	383	2.9
SL	90	126	145	29.6	7.8	431	3.4
SL	80	120	138	25.8	6.8	484	4.0
SL	70	114	131	22.1	5.8	551	4.8
SL	60	106	122	18.6	4.9	624	5.9
SL	50	97	112	15.3	4.0	710	7.3
2000	100	133	154	33.6	8.9	386	2.8
2000	90	128	147	29.6	7.8	435	3.3
2000	80	122	141	25.8	6.8	489	3.9
2000	70	116	133	22.1	5.8	557	4.7
2000	60	108	124	18.6	4.9	631	5.8
2000	50	99	114	15.3	4.0	718	7.2
4000	100	136	156	33.6	8.9	392	2.8
4000	90	131	150	29.6	7.8	442	3.3
4000	80	124	143	25.8	6.8	493	3.9
4000	70	118	135	22.1	5.8	562	4.6
4000	60	110	126	18.6	4.9	637	5.7
4000	50	100	115	15.3	4.0	720	7.1
6000	100	139	159	33.6	8.9	398	2.7
6000	90	133	153	29.6	7.8	445	3.2
6000	80	127	146	25.8	6.8	501	3.8
6000	70	120	138	22.1	5.8	567	4.5
6000	60	111	128	18.6	4.9	638	5.5
6000	50	102	117	15.3	4.0	728	6.9
8000	100	141	162	33.6	8.9	401	2.6
8000	90	135	156	29.6	7.8	449	3.1
8000	80	129	148	25.8	6.8	505	3.7
8000	70	122	140	22.1	5.8	572	4.4
8000	60	113	130	18.6	4.9	644	5.4
8000	50	103	119	15.3	4.0	729	6.8
10000	90	138	159	29.6	7.8	455	3.0
10000	80	131	151	25.8	6.8	509	3.6

Press. Alt.	Load	Speed		Fuel Flow		Distance	Endu-rance Time
[ft]	[%]	[KTAS]	[mph]	[l/h]	[US Gal/h]	[NM]	[Hrs]
10000	70	124	142	22.1	5.8	576	4.3
10000	60	115	132	18.6	4.9	650	5.3
10000	50	105	120	15.3	4.0	737	6.7
12000	90	140	162	29.6	7.8	458	2.9
12000	80	134	154	25.8	6.8	516	3.5
12000	70	126	145	22.1	5.8	581	4.2
12000	60	117	134	18.6	4.9	655	5.2
12000	50	106	122	15.3	4.0	737	6.5
14000	90	143	165	29.6	7.8	465	2.8
14000	80	136	157	25.8	6.8	520	3.4
14000	70	128	147	22.1	5.8	585	4.1
14000	60	119	137	18.6	4.9	661	5.1
14000	50	108	124	15.3	4.0	744	6.4
16000	80	138	159	25.8	6.8	524	3.2
16000	70	130	150	22.1	5.8	590	4.0
16000	60	121	139	18.6	4.9	666	4.9
16000	50	109	126	15.3	4.0	745	6.2
18000	80	141	162	25.8	6.8	531	3.1
18000	70	132	152	22.1	5.8	594	3.8
18000	60	123	141	18.6	4.9	671	4.8
18000	50	111	127	15.3	4.0	751	6.1

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

CRUISE PERFORMANCE, RANGE AND ENDURANCE
with long-range tanks (Cessna 172N) 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 158.6 l (41.9 US gal) usable fuel.
2. The table assumes 4 l (1.1 US gal) for startup and taxi; time, fuel and distance to climb and 45 min. reserve.
3. Increase true airspeed (KTAS) and maximum range (NM) by 1% per 10°C above ISA temperature.
4. Cruise Power above 75% 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	131	151	33.6	8.9	505	3.9
SL	90	126	145	29.6	7.8	564	4.5
SL	80	120	138	25.8	6.8	629	5.2
SL	70	114	131	22.1	5.8	712	6.2
SL	60	106	122	18.6	4.9	802	7.6
SL	50	97	112	15.3	4.0	907	9.4
2000	100	133	154	33.6	8.9	510	3.8
2000	90	128	147	29.6	7.8	570	4.4
2000	80	122	141	25.8	6.8	636	5.2
2000	70	116	133	22.1	5.8	720	6.1
2000	60	108	124	18.6	4.9	812	7.5
2000	50	99	114	15.3	4.0	920	9.2
4000	100	136	156	33.6	8.9	519	3.7
4000	90	131	150	29.6	7.8	580	4.3
4000	80	124	143	25.8	6.8	643	5.1
4000	70	118	135	22.1	5.8	728	6.0
4000	60	110	126	18.6	4.9	822	7.3
4000	50	100	115	15.3	4.0	924	9.1
6000	100	139	159	33.6	8.9	527	3.6
6000	90	133	153	29.6	7.8	586	4.2
6000	80	127	146	25.8	6.8	655	5.0
6000	70	120	138	22.1	5.8	736	5.9
6000	60	111	128	18.6	4.9	824	7.2
6000	50	102	117	15.3	4.0	936	9.0
8000	100	141	162	33.6	8.9	532	3.5
8000	90	135	156	29.6	7.8	591	4.1
8000	80	129	148	25.8	6.8	661	4.9
8000	70	122	140	22.1	5.8	744	5.8
8000	60	113	130	18.6	4.9	834	7.1
8000	50	103	119	15.3	4.0	939	8.8
10000	90	138	159	29.6	7.8	601	4.0
10000	80	131	151	25.8	6.8	667	4.8

Press. Alt.	Load	Speed		Fuel Flow		Distance	Endu-rance Time
[ft]	[%]	[KTAS]	[mph]	[l/h]	[US Gal/h]	[NM]	[Hrs]
10000	70	124	142	22.1	5.8	751	5.7
10000	60	115	132	18.6	4.9	843	7.0
10000	50	105	120	15.3	4.0	951	8.7
12000	90	140	162	29.6	7.8	606	3.9
12000	80	134	154	25.8	6.8	678	4.7
12000	70	126	145	22.1	5.8	759	5.6
12000	60	117	134	18.6	4.9	852	6.9
12000	50	106	122	15.3	4.0	953	8.6
14000	90	143	165	29.6	7.8	616	3.8
14000	80	136	157	25.8	6.8	685	4.6
14000	70	128	147	22.1	5.8	766	5.5
14000	60	119	137	18.6	4.9	860	6.7
14000	50	108	124	15.3	4.0	964	8.4
16000	80	138	159	25.8	6.8	691	4.4
16000	70	130	150	22.1	5.8	773	5.4
16000	60	121	139	18.6	4.9	869	6.6
16000	50	109	126	15.3	4.0	967	8.3
18000	80	141	162	25.8	6.8	701	4.3
18000	70	132	152	22.1	5.8	780	5.2
18000	60	123	141	18.6	4.9	878	6.4
18000	50	111	127	15.3	4.0	977	8.1

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

CRUISE PERFORMANCE, RANGE AND ENDURANCE
with standard tanks at 1089 kg (2400 lbs)
(Cessna 172P)

Conditions:
Take-off weight 1089 kg (2400 lbs)
Flaps Up
Zero wind

Notes:
1. Endurance information is based on standard tanks with 127.4 l (33.6 US gal) usable fuel.
2. The table assumes 4 l (1.1 US gal) for startup and taxi; time, fuel and distance to climb and 45 min. reserve.
3. Increase true airspeed (KTAS) and maximum range (NM) by 1% per 10°C above ISA temperature.
4. Cruise Power above 75% 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	128	147	33.6	8.9	374	2.9
SL	90	123	141	29.6	7.8	421	3.4
SL	80	117	135	25.8	6.8	472	4.0
SL	70	111	127	22.1	5.8	537	4.8
SL	60	103	119	18.6	4.9	606	5.9
SL	50	94	108	15.3	4.0	688	7.3
2000	100	130	150	33.6	8.9	377	2.8
2000	90	125	144	29.6	7.8	424	3.3
2000	80	119	137	25.8	6.8	476	3.9
2000	70	112	129	22.1	5.8	537	4.7
2000	60	105	120	18.6	4.9	613	5.8
2000	50	96	110	15.3	4.0	696	7.2
4000	100	133	153	33.6	8.9	383	2.8
4000	90	127	146	29.6	7.8	428	3.2
4000	80	121	139	25.8	6.8	481	3.8
4000	70	114	131	22.1	5.8	542	4.6
4000	60	106	122	18.6	4.9	613	5.6
4000	50	97	111	15.3	4.0	698	7.0
6000	100	135	155	33.6	8.9	386	2.7
6000	90	129	149	29.6	7.8	431	3.1
6000	80	123	142	25.8	6.8	485	3.7
6000	70	116	134	22.1	5.8	547	4.5
6000	60	108	124	18.6	4.9	620	5.5
6000	50	98	113	15.3	4.0	698	6.9
8000	100	138	158	33.6	8.9	392	2.6
8000	90	132	152	29.6	7.8	438	3.0
8000	80	125	144	25.8	6.8	489	3.6
8000	70	118	136	22.1	5.8	552	4.4
8000	60	110	126	18.6	4.9	626	5.4
8000	50	100	115	15.3	4.0	706	6.8
10000	90	134	154	29.6	7.8	441	2.9
10000	80	128	147	25.8	6.8	496	3.5

Press. Alt.	Load	Speed		Fuel Flow		Distance	Endu-rance Time
[ft]	[%]	[KTAS]	[mph]	[l/h]	[US Gal/h]	[NM]	[Hrs]
10000	70	120	138	22.1	5.8	556	4.3
10000	60	111	128	18.6	4.9	626	5.3
10000	50	101	116	15.3	4.0	707	6.6
12000	90	137	157	29.6	7.8	447	2.8
12000	80	130	149	25.8	6.8	500	3.4
12000	70	122	140	22.1	5.8	561	4.2
12000	60	113	130	18.6	4.9	631	5.1
12000	50	102	118	15.3	4.0	707	6.5
14000	90	139	160	29.6	7.8	451	2.7
14000	80	132	152	25.8	6.8	503	3.3
14000	70	124	143	22.1	5.8	565	4.0
14000	60	115	132	18.6	4.9	636	5.0
14000	50	104	119	15.3	4.0	714	6.3
16000	80	134	155	25.8	6.8	507	3.2
16000	70	126	145	22.1	5.8	569	3.9
16000	60	117	134	18.6	4.9	641	4.8
16000	50	105	121	15.3	4.0	714	6.1
18000	80	137	157	25.8	6.8	514	3.0
18000	70	128	148	22.1	5.8	573	3.7
18000	60	118	136	18.6	4.9	641	4.7
18000	50	107	123	15.3	4.0	720	5.9

Figure 5-4c Cruise Performance, Range and Endurance
with standard tanks, Cessna 172P at 1089 kg (2400 lbs)

CRUISE PERFORMANCE, RANGE AND ENDURANCE
with long-range tanks at 1089 kg (2400 lbs)
(Cessna 172P)

Conditions:
Take-off weight 1089 kg (2400 lbs)
Flaps Up
Zero wind

Notes:
1. Endurance information is based on long-range tanks with 158.6 l (41.9 US gal) usable fuel.
2. The table assumes 4 l (1.1 US gal) for startup and taxi; time, fuel and distance to climb and 45 min. reserve.
3. Increase true airspeed (KTAS) and maximum range (NM) by 1% per 10°C above ISA temperature.
4. Cruise Power above 75% 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	128	147	33.6	8.9	493	3.9
SL	90	123	141	29.6	7.8	550	4.5
SL	80	117	135	25.8	6.8	613	5.2
SL	70	111	127	22.1	5.8	693	6.2
SL	60	103	119	18.6	4.9	779	7.6
SL	50	94	108	15.3	4.0	879	9.4
2000	100	130	150	33.6	8.9	498	3.8
2000	90	125	144	29.6	7.8	556	4.4
2000	80	119	137	25.8	6.8	620	5.1
2000	70	112	129	22.1	5.8	695	6.1
2000	60	105	120	18.6	4.9	789	7.4
2000	50	96	110	15.3	4.0	892	9.2
4000	100	133	153	33.6	8.9	507	3.7
4000	90	127	146	29.6	7.8	562	4.3
4000	80	121	139	25.8	6.8	627	5.0
4000	70	114	131	22.1	5.8	703	6.0
4000	60	106	122	18.6	4.9	791	7.3
4000	50	97	111	15.3	4.0	895	9.1
6000	100	135	155	33.6	8.9	512	3.6
6000	90	129	149	29.6	7.8	567	4.2
6000	80	123	142	25.8	6.8	633	4.9
6000	70	116	134	22.1	5.8	711	5.9
6000	60	108	124	18.6	4.9	801	7.2
6000	50	98	113	15.3	4.0	898	8.9
8000	100	138	158	33.6	8.9	520	3.5
8000	90	132	152	29.6	7.8	577	4.1
8000	80	125	144	25.8	6.8	640	4.8
8000	70	118	136	22.1	5.8	719	5.8
8000	60	110	126	18.6	4.9	810	7.1
8000	50	100	115	15.3	4.0	910	8.8
10000	90	134	154	29.6	7.8	582	4.0
10000	80	128	147	25.8	6.8	651	4.7

Press. Alt.	Load	Speed		Fuel Flow		Distance	Endu-rance Time
[ft]	[%]	[KTAS]	[mph]	[l/h]	[US Gal/h]	[NM]	[Hrs]
10000	70	120	138	22.1	5.8	726	5.7
10000	60	111	128	18.6	4.9	812	6.9
10000	50	101	116	15.3	4.0	913	8.7
12000	90	137	157	29.6	7.8	592	3.9
12000	80	130	149	25.8	6.8	657	4.6
12000	70	122	140	22.1	5.8	733	5.6
12000	60	113	130	18.6	4.9	821	6.8
12000	50	102	118	15.3	4.0	915	8.5
14000	90	139	160	29.6	7.8	597	3.8
14000	80	132	152	25.8	6.8	663	4.5
14000	70	124	143	22.1	5.8	740	5.4
14000	60	115	132	18.6	4.9	829	6.7
14000	50	104	119	15.3	4.0	926	8.3
16000	80	134	155	25.8	6.8	669	4.4
16000	70	126	145	22.1	5.8	747	5.3
16000	60	117	134	18.6	4.9	838	6.5
16000	50	105	121	15.3	4.0	928	8.2
18000	80	137	157	25.8	6.8	679	4.2
18000	70	128	148	22.1	5.8	754	5.2
18000	60	118	136	18.6	4.9	839	6.4
18000	50	107	123	15.3	4.0	938	8.0

Figure 5-4d Cruise Performance, Range and Endurance with long-range tanks, Cessna 172P at 1089 kg (2400 lbs)

CRUISE PERFORMANCE, RANGE AND ENDURANCE with Integraltanks at 1089 kg (2400 lbs) (Cessna 172P)

Conditions:
Take-off weight 1089 kg (2400 lbs)
Flaps Up
Zero wind

Notes:
1. Endurance information is based on integral tanks with 196.8 l (52 US gal) usable fuel.
2. The table assumes 4 l (1.1 US gal) for startup and taxi; time, fuel and distance to climb and 45 min. reserve.
3. Increase true airspeed (KTAS) and maximum range (NM) by 1% per 10°C above ISA temperature.
4. Cruise Power above 75% 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	128	147	33.6	8.9	638	5.0
SL	90	123	141	29.6	7.8	709	5.8
SL	80	117	135	25.8	6.8	787	6.7
SL	70	111	127	22.1	5.8	885	8.0
SL	60	103	119	18.6	4.9	990	9.6
SL	50	94	108	15.3	4.0	1114	11.9
2000	100	130	150	33.6	8.9	646	4.9
2000	90	125	144	29.6	7.8	717	5.7
2000	80	119	137	25.8	6.8	796	6.6
2000	70	112	129	22.1	5.8	889	7.9
2000	60	105	120	18.6	4.9	1005	9.5
2000	50	96	110	15.3	4.0	1132	11.7
4000	100	133	153	33.6	8.9	658	4.8
4000	90	127	146	29.6	7.8	726	5.6
4000	80	121	139	25.8	6.8	806	6.5
4000	70	114	131	22.1	5.8	900	7.8
4000	60	106	122	18.6	4.9	1009	9.4
4000	50	97	111	15.3	4.0	1137	11.6
6000	100	135	155	33.6	8.9	665	4.7
6000	90	129	149	29.6	7.8	734	5.5
6000	80	123	142	25.8	6.8	816	6.4
6000	70	116	134	22.1	5.8	912	7.6
6000	60	108	124	18.6	4.9	1023	9.3
6000	50	98	113	15.3	4.0	1143	11.4
8000	100	138	158	33.6	8.9	677	4.6
8000	90	132	152	29.6	7.8	748	5.4
8000	80	125	144	25.8	6.8	825	6.3
8000	70	118	136	22.1	5.8	923	7.5
8000	60	110	126	18.6	4.9	1036	9.1
8000	50	100	115	15.3	4.0	1160	11.3
10000	90	134	154	29.6	7.8	755	5.3
10000	80	128	147	25.8	6.8	840	6.2

Press. Alt.	Load	Speed		Fuel Flow		Distance	Endu-rance Time
[ft]	[%]	[KTAS]	[mph]	[l/h]	[US Gal/h]	[NM]	[Hrs]
10000	70	120	138	22.1	5.8	933	7.4
10000	60	111	128	18.6	4.9	1040	9.0
10000	50	101	116	15.3	4.0	1165	11.1
12000	90	137	157	29.6	7.8	769	5.2
12000	80	130	149	25.8	6.8	849	6.1
12000	70	122	140	22.1	5.8	944	7.3
12000	60	113	130	18.6	4.9	1053	8.9
12000	50	102	118	15.3	4.0	1170	11.0
14000	90	139	160	29.6	7.8	776	5.1
14000	80	132	152	25.8	6.8	858	6.0
14000	70	124	143	22.1	5.8	954	7.2
14000	60	115	132	18.6	4.9	1065	8.7
14000	50	104	119	15.3	4.0	1186	10.8
16000	80	134	155	25.8	6.8	867	5.9
16000	70	126	145	22.1	5.8	965	7.0
16000	60	117	134	18.6	4.9	1078	8.6
16000	50	105	121	15.3	4.0	1190	10.7
18000	80	137	157	25.8	6.8	882	5.7
18000	70	128	148	22.1	5.8	975	6.9
18000	60	118	136	18.6	4.9	1081	8.4
18000	50	107	123	15.3	4.0	1205	10.5

Figure 5-4e Cruise Performance, Range and Endurance
with Integraltanks, Cessna 172P at 1089 kg (2400 lbs)

SECTION 5b
PERFORMANCE

☒	Note:	This chapter applies to aircraft with propellers **MTV-6-A/190-69**. The correct propeller designation can be found on the blades.

☒	Note:	The chapter not relevant to the respective propeller can be omitted.

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 additional distances (min. 20%) 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	153	177	190	204	217	239	269
	50 ft (15 m) obstacle	240	277	297	319	340	375	424
1000	Gnd Roll	164	190	203	218	233	256	289
	50 ft (15 m) obstacle	257	297	318	342	365	402	455
2000	Gnd Roll	176	204	218	234	250	275	309
	50 ft (15 m) obstacle	276	318	341	366	391	431	487
3000	Gnd Roll	189	218	234	251	268	295	332
	50 ft (15 m) obstacle	295	341	366	393	419	462	522
4000	Gnd Roll	203	234	251	269	287	316	356
	50 ft (15 m) obstacle	317	366	392	421	450	496	561
5000	Gnd Roll	218	251	269	289	308	339	382
	50 ft (15 m) obstacle	340	393	421	452	483	532	602
6000	Gnd Roll	234	270	289	310	331	365	410
	50 ft (15 m) obstacle	365	422	452	486	518	572	646
7000	Gnd Roll	256	296	317	340	363	400	450
	50 ft (15 m) obstacle	401	463	495	532	568	627	708
8000	Gnd Roll	281	324	347	373	398	438	493
	50 ft (15 m) obstacle	439	507	543	583	623	687	776
9000	Gnd Roll	311	359	385	413	441	485	546
	50 ft (15 m) obstacle	487	562	602	646	690	761	860
10000	Gnd Roll	344	398	426	457	488	537	605
	50 ft (15 m) obstacle	539	623	667	717	765	844	954

Figure 5-1a 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	503	581	622	668	713	785	883
	50 ft (15 m) obstacle	787	909	974	1046	1116	1232	1392
1000	Gnd Roll	539	623	667	716	764	841	946
	50 ft (15 m) obstacle	843	974	1043	1120	1196	1319	1491
2000	Gnd Roll	578	668	715	767	819	901	1014
	50 ft (15 m) obstacle	904	1044	1118	1201	1282	1414	1598
3000	Gnd Roll	620	716	766	823	878	967	1088
	50 ft (15 m) obstacle	969	1120	1199	1288	1374	1517	1714
4000	Gnd Roll	665	768	822	883	942	1037	1167
	50 ft (15 m) obstacle	1040	1201	1286	1381	1475	1627	1839
5000	Gnd Roll	714	824	883	948	1011	1113	1253
	50 ft (15 m) obstacle	1116	1290	1381	1483	1583	1747	1973
6000	Gnd Roll	766	885	948	1018	1086	1196	1345
	50 ft (15 m) obstacle	1199	1385	1483	1592	1700	1876	2119
7000	Gnd Roll	840	970	1039	1115	1191	1310	1474
	50 ft (15 m) obstacle	1314	1518	1625	1745	1863	2056	2323
8000	Gnd Roll	921	1064	1139	1223	1305	1436	1616
	50 ft (15 m) obstacle	1440	1664	1782	1913	2042	2253	2546
9000	Gnd Roll	1020	1178	1261	1354	1445	1591	1790
	50 ft (15 m) obstacle	1596	1844	1974	2120	2263	2497	2822
10000	Gnd Roll	1130	1305	1397	1500	1601	1762	1983
	50 ft (15 m) obstacle	1769	2044	2189	2351	2510	2769	3129

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

GROUND ROLL AND TAKE-OFF DISTANCE at 1089 kg (2400 lbs) (Cessna 172P only)

SHORT FIELD TAKE-OFFS

Conditions:

Take-off weight 1089 kg (2400 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 additional distances (min. 20%) 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	171	198	212	228	243	267	301
	50 ft (15 m) obstacle	268	310	332	356	380	419	474
1000	Gnd Roll	184	212	227	244	260	286	322
	50 ft (15 m) obstacle	287	332	355	381	407	449	508
2000	Gnd Roll	197	227	243	261	279	307	345
	50 ft (15 m) obstacle	308	356	381	409	436	482	544
3000	Gnd Roll	211	244	261	280	299	329	370
	50 ft (15 m) obstacle	330	381	408	438	468	516	583
4000	Gnd Roll	226	262	280	301	321	353	397
	50 ft (15 m) obstacle	354	409	438	470	502	554	626
5000	Gnd Roll	243	281	301	323	344	379	427
	50 ft (15 m) obstacle	380	439	470	505	539	595	672
6000	Gnd Roll	261	301	323	347	370	407	458
	50 ft (15 m) obstacle	408	472	505	542	579	639	722
7000	Gnd Roll	286	330	354	380	405	446	502
	50 ft (15 m) obstacle	447	517	553	594	634	700	791
8000	Gnd Roll	313	362	388	416	444	489	550
	50 ft (15 m) obstacle	490	567	607	651	695	767	867
9000	Gnd Roll	347	401	429	461	492	542	609
	50 ft (15 m) obstacle	543	628	672	722	771	850	961
10000	Gnd Roll	385	444	476	511	545	600	675
	50 ft (15 m) obstacle	603	696	745	800	855	943	1065

Figure 5-1c Take-Off Distance [m] at take-off weight 1089 kg (2400 lbs) (Cessna 172P only)

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	562	649	695	746	797	877	986
	50 ft (15 m) obstacle	879	1016	1087	1168	1247	1375	1554
1000	Gnd Roll	602	696	745	800	853	939	1057
	50 ft (15 m) obstacle	942	1088	1165	1251	1336	1474	1665
2000	Gnd Roll	645	746	798	857	915	1007	1133
	50 ft (15 m) obstacle	1009	1166	1249	1341	1431	1579	1785
3000	Gnd Roll	692	799	856	919	981	1080	1215
	50 ft (15 m) obstacle	1082	1251	1339	1438	1535	1694	1914
4000	Gnd Roll	742	858	918	986	1052	1158	1303
	50 ft (15 m) obstacle	1161	1342	1437	1543	1647	1817	2053
5000	Gnd Roll	797	921	986	1058	1130	1243	1399
	50 ft (15 m) obstacle	1246	1440	1542	1656	1768	1951	2204
6000	Gnd Roll	856	989	1059	1137	1213	1335	1502
	50 ft (15 m) obstacle	1339	1547	1656	1779	1899	2095	2367
7000	Gnd Roll	938	1084	1160	1246	1330	1464	1647
	50 ft (15 m) obstacle	1467	1695	1815	1949	2081	2296	2594
8000	Gnd Roll	1028	1188	1272	1366	1458	1604	1805
	50 ft (15 m) obstacle	1608	1858	1990	2137	2281	2517	2844
9000	Gnd Roll	1139	1316	1409	1512	1614	1777	1999
	50 ft (15 m) obstacle	1782	2059	2205	2368	2528	2789	3152
10000	Gnd Roll	1262	1458	1561	1675	1788	1968	2215
	50 ft (15 m) obstacle	1976	2283	2445	2626	2803	3093	3495

Figure 5-1d Take-Off Distance [ft] at take-off weight 1089 kg (2400 lbs) (Cessna 172P only)

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] Outside Air Temperature [°C]				
		-20°C	0°C	+20°C	+40°C	+50°C
0	69	938	924	911	796	659
1000	69	932	917	904	789	651
2000	69	925	910	897	782	644
3000	69	918	903	889	774	636
4000	69	911	896	881	766	628
5000	69	904	888	874	758	620
6000	69	896	881	866	750	611
7000	69	888	873	857	741	603
8000	69	881	864	849	732	594
9000	69	847	830	814	700	563
10000	69	812	796	779	666	533
11000	69	778	761	744	633	502
12000	69	743	726	709	599	471
13000	69	708	691	673	566	439
14000	69	673	655	638	531	408
15000	69	638	619	601	497	376
16000	69	602	583	565	462	343
17000	69	566	547	528	427	311
18000	69	530	510	491	392	278

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

MAXIMUM RATE-OF-CLIMB at 1089 kg (2400 lbs)
(Cessna 172P only)

Conditions:

Take-off weight 1089 kg (2400 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] Outside Air Temperature [°C]				
		-20°C	0°C	+20°C	+40°C	+50°C
0	69	876	862	849	738	606
1000	69	870	855	841	731	598
2000	69	863	848	834	723	590
3000	69	856	841	826	715	582
4000	69	849	833	819	707	574
5000	69	841	826	811	699	566
6000	69	834	818	802	690	557
7000	69	826	810	794	682	548
8000	69	818	801	785	673	539
9000	69	785	768	752	641	510
10000	69	751	734	718	608	480
11000	69	718	700	683	576	450
12000	69	684	666	649	543	419
13000	69	650	632	614	510	388
14000	69	616	597	579	476	357
15000	69	581	562	544	443	326
16000	69	546	527	508	409	294
17000	69	511	491	472	374	262
18000	69	476	456	436	340	230

Figure 5-2b Maximum Rate of Climb at take-off weight 1089 kg (2400 lbs) (Cessna 172P only)

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.	OAT	Vy	ROC	Time	Distance	Fuel used	
[ft]	[°C]	[KIAS]	[FPM]	[MIN]	[NM]	[l]	[US Gal]
0	15	69	914	0,0	0,0	0,0	0,0
1000	13	69	908	1,1	1,3	0,6	0,2
2000	11	69	903	2,2	2,6	1,2	0,3
3000	9	69	897	3,3	4,0	1,9	0,5
4000	7	69	891	4,4	5,4	2,5	0,7
5000	5	69	885	5,6	6,9	3,1	0,8
6000	3	69	878	6,7	8,5	3,7	1,0
7000	1	69	872	7,8	10,1	4,4	1,2
8000	-1	69	865	9,0	11,8	5,0	1,3
9000	-3	69	832	10,2	13,5	5,6	1,5
10000	-5	69	800	11,4	15,4	6,1	1,6
11000	-7	69	767	12,7	17,4	6,6	1,7
12000	-9	69	733	14,0	19,5	7,1	1,9
13000	-11	69	700	15,4	21,8	7,6	2,0
14000	-13	69	667	16,9	24,3	8,1	2,1
15000	-15	69	633	18,4	27,0	8,6	2,3
16000	-17	69	599	20,0	29,8	9,1	2,4
17000	-19	69	565	21,7	32,9	9,6	2,5
18000	-21	69	530	23,6	36,3	10,1	2,7

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

TIME, FUEL AND DISTANCE TO CLIMB at 1089 KG (Cessna 172P only)

Conditions:

Take-off weight 1089 kg (2400 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.	OAT	Vy	ROC	Time	Distance	Fuel used	
[ft]	[°C]	[KIAS]	[FPM]	[MIN]	[NM]	[l]	[US Gal]
0	15	69	852	0,0	0,0	0,0	0,0
1000	13	69	846	1,2	1,4	0,7	0,2
2000	11	69	840	2,4	2,8	1,3	0,3
3000	9	69	834	3,6	4,3	2,0	0,5
4000	7	69	828	4,8	5,9	2,7	0,7
5000	5	69	822	6,0	7,5	3,3	0,9
6000	3	69	815	7,2	9,1	4,0	1,1
7000	1	69	809	8,4	10,9	4,7	1,2
8000	-1	69	802	9,7	12,7	5,4	1,4
9000	-3	69	770	10,9	14,5	6,0	1,6
10000	-5	69	738	12,3	16,6	6,5	1,7
11000	-7	69	706	13,7	18,7	7,1	1,9
12000	-9	69	674	15,1	21,1	7,7	2,0
13000	-11	69	641	16,6	23,6	8,2	2,2
14000	-13	69	609	18,2	26,3	8,7	2,3
15000	-15	69	576	19,9	29,2	9,3	2,5
16000	-17	69	543	21,7	32,3	9,8	2,6
17000	-19	69	510	23,6	35,8	10,4	2,7
18000	-21	69	476	25,6	39,5	10,9	2,9

Figure 5-3b Time, Fuel and Distance to Climb at 1089 kg (2400 lbs) (Cessna 172P only)

CRUISE PERFORMANCE, RANGE AND ENDURANCE with standard tanks 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 127.4 l (33.6 US gal) usable fuel.
2. The table assumes 4 l (1.1 US gal) for startup and taxi; time, fuel and distance to climb and 45 min. reserve.
3. Increase true airspeed (KTAS) and maximum range (NM) by 1% per 10°C above ISA temperature.
4. Cruise Power above 75% 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	125	144	33,6	8,9	365	2,9
SL	90	120	139	29,6	7,8	412	3,4
SL	80	115	133	25,8	6,8	465	4,0
SL	70	110	126	22,1	5,8	530	4,8
SL	60	103	119	18,6	4,9	608	5,9
SL	50	95	110	15,3	4,0	698	7,3
2000	100	127	147	33,6	8,9	370	2,8
2000	90	123	141	29,6	7,8	416	3,3
2000	80	118	135	25,8	6,8	470	3,9
2000	70	112	129	22,1	5,8	536	4,7
2000	60	105	121	18,6	4,9	613	5,8
2000	50	97	112	15,3	4,0	702	7,2
4000	100	130	149	33,6	8,9	374	2,7
4000	90	125	144	29,6	7,8	421	3,2
4000	80	120	138	25,8	6,8	475	3,8
4000	70	114	131	22,1	5,8	541	4,6
4000	60	107	123	18,6	4,9	618	5,6
4000	50	98	113	15,3	4,0	707	7,0
6000	100	132	152	33,6	8,9	379	2,6
6000	90	127	147	29,6	7,8	426	3,1
6000	80	122	140	25,8	6,8	480	3,7
6000	70	116	133	22,1	5,8	546	4,5
6000	60	109	125	18,6	4,9	623	5,5
6000	50	100	115	15,3	4,0	711	6,9
8000	100	135	155	33,6	8,9	383	2,5
8000	90	130	150	29,6	7,8	431	3,0
8000	80	124	143	25,8	6,8	485	3,6
8000	70	118	136	22,1	5,8	551	4,4
8000	60	111	127	18,6	4,9	628	5,4
8000	50	101	117	15,3	4,0	714	6,7
10000	90	133	153	29,6	7,8	435	2,9
10000	80	127	146	25,8	6,8	490	3,5

Press. Alt.	Load	Speed		Fuel Flow		Distance	Endu-rance Time
[ft]	[%]	[KTAS]	[mph]	[l/h]	[US Gal/h]	[NM]	[Hrs]
10000	70	120	138	22,1	5,8	556	4,2
10000	60	113	130	18,6	4,9	632	5,2
10000	50	103	118	15,3	4,0	716	6,6
12000	90	135	156	29,6	7,8	440	2,8
12000	80	129	149	25,8	6,8	495	3,4
12000	70	123	141	22,1	5,8	560	4,1
12000	60	115	132	18,6	4,9	636	5,1
12000	50	104	120	15,3	4,0	718	6,4
14000	90	138	159	29,6	7,8	445	2,7
14000	80	132	152	25,8	6,8	500	3,2
14000	70	125	144	22,1	5,8	565	3,9
14000	60	117	134	18,6	4,9	640	4,9
14000	50	105	121	15,3	4,0	718	6,2
16000	80	134	155	25,8	6,8	505	3,1
16000	70	127	146	22,1	5,8	570	3,8
16000	60	118	136	18,6	4,9	643	4,7
16000	50	107	123	15,3	4,0	717	6,0
18000	80	137	158	25,8	6,8	512	2,9
18000	70	130	149	22,1	5,8	577	3,6
18000	60	120	139	18,6	4,9	649	4,5
18000	50	107	124	15,3	4,0	718	5,8

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

CRUISE PERFORMANCE, RANGE AND ENDURANCE
with long-range tanks (Cessna 172N) 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 158.6 l (41.9 US gal) usable fuel.
2. The table assumes 4 l (1.1 US gal) for startup and taxi; time, fuel and distance to climb and 45 min. reserve.
3. Increase true airspeed (KTAS) and maximum range (NM) by 1% per 10°C above ISA temperature.
4. Cruise Power above 75% 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	125	144	33,6	8,9	482	3,9
SL	90	120	139	29,6	7,8	539	4,5
SL	80	115	133	25,8	6,8	605	5,2
SL	70	110	126	22,1	5,8	685	6,2
SL	60	103	119	18,6	4,9	781	7,6
SL	50	95	110	15,3	4,0	893	9,4
2000	100	127	147	33,6	8,9	488	3,8
2000	90	123	141	29,6	7,8	546	4,4
2000	80	118	135	25,8	6,8	612	5,1
2000	70	112	129	22,1	5,8	693	6,1
2000	60	105	121	18,6	4,9	789	7,4
2000	50	97	112	15,3	4,0	900	9,2
4000	100	130	149	33,6	8,9	495	3,7
4000	90	125	144	29,6	7,8	553	4,3
4000	80	120	138	25,8	6,8	620	5,0
4000	70	114	131	22,1	5,8	701	6,0
4000	60	107	123	18,6	4,9	797	7,3
4000	50	98	113	15,3	4,0	907	9,1
6000	100	132	152	33,6	8,9	502	3,6
6000	90	127	147	29,6	7,8	560	4,2
6000	80	122	140	25,8	6,8	628	4,9
6000	70	116	133	22,1	5,8	710	5,9
6000	60	109	125	18,6	4,9	806	7,2
6000	50	100	115	15,3	4,0	914	8,9
8000	100	135	155	33,6	8,9	509	3,5
8000	90	130	150	29,6	7,8	568	4,1
8000	80	124	143	25,8	6,8	635	4,8
8000	70	118	136	22,1	5,8	718	5,8
8000	60	111	127	18,6	4,9	813	7,0
8000	50	101	117	15,3	4,0	920	8,8
10000	90	133	153	29,6	7,8	575	4,0
10000	80	127	146	25,8	6,8	643	4,7

Press. Alt.	Load	Speed		Fuel Flow		Distance	Endu-rance Time
[ft]	[%]	[KTAS]	[mph]	[l/h]	[US Gal/h]	[NM]	[Hrs]
10000	70	120	138	22,1	5,8	726	5,6
10000	60	113	130	18,6	4,9	821	6,9
10000	50	103	118	15,3	4,0	926	8,6
12000	90	135	156	29,6	7,8	583	3,8
12000	80	129	149	25,8	6,8	651	4,6
12000	70	123	141	22,1	5,8	733	5,5
12000	60	115	132	18,6	4,9	828	6,7
12000	50	104	120	15,3	4,0	930	8,4
14000	90	138	159	29,6	7,8	590	3,7
14000	80	132	152	25,8	6,8	659	4,4
14000	70	125	144	22,1	5,8	741	5,4
14000	60	117	134	18,6	4,9	835	6,6
14000	50	105	121	15,3	4,0	933	8,2
16000	80	134	155	25,8	6,8	667	4,3
16000	70	127	146	22,1	5,8	749	5,2
16000	60	118	136	18,6	4,9	842	6,4
16000	50	107	123	15,3	4,0	935	8,0
18000	80	137	158	25,8	6,8	678	4,1
18000	70	130	149	22,1	5,8	760	5,0
18000	60	120	139	18,6	4,9	851	6,2
18000	50	107	124	15,3	4,0	937	7,8

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

CRUISE PERFORMANCE, RANGE AND ENDURANCE
with standard tanks at 1089 kg (2400 lbs)
(Cessna 172P)

Conditions:
Take-off weight 1089 kg (2400 lbs)
Flaps Up
Zero wind

Notes:
1. Endurance information is based on standard tanks with 127.4 l (33.6 US gal) usable fuel.
2. The table assumes 4 l (1.1 US gal) for startup and taxi; time, fuel and distance to climb and 45 min. reserve.
3. Increase true airspeed (KTAS) and maximum range (NM) by 1% per 10°C above ISA temperature.
4. Cruise Power above 75% 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	125	144	33,6	8,9	365	2,9
SL	90	120	138	29,6	7,8	411	3,4
SL	80	115	132	25,8	6,8	464	4,0
SL	70	109	126	22,1	5,8	529	4,8
SL	60	103	118	18,6	4,9	604	5,9
SL	50	95	109	15,3	4,0	691	7,3
2000	100	127	146	33,6	8,9	369	2,8
2000	90	122	141	29,6	7,8	415	3,3
2000	80	117	135	25,8	6,8	469	3,9
2000	70	111	128	22,1	5,8	533	4,7
2000	60	104	120	18,6	4,9	609	5,7
2000	50	96	110	15,3	4,0	695	7,2
4000	100	130	149	33,6	8,9	373	2,7
4000	90	125	144	29,6	7,8	420	3,2
4000	80	119	137	25,8	6,8	473	3,8
4000	70	113	130	22,1	5,8	538	4,6
4000	60	106	122	18,6	4,9	613	5,6
4000	50	97	112	15,3	4,0	698	7,0
6000	100	132	152	33,6	8,9	378	2,6
6000	90	127	146	29,6	7,8	424	3,1
6000	80	122	140	25,8	6,8	478	3,7
6000	70	115	133	22,1	5,8	542	4,5
6000	60	108	124	18,6	4,9	617	5,5
6000	50	99	113	15,3	4,0	700	6,8
8000	100	135	155	33,6	8,9	382	2,5
8000	90	130	149	29,6	7,8	428	3,0
8000	80	124	143	25,8	6,8	482	3,6
8000	70	118	135	22,1	5,8	547	4,3
8000	60	110	126	18,6	4,9	621	5,3
8000	50	100	115	15,3	4,0	701	6,7
10000	90	132	152	29,6	7,8	433	2,9
10000	80	126	145	25,8	6,8	486	3,4

Press. Alt.	Load	Speed		Fuel Flow		Distance	Endu-rance Time
[ft]	[%]	[KTAS]	[mph]	[l/h]	[US Gal/h]	[NM]	[Hrs]
10000	70	120	138	22,1	5,8	551	4,2
10000	60	112	128	18,6	4,9	624	5,2
10000	50	101	116	15,3	4,0	701	6,5
12000	90	135	155	29,6	7,8	437	2,7
12000	80	129	148	25,8	6,8	491	3,3
12000	70	122	140	22,1	5,8	555	4,0
12000	60	113	131	18,6	4,9	627	5,0
12000	50	102	117	15,3	4,0	700	6,3
14000	90	138	158	29,6	7,8	441	2,6
14000	80	131	151	25,8	6,8	495	3,1
14000	70	124	143	22,1	5,8	558	3,9
14000	60	115	133	18,6	4,9	629	4,8
14000	50	103	118	15,3	4,0	697	6,1
16000	80	134	154	25,8	6,8	499	3,0
16000	70	126	145	22,1	5,8	562	3,7
16000	60	117	135	18,6	4,9	631	4,6
16000	50	103	119	15,3	4,0	692	5,9
18000	80	136	157	25,8	6,8	505	2,8
18000	70	129	148	22,1	5,8	568	3,5
18000	60	119	137	18,6	4,9	635	4,4
18000	50	103	119	15,3	4,0	686	5,7

Figure 5-4c Cruise Performance, Range and Endurance
with standard tanks, Cessna 172P at 1089 kg (2400 lbs)

CRUISE PERFORMANCE, RANGE AND ENDURANCE
with long-range tanks at 1089 kg (2400 lbs)
(Cessna 172P)

Conditions:
Take-off weight 1089 kg (2400 lbs)
Flaps Up
Zero wind

Notes:
1. Endurance information is based on long-range tanks with 158.6 l (41.9 US gal) usable fuel.
2. The table assumes 4 l (1.1 US gal) for startup and taxi; time, fuel and distance to climb and 45 min. reserve.
3. Increase true airspeed (KTAS) and maximum range (NM) by 1% per 10°C above ISA temperature.
4. Cruise Power above 75% 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	125	144	33,6	8,9	481	3,9
SL	90	120	138	29,6	7,8	538	4,5
SL	80	115	132	25,8	6,8	603	5,2
SL	70	109	126	22,1	5,8	683	6,2
SL	60	103	118	18,6	4,9	777	7,6
SL	50	95	109	15,3	4,0	884	9,4
2000	100	127	146	33,6	8,9	487	3,8
2000	90	122	141	29,6	7,8	544	4,4
2000	80	117	135	25,8	6,8	610	5,1
2000	70	111	128	22,1	5,8	690	6,1
2000	60	104	120	18,6	4,9	784	7,4
2000	50	96	110	15,3	4,0	890	9,2
4000	100	130	149	33,6	8,9	494	3,7
4000	90	125	144	29,6	7,8	551	4,3
4000	80	119	137	25,8	6,8	618	5,0
4000	70	113	130	22,1	5,8	698	6,0
4000	60	106	122	18,6	4,9	791	7,3
4000	50	97	112	15,3	4,0	896	9,0
6000	100	132	152	33,6	8,9	500	3,6
6000	90	127	146	29,6	7,8	558	4,2
6000	80	122	140	25,8	6,8	625	4,9
6000	70	115	133	22,1	5,8	705	5,9
6000	60	108	124	18,6	4,9	799	7,1
6000	50	99	113	15,3	4,0	901	8,9
8000	100	135	155	33,6	8,9	507	3,4
8000	90	130	149	29,6	7,8	565	4,0
8000	80	124	143	25,8	6,8	632	4,8
8000	70	118	135	22,1	5,8	713	5,7
8000	60	110	126	18,6	4,9	805	7,0
8000	50	100	115	15,3	4,0	904	8,7
10000	90	132	152	29,6	7,8	572	3,9
10000	80	126	145	25,8	6,8	639	4,6

Press. Alt.	Load	Speed		Fuel Flow		Distance	Endu-rance Time
[ft]	[%]	[KTAS]	[mph]	[l/h]	[US Gal/h]	[NM]	[Hrs]
10000	70	120	138	22,1	5,8	720	5,6
10000	60	112	128	18,6	4,9	812	6,8
10000	50	101	116	15,3	4,0	907	8,5
12000	90	135	155	29,6	7,8	579	3,8
12000	80	129	148	25,8	6,8	646	4,5
12000	70	122	140	22,1	5,8	727	5,4
12000	60	113	131	18,6	4,9	817	6,7
12000	50	102	117	15,3	4,0	908	8,3
14000	90	138	158	29,6	7,8	586	3,6
14000	80	131	151	25,8	6,8	654	4,4
14000	70	124	143	22,1	5,8	733	5,3
14000	60	115	133	18,6	4,9	823	6,5
14000	50	103	118	15,3	4,0	907	8,1
16000	80	134	154	25,8	6,8	661	4,2
16000	70	126	145	22,1	5,8	740	5,1
16000	60	117	135	18,6	4,9	828	6,3
16000	50	103	119	15,3	4,0	903	7,9
18000	80	136	157	25,8	6,8	670	4,0
18000	70	129	148	22,1	5,8	749	4,9
18000	60	119	137	18,6	4,9	834	6,1
18000	50	103	119	15,3	4,0	897	7,7

Figure 5-4d Cruise Performance, Range and Endurance with long-range tanks, Cessna 172P at 1089 kg (2400 lbs)

CRUISE PERFORMANCE, RANGE AND ENDURANCE with Integraltanks at 1089 kg (2400 lbs) (Cessna 172P)

Conditions:
Take-off weight 1089 kg (2400 lbs)
Flaps Up
Zero wind

Notes:
1. Endurance information is based on integral tanks with 196.8 l (52 US gal) usable fuel.
2. The table assumes 4 l (1.1 US gal) for startup and taxi; time, fuel and distance to climb and 45 min. reserve.
3. Increase true airspeed (KTAS) and maximum range (NM) by 1% per 10°C above ISA temperature.
4. Cruise Power above 75% 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	125	144	33,6	8,9	623	5,0
SL	90	120	138	29,6	7,8	693	5,8
SL	80	115	132	25,8	6,8	774	6,7
SL	70	109	126	22,1	5,8	872	8,0
SL	60	103	118	18,6	4,9	988	9,6
SL	50	95	109	15,3	4,0	1120	11,9
2000	100	127	146	33,6	8,9	632	4,9
2000	90	122	141	29,6	7,8	702	5,7
2000	80	117	135	25,8	6,8	784	6,6
2000	70	111	128	22,1	5,8	883	7,9
2000	60	104	120	18,6	4,9	999	9,5
2000	50	96	110	15,3	4,0	1130	11,7
4000	100	130	149	33,6	8,9	641	4,8
4000	90	125	144	29,6	7,8	712	5,6
4000	80	119	137	25,8	6,8	794	6,5
4000	70	113	130	22,1	5,8	894	7,7
4000	60	106	122	18,6	4,9	1010	9,3
4000	50	97	112	15,3	4,0	1139	11,5
6000	100	132	152	33,6	8,9	651	4,7
6000	90	127	146	29,6	7,8	722	5,4
6000	80	122	140	25,8	6,8	805	6,4
6000	70	115	133	22,1	5,8	905	7,6
6000	60	108	124	18,6	4,9	1020	9,2
6000	50	99	113	15,3	4,0	1147	11,4
8000	100	135	155	33,6	8,9	660	4,6
8000	90	130	149	29,6	7,8	732	5,3
8000	80	124	143	25,8	6,8	816	6,3
8000	70	118	135	22,1	5,8	916	7,5
8000	60	110	126	18,6	4,9	1031	9,0
8000	50	100	115	15,3	4,0	1154	11,2
10000	90	132	152	29,6	7,8	743	5,2
10000	80	126	145	25,8	6,8	826	6,1

Press. Alt.	Load	Speed		Fuel Flow		Distance	Endu-rance Time
[ft]	[%]	[KTAS]	[mph]	[l/h]	[US Gal/h]	[NM]	[Hrs]
10000	70	120	138	22,1	5,8	926	7,3
10000	60	112	128	18,6	4,9	1041	8,9
10000	50	101	116	15,3	4,0	1159	11,0
12000	90	135	155	29,6	7,8	753	5,1
12000	80	129	148	25,8	6,8	837	6,0
12000	70	122	140	22,1	5,8	937	7,2
12000	60	113	131	18,6	4,9	1051	8,7
12000	50	102	117	15,3	4,0	1163	10,8
14000	90	138	158	29,6	7,8	764	4,9
14000	80	131	151	25,8	6,8	848	5,8
14000	70	124	143	22,1	5,8	948	7,0
14000	60	115	133	18,6	4,9	1060	8,5
14000	50	103	118	15,3	4,0	1164	10,6
16000	80	134	154	25,8	6,8	859	5,7
16000	70	126	145	22,1	5,8	958	6,8
16000	60	117	135	18,6	4,9	1068	8,3
16000	50	103	119	15,3	4,0	1161	10,4
18000	80	136	157	25,8	6,8	872	5,5
18000	70	129	148	22,1	5,8	971	6,7
18000	60	119	137	18,6	4,9	1078	8,1
18000	50	103	119	15.3	4.0	1154	10.2

Figure 5-4e Cruise Performance, Range and Endurance
with Integraltanks, Cessna 172P at 1089 kg (2400 lbs)

SECTION 6
HANDLING ON GROUND & MAINTENANCE

☒	**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

The TAE 125-02-114 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.
Notice that on warm engines 5 minutes after engine shut-off there are 80% of the entire engine oil in the oil pan and therefore visible o the oil dip stick. On warm engines oil should be added if the oil dip stick shows oil levels below 50%. After 30 minutes the real oil level is visible on the dip stick.
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-02-02. The Supplement of the Aircraft Maintenance Manual has to be considered as well, see AMM-20-02.

GEARBOX OIL

To ensure the necessary propeller speed, the engine is 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-02-02. The Supplement of the Aircraft Maintenance Manual has to be considered as well, see AMM-20-02.

☒	**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

The TAE 125-02-114 engine can be operated with kerosene(JET A-1, Jet A, Fuel No.3, JP-8, TS-1) or Diesel fuel. Due to the higher specific density of JET A-1 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 Operations and Maintenance Manual, see OM-02-02. The Supplement of the Aircraft Maintenance Manual has to be considered as well, see AMM-20-02.

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

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SECTION 7
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 (11.4 l to 0.84 kg/l)		1.17	
long-range tanks (15.0 l to 0.84 kg/l)		1.17	
integraltanks (22.8 l to 0.84 kg/l)		1.17	
plus Coolant (6 l to 1.0 kg/l)		-0.26	
Changes in Equipment			
Basic Empty Weight			

Figure 7-1 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), Standard tanks (127.4 l max.) Long-range tanks (158.6 l max.) Integral tanks (196.8 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 (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 combinded weight capacity for Baggage Areas 1 and 2 is 54 kg.		

Figure 7-2 Calculating Weight and Moment

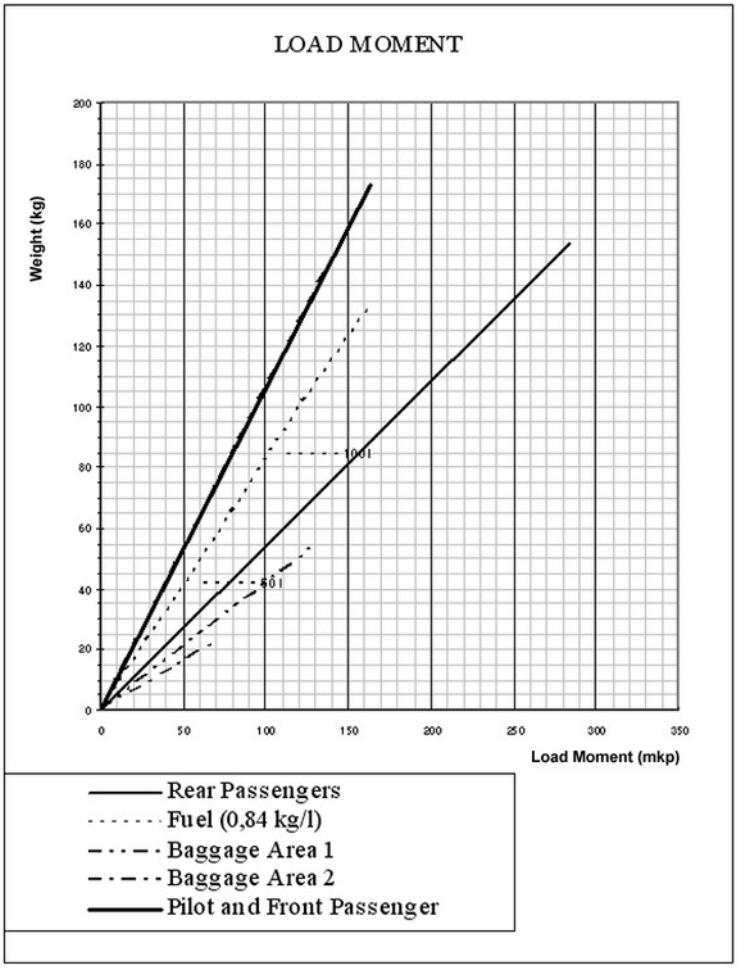

Figure 7-3 Load Moment

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SECTION 8
SPECIAL EQUIPMENT
EQUIPMENT LIST

CARBURETOR AIR TEMPERATURE GAGE

N/A

QUICK OIL DRAIN VALVE

N/A

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SECTION 9
SUPPLEMENTS

TABLE OF CONTENTS

No supplements

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