Supplement
Pilot’s Operating Handbook
for
Piper

Piper PA-28-151 - Cherokee Warrior
Piper PA-28-161 - Cadet, Warrior II & III

Equipped with TAE 125-114 Installation
CENTURION 2.0S

Issue 1

MODEL No. ____________________________
SERIAL No. ____________________________
REGISTRATION No. ____________________________

This supplement must be attached to the EASA approved Pilot’s Operating Handbook when the TAE 125 installation has been installed in accordance with EASA STC 10014364.

The information contained in this supplement supersedes or adds to the EASA approved Pilot’s Operating Handbook and FAA approved AFM 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 STC No. 10014364.

TAE-Nr.: 40-0310-40121
**LOG OF REVISIONS**

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<td>April 2012</td>
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Approval

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

General Remark

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

<table>
<thead>
<tr>
<th>Unit [abbr.]</th>
<th>Conversion factor SI to US / Imperial</th>
<th>Conversion factor US / Imperial to SI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( l ) / 0.9464 = [US qt]</td>
<td>[US qt] / 0.9464 = [l]</td>
</tr>
<tr>
<td></td>
<td>( l ) / 4.5460 = [Imp gal]</td>
<td>[Imp gal] / 4.5460 = [l]</td>
</tr>
<tr>
<td></td>
<td>( l ) x 61.024 = [in³]</td>
<td>[in³] / 61.024 = [l]</td>
</tr>
<tr>
<td>US gallon [US gal]</td>
<td></td>
<td>[US gal] x 3.7854 = [l]</td>
</tr>
<tr>
<td>US quart [US qt]</td>
<td></td>
<td>[US qt] x 0.9464 = [l]</td>
</tr>
<tr>
<td>Imperial gallon [Imp gal]</td>
<td></td>
<td>[Imp gal] x 4.5460 = [l]</td>
</tr>
<tr>
<td>Cubic inch [in³]</td>
<td></td>
<td>[in³] / 61.024 = [l]</td>
</tr>
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</table>

#### TORQUE

<table>
<thead>
<tr>
<th>Unit [abbr.]</th>
<th>Conversion factor SI to US / Imperial</th>
<th>Conversion factor US / Imperial to SI</th>
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</thead>
<tbody>
<tr>
<td>Kilopondmeter [kpm]</td>
<td></td>
<td>[kpm] x 7.2331 = [ft.lb]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[kpm] x 86.7962 = [in.lb]</td>
</tr>
<tr>
<td>Foot pound [ft.lb]</td>
<td></td>
<td>[ft.lb] / 7.2331 = [kpm]</td>
</tr>
<tr>
<td>Inch pound [in.lb]</td>
<td></td>
<td>[in.lb] / 86.7962 = [kpm]</td>
</tr>
</tbody>
</table>

#### TEMPERATURE

<table>
<thead>
<tr>
<th>Unit [abbr.]</th>
<th>Conversion factor SI to US / Imperial</th>
<th>Conversion factor US / Imperial to SI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Degree Celsius [ºC]</td>
<td></td>
<td>[ºC] x 1.8 + 32 = [ºF]</td>
</tr>
<tr>
<td>Degree Fahrenheit [ºF]</td>
<td></td>
<td>([ºF] - 32) / 1.8 = [ºC]</td>
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</table>

#### SPEED

<table>
<thead>
<tr>
<th>Unit [abbr.]</th>
<th>Conversion factor SI to US / Imperial</th>
<th>Conversion factor US / Imperial to SI</th>
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</thead>
<tbody>
<tr>
<td>Kilometers per hour [km/h]</td>
<td></td>
<td>[km/h] / 1.852 = [kts]</td>
</tr>
<tr>
<td>Meters per second [m/s]</td>
<td></td>
<td>[m/s] / 1.609 = [mph]</td>
</tr>
<tr>
<td>Miles per hour [mph]</td>
<td></td>
<td>[mph] / 196.85 = [fpm]</td>
</tr>
<tr>
<td>Knots [kts]</td>
<td></td>
<td>[kts] x 1.852 = [km/h]</td>
</tr>
<tr>
<td>Feet per minute [fpm]</td>
<td></td>
<td>[fpm] / 196.85 = [m/s]</td>
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</table>
### PRESSURE

<table>
<thead>
<tr>
<th>Unit [Abbr.]</th>
<th>Conversion factor SI to US / Imperial</th>
<th>Conversion factor US / Imperial to SI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bar [bar]</td>
<td>[bar] x 14.5038 = [psi]</td>
<td>[psi] / 14.5038 = [bar]</td>
</tr>
<tr>
<td>Hectopascal [hpa]</td>
<td>[hpa] / 33.864 = [inHg]</td>
<td>[inHg] x 33.864 = [hpa]</td>
</tr>
<tr>
<td>Millibar [mbar]</td>
<td>[mbar] / 33.864 = [inHg]</td>
<td>[inHg] x 33.864 = [mbar]</td>
</tr>
<tr>
<td>Pounds per square inch [psi] inches of mercury column [inHg]</td>
<td>[inHg] x 33.864 = [mbar]</td>
<td>[mbar] / 33.864 = [inHg]</td>
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</tbody>
</table>

### MASS

<table>
<thead>
<tr>
<th>Unit [Abbr.]</th>
<th>Conversion factor SI to US / Imperial</th>
<th>Conversion factor US / Imperial to SI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kilogramm [kg]</td>
<td>[kg] / 0.45359 = [lb]</td>
<td>[lb] x 0.45359 = [kg]</td>
</tr>
<tr>
<td>Pound [lb]</td>
<td>[lb] x 0.45359 = [kg]</td>
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### LENGTH

<table>
<thead>
<tr>
<th>Unit [Abbr.]</th>
<th>Conversion factor SI to US / Imperial</th>
<th>Conversion factor US / Imperial to SI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meter [m]</td>
<td>[m] / 0.3048 = [ft]</td>
<td>[ft] x 0.3048 = [m]</td>
</tr>
<tr>
<td>Millimeter [mm]</td>
<td>[mm] / 25.4 = [in]</td>
<td>[in] x 25.4 = [mm]</td>
</tr>
<tr>
<td>Kilometer [km]</td>
<td>[km] / 1.852 = [nm]</td>
<td>[nm] x 1.852 = [km]</td>
</tr>
<tr>
<td>Inch [in]</td>
<td>[in] x 25.4 = [mm]</td>
<td>[mm] / 0.3048 = [in]</td>
</tr>
<tr>
<td>Foot [ft]</td>
<td>[ft] x 0.3048 = [m]</td>
<td>[m] / 0.3048 = [ft]</td>
</tr>
<tr>
<td>Nautical mile [nm]</td>
<td>[nm] x 1.852 = [km]</td>
<td>[km] / 1.852 = [nm]</td>
</tr>
<tr>
<td>Statute mile [sm]</td>
<td>[sm] x 1.609 = [km]</td>
<td>[km] / 1.609 = [sm]</td>
</tr>
</tbody>
</table>

### FORCE

<table>
<thead>
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<th>Unit [Abbr.]</th>
<th>Conversion factor SI to US / Imperial</th>
<th>Conversion factor US / Imperial to SI</th>
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</thead>
<tbody>
<tr>
<td>Newton [N]</td>
<td>[N] / 4.448 = [lb]</td>
<td>[lb] x 4.448 = [N]</td>
</tr>
<tr>
<td>Decanewton [daN]</td>
<td>[daN] / 0.4448 = [lb]</td>
<td>[lb] x 0.4448 = [daN]</td>
</tr>
<tr>
<td>Pound [lb]</td>
<td>[lb] x 4.448 = [N]</td>
<td>[N] / 4.448 = [lb]</td>
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</table>

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<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tr>
<td>TAE</td>
<td>Thielert Aircraft Engines GmbH, developing and manufacturing company of TAE 125</td>
</tr>
<tr>
<td>FADEC</td>
<td>Full Authority Digital Engine Control</td>
</tr>
<tr>
<td>CED 125</td>
<td>Compact Engine Display Multifunctional instrument for indication of engine data of TAE 125</td>
</tr>
<tr>
<td>AED 125</td>
<td>Auxiliary Engine Display Multifunctional instrument for indication of engine and airplane data</td>
</tr>
</tbody>
</table>
SECTION 1
GENERAL

CONVENTIONS IN THIS HANDBOOK

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

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

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

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

UPDATE AND REVISION OF THE MANUAL

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

◆ Note: The TAE-No. of this POH supplement is published on the cover sheet of this supplement.
ENGINE
Engine manufacturer: Thielert Aircraft Engines GmbH
Engine model: Centurion 2.0S (TAE 125-02-114)

The Centurion 2.0 S 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. The engine is controlled by a FADEC system. The propeller is driven by a built-in gearbox (i = 1.69) with mechanical vibration damping and overload release. The engine has an electrical self starter and an alternator.

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

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

⚠️ WARNING  The engine requires an electrical power source for operation. If the main battery and alternator fail simultaneously, the engine will only operate on A-FADEC for maximum 30 minutes on FADEC backup battery power. Therefore, it is important to pay attention to indications of alternator failure.
PROPELLER
Manufacturer: MT Propeller Entwicklung GmbH
Model: MTV-6-A/187-129
Number of blades: 3
Diameter: 1.87 m (73.6 in)
Type: Variable-pitch propeller (constant speed)

LIQUIDS

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

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

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

Gearbox oil: Shell Spirax S6 GXME 75W-80
............................. Shell Spirax S4 G 75W-90
............................. Shell Spirax EP 75W-90
............................. Shell Getriebeöl EP 75W-90 API GL-4
............................. Shell Spirax GSX 75W-80 GL-4

■ CAUTION: Use the approved oil with exact designation only.
Coolant: ................. Water/Radiator Protection at a ratio of 50:50
Radiator Protection: ........... BASF Glysantin Protect Plus/G48
.............................................. Mobil Antifreeze Extra/G48
............................................. ESSO Antifreeze Extra/G48
..................................... Comma Xstream Green - Concentrate/G48
........................................................ Zerex Glysantin G48

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

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

◆ Note: The freezing point of the coolant is -36°C (-32.8°F).
SECTION 2
LIMITATIONS

AIRSPEED LIMITATIONS
No change

AIRSPEED INDICATION MARKINGS
No change

ENGINE OPERATING LIMITS
Engine manufacturer: Thielert Aircraft Engines GmbH
Engine model: Centurion 2.0S (TAE-125-02-114)
Take-off and Max. continuous power: 114 kW (155 HP)
Take-off and Max. continuous RPM: 2300 rpm
Max. recommended cruise: 85%

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

⚠️ 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.

◆ Note: This change of the original aircraft is certified up to an altitude of 16400 ft (5000m).
Engine operating limits for take-off and continuous operation:

\[ \textbf{WARNING:} \quad \text{It is not allowed to start the engine outside of these temperature limits.} \]

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: \(-32^\circ\text{C} (-25.6^\circ\text{F})\)
- Minimum operating limit temperature: \(50^\circ\text{C} (122^\circ\text{F})\)
- Maximum operating limit temperature: \(140^\circ\text{C} (284^\circ\text{F})\)

**Coolant temperature**
- Minimum engine starting temperature: \(-32^\circ\text{C} (-25.6^\circ\text{F})\)
- Minimum operating limit temperature: \(60^\circ\text{C} (140^\circ\text{F})\)
- Maximum operating limit temperature: \(105^\circ\text{C} (221^\circ\text{F})\)

**Gearbox temperature**
- Minimum operating limit temperature: \(-30^\circ\text{C} (-22^\circ\text{F})\)
- Maximum operating limit temperature: \(120^\circ\text{C} (248^\circ\text{F})\)
Fuel Temperature

Min. fuel temperature limits in the fuel tank:

<table>
<thead>
<tr>
<th>Fuel</th>
<th>Minimum permissible fuel temperature in the fuel tank before take-off</th>
<th>Minimum permissible fuel temperature in the fuel tank during the flight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diesel</td>
<td>greater than 0° (32°F)</td>
<td>-5° (23°F)</td>
</tr>
</tbody>
</table>

Table 2-1 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 observed. 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 (14.5psi)
Minimum oil pressure (at Take-off power): ......2.3 bar (33.4 psi)
Minimum oil pressure (in flight): ..................... 2.3 bar (33.4 psi)
Maximum oil pressure: ..........................................6.0 bar (87 psi)
Maximum oil pressure (cold start < 20 sec.):.....6.5 bar (94.3 psi)
Maximum oil consumption: .................................0.1 l/h (0.1 quart/h)
ENGINE INSTRUMENT MARKINGS

The engine data of the Centurion 2.0S installation to be monitored are integrated in the combined engine instrument CED-125.

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

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Red range</th>
<th>Amber range</th>
<th>Green range</th>
<th>Amber range</th>
<th>Red range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tachometer [RPM]</td>
<td>--------</td>
<td>-----------</td>
<td>0-2300</td>
<td>--------</td>
<td></td>
</tr>
<tr>
<td>Oil pressure [bar]</td>
<td>0-1.2</td>
<td>1.2-2.3</td>
<td>2.3-5.2</td>
<td>5.2-6.0</td>
<td>&gt; 6.0</td>
</tr>
<tr>
<td>Oil pressure [psi]</td>
<td>0-17.4</td>
<td>17.4-33.4</td>
<td>33.4-75.4</td>
<td>75.4-87.0</td>
<td>&gt; 87.0</td>
</tr>
<tr>
<td>Coolant temperature [°C]</td>
<td>&lt; -32</td>
<td>-32...+60</td>
<td>60-101</td>
<td>101-105</td>
<td>&gt; 105</td>
</tr>
<tr>
<td>Coolant temperature [°F]</td>
<td>&lt; -25.6</td>
<td>-25.6+140</td>
<td>140-214</td>
<td>214-221</td>
<td>&gt; 221</td>
</tr>
<tr>
<td>Oil temperature [°C]</td>
<td>&lt; -32</td>
<td>-32...+50</td>
<td>50-125</td>
<td>125-140</td>
<td>&gt; 140</td>
</tr>
<tr>
<td>Oil temperature [°F]</td>
<td>&lt; -25.6</td>
<td>-25.6+122</td>
<td>122+257</td>
<td>257-284</td>
<td>&gt; 284</td>
</tr>
<tr>
<td>Gearbox temperature [°C]</td>
<td>--------</td>
<td>-----------</td>
<td>&lt; 115</td>
<td>115-120</td>
<td>&gt; 120</td>
</tr>
<tr>
<td>Gearbox temperature [°F]</td>
<td>--------</td>
<td>-----------</td>
<td>&lt; 239</td>
<td>239-248</td>
<td>&gt; 248</td>
</tr>
<tr>
<td>Load [%]</td>
<td>--------</td>
<td>-----------</td>
<td>0-100</td>
<td>-----------</td>
<td>--------</td>
</tr>
</tbody>
</table>

Table 2-2 Markings of the engine instruments

Figure 2-1a AED
Figure 2-1b CED
Note: If an engine reading is in the amber or red range, the caution light is activated. It only extinguishes when the "CED/AED-Test/Confirm" button is pressed. If this button is pressed longer than a second, a selftest of the instrument is initiated.
WEIGHT LIMITS

PA 28-151 Cherokee Warrior (normal category):
  Maximum Ramp Weight: .................. 1056 kg (2327 lbs)
  Maximum Takeoff Weight: ............... 1055 kg (2325 lbs)
  Maximum Landing Weight ............... 1055 kg (2325 lbs)

PA 28-151 (utility category):
  Maximum Ramp Weight: .................. 886 kg (1953 lbs)
  Maximum Takeoff Weight: ............... 885 kg (1950 lbs)
  Maximum Landing Weight ............... 885 kg (1950 lbs)

PA 28-161 Cherokee Warrior II & Cadet (S/N 28-7716001 through 28-8216300 & S/N 2841001 through 2841365):
  Maximum Ramp Weight: .................. 1056 kg (2327 lbs)
  Maximum Takeoff Weight: ............... 1055 kg (2325 lbs)
  Maximum Landing Weight ............... 1055 kg (2325 lbs)

PA 28-161 Warrior II (S/N 28-8316001 through 28-8616057 & 2816001 through 2816109)
PA 28-161 Warrior III (S/N 2816110 through 2816119 & 2842001 and up):
  Maximum Ramp Weight: .................. 1110 kg (2447 lbs)
  Maximum Takeoff Weight: ............... 1107 kg (2440 lbs)
  Maximum Landing Weight ............... 1107 kg (2440 lbs)

PA 28-161 (utility category):
  Maximum Ramp Weight: .................. 917 kg (2022 lbs)
  Maximum Takeoff Weight: ............... 916 kg (2020 lbs)
  Maximum Landing Weight ............... 916 kg (2020 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

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

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

KINDS OF OPERATION EQUIPMENT LIST

No change
PERMISSIBLE FUEL GRADES

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

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

MAXIMUM FUEL QUANTITIES

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

2 standard tanks: .................................... each 85.2 l (22.5 US gal)
Total capacity: .................................................. 170.4 l (45 US gal)
Total usable fuel: .............................................. 162.8 l (43 US gal)
Total unusable fuel: .................................................. 7.6 l (2 US gal)

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

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

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

Gearbox oil:.............................. Shell Spirax S6 GXME 75W-80
.............................. Shell Spirax S4 G 75W-90
.............................. Shell Spirax EP 75W-90
.............................. Shell Getriebeöl EP 75W-90 API GL-4
.............................. Shell Spirax GSX 75W-80 GL-4

■ CAUTION: Use the approved oil with exact designation only.
PLACARDS

Near the fuel tank caps:

Normal Category

JET A-1 / Diesel Fuel
CAP. 81.0 LITER (21.5 U.S. GAL.) USABLE
TO BOTTOM OF FILLER INDICATOR TAB

Utility Category

JET A-1 / Diesel Fuel
CAP. 57.0 LITER (15 U.S. GAL.) USABLE

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

"Oil, see POH supplement"

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

„ATTENTION 12 V DC OBSERVE CORRECT POLARITY“

OR

„ATTENTION 24 V DC OBSERVE CORRECT POLARITY“
SECTION 3
EMERGENCY PROCEDURES
INDEX OF CHECKLISTS

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

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

EMERGENCY PROCEDURES CHECK LIST

ENGINE FIRE WHEN STARTING ENGINE ON GROUND

(1) Engine Master - OFF
(2) Fuel Selector - CLOSED
(3) Electrical Fuel Pump - OFF
(4) Switch “Battery” - OFF
(5) Extinguish the flames with a fire extinguisher, wool blankets or sand.
(6) Examine the fire damages thoroughly and repair or replace the damaged parts before the next flight.
ENGINE MALFUNCTION
DURING TAKE-OFF (ON GROUND)
- Take-off abort -

(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) Circuit Breaker or Switch "Alternator", Switches "Main Bus" and "Battery" - OFF

IMMEDIATELY AFTER TAKE-OFF
- Take-off abort -

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.............................. 73 KIAS (wing flaps retracted)
............................. 65 KIAS (wing flaps extended)
(2) Fuel Selector - CLOSED
(3) Engine Master - OFF
(4) Wing flaps - as required (40° is recommended)
(5) Circuit Breaker or Switch "Alternator", Switches "Main Bus" and "Battery" - OFF
LOSS OF ENGINE POWER DURING FLIGHT
(1) Push Thrust Lever full forward (Take-off position).
(2) Fuel Selector to tank with sufficient fuel quantity and temperature
(3) Electrical Fuel Pump - ON
(4) Establish Best Glide Speed
(5) Check engine parameters (FADEC lights, oil pressure and temperature, fuel quantity)

If normal engine performance 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 before the next flight.

EMERGENCY LANDING WITH ENGINE OUT
If all attempts to restart the engine fail and an emergency landing is imminent, select suitable site and proceed as follows:
(1) When field can easily be reached slow down to 63 KIAS for shortest landing.
(2) Fuel Selector - CLOSED
(3) Engine Master - OFF
(4) Flaps - as required (40° is recommended)
(5) Circuit Breaker or Switch "Alternator", Switches "Main Bus" and Battery" - OFF
(6) Seat belts and harnesses - TIGHT
(7) Touch-down-slightly nose up attitude
(8) Brake firmly

◆ Note: Gliding Distance. Refer to Figure "Glide range" in Section 5 of this Supplement to the Pilot’s Operating Handbook.
Fires

ENGINE FIRE DURING TAKE-OFF (ON GROUND)

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

ENGINE FIRE IN FLIGHT

1. Engine Master - OFF
2. Fuel Selector - CLOSED
3. Select an appropriate airspeed to avoid engine overspeed
4. Electrical Fuel Pump - OFF (if in use)
5. Switch “Main Bus” - OFF
6. Cabin heat and defroster - OFF
7. Perform emergency landing (as described in the procedure “Emergency Landing With Engine Out”)

ELECTRICAL FIRE IN FLIGHT

The first signs of an electrical fire is usually the odour of burning or smouldering insulation. Proceed as follows:

1. Switch “Main Bus” - OFF
2. Switch “Avionics” - OFF
3. Vents - OPEN
4. Cabin Heat - OFF
5. Fire Extinguisher – Activate (if available)
If there is evidence of continued electrical fire, consider turning off battery and alternator.

**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.

If the FADEC Backup battery is not installed this will shut down the engine and require an emergency landing. The engine has been demonstrated to continue operating for a maximum of 30 minutes when powered by the FADEC Backup battery only.

(6) Check Circuit Breaker, do not reset if open
(7) Switch “Main Bus” - ON
(8) Switch “Avionics” - ON

**WARNING:** Turn on only electrical equipment required to continue flight depending on the situation and land as soon as practical. Do only switch ON one at a time, with delay after each.
LOSS OF OIL PRESSURE
(<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 longer
climbouts at low airspeed engine
temperatures could rise into the amber
range and trigger the caution light. This
warning allows the pilot to avoid
overheating of the engine as follows:
(1) Increase airspeed by decreasing the
   pitch angle
(2) Reduce power, if the engine
   temperature approaches the red area

LOSS OF FUEL PRESSURE
Not applicable for TAE 125 installation
HIGH OIL TEMPERATURE (“OT” in red range)
(1) Increase airspeed and reduce power as quickly as possible
(2) Check the oil pressure: if the oil pressure is lower than normal (<2.3 bar at 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 normal range:
   i) Land as soon as practical.

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

“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) As far as coolant temperature and/or oil temperature are rising into amber or red range,
   i) Land as soon as practical.
   ii) Be prepared for an emergency landing.
   iii) Expect an engine failure.

HIGH GEARBOX TEMPERATURE (“GT” in red range)
(1) Reduce power to 55% - 75% as quickly as possible
(2) Land as soon as practical
ELECTRICAL POWER SUPPLY SYSTEM MALFUNCTIONS

**CAUTION:** The Centurion 2.0S requires an electrical power source for its operation. If the alternator fails, continued engine operation time is dependant upon the remaining capacity of the main battery, the FADEC backup battery (if installed) and equipment powered. The engine has been demonstrated to continue operating for approximately 120 minutes based upon the following assumptions:

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Time switched on in [min]</th>
<th>in [%]</th>
</tr>
</thead>
<tbody>
<tr>
<td>NAV/COM 1 receiving</td>
<td>ON</td>
<td>120</td>
</tr>
<tr>
<td>NAV/COM 1 transmitting</td>
<td>ON</td>
<td>12</td>
</tr>
<tr>
<td>NAV/COM 2 receiving</td>
<td>OFF</td>
<td>0</td>
</tr>
<tr>
<td>NAV/COM 2 transmitting</td>
<td>OFF</td>
<td>0</td>
</tr>
<tr>
<td>GPS</td>
<td>ON</td>
<td>60</td>
</tr>
<tr>
<td>Transponder</td>
<td>ON</td>
<td>120</td>
</tr>
<tr>
<td>Fuel Pump</td>
<td>OFF</td>
<td>0</td>
</tr>
<tr>
<td>AED-125</td>
<td>ON</td>
<td>120</td>
</tr>
<tr>
<td>Battery Ignition Relay</td>
<td>ON</td>
<td>120</td>
</tr>
<tr>
<td>CED-125</td>
<td>ON</td>
<td>120</td>
</tr>
<tr>
<td>Landing Light</td>
<td>ON</td>
<td>12</td>
</tr>
<tr>
<td>Flood Light</td>
<td>ON</td>
<td>1.2</td>
</tr>
<tr>
<td>Pilot Heat</td>
<td>ON</td>
<td>24</td>
</tr>
<tr>
<td>Wing Flaps</td>
<td>ON</td>
<td>1.2</td>
</tr>
<tr>
<td>Interior Lightning</td>
<td>OFF</td>
<td>0</td>
</tr>
<tr>
<td>Navigation Lights</td>
<td>OFF</td>
<td>0</td>
</tr>
<tr>
<td>Beacon Lights</td>
<td>OFF</td>
<td>0</td>
</tr>
<tr>
<td>Strobe Lights</td>
<td>OFF</td>
<td>0</td>
</tr>
<tr>
<td>ADF</td>
<td>OFF</td>
<td>0</td>
</tr>
<tr>
<td>Intercom</td>
<td>OFF</td>
<td>0</td>
</tr>
<tr>
<td>Turn Indicator</td>
<td>OFF</td>
<td>0</td>
</tr>
<tr>
<td>Engine control system</td>
<td>ON</td>
<td>120</td>
</tr>
</tbody>
</table>
■ CAUTION: This table only gives a reference point. The pilot should turn off all nonessential items and supply power only to equipment which is absolutely necessary for continued flight depending upon the situation. If deviated from this recommendation, the remaining engine operating time may change.

▲ WARNING: If the power supply from both alternator and main battery is interrupted, continued engine operation is dependant on the remaining capacity of the FADEC backup battery (if installed). The engine has been demonstrated to continue operating for 30 minutes when powered by the FADEC backup battery only. In this case, all electrical equipment will not operate:
- land immediately
- do not switch the „FORCE-B“ switch, this will shut down the engine
ALTERNATOR WARNING LIGHT ILLUMINATES DURING NORMAL ENGINE OPERATION

(1) Ammeter - CHECK
(2) Circuit Breaker or Switch "Alternator" CHECK - ON

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

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

(5) The pilot should
   i) Land as soon as practical.
   ii) Be prepared for an emergency landing.
   iii) Expect an engine failure.
AMMETER SHOWS BATTERY DISCHARGE DURING NORMAL ENGINE OPERATION FOR MORE THAN 5 MINUTES

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

(1) Circuit Breaker or Switch “Alternator” 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!

(2) Battery Switch CHECK - ON

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

(4) The pilot should,
   i) Land as soon as practical.
   ii) Be prepared for an emergency landing.
   iii) Expect an engine failure.
TOTAL ELECTRICAL FAILURE
(all equipment inoperative, except engine)

▲ WARNING: If the power supply from both alternator and main battery is interrupted simultaneously, continued engine operation is dependant on the remaining capacity of the FADEC backup battery. The engine has been demonstrated to continue operating for 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.

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

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

◆ 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.

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

Both FADEC Lights are flashing

◆ Note: The load display may not correspond to the actual value.

(1) Press FADEC testknob at least 2 seconds
(2) FADEC Light extinguished (LOW category warning):
   a) Continue flight normally
   b) Inform service center after landing
(3) FADEC Light steadily illuminated (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 tank was flown dry, proceed at the first signs of insufficient fuel feed as follows:
   a) Immediately switch the Fuel Selector to tank with sufficient fuel quantity.
   b) Electrical Fuel Pump - ON
   c) Select an appropriate airspeed to avoid engine overspeed.
   d) Check the engine (engine parameters, airspeed / altitude change, whether the engine responds to changes in the Thrust Lever position).
   e) If the engine acts normally, continue the flight and land as soon as practical.

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

ABNORMAL ENGINE BEHAVIOR
If the engine acts abnormally during flight and the system does not automatically switch to the B-FADEC, it is possible to switch to the B-FADEC manually.
(1) Select an appropriate airspeed to avoid engine overspeed

**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.

(2) "Force B" switch - SELECT manually to B-FADEC
(3) Flight may be continued, but the pilot should:
   i) Select an appropriate airspeed to avoid engine overspeed.
   ii) Land as soon as practical
   iii) Be prepared for an emergency landing

**SPIN RECOVERY**
No change for the TAE 125 installation

**OPEN DOOR**
No change for the TAE 125 installation
ROUGH ENGINE OPERATION

ENGINE MALFUNCTION DURING FLIGHT

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

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

(1) Immediately switch the Fuel Selector to tank with sufficient fuel quantity
(2) Electrical Fuel Pump - ON
(3) Check the engine (engine parameters, airspeed/altitude change, whether the engine responds to changes in the Thrust Lever position)
(4) If the engine acts normally, continue the flight and land as soon as practical.

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

PROPELLER RPM TOO HIGH

with propeller RPM between 2,300 and 2,400 for more than 20 seconds or over 2,400:

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

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

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

1. Change the power setting and attempt to find a 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, reduce power to 55% - 75% or select a power level where the propeller RPM fluctuations are minimum. Fly at an airspeed below 110 KIAS and land as soon as practical.

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 appropriate airspeed to avoid engine overspeed.
2. Engine Master - OFF.
3. Fuel Selector - CLOSED.
4. Electrical Fuel Pump - OFF (if in use).
5. If the propeller also has to be stopped (for instance, due to excessive vibrations):
   i) Reduce airspeed to below 55 KIAS.
   ii) when the propeller is stopped, continue to glide at 73 KIAS.
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 (maximal 100 KIAS)
2. Glide below 13000 ft
3. Fuel Selector to tank with sufficient fuel quantity and temperature
4. Electrical Fuel Pump - ON
5. Thrust Lever - IDLE
6. Engine Master OFF, than ON (if the propeller does not turn, then additionally “Starter” ON)
7. Check the engine power: Thrust Lever 100%, engine parameters, check altitude and airspeed

◆ 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 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 jammed, do not use the starter

◆ Note: If the Engine Master is in position OFF, the load display shows 0% even if the propeller is turning.

CARBURETOR ICING

Not applicable for TAE 125 installation.
FLIGHT IN ICING CONDITIONS

▲ WARNING: Flight into known icing conditions is prohibited.

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. Cabin heat control full 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 unexplained loss in engine power could be caused by ice blocking the air intake filter. Opening the "Alternate Air Door" allows preheated air from the engine compartment to be aspirated.
6. Plan a landing at the nearest airfield. With an extremely rapid ice build up, select a suitable "off airfield" landing side.
7. With an ice accumulation of 0.5 cm or more on the wing leading edges, a significantly higher stall speed should be expected.
8. Leave wing flaps retracted. With a severe ice build up on the horizontal tail, the change in wing wake airflow direction caused by wing flap extension could result in a loss of elevator effectiveness.
9. Open left window, if practical, scrape ice from a portion of the windshield for visibility in the landing approach.
10. Perform a landing approach using a forward slip, if necessary, for improved visibility.
11. Approach at increased airspeed depending upon the amount of the accumulation.
12. Perform a landing in level attitude.
SECTION 4
NORMAL PROCEDURES

PREFLIGHT INSPECTION

PREPARATION
Airplane status ........................................... airworthy, papers on board
Logbook ...................................................... CHECK refuelling with allowed fuel (see section 2)
Weather ............................................................... suitable
Baggage ............................................................... weighed, stowed, tied
Weight and CG .................................................. within limits
Navigation .......................................................... planned
Charts and navigation equipment .................. on board
Performance and range ...................................... computed and safe
COCKPIT
(1) Control wheel.................................release belts
(2) Avionics ..................................................OFF
(3) Parking brake ........................................SET
(4) Electric switches .....................................OFF
(5) Engine Master switch..............................OFF
(6) Shut-off Cabin Heat..............................OPEN

⚠️ 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.

(7) Switches “Battery” and “Main Bus”..............ON
(8) Fuel quantity gauges ..................................CHECK
(9) Fuel Temperature ....................................CHECK
(10) “Water level” Light on AED .................CHECK, that OFF
(11) Annunciator panel ..................................CHECK
(12) Switches “Battery” and “Main Bus”..............OFF
(13) Flight Controls .........................................CHECK
(14) Flaps ..................................................CHECK
(15) Trim ..................................................CHECK, set NEUTRAL
(16) Pitot drain ...........................................DRAIN, CLOSE
(17) Static drain ...........................................DRAIN, CLOSE
(18) Windows .............................................CHECK, CLEAN
(19) Tow bar ..............................................STOW
(20) Baggage .............................................SECURE
(21) Baggage door .....................................CLOSE, SECURE
RIGHT WING

(1) Wing................................................. free of ice, snow, frost

(2) Control surfaces......................... CHECK for interference
   free of ice, snow, frost

(3) Hinges............................................. CHECK for interference

(4) Static wicks......................................................... CHECK

(5) Wing tip and lights .................................................. CHECK

(6) Fuel tank ........................................... CHECK supply visually,
   fuel level not above bottom of filler indicator tab
   secure caps

(7) Fuel tank sump ........................................... DRAIN, CHECK for water
   sediment and proper fuel (see section 2)

(8) Fuel vent................................................................. CLEAR

(9) Tie down and chock................................. REMOVE

(10) Main gear strut...... Proper Inflation (114 ± 6 mm / 4.50 in.)

(11) Tire................................................................. CHECK

(12) Brake block and discs............................................. CHECK

(13) Fresh air inlet.......................................................... CLEAR

NOSE

(1) Oil ................................................................. CHECK level

(2) Oil dipstick ......................................................... SECURE

(3) Fuel and oil .......................................................... CHECK for leaks

(4) Cowling ............................................................. SECURE

(5) Windshield .......................................................... CHECK

(6) Propeller and spinner................................. CHECK

(7) Air inlets ....................................................... UNDAMAGED and CLEAR

(8) Landing light .......................................................... CHECK

(9) Gearbox oil .......................................................... CHECK level

(10) Nose chock ....................................................... REMOVE

(11) Nose gear strut ...... Proper Inflation (83 ± 6 mm / 3.25 in.)

(12) Nose wheel tire.................................................... CHECK
(13) Fuel strainer.............................................................DRAIN
    CHECK for watersediment and proper fuel (see section 2)

LEFT WING
(1) Wing.............................................................free of ice, snow, frost
(2) Fresh air inlet..............................................................CLEAR
(3) Main gear strut...... Proper Inflation (114 ± 6 mm / 4.50 in.)
(4) Tire..............................................................CHECK
(5) Brake block and discs............................................CHECK
(6) Fuel tank.................................................CHECK supply visually, fuel level not above bottom of filler indicator tab secure caps
(7) Fuel tank sump .................................................DRAIN, CHECK for water, sediment and proper fuel (see section 2)
(8) Fuel vent..............................................................CLEAR
(9) Tie down and chock..............................................REMOVE
(10) Pitot heat..............................................................REMOVE cover - holes CLEAR
(11) Wing tip and lights .................................................CHECK
(12) Control surfaces.................................................CHECK for interference-free of ice, snow, frost
(13) Hinges.............................................................CHECK for interference
(14) Static wicks.............................................................CHECK

FUSELAGE
(1) Antennas.................................................................CHECK
(2) Empennage.............................................................free of ice, snow, frost
(3) Fresh air inlet..............................................................CLEAR
(4) Stabilator and trim tab.................................................CHECK for interference
(5) Tie down.................................................................REMOVE
(6) Battery switch...........................................................ON
(7) Check lighting.............................................................CHECK
(8) Nav and strobe lights.................................................CHECK
(9) Stall warning.............................................................CHECK
(10) Pitot heat................................................................. CHECK
(11) All switches.............................................................. OFF
(12) Passengers..............................................................board
(13) Cabin door .............................................................CLOSE and SECURE
(14) Seat belts and harnesses ... FASTEN - CHECK inertia reel

BEFORE STARTING ENGINE
(1) Brakes.............................................................................SET
(2) Fuel Selector................................................................. desired tank
(3) Radios............................................................................. OFF
(4) Alternate Air Door ....................................................... CLOSED

STARTING ENGINE

▲ 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.

(1) Thrust Lever................................................................. IDLE
(2) Circuit Breaker "Alternator" ................................. CHECK IN or
(3) Switch "Alternator" ......................................................... ON
(4) Switches "Battery" and "Main Bus" ............................. ON

CHECK fuel quantity and temperature

■ 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.

(5) Strobe lights................................................................. ON
(6) Electrical fuel pump ................................................... ON
(7) Engine Master............................................................. ON
(8) Glow Control Light ......................... CHECK ON, then OFF
(9) Starter ......................................... ENGAGE until engine starts
(10) Oil pressure .................................................. CHECK

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

(11) CED/AED Test Button .... PRESS (to delete Caution Light)
(12) Ammeter .................. CHECK for positive charging current
(13) Voltmeter .............................. CHECK for GREEN range

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 should 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.

(14) Avionics ................................................................. ON
(15) Ammeter .................. Check for positive charging current
(16) Voltmeter ................................. Check for green range

STARTING ENGINE WHEN COLD ......................... N/A
STARTING ENGINE WHEN HOT ............................ N/A
STARTING ENGINE WHEN FLOODED ...................... N/A
GROUND CHECK ..................................................... N/A

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WARM UP
Let the engine warm up for about 2 minutes at 890 RPM.
Increase RPM to 1400 until Oil temperature 50°C, Coolant temperature 60°C.

FADEC AND PROPELLER ADJUSTMENT FUNCTION CHECK

- a) Thrust Lever - IDLE, both FADEC lights should be OFF
- b) FADEC Test Button - PRESS and HOLD 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 A-component (only FADEC A light is ON), RPM increases
g) The propeller control is excited; RPM decreases
h) FADEC A light goes OFF, idle RPM is reached, the test is completed
i) FADEC Test Button - RELEASE

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

⚠️ WARNING: The whole test procedure has to be performed without any failure. In case the engine shuts down or the FADEC lights are flashing, take-off is prohibited. This applies even if the engine seems to run without failure after the test.
◆ Note: If the Test Button is released before the self-test is over, the FADEC immediately switches over to normal operation.

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

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

BEFORE TAKE-OFF
Circuit Breaker or Switch "Alternator", Switches "Battery" and "Main Bus".......................................................... CHECK ON
Flight instruments............................................................ CHECK
Alternator Warning Light .................................................... OFF
Fuel Selector....................................................................... proper tank
Fuel Temperature ............................................................. CHECK
Electrical Fuel Pump ........................................................... ON
Engine Instruments ............................................................. CHECK
Alternate Air Door ............................................................ CLOSED
Seat backs ....................................................................... ERECT
Belts / harness .............................................................. FASTENED / CHECK
Empty seats. ................................................................. seat belts snugly FASTENED
Flaps .............................................................................. SET
Trim tab ......................................................................... SET
Controls .......................................................................... FREE
Door ............................................................................. LATCH

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.
TAKE-OFF

Normal take-off
(1) Flaps ..................................................... 25° (second notch)
(2) Trim .......................................................... SET
(3) Accelerate to 45 - 57 KIAS (depending on flight mass)
(4) Control wheel ...... back pressure to rotate to climb attitude
(5) Accelerate to and maintain 55 - 65 KIAS (depending on flight mass) until obstacle clearance is achieved
(6) Best rate climb speed (flaps 10°)......................... 65 KIAS

◆ Note: For better engine cooling a climb speed of 79 KIAS is recommended.

(7) Flaps ...................................................... RETRACT slowly

CLIMB
(1) Best rate climb speed (flaps up) ......................... 70 KIAS

◆ Note: For better engine cooling a climb speed of 79 KIAS is recommended.

(2) En route ....................................................... 70 - 87 KIAS
(3) Electrical Fuel Pump ..................... OFF at desired altitude

CRUISING
(1) Cruise Power ............................................... SET (max. 100%, 75% or less is recommended)
(2) CED 125, AED 125 and Caution Light .......... MONITOR (oil pressure, water level as well as temperature of oil, water, gearbox and fuel within operating limits)
(3) Fuel quantity ................................................. MONITOR (Gauges and LOW LEVEL caution lights)
(4) Select the other fuel tank approximately every 30 minutes to empty and heat both tanks equally (observe Section 2)
"Operating Limits" Chapter "Engine Operating Limits").

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

(5) FADEC Warning Lights.............................. MONITOR

DESCENT

Normal
(1) Thrust Lever............................................. AS REQUIRED
(2) Airspeed.................................................. NOT EXCEED VNO

Power off
(1) Thrust Lever................................................... IDLE
(2) Airspeed..................................................... AS REQUIRED
(3) Power..........................verify with Thrust Lever every 30 seconds

APPROACH AND LANDING
(1) Fuel Selector.............................................. proper tank
(2) Seat backs................................................... ERECT
(3) Belts / harness ......................................... FASTEN / CHECK
(4) Electrical Fuel Pump...................................... ON
(5) Flaps .................................................. SET - NOT EXCEED VFE
(6) Trim............................................................. to 70 KIAS
(7) Final approach speed (flaps 40°)................. 63 KIAS

STOPPING ENGINE
(1) Flaps .......................................................... RETRACT
(2) Electrical Fuel Pump....................................... OFF
(3) Radios.............................................................. OFF
(4) Thrust Lever................................................... IDLE
(5) Engine Master................................................... OFF
(6) Switches "Battery" and "Main Bus".................. OFF
SECTION 5
PERFORMANCE

FLIGHT PLANNING EXAMPLE

◆ Note: The information contained in this Section is to be used for example purposes only. The maximum weights according to section 2 are to be observed for flight planning. This example is based on a PA 28-161 - Normal category; Max. Ramp Weight 1110 kg (2447 lbs), Max. Take-Off Weight 1107 kg (2440 lbs)

a) Airplane Loading

The first step in planning a flight is to calculate the airplane weight and center of gravity by utilizing the information provided by Section 6 (Weight and Balance) of this supplement to the Pilot’s Operating Handbook.

The Basic Empty Weight of the airplane, determined by the company who made the modification, has been entered in Figure 6-5a of this supplement. If any alterations to airplane have been made affecting weight and balance, reference to the aircraft logbook and Weight and Balance Record (Figure 6-7) should be made to determine the current Basic Empty Weight of the airplane.

Make use of the Weight and Balance Loading Form (Figure 6-11a) of this supplement and the C.G. Range and Weight graph of the EASA approved Pilot's Operating Handbook approved to determine the total weight of the airplane and the center of gravity position.
After proper utilization of the information provided, the following weights apply to the flight planning example:

The landing weight cannot be determined until the weight of fuel to be used has been established (refer to item (g)(1)).

1. Basic Empty Weight .......................... 730 kg (1609 lbs)
2. Occupants (3 x 77 kg/170 lbs) ........... 231 kg (509 lbs)
3. Baggage and cargo ............................... 30 kg (66 lbs)
4. Fuel (0.80 kg/l x 160 l, JET A-1) .......... 128 kg (282 lbs)
5. Take-off Weight ................................. 1081 kg (2383 lbs)
6. Landing Weight
   (a) (5) minus (g) (1)
   (1050 kg minus 50.9 kg) .................. 1000.9 kg
   (2315 lbs minus 112.2 lbs) ............ 2207 lbs

The take-off weight is below the maximum of 1107 kg (2440 lbs), and the weight and balance calculations have determined that the C.G. position is within the approved limits.

(b) Take-off and landing

Now that the aircraft loading has been determined, all aspects of the take-off and landing must be considered.

All of the existing conditions at the departure and destination airport must be acquired, evaluated and maintained throughout the flight.

Apply the departure airport conditions and take-off weight to the appropriate take-off performance figures (Figure 5-1) to determine the length of runway necessary for the take-off and/or the barrier distance.

The landing distance calculations are performed in the same manner using the existing conditions at the destination airport and, when established, the landing weight.
The conditions and calculations for the example flight are listed below. The take-off and landing distances required for the example flight have fallen well below the available runway lengths.

<table>
<thead>
<tr>
<th>Departure Airport</th>
<th>Destination Airport</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) 1500 ft</td>
<td>2500 ft</td>
</tr>
<tr>
<td>(2) 77°C (ISA + 15°C)</td>
<td>24°C (ISA + 14°C)</td>
</tr>
<tr>
<td>131°F (ISA + 27°F)</td>
<td>75°F (ISA + 25°F)</td>
</tr>
<tr>
<td>(3) 0 knots</td>
<td>0 knots</td>
</tr>
<tr>
<td>(4) 1463 m</td>
<td>2316 m</td>
</tr>
</tbody>
</table>

The takeoff distance chart, Figure 5-1 (Takeoff Distance), should be consulted, keeping in mind that distances shown are based on the short field technique. Conservative distances can be established by reading the chart at the next higher value of weight, temperature and altitude. For example, in this particular sample problem, the takeoff distance information presented for a weight of 1,107 kg, pressure altitude of 2000 ft and a temperature of ISA+20°C/ +36°F should be used and results in the following:

- Ground Roll: 331 m (1086 ft)
- Total Distance to clear a 15 m obstacle: 660 m (2165 ft)

For calculation of landing distance refer to original POH

◆ Note: The remainder or the performance charts used in this flight planning example assume no wind condition. The effect of winds aloft must be considered by the pilot when computing climb, cruise and descent performance.
(c) Climb

The next step in the flight plan is to determine the necessary climb segment components. The desired cruise pressure altitude and corresponding cruise outside air temperature values are the first variables to be considered in determining the climb components from the table "Time, Fuel and Distance to Climb" (Tab. 5-3). After time, distance and quantity of fuel for the cruise pressure altitude and outside air temperature values have been established, apply the existing conditions at the departure field to Tab. 5-3. Now, subtract the values obtained from the table for the field of departure conditions from those for the cruise pressure altitude. The remaining values are the true fuel, time and distance components for the climb segment of the flight plan corrected for field pressure altitude and temperature.

The following values were determined from the above instructions in the flight planning example:

1. Cruise Pressure Altitude .................................. 5000 ft
2. Cruise OAT ...... 16°C (ISA + 11°C) / 61°F (ISA + 20°F)

Due to the difference in temperature to the standard atmosphere, the following correction applies:

\[
\frac{11°C(20°F)}{10°C(18°F)} \times 10% = 11% \text{ Increase}
\]

3. Time to Climb

   \((-7.3 \text{ min minus } 1.4 \text{ min } = 5.9) + 11\%\) ....... 6.6 min

4. Distance to Climb

   \((-9.4 \text{ NM minus } 1.7 \text{ NM } = 7.7) + 11\%\) .......... 8.6 NM

5. Fuel to Climb

   \((-4.2 \text{ l minus } 0.8 \text{ l Jet A-1 } = 3.4 \text{ l}) + 11\%) \ldots 3.8 \text{ l}

6. Fuel to start-up, taxi and take-off ............... 1l / 0.3 US gal

7. Fuel for start-up, taxi and take-off and climb

   \((-1 \text{ l plus } 3.8 \text{ l})\) .............................................. 4.8 l

   \((-0.3 \text{ US gal plus } 1 \text{ US gal})\) ...................... 1.3 US gal

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(d) Descent

To determine the descent data for fuel, time and distance Table 5-4 "Cruise performance, range and endurance" can be used with sufficient accuracy.

(e) Cruise

Using the total distance to be traveled during the flight, subtract the previously calculated distance to climb to establish the total cruise distance.

Calculate the cruise fuel consumption for the cruise power setting with Table 5-4.

The cruise time is found by dividing the cruise distance by the cruise speed and the cruise fuel is found by multiplying the cruise fuel consumption by the cruise time.

The cruise calculations established for the cruise segment of the flight planning example are as follows:

1. Total Distance ............................................. 300 NM
2. Cruise Distance
   (e)(1) minus (c)(4)
   (300 NM - 8.6 NM) .................................... 291.4 NM
3. Cruise Power ............................................ 70%
4. Cruise Speed .......................................... 109.5 KTAS
5. Cruise Fuel Consumption ................ 22.1 l/h (5.8 US gal/h)
6. Cruise Time
   (e)(2) divided by (e)(4)
   (291.4 NM divided by 109.5 KTAS) ............. = 2.66 h
7. Cruise Fuel
   (e)(5) multiplied by (e)(6)
   (22.1 l/h x 2.91 h) ................................... = 58.8 l
   (5.8 US gal/h x 2.91 h) .......................... = 15.5 US gal
(f) **Total Flight Time**

The total flight time is determined by adding the time to climb and the cruise time.

◆ **Note:** The time values taken from the climb table are in minutes and must be converted to hours before adding them to the cruise time.

The following flight time is required for the flight planning example:

\[
\text{Total Flight Time} = (c)(3) + (e)(6) = (0.11 \text{ h} + 2.66 \text{ h}) = 2.77 \text{ h}
\]

(g) **Total Fuel Required**

Determine the total fuel required by adding the fuel to climb and the cruise fuel. When the total fuel (in US gal or liters) is determined, multiply this value by 0.84 kg/l (7 lb/US gal) for JET A-1 or for Diesel to determine the total fuel weight used for flight.

The total fuel calculations for the example flight plan are shown below:

(1) **Total Fuel Required**

\[
\begin{align*}
\text{(c)(7) plus (e)(7)} & = (4.8 \text{ l plus 58.8 l of Jet A-1}) = 63.6 \text{ l} \\
\text{(1.1 US gal plus 15.5 US gal)} & = 17 \text{ US gal} \\
\text{(63.6 l x 0.80 kg/l)} & = 50.9 \text{ kg} \\
\text{(17 US gal x 7 lb/US gal)} & = 112.2 \text{ lbs}
\end{align*}
\]
TAKE-OFF DISTANCE

Notes:
(1) Decrease distances 10% for each 9 Knots headwind; 
    Increase distances 10% for each 2 knots of tailwind up to 
    10 Knots.
(2) For operation on dry, grass runway, increase distances by 
    15% of the "ground roll" figure.
(3) Consider additions for wet grass runway, softened 
    ground or snow.
**Conditions:**

Weight 916 kg (2019 lbs)
Flaps 25°
Full Power Prior to Brake Release
Paved, level, dry runway
Zero Wind
Lift-off speed: 47 KIAS
Speed at 15 m (50 ft): 51 KIAS

### Takeoff Distance at 916 kg (2019 lbs)

<table>
<thead>
<tr>
<th>Press. Alt. [ft]</th>
<th>Distance</th>
<th>TEMPERATURE - °C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>ISA</td>
</tr>
<tr>
<td>0</td>
<td>Gnd Roll</td>
<td>156</td>
</tr>
<tr>
<td>50 ft</td>
<td></td>
<td>310</td>
</tr>
<tr>
<td>1000</td>
<td>Gnd Roll</td>
<td>165</td>
</tr>
<tr>
<td>50 ft</td>
<td></td>
<td>328</td>
</tr>
<tr>
<td>2000</td>
<td>Gnd Roll</td>
<td>174</td>
</tr>
<tr>
<td>50 ft</td>
<td></td>
<td>347</td>
</tr>
<tr>
<td>3000</td>
<td>Gnd Roll</td>
<td>184</td>
</tr>
<tr>
<td>50 ft</td>
<td></td>
<td>367</td>
</tr>
<tr>
<td>4000</td>
<td>Gnd Roll</td>
<td>195</td>
</tr>
<tr>
<td>50 ft</td>
<td></td>
<td>388</td>
</tr>
<tr>
<td>5000</td>
<td>Gnd Roll</td>
<td>207</td>
</tr>
<tr>
<td>50 ft</td>
<td></td>
<td>411</td>
</tr>
<tr>
<td>6000</td>
<td>Gnd Roll</td>
<td>219</td>
</tr>
<tr>
<td>50 ft</td>
<td></td>
<td>436</td>
</tr>
<tr>
<td>7000</td>
<td>Gnd Roll</td>
<td>232</td>
</tr>
<tr>
<td>50 ft</td>
<td></td>
<td>462</td>
</tr>
<tr>
<td>8000</td>
<td>Gnd Roll</td>
<td>246</td>
</tr>
<tr>
<td>50 ft</td>
<td></td>
<td>490</td>
</tr>
<tr>
<td>9000</td>
<td>Gnd Roll</td>
<td>264</td>
</tr>
<tr>
<td>50 ft</td>
<td></td>
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<td>10000</td>
<td>Gnd Roll</td>
<td>289</td>
</tr>
<tr>
<td>50 ft</td>
<td></td>
<td>576</td>
</tr>
</tbody>
</table>

Figure 5-1a Takeoff Distance at take-off weight 916 kg (2019 lbs)
Conditions:
Weight 1055 kg (2325 lbs)
Flaps 25°
Full Power Prior to Brake Release
Paved, level, dry runway
Zero Wind
Lift-off speed: 50 KIAS
Speed at 15 m (50 ft): 55 KIAS

Takeoff Distance at 1055 kg (2325 lbs)

<table>
<thead>
<tr>
<th>Press. Alt.</th>
<th>Distance</th>
<th>TEMPERATURE - °C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>[ft]</td>
<td>[m]</td>
</tr>
<tr>
<td>0</td>
<td>Gnd Roll</td>
<td>225</td>
</tr>
<tr>
<td></td>
<td>50 ft</td>
<td>447</td>
</tr>
<tr>
<td>1000</td>
<td>Gnd Roll</td>
<td>238</td>
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<tr>
<td></td>
<td>50 ft</td>
<td>473</td>
</tr>
<tr>
<td>2000</td>
<td>Gnd Roll</td>
<td>252</td>
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<tr>
<td></td>
<td>50 ft</td>
<td>500</td>
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<tr>
<td>3000</td>
<td>Gnd Roll</td>
<td>266</td>
</tr>
<tr>
<td></td>
<td>50 ft</td>
<td>530</td>
</tr>
<tr>
<td>4000</td>
<td>Gnd Roll</td>
<td>282</td>
</tr>
<tr>
<td></td>
<td>50 ft</td>
<td>561</td>
</tr>
<tr>
<td>5000</td>
<td>Gnd Roll</td>
<td>299</td>
</tr>
<tr>
<td></td>
<td>50 ft</td>
<td>594</td>
</tr>
<tr>
<td>6000</td>
<td>Gnd Roll</td>
<td>316</td>
</tr>
<tr>
<td></td>
<td>50 ft</td>
<td>629</td>
</tr>
<tr>
<td>7000</td>
<td>Gnd Roll</td>
<td>335</td>
</tr>
<tr>
<td></td>
<td>50 ft</td>
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<td>8000</td>
<td>Gnd Roll</td>
<td>356</td>
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<tr>
<td></td>
<td>50 ft</td>
<td>707</td>
</tr>
<tr>
<td>9000</td>
<td>Gnd Roll</td>
<td>381</td>
</tr>
<tr>
<td></td>
<td>50 ft</td>
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<td>10000</td>
<td>Gnd Roll</td>
<td>471</td>
</tr>
<tr>
<td></td>
<td>50 ft</td>
<td>832</td>
</tr>
</tbody>
</table>

Figure 5-1b Takeoff Distance at take-off weight 1055 kg (2325 lbs)
TAKE-OFF DISTANCE

(only PA 28-161 Warrior II S/N 28-8316001 through 28-8616057 & 2816001 through 2816109
PA 28-161 Warrior III S/N 2816110 through 2816119 & 2842001 and up)

Notes:
(1) Decrease distances 10% for each 9 Knots headwind;
Increase distances 10% for each 2 knots of tailwind up to
10 Knots.
(2) For operation on dry, grass runway, increase distances by
15% of the “ground roll” figure.
(3) Consider additions for wet grass runway, softened
ground or snow.
Conditions:
Weight 1107 kg (2440 lbs)
Flaps 25°
Full Power Prior to Brake Release
Paved, level, dry runway
Zero Wind
Lift-off speed: 52 KIAS
Speed at 15 m (50 ft): 57 KIAS

<table>
<thead>
<tr>
<th>Press. Alt.</th>
<th>Distance</th>
<th>TEMPERATURE - °C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>[ft]</td>
<td>[m]</td>
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Figure 5-1c Takeoff Distance at take-off weight 1107 kg (2440 lbs)
MAXIMUM CLIMB SPEED

Conditions:
Take-off weight 916 kg (2019 lbs)
Climb speed \( V_y = 70 \) KIAS
Flaps Up
Full Power

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Figure 5-2a Climb speed, 916 kg (2019 lbs)
Conditions:
Take-off weight 1055 kg (2325 lbs)
Climb speed $V_y = 70$ KIAS
Flaps Up
Full Power

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Figure 5-2b Climb speed, 1055 kg (2325 lbs)
MAXIMUM CLIMBSPEED

(PA 28-161 Warrior II S/N 28-8316001 through 28-8616057 & 2816001 through 2816109
PA 28-161 Warrior III S/N 2816110 through 2816119 & 2842001 and up)

Conditions:
Take-off weight 1107 kg (2440 lbs)
Climb speed $V_y = 70$ KIAS
Flaps Up
Full Power

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Figure 5-2c Climbspeed, 1107 kg (2440 lbs)
TIME, FUEL AND DISTANCE TO CLIMB

Notes:
(1) Add 1 l (0.3 US gal) of fuel for engine start, taxi and takeoff allowance.
(2) Increase time and distance by 10% for 10°C/ 18°F 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 $v_y = 70$ KIAS.

Conditions:
Takeoff weight 916 kg (2019 lbs)
Climb speed $v_y = 70$ KIAS
Flaps Up; Full Power; Zero wind, Standard Temperature
## Figure 5-3a Time, Fuel and Distance to Climb at 916 kg (2019 lbs)

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Conditions:
Takeoff weight 1055 kg (2325 lbs)
Climb speed $v_y = 70$ KIAS
Flaps Up; Full Power; Zero wind, Standard Temperature

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Figure 5-3b Time, Fuel and Distance to Climb at 1055 kg (2325 lbs)
Conditions:

(only PA 28-161 Warrior II S/N 28-8316001 through 28-8616057 & 2816001 through 2816109
PA 28-161 Warrior III S/N 2816110 through 2816119 & 2842001 and up)

Takeoff weight 1107 kg (2440 lbs)
Climb speed $v_y = 70$ KIAS
Flaps Up; Full Power; Zero wind, Standard Temperature

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Figure 5-3c Time, Fuel and Distance to Climb at 1107 kg (2440 lbs)
CRUISE PERFORMANCE, RANGE AND ENDURANCE

Conditions:
Flaps Up
Zero wind

Notes:
(1) Endurance information are based on fuel tanks with a capacity of 162.8 l (43 US gal) usable fuel and include a reserve of 45 min.
(2) Increase true airspeed and range by 2% per 10°C (18°F) above ISA temperature. Decrease true airspeed and range by 2% per 10°C (18°F) below ISA temperature.
Cruise Performance, Range and Endurance
at 1055 kg (2325 lbs)

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### Figure 5-4a Cruise Performance, Range and Endurance at 1055 kg (2325 lbs)

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Cruise Performance, Range and Endurance at 1107 kg (2440 lbs)

(only PA 28-161 Warrior II S/N 28-8316001 through 28-8616057 & 2816001 through 2816109
PA 28-161 Warrior III S/N 2816110 through 2816119 & 2842001 and up)

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Figure 5-4b Cruise Performance, Range and Endurance at 1107 kg (2440 lbs)

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GLIDE RANGE

Conditions:
Propeller windmilling
Flaps 0°, Zero wind, 78 KIAS

Figure 5-5a Glide Range
Figure 5-6b Power at Altitude

Centurion 2.0 - 155hp

Altitude [ft]

0 2000 4000 6000 8000 10000 12000 14000 16000 18000 20000

Power [HP]

2300 (100%)
2180 (90%)
2030 (75%)
1960 (65%)
1880 (50%)
1750 (25%)

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Issue 1
Revision -, April 2012
SECTION 6
WEIGHT & BALANCE
MODEL PA28-151 (Cherokee Warrior)

Airplane Serial Number: ____________
Registration Number: ____________
Date: ____________

AIRPLANE BASIC EMPTY WEIGHT

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*The standard empty weight includes full engine oil capacity, full gearbox oil capacity, full coolant capacity and 8 l (2 US gal) unusable fuel.

AIRPLANE USEFUL LOAD

(Ramp Weight) - (Basic Empty Weight) = Useful Load
(Normal category: 1055 kg) - (..........kg) = kg
(2326 lb) - (..........lb) = lb
(Utility category: 885 kg) - (..........kg) = kg
(1951 lb) - (..........lb) = lb

THIS BASIC EMPTY WEIGHT, C.G. AND USEFUL LOAD ARE FOR THE AIRPLANE AS INSPECTED AFTER MODIFICATION. REFER TO APPROPRIATE AIRCRAFT RECORD WHEN ALTERATIONS HAVE BEEN MADE.

WEIGHT & BALANCE DATA FORM
Figure 6-5a
Supplement POH PA-28-151/-161 with Centurion C2.0S Installation

MODEL PA28-161 (Cherokee Warrior II)

Airplane Serial Number: ____________  
Registration Number: ____________  
Date: ____________  

AIRPLANE BASIC EMPTY WEIGHT

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<th>Weight (kg/lb)</th>
<th>C.G. Arm (m/ in Aft of Datum)</th>
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* The standard empty weight includes full engine oil capacity, full gearbox oil capacity, full coolant capacity and 8 l (2 US gal) unusable fuel.

AIRPLANE USEFUL LOAD

(Ramp Weight) - (Basic Empty Weight) = Useful Load  
(Normal category: 1055 kg) - (............kg) = kg  
(2326 lb) - (............lb) = lb  
(Utility category: 916 kg) - (............kg) = kg  
(2019 lb) - (............lb) = lb

THIS BASIC EMPTY WEIGHT, C.G. AND USEFUL LOAD ARE FOR THE AIRPLANE AS INSPECTED AFTER MODIFICATION. REFER TO APPROPRIATE AIRCRAFT RECORD WHEN ALTERATIONS HAVE BEEN MADE.
MODEL PA28-161

Warrior II (S/N 28-8316001 through 28-8616057 & 2816001 through 2816109)

Warrior III (S/N 2816110 through 2816119 & 2842001 and up)

Airplane Serial Number: ____________
Registration Number: ____________
Date: __________________

AIRPLANE BASIC EMPTY WEIGHT

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* The standard empty weight includes full engine oil capacity, full gearbox oil capacity, full coolant capacity and 8 l (2 US gal) unusable fuel.

AIRPLANE USEFUL LOAD

(Ramp Weight) - (Basic Empty Weight) = Useful Load
(Normal category: 1107 kg) - (..........kg) = kg
(2440 lb) - (..........lb) = lb
(Utility category: 916 kg) - (..........kg) = kg
(2019 lb) - (..........lb) = lb

THIS BASIC EMPTY WEIGHT, C.G. AND USEFUL LOAD ARE FOR THE AIRPLANE AS INSPECTED AFTER MODIFICATION. REFER TO APPROPRIATE AIRCRAFT RECORD WHEN ALTERATIONS HAVE BEEN MADE.

WEIGHT & BALANCE DATA FORM

Figure 6-5b
WEIGHT & BALANCE DETERMINATION FOR FLIGHT

(a) Add the weight of all items to be loaded to the basic empty weight.

(b) Use the Loading Graph (Figure 6-13) to determine the moment of all items to be carried in the airplane.

(c) Add the moment of all items to be loaded to the basic empty weight moment.

(d) Divide the total moment by the total weight to determine the C.G. location.

(e) By using the figures of item (a) and (d) (above), locate a point on the C.G. range and weight graph (Figure 6-15). If the point falls within the C.G. envelope, the loading meets the weight and balance requirements.
* Utility Category Operation - No baggage or aft passengers allowed. Maximum baggage as per original POH

Totals must be within approved weight and C.G. limits. It is the responsibility of the airplane owner and the pilot to insure that the airplane is loaded properly. The Basic Empty Weight C.G. is noted on the Weight & Balance Data Form (Figure 6-5a). If the airplane has been altered, refer to the Weight and Balance Record for this information.

<table>
<thead>
<tr>
<th>Weight (kg)</th>
<th>Arm Aft Datum (m)</th>
<th>Moment (kgm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Basic Empty Weight</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Pilot and Front Passenger</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Passengers (Rear Seats)*</td>
<td>2.04</td>
<td></td>
</tr>
<tr>
<td>- Fuel (max. 162 l usable)</td>
<td>3.00</td>
<td></td>
</tr>
<tr>
<td>- Baggage* (max. 90 kg, PA 28-161 Cadet max. 23 kg)</td>
<td>2.41</td>
<td>3.63</td>
</tr>
<tr>
<td>- Ramp Weight (1056 kg Normal aircraft, 917 kg Utility, Maximum)</td>
<td>-1</td>
<td>2.41</td>
</tr>
<tr>
<td>- Fuel Allowance for Engine Start, Taxi and Run up</td>
<td>2.41</td>
<td>-2.41</td>
</tr>
<tr>
<td>- Take-off Weight (1055 kg Normal aircraft, 916 kg Utility, Maximum)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Utility Category Operation - No baggage or aft passengers allowed. Maximum baggage as per original POH

Totals must be within approved weight and C.G. limits. It is the responsibility of the airplane owner and the pilot to insure that the airplane is loaded properly. The Basic Empty Weight C.G. is noted on the Weight & Balance Data Form (Figure 6-5a). If the airplane has been altered, refer to the Weight and Balance Record for this information.
WEIGHT & BALANCE LOADING FORM
PA28-151/-161
Figure 6-1a

Beladungsdiagramm PA 28-151/-161

Figure 6-1a Loading Graph
Figure 6-1b

**C.G. Range and Weight Envelope**

PA28-151 Cherokee Warrior

S/N28-7415001 thr. 28-7715314

**Aircraft Weight [kg]**

- Utility category
- Normal category
Figure 6-1c

C.G. Range and Weight Envelope
PA28-161 Cherokee Warrior II & Cadet
S/N 28-7716001 thr. 28-8216300 and 2841001 thr. 2841365

Aircraft Weight [kg]

C.G. Location [cm aft datum]
Figure 6-1-d

C.G. Range and Weight Envelope

PA28-161 Warrior II S/N 28-16001 thr. 28-16057 and 28-16001 thr. 28-16109
PA28-161 Warrior III S/N 28-16110 thr. 28-16119 and up

Aircraft Weight [kg]

C.G. Location [cm aft datum]

Utility category

Normal category

VFR category

C.G. Location

PA28-151/161 with Centurion C2.0S Installation
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SECTION 7
DESCRIPTION AND OPERATION OF THE AIRPLANE AND ITS SYSTEMS

ENGINE AND PROPELLER
The Centurion 2.0 S 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. The engine is controlled by a FADEC system. The propeller is driven by a built-in gearbox (i = 1.69) with mechanical vibration damping and overload release. The engine has an electrical self starter and an alternator.

The constant speed propeller MTV-6-A-187/129 has three propeller blades and is electronically controlled by the FADEC.

ENGINE CONTROLS
The engine is operated by the pilot exclusively by means of the Thrust Lever (see Figure 7-5a). The friction lock as the lower knob on the Thrust Lever can easily be operated with the forefinger and middle finger.

Due to the Diesel principle mixture control, carburetor pre-heating, ignition magnetos and spark-plugs as well as priming system are omitted.

An alternate air door has been added and can be opened by the pilot in case of a blocked air filter. The control is located right of the Thrust Lever.

Figure 7-5a Thrust Lever
FUEL SYSTEM

The fuel system for the Centurion 2.0S installation includes the original fuel tank of the Piper PA-28. Additional sensors for fuel temperature and "Low Level" Warning are installed.

The fuel flows out of the tank to the fuel selector valve (located on the left side panel forward of the pilot’s seat) with the positions LEFT, RIGHT and OFF. The safety knob must be lifted if the fuel selector should be moved from or into position OFF. The electrically driven fuel pump supports the fuel flow to the filter module if required. Upstream to the fuel filter module a thermostat-controlled fuel pre-heater is installed.

Then, the engine-driven feed pump and the high pressure pump supply the rail, from where the fuel is injected into the cylinders depending upon the position of the thrust lever and regulation by the FADEC.

Surplus fuel flows to the filter module and then back through the fuel selector valve into the pre-selected tank.

A temperature sensor in the filter module controls the heat exchange between the fuel feed and return.

Since Diesel and Kerosene fuel tends to form paraffin at low temperatures, the information in Section 2 "Limitations" pertaining to fuel temperature have to be observed. The return fuel ensures a quicker rapid warm up of the fuel in the tank in use.

Diesel according DIN EN 590 has to be used exclusively.

◆ Note: There are differences in the national supplements to EN 590. Approved are Diesel fuels with the addition DIN.

<table>
<thead>
<tr>
<th>Fuel Capacity</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Tanks</td>
<td>Total Usable Fuel</td>
</tr>
<tr>
<td>2 Standard Tanks: each 22.5 US gal = 85 l</td>
<td>43 US gal = 162.8 l</td>
</tr>
</tbody>
</table>
CAUTION: In flight conditions with one wing pointing downward continuously (e.g. slipping), switch the fuel selector to the upward pointing fuel tank.

Figure 7-9a Scheme of the Fuel System
ELECTRICAL SYSTEM

The electrical system of the Centurion 2.0S installations differs from the previous installation and is equipped with the following operating and display elements:

1. Switch "Main Bus"
   This switch controls the Main Bus. The Main Bus is necessary to be able to run FADEC and engine with Battery/Alternator without disturbance in the event of onboard electrical system malfunctions. In normal operation Alternator, Main Bus and Battery must be ON.

2. Circuit Breaker or Switch "Alternator"
   Controls the alternator. The circuit breaker must be in during normal operation, the guarded switch must be closed during normal operation.

3. Switch "Battery"
   Controls the Main Battery.

4. Push Button “Starter”
   Controls the magneto switch of the starter.

5. Ammeter
   The Ammeter shows the charging or discharging current to/from the battery.

6. Warning Light "Alternator"
   Illuminates when the power output of the alternator is too low or the Circuit Breaker or Switch "Alternator" 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. Switch "Fuel Pump" (if installed)
   This switch controls the electrical fuel pump.
8. Switch "Engine Master"
The switch "Engine Master" 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. Backup Battery (if installed)
The electrical system includes a backup battery to ensure power supply to A-FADEC in case that supply from both battery and alternator is interrupted. The engine has been demonstrated to continue operating for 30 minutes when powered by the FADEC backup battery only. Only A-FADEC is connected to the backup battery.

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

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

The basic wiring of the Centurion 2.0S installation is available in 14V as well as 28V versions.
Figure 7-11a Basic Wiring of the Electrical System with alternator c/b and without FADEC backup battery

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Figure 7-11b Basic Wiring of the Electrical System with alternator switch and FADEC Backup Battery
INSTRUMENT PANEL

The following information relate to Figure 7-15 "The instrument panel" of the EASA approved Pilot’s Operating Handbook. Components of the new installation can be seen as an example in the following Figures.

Figure 7-15a Example Warrior & Warrior II with Centurion 2.0S installation

Figure 7-15b Example Warrior III with Centurion 2.0S installation
(1) "Engine Master" - Master Switch for Engine
(2) "Starter" Push Button for Starter
(3) AED 125 SR with indication of Fuel Temperature, Voltage, Fuel Flow and a caution light "Water Level" (amber) for low coolant level
(4) CED 125, combined engine monitoring instrument for Propeller Rotary Speed, Oil Pressure, Oil Temperature, Coolant Temperature, Gearbox Temperature and Load. (Engine instrument for Oil Temperature, Oil Pressure and Fuel Pressure N/A)
(5) "Alt. Air Door" Alternate Air Door (Carburetor Heat Button N/A)
(6) "Force B" Switch for manually switching the FADEC
(7) Lightpanel with:
   "FADEC" test knob
   "A FADEC B" warning lights for FADEC A and B
   "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
   "Fuel L"; "Fuel R"- caution lights for low fuel level (amber)
   "Glow" Glow Control Light (amber)

   ![Lightpanel Diagram](image)

   Figure 7-15f Lightpanel

(8) "ALT" Circuit Breaker or guarded switch for Alternator
FADEC-RESET

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

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

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

The Centurion 2.0S is equipped with a fluid-cooling system. A three-way thermostat regulates the flow of coolant between the large and small cooling circuit. Up to a coolant temperature of 84°C (183°F) the coolant flows exclusively through the small circuit, between 84 and 94°C (183 and 201°F) through the small and the large circuit simultaneously. If the coolant 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 coolant temperature of 105°C (221°F). A sensor in the expansion reservoir sends a signal to the caution Light "Water Level" on the instrument panel, if the coolant level is low.

The coolant temperature is measured in the housing of the thermostat and passed on to the FADEC and CED 125. The connection to the heat exchanger for cabin heating is always open; the warm air supply is regulated by the pilot over the heating valve. See Figure 7-16.

In normal operation the control knob "Shut-off Cabin Heat" must be OPEN, with the control knob "Cabin Heat" the supply of warm air into the cabin can be controlled. In case of certain emergencies (refer to section 3), the control knob "Shut-off Cabin Heat" has to be closed according to the appropriate procedures.
Warm air for cabin heating and windscreen defrosting system is delivered from the heat exchanger of the TAE 125 installation cooling system. See article "Cooling" above.
SECTION 8
AIRPLANE HANDLING, SERVICING AND MAINTENANCE

- **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.

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

**ENGINE AIR FILTER**
Checks and exchanges of the engine air filter have to be performed regularly according to the Operation and Maintenance Manual OM-02-02. See also Supplement AMM-40-02.

**PROPELLER SERVICE**
Avoid high propeller rotary speeds on stationary ground runs to avoid nicks in the propeller blades due to stones. Clean the propeller regularly from dirt and oil. A small amount of oil is acceptable since assembly oil can leak out during the first operating hours. Do not push or pull the aircraft on the propeller spinner!

**ENGINE OIL**
The Centurion 2.0S is filled with 4.5 - 6 l (1.2 - 1.6 gallon) engine oil. 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 cowl. 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. Checks and exchanges of oil and oil filter have to be performed regularly according to Operation and Maintenance Manual.
GEARBOX OIL

To ensure the necessary propeller speed, the Centurion 2.0S is equipped with a reduction gearbox filled with gearbox oil according to Operation and Maintenance Manual OM-02-02, see also Supplement AMM-40-02. 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 a microfilter in the Constant Speed Unit.

Regular checks as well as oil and filter exchanges have to be performed according to Operation and Maintenance Manual OM-02-02, see also Supplement AMM-40-02.

FUEL SYSTEM

Regular checks as well as fuel filter exchanges have to be performed according to Operation and Maintenance Manual OM-02-02, see also Supplement AMM-40-02.

The Centurion 2.0S can be operated with JET A-1 Kerosene or Diesel.

Due to the higher specific density of JET A-1 or Diesel in comparison to aviation gasoline (AVGAS) the permissible capacity for fuel tanks is reduced to a total of 170 l (45 US gal). Appropriate placards are attached near the fuel filler connections.

For temperature limitations refer to Section 2 "Limitations" and Section 4 "Normal Procedures".

It is recommended to refuel before each flight and to enter the type of fuel into the log-book.
**BATTERY SERVICE**
Regular checks and exchanges of the battery, FADEC backup battery and the alternator excitation battery have to be performed according to Operation and Maintenance Manual OM-02-02, see also Supplement AMM-40-02.

**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. 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.

**ENGINE CLEANING**
Cleaning the engine has to be performed according to Operation and Maintenance Manual OM-02-02, see also Supplement AMM-40-02.

**COOLANT**
Regular checks and exchanges of coolant and hoses have to be performed according to Operation and Maintenance Manual OM-02-02, see also Supplement AMM-40-02.
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