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6) List of amendments

00521

Currt no.	Chapter	Pages	Date of modification	Note of approval	Date of approval by authority	Date of insertion	Marks / Signature
0	1÷5 7÷9 11÷15	all all all	98 12 01	not required		98 12 01	AA/HeC
0	6,10	all*	98 12 01	english version not required	german version 1.12.1998	98 12 01	AA/HeC
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3	6	6 - 1	2004 07 01				
	14	10 - 1	2004 07 01				
		10 - 7	2004 07 01	english version	german		
		10 - 9	2004 07 01	not required	version		
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*The note of approval of the Aviation Authority refers only to the certified engines of the Type 914 F (TW10 - ACG).

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10) Operating instructions

The data of the certified engines are based on type certificate of type 914 F (TW10 - ACG).

10.1) General limits of operation

10.1.1) Operating speeds and limits

1. Speed:

Take-off speed ..... 5800 rpm (5 min.)
Max. continuous speed ..... 5500 rpm
Idle speed ..... approx. 1400 rpm

2. Manifold pressure:

Take-off performance ..... max. 1350 hPa (39,9 in.HG)
Max. continuous performance ... max. 1200 hPa (35,4 in.HG)

■ ATTENTION: Due to the control behaviour an overshooting of the manifold pressure is possible. But within 2 seconds this pressure has to stabilize within the allowance.

3. Acceleration:

Limit of engine operation at zero gravity and in **negative "g"** conditions

max. ..... 5 seconds at max. -0,5 g

4. Critical flying altitude:

Take-off performance ..... up to max. 2450 m (8000 ft) above sea level
Continuous performance ..... up to max. 4500 m (16000 ft) above sea level

■ ATTENTION: Up to the stated critical flight altitude the respective manifold pressure is available.

5. Oil pressure:

max. ..... 7 bar (102 psi)

■ ATTENTION: For a short period admissible at cold start.

min. ..... 0,8 bar (12 psi) (below 3500 rpm)
**1,5 bar (22 psi)*
normal ..... 2,0 ÷ 5,0 bar (29 ÷ 73 psi) (above 3500 rpm)
**1,5 ÷ *5,0 bar* (22 ÷ 73 psi)
**914 UL starting with S/N 4,417.665*
**914 F starting with S/N 4,420.085*

6. Oil temperature:

max. ..... 130 °C ..... (255 °F)
min. ..... 50 °C ..... (120 °F)
normal operating temperature ... approx. 90 ÷ 110 °C(190÷230 °F)

7. Cylinder head temperature:

max. ..... 135 °C ..... (275 °F)
reading at observation point of the hotter cylinder head, either no. 2 or no.3.

normal operating temperature.. ..approx.75÷110 °C.....(167÷230 °F)

8. Airbox temperature:

* intervention temperature ..... 72°C (160° F)
* intervention temperature ..... 88°C (190° F)

** 914 UL commencing with S/N 4,417.598 (TCU part no. 966 471)*

** 914 F commencing with S/N 4,420.200 (TCU part no. 966 741)*

9. Fuel pressure:

max. ..... Airbox pressure + 0,35 bar (5,08 psi)
min. ..... Airbox pressure + 0,15 bar (2,18 psi)
normal ..... Airbox pressure + 0,25 bar (3,63 psi)

◆ NOTE: Exceeding the max. admissible fuel pressure will override the float valve of the carburetor.

10. Power consumption of the hydraulic propeller governor:

max. ..... 600 W

11. Power consumption of the vacuum pump:

max. ..... 300 W

12. Power consumption of the external alternator:

max. ..... 1200 W

13. Deviation from bank angle

max. ..... 40°

◆ NOTE: Up to this value the dry sump lubrication system warrants lubrication in every flight situation.

14. Rotation reverse the direction of engine rotation

max. 1rotation

10.1.1.1) Performance graphs for standard conditions ISA (International Standard Atmosphere)

Take-off performance ..... 84,5 kW at 5800 rpm
1300 hPa (38,4 in.HG)
* 1320 hPa (39,0 in.HG)

Max. continuous performance ... 73,5 kW at 5500 1/min
1150 hPa (34,0 in.HG)
* 1180 hPa (34,9 in.HG)

◆ NOTE: The stated pressure in the suction tube is always lower by the pressure loss in the carburetors than the TCU controlled airbox pressure and may be therefore subject to bigger deviations.

** 914 UL starting with engine no. 4,417.598 (TCU part no. 966 471)*

** 914 F starting with engine no. 4,420.200 (TCU part no. 966 741)*

10.2) Operating media

10.2.1) Coolant

The following water-free coolant concentrate can be used based on propylene glycol.

	mixture ratio %	
designation	**concentrate**	**water**
EVANS NPG+ *	100	0

07032

* or equivalent

When correctly applied (100% coolant concentration), there is sufficient protection against vapor bubble formation, freezing or thickening of the coolant within the operating limits.

▲ WARNING: Provided nothing else has been specified by the manufacturer of the coolant concentrate, the coolant concentrate may not be mixed with conventional glycol/water coolant or with additives. Non-observance can lead to damages to the cooling system and to motor damages, since the properties of the coolant no longer exist.

■ CAUTION: The specifications of the manufacturer of the coolant concentrate are to be observed.

◆ NOTE: Depending on the installation circumstances (max. cylinder head temperature reached), conventional coolant can also be used. For this purpose, see the flight manual of the aircraft manufacturer.

10.2.2) Fuel

The following fuels* can be used.

914 UL / F
min. ROZ 95
EN 228 Super
EN 228 Super plus
AVGAS 100 LL

02990

Due to the higher lead content in AVGAS, the wear of the valve seats, the deposits in combustion chamber and lead sediments in the lubrication system will increase. Therefore, use AVGAS only if you encounter problems with vapour lock or if the other fuel types are not available.

■ ATTENTION: Use only fuel suitable for the respective climatic zone.

◆ NOTE: Risk of vapour formation if using winter fuel for summer operation.

* See also section 13) fuels FAA / DOT.

10.2.3) Lubricants

Oil: **Motorcycle oil of a registered brand with gear additives**. If using aircraft engine oil; than only blended one.

■ CAUTION**:** At the selection of suitable lubricants refer to the additional information in the Service Information SI-18-1997, current issue.

Oil specification

— Use only oil with API classification "**SF**" or "**SG**"!

— Due to the high stresses in the reduction gears, oils with gear additives such as high performance motor cycle oils are required.

— Because of the incorporated friction clutch, oils with friction modifier additives are unsuitable as this could result in a slipping clutch during normal operation.

— Heavy dury 4-stroke motor cycle oils meet all the requirements. These oils are normally no mineral oils but semi- or full synthetic oils.

— Oils primarity for Diesel engines are due to **insufficient high temperature properties and additives which favour clutch slipping, generally unsuitable.**

■ CAUTION**:** If the engine is mainly run on AVGAS **more frequent** oil changes will be required. See Service Information SI-18-1997, current issue.

Oil capacity: ..... 3 l (min. 2 l) (6.4 liq pt, min. 4.2 liq pt)

Oil consumption: ..... max 0,06 l/h (0.13 liq pt/h)

Oil viscosity:

Use of multi-grade oils is recommended.

◆ NOTE**:** Multi-viscosity grade oils are less sensitive to temperature variations than single grade oils. They are suitable for use throughout the seasons, ensure rapid lubrication of all engine components at cold start and get less fluid at higher temperatures.

Table of lubricants (See fig. 15)

Since the temperature range of neighbouring SAE grades overlap, there is no need for change of oil viscosity at short duration of ambient temperature fluctuations.

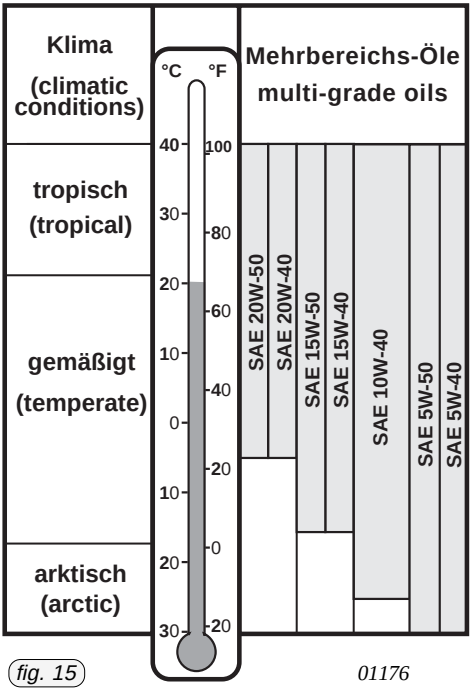

fig. 15 *01176*

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10.3) Standard operation

To warrant reliability and efficiency of the engine, meet and carefully observe all the operating and maintenance instructions.

10.3.1) Daily checks

▲ WARNING: **Risk of burnings and scalds!**
Conduct checks on the cold engine only!

▲ WARNING: **Ignition "OFF".** Before cranking the propeller switch off both ignition circuits and anchor the aircraft. Have the cockpit occupied by a competent person.

■ CAUTION: If established abnormalities (e.g. excessive resistance of the engine, noises etc.) inspection in accordance with the relevant Maintenance Manual is necessary. Do not release the engine into service before rectification.

Coolant level:

■ CAUTION: The coolant specifications of the section 10.2 Operating media are to be observed.

— Verify coolant level in the **expansion tank**, replenish as required up to top.

The coolant level must be at least 2/3 of the expansion tank.

— Verify coolant level in the **overflow bottle**, replenish as required.

The coolant level must be between max. and min. mark or at least 0.2 litre (0.4 liq pt).

Check of mechanical components:

Turn propeller by hand in direction of engine rotation several times and observe engine for odd noises or excessive resistance and normal compression.

Gear box:

— **Version without overload clutch:**

No further checks are necessary.

— **Version with overload clutch:**

Turn the propeller by hand to and fro, feeling the free rotation of 15 ° or 30 ° before the crankshaft starts to rotate.

If the propeller can be turned between the dogs with practically **no friction** at all (less than 25 Nm / 222 in.lb) further investigation is necessary.

Carburetor:

— Verify free movement of throttle cable and starting carburetor over the complete range. Check from the cockpit.

Exhaust system and trubocharger:

— Inspect for cracks, damages, leakage and general condition.

10.3.2) Before engine start

Carry out pre-flight checks.

10.3.3) Pre-flight checks

▲ WARNING: **Ignition "OFF"** Before cranking the propeller switch off both ignition circuits and anchor the aircraft. Have the cockpit occupied by a competent person.

Operating media:

▲ WARNING: Carry out pre-flight checks on the cold or luke warm engine only! **Risk of burning and scalds**.

Check for any oil-, coolant- and fuel leaks.

If leaks are evident, rectify before flight.

■ CAUTION: The coolant specifications of the section 10.2 Operating media are to be observed.

— Verify coolant level in the **overflow bottle**, replenish as required.

The coolant level must be between min. and max. mark or at least 0.2 litre (0.4 liq pt).

■ CAUTION: The oil specifications of the section 10.2 Operating media are to be observed.

— Check oil level and replenish as required.

▲ WARNING: Propeller may not be turned reverse the normal direction of rotation. See also section 10.1) General limits of operation.

— Prior to oil check, turn the propeller by hand in direction of engine rotation several times to pump oil from the engine into the oil tank, or let the engine idle for 1 minute.

This process is finished when air is returning back to the oil tank and can be noticed by a murmur from the open oil tank.

◆ NOTE: Oil level should be between max. and min. mark of the oil level gauge but must never be below min. mark. Before longer periods of operation ensure that oil level is at least up to mid-position.

Difference between max.- and min.- mark = 0,45 litre (0.95 liq pt)

10.3.4) Engine start

▲ WARNING! Do not take the engine into operation if any person is near the aircraft.

Fuel cock. ..... open

Starting carb. ..... activated

◆ NOTE: If the engine is already in operating temperature, start the engine without choke.

Throttle lever. ..... set to idle position

Master switch. ..... on

Function test of TCU:

◆ NOTE: When switching on the voltage supply, both lamps are automatically subject to a function test.

For approx. 1 - 2 seconds both lamps illuminate and then extinguish. If not, a check as per Maintenance Manual is necessary.

▲ WARNING: Do not take the engine into operation before having rectified the cause of deficiency.

electric fuel pump ..... on

Ignition. ..... both circuits switched on

Starter button. ..... actuate

■ ATTENTION: Activate starter for max. 10 sec. only (without interruption), followed by a cooling period of 2 minutes!

As soon as engine runs, adjust throttle to achieve smooth running at approx. 2500 r.p.m.

Check if oil pressure has risen within 10 seconds and monitor oil pressure. Increase of engine speed is only permitted at steady oil pressure readings above 2 bar (30 psi).

At an engine start with low oil temperature, continue to observe the oil pressure as it could drop again due to the increased flow resistance in the suction line. The number of revolutions may be only so far increased that the oil pressure remains steady.

De-activate starting carb.

■ ATTENTION: Since the engine comprises a reduction gear with shock absorber, take special care of the following:

To prevent impact load, start with throttle lever in idle position or at the most up to 10% open.

For the same reason, wait for around 3 sec. after throttling back to partial load to reach constant speed before re-acceleration.

For checking the two ignition circuits, only one circuit may be switched off and on at times.

■ ATTENTION: Do not actuate starter button (switch) as long as the engine is running. Wait until complete stop of engine!