ROTAX
AIRCRAFT ENGINES

SERVICE LETTER

ESSENTIAL INFORMATION REGARDING ENGINE BEHAVIOR, PERFORMANCE AND MANIFOLD PRESSURE DATA FOR ROTAX® ENGINE TYPE 912 AND 914 (SERIES)

SL-912-016
SL-914-014

Symbols used:

Please, pay attention to the following symbols throughout this document emphasizing particular information.

▲ WARNING: Identifies an instruction, which if not followed, may cause serious injury or even death.

■ CAUTION: Denotes an instruction which if not followed, may severely damage the engine or could lead to suspension of warranty.

◆ NOTE: Information useful for better handling.

| || A revision bar outside of the page margin indicates a change to text or graphic.

1) Planning information

1.1) Engines affected

All versions of the engine type:
- 912 (Series)
- 914 (Series)

1.2) Concurrent ASB/SB/SI and SL

none

1.3) Reason

Field experience has shown that additional information is necessary on the handling of ROTAX® aircraft engines type 912 and 914.
The areas of special importance are:
- Engine load (power setting) and its effect on the possibility of detonation and/or pre-ignition
- Idle speed setting
- Carburetor synchronization
- Balancing of the propeller

■ CAUTION: Compliance with these given instruction can help reduce the risk of engine overload but will not protect against incorrect operation and engine installation where limits of operation are exceeded. In addition the applicable limits in the Operators Manual have to be respected.

1.4) Subject

Essential information regarding engine behavior, performance and manifold pressure data for ROTAX® Engine Type 912 and 914 (Series).

1.5) Compliance

RECOMMENDED

1.6) Approval

The technical content is approved under the authority of DOA No. EASA.21J.048.

1.7) Manpower

none

d04645.fm

1.8) Mass data

change of weight - - - none.
moment of inertia - - - unaffected.

1.9) Electrical load data

no change

1.10) Software accomplishment summary

no change

1.11) References

In addition to this technical information refer to current issue of
- Operators Manual (OM)
- Installation Manual (IM)

◆ NOTE: The status of Manuals can be determined by checking the table of amendments of the Manual. The 1st column of this table is the revision status. Compare this number to that listed on the ROTAX® WebSite: www.rotax-aircraft-engines.com. Updates and current revisions can be downloaded for free.

1.12) Other publications affected

none

1.13) Interchangeability of parts

not affected

2) Material Information

none

3) Accomplishment / Instructions

Accomplishment

All the measures must be taken and confirmed by the following persons or facilities:

- Operators of ROTAX® Aircraft engines
- Aircraft Manufacturer (OEM's)

▲ WARNING: Proceed with this work only in a non-smoking area and not close to sparks or open flames. Switch off ignition and secure engine against unintentional operation. Secure aircraft against unauthorized operation. Disconnect negative terminal of aircraft battery.

▲ WARNING: Risk of scalds and burns! Allow engine to cool sufficiently and use appropriate safety gear while performing work.

▲ WARNING: Should removal of a locking device (e.g. lock tabs, self-locking fasteners, etc.) be required when undergoing disassembly/assembly, always replace with a new one.

◆ NOTE: All work has to be performed in accordance with the relevant Maintenance Manual.

3.1) Engine load (Power settings)

3.1.1) Background information

In isolated cases there have been situations of overloading the engine, leading to possible detonation (uncontrolled ignition of fuel/air mix) and/or pre-ignition (fuel/air mixed at incorrect time). Investigation showed if one or more parameter is exceeded and/or a combination at or near the limit can result in a higher risk of engine damage.

Parameters that have an effect detonation/pre-ignition	
Deviation/effect	**Possible cause**
High cylinder head temperature.	Insufficient cooling capacity (e.g. low coolant level, semi blocked radiator for winter, coolant pressure loss, poor engine installation).
High intake air temperature.	Fresh air intake receiving hot air (e.g. carburetor heat on, engine installation). Incorrect use of carburetor heat.
Ignition timing incorrect.	Incorrect spark plug grade/ heat range.
Pour fuel quality.	to low octane, contaminated fuel, excessive water, excessive alcohol, oil or diesel mixed. Use of non approved fuel additives.
Lean fuel/air mixture.	Non standard air box or filter, fuel system fault, incorrect jetting, poorly maintained carburetors. Use of non approved mixture leaning devices.
High engine load with low RPM.	Non suitable propeller (e.g. over pitched); in-flight-varible pitch propellers with incorrect control/operation of propeller (adjustment, rpm/manifold pressure). Refer to 3.1.2.

■ CAUTION: The execution of the engine installation will greatly affect certain aspects such as, intake air temperature, fuel mixture and running temperatures.

Examples:

- Due to poor engine installation an increased intake air temperature under the cowling (often not measured in flight) is possible. This could cause exceedance of the limits of operation (e.g. CHT and EGT). This could lead to a higher possibility of engine damage.
- An airbox other than a ROTAX® genuine item could considerably affect mixture. This is also relevant for cowling design that supplies hot air to the engine and/or does restrict airflow for adequate cooling.

3.1.2) Performance recommendations

Step	Procedure
1	Engine speed over 5500 rpm is restricted to 5 min maximum (As detailed in the Operators Manual 912/914 Series).
2	Take off RPM at WOT (wide open throttle) should not be below 5200 rpm to avoid over loading the engine.
3	Continuous use of engine speed below 5200 rpm with WOT should be avoided.

◆ NOTE: These recommendations are especially valid when coolant/cylinder head temperature higher than 120 °C (248 °F) and pressure altitude below approximately 1000 meters (3500 ft.).

3.1.3) Fixed pitch and ground adjustable propellers

■ CAUTION: ROTAX® strongly advises the installation of a manifold absolute pressure gauge. It is necessary to use a MAP gauge when setting a ground adjustable propeller. Fixed pitched propellers should be set so that the take off rpm is above 5200 rpm (WOT).

3.1.4) In-flight variable pitch and constant speed propellers

■ CAUTION: Manifold absolute pressure gauge must be fitted to aircraft with variable or constant speed propellers!
Correct procedure for in - flight variable pitch and constant speed propellers to avoid unnecessary load on the engine.

Step	Procedure
1	To increase power, first increase rpm by advancing the prop control, then increase MAP with the throttle. Refer also to the pilot operating handbook of the aircraft manufacturer for relevant power setting.
2	To decrease power, first reduce MAP with the throttle, and then decrease rpm with the propeller control.

3.2) Exhaust gas CO testing

- All ROTAX® aircraft engine are bench tested and have a relevant carburetion calibration set at the factory.

◆ NOTE: At calibration (standard day condition) only genuine ROTAX® spare parts and/or accessories were used. Non- genuine ROTAX® parts have to be tested accordingly.

- As mentioned in the Installation Manual, it is the responsibility of the aircraft manufacturer to carry out exhaust gas CO measurement to confirm that their installation and/ or use of non ROTAX® parts does not have a detrimental effect on carburetor calibration and is within ROTAX® stated limits.

◆ NOTE: The test should be performed as a ground run with full load (WOT, at no less that 5200 rpm, minimum of 900 hPa manifold pressure) with the engine cowl fixed in flight position and engine at full operating temperature.

3.3) Idle speed setting

■ CAUTION: It is strongly recommended that there is a mechanical “stop“-position on the throttle control inside the cockpit. This is to ensure that the throttles cannot be forced so as to bend the “stops“ on the carburetors and inadvertently stop the engine.
Ensure the engine is at its lowest possible idle speed (minimum of 1400 rpm) before selecting ignition off!

Step	Procedure
1	To reach an ideal engine run the engine idle speeds must be maintained as high as practical (max. 1800 rpm).
2	The idle speed has to be set for 1400 to 1800 rpm. The engine start and stop behavior is best in this rpm-range.
3	After engine start or landing it is recommended to advance the throttle that the engine runs smooth. Ground idle should be between 1400 and 1800 rpm.

◆ NOTE: There is no recommended idle speed in that relevant range that will suit all installations to the wide variation in propeller weights/moments of inertia.

3.4) Carburetor synchronization and maintenance

Regular pneumatic synchronizing of the carburetors and mechanical synchronization of the bowden cables for the throttles and chokes can greatly improve smoothness of engine operation.

Step	Procedure
1	At unusual vibration synchronizing the carburetors is prudent.
2	Adjust the idle mixture screw after synchronizing to smooth engine run.
3	Confirm that any electric boost pumps do not exceed the maximum fuel pressure of 0.4 bar (5.8 psi) to the carburetors when run in conjunction with the mechanical pump.
4	Check for a leaking float valve and to confirm the position for the float height.

3.5) Balancing of the propeller assembly

The correct balancing of the propeller assembly according to the manufacturer´s instructions will reduce engine vibration and decrease wear of gear reduction unit components.
Modern dynamic balancing is performed with the propeller on the aircraft.

3.6) Starting procedure and tips

Field experience has shown that starting the 912 and 914 (Series) of engine type can be difficult when using traditional aircraft engines techniques.

Cold engines	
Step	**Procedure**
1	Due a feature of the carburetor design the throttle must be at idle (fully closed) when starting a cold engine.
2	The choke must be fully opened.
3	Soon after starting advance the throttle to around 2000 rpm and slowly close the choke.
4	Keep engine at around 2200 rpm for warm up period.

◆ NOTE: Enigne type 914 Series - engine start at cold temperatures: Compared to 912 Series the choke must be kept open a bit longer and the throttle closed for some time while the engine gains heat. If the choke is removed too early the engine could stop.

Hot engines	
Step	**Procedure**
1	It is always prudent to park the aircraft with the nose pointing into wind to aid the cooling after shut down and prevent excessive heat soak under the engine cowling.
2	Open the throttle a small amount slowly while cranking (choke closed). Once the engine fires, advance throttle to 1800 / 2000 rpm.

Engines which have not started due to wrong procedure and are “flooded”	
Step	**Procedure**
1	Open throttle fully (choke closed).
2	Ignition ON and start the engine.

■ CAUTION: As ignition and starter are on the same switch, pay attention for sudden start of engine at high rpm.

3.7) Engine shut down tips

Step	Procedure
1	To reduce loading on the propeller and gearbox (e.g. by adjusting the propeller to fine pitch of in-flight variable pitch propellers) and throttle to idle position.
2	After cooling down run, close throttle fully so engine at its minimum speed, switch ignition off on one circuit for a short time (2-3 seconds) then switch off the second circuit.
3	914 Series: Always pay attention to cool down period to protect the turbocharger

Approval of translation to best knowledge and judgement - in any case the original text in German language and the metric units (SI-system) are authoritative.