ROTAX®

This SL revises SL-912-016/SL-914-014 revision 1 dated 30 December 2016

SERVICE LETTER

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

ATA System: 72-00-00 Engine

1) Planning information

To obtain satisfactory results, procedures specified in this publication must be accomplished with accepted methods and prevailing legal regulations.
BRP-Rotax GmbH & Co KG. cannot accept any responsibility for the quality of work performed in accomplishing the requirements of this publication.

1.1) Applicability

All versions of ROTAX® engine types:

Engine type	Serial number
912 (Series)	all
914 (Series)	all

1.2) Concurrent ASB/SB/SI and SL

SI-912-016 / SI-914-019, “Selection of suitable operating fluids for ROTAX® Engine Type 912 i, 915 i, 912 and 914 (Series)”.

1.3) Reason

Detailed analysis and investigation of field experience has shown that additional information is necessary on the handling (Aircraft Operators) and the installation (Aircraft Manufacturer OEM’s) of ROTAX® aircraft engines type 912 and 914.
Main contributing factors:

- Fuel type and quality
- Lean fuel/air mixture
- Exhaust back pressure
- Engine power setting
- Engine load
- Airbox temperature / engine compartment ventilation
- Carburetor heat
- Coolant temperature / cylinder head temperature

Further contributing factors:

- Ignition timing
- Exhaust gas CO testing / HC testing
- Ambient conditions
- Instrumentation
- Balancing of the propeller assembly
- Idle speed setting
- Carburetor synchronization and maintenance

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- Starting procedure and tips / Engine shut down tips

NOTICE

Compliance with these given instructions 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 (OM) and Installation Manual (IM) must 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 of this document is approved under the authority of the DOA ref. EASA.21J.048.

1.7) Labor time

None.

1.8) Mass data

Change of weight - - - none.

Moment of inertia - - - unaffected.

1.9) Electrical load data

No change.

1.10) Software modifications

No change.

1.11) References

In addition to this technical information refer to current issue of

- Operators Manual (OM)
- Installation Manual (IM)
- Maintenance Manual Line (MML)
- Maintenance Manual Heavy (MMH)

NOTE: The status of the Manuals can be determined by checking the table of amendments. The 1st column of this table shows the revision status. Compare this number to that listed on the ROTAX® website: www.FLYROTAX.com. Updates and current revisions can be downloaded for free.

1.12) Other Publications affected

- not affected

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2) Material Information

None.

3) Accomplishment/Instructions

- ROTAX® reserves the right to make any amendments to existing documents, which might become necessary due to this standardization, at the time of next revision or issue.

NOTE: Before maintenance, review the entire documentation to make sure you have a complete understanding of the procedure and requirements.

Accomplishment

All measures must be implemented and confirmed by at least one of the following persons or organizations:

- Persons with approved qualifications for the corresponding engine types. Only authorized persons (iRMT, Level Line Maintenance) are entitled to carry out this work
- Aircraft Manufacturer (OEM)

NOTE: Indicates supplementary information which may be needed to fully complete or understand an instruction.

All work has to be performed in accordance with the relevant Maintenance Manuals of the respective engine type.

General

All general inspection, maintenance and repair has to be carried out e.g. in accordance with relevant Advisory Circular AC 43.13 from FAA.

Advisory Circular

This Manual “Advisory Circular” AC describes maintenance methods, techniques and practice. These are recognized and authorized for inspection and repairs in non-pressurized areas for which there are no separate maintenance and repair instructions.

3.1) Introduction

In isolated cases there have been situations of overloading the engine, leading to possible detonation (uncontrolled ignition of fuel/air mixture) and/or pre-ignition (fuel/air mixture ignited at incorrect time) which affects the engine's longevity.

The root causes for detonation are quite complex and in most analyzed cases, a combination of several factors is listed in the table below. Visible detonation damage on an engine is always the accumulation of micro-damage on components caused by a significant amount of incorrect combustion sequences. However, once a critical threshold is reached, the damage caused to combustion-related components (pistons, piston rings, cylinders, cylinder heads) progresses quickly.

This Service Letter intends to convey additional information on this phenomenon and help all involved parties (OEM, operator, maintenance organization) to prevent detonation and therefore maximize their contribution towards engine reliability and longevity.

The points outlined mostly apply to the carburetor engines (ROTAX® 912 and 914 Series) as the calibration of air/fuel mixture and ignition timing is fixed by its mechanical components, in contrary to fuel-injected, electronically controlled engines (ROTAX® 912 i and 915 i Series) where the presence of various sensors in conjunction with the ECU allow flexible adaption to the contributing factors listed below.

Main contributing factors	Reference
Fuel type and quality	See section 3.2
Exhaust back pressure	See section 3.3
Engine power setting	See section 3.4
Engine load	See section 3.5
Airbox temperature	See section 3.6
Carburetor heat	See section 3.7
Coolant temperature / cylinder head temperature	See section 3.8

Further contributing factors	Reference
Ignition timing	See section 3.9
Lean fuel/air mixture	See section 3.10
Exhaust gas CO testing / HC testing	See section 3.11
Ambient conditions	See section 3.12
Instrumentation	See section 3.13
Balancing of the propeller assembly	See section 3.14
Idle speed setting	See section 3.15
Carburetor synchronization and maintenance	See section 3.16
Starting procedure and tips / Engine shut down tips	See section 3.17

3.2) Fuel type and quality

3.2.1) Background information

Service Instruction SI-912-016 / SI-914-019, “Selection of suitable operating fluids for ROTAX® Engine Type 912 i, 915 i, 912 and 914 (Series)” shows the generally approved fuels as per ingredients.

Beside SI-912-016 / SI-914-019 several other factors need to be considered during the process of fuel selection:

- Prevailing ambient conditions (pressure and temperature, depending on location and climate zone of usage, see section 3.4.1)
- Engine operation in applications with potential high engine loads (e.g. glider towing, flight schools, floatplanes & amphibious aircraft)
- Probability of pilot errors during operating; (e.g. incorrect application of propeller pitch or carburetor heat by inexperienced students in flight school applications)

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NOTE: In general, the minimum RON 98 fuels significantly reduce the proneness to detonation damage and increases engine longevity. The selection of proper fuels is one of the main levers to prevent detonation damage, especially in the case of other contributing factors being present (see the table in section 3.1). ROTAX®, therefore, recommends a minimum of RON 98 fuels in case of uncertainties or doubts.

Independent of the chosen fuel the following topics are also crucial:

- Clean fuel (consider filtering/screening while fueling)
- No contaminants (water, alcohol, oil, diesel, fuel additives)
- Appropriate storage (duration, approved container)
- If available select summer / winter blends according to the relevant season

3.2.2) OEM information

For specifying the approved fuel types for the aircraft in the respective AFM / POH (pilot operating handbook) or equivalent, please refer to SI-912-016 / SI-914-019, “Selection of suitable operating fluids for ROTAX® Engine Type 912 i, 915 i, 912 and 914 (Series)”, current version, for general recommendations.

NOTE: As outlined in section 3.2.1, please pay special attention to additional factors to support engine longevity. In case of uncertainties or doubts, use minimum RON 98 fuels.

3.2.3) Operator information

Please follow recommendations with regards to approved fuel types as per AFM / POH (pilot operating handbook):

- In case of contradiction or doubts opt for minimum RON 98 fuels
- Avoid any contamination of fuel by e.g. water, alcohol (exceeding the specified limit), oil or diesel
- Refrain from using non-approved fuel additives
- Ensure that the fuel source (airport/landing strip, automotive fuel station) meets the required quality standards

NOTE: Implement procedures to regularly check, track and document the quality of the fuel used. In case of detonation damages, it is mandatory to provide a fuel sample of the fuel being used during time of incident.

3.2.4) Maintenance information

- Check for signs of contaminated fuel (alcohol - exceeding specified limit, oil, diesel, fuel additives)
- In case of detonation events, ensure the required fuel samples can be provided to the authorized distributor for any warranty application
- In case of the combination of lower octane fuels and evidence of contributing factors (see 3.1) please advise the operator to change over to minimum RON 98 fuels

3.3) Exhaust back-pressure

3.3.1) Background information

Excessive exhaust back pressure is one of the main contributing factors of detonation. Pay special attention to the limits outlined in the latest Installation Manual (IM) of the respective engine types.

3.3.2) OEM information

In case of modifying or not using the ROTAX® exhaust assy, the OEM has to pay special attention and stay within the allowed limits of back pressure.

- Perform and document an exhaust back pressure measurement following the installation manual procedure. This has to be done with a serial production aircraft (not a development prototype that is subject to change) This will also apply to any modifications to the exhaust system; in this case, the measurements have to be repeated and results updated.

In case of any questions, please refer to the authorized distributor for support.

NOTE: A suitable documentation of these back-pressure measurements have to be provided for any warranty application due to detonation.

3.3.3) Operator information

None.

3.3.4) Maintenance information

Please check exhaust system while performing maintenance events.

Pay special attention to:

- Any unauthorized modifications or improper repairs on the exhaust system
- Damages due to mechanical impact, e.g. heavy landing
- When performing repairs to the exhaust system, avoid e.g. excessive welding seams, introducing kinks, or any other modifications which might limit the available cross-section of the exhaust system (thus increasing exhaust back-pressure)

3.4) Engine power setting

3.4.1) Background information

Performance and manifold pressure (MAP) are a very important factor to assure proper operations and combustion conditions and is also strongly influenced by the choice of fuel type.

NOTE: The shown manifold pressure graph is based on the ROTAX® engine type 912 S/ 912 ULS and is not relevant for ROTAX® engine type 912 A, 912 F, 912 UL, 914 F and 914 UL.

NOTE: The Wide Open Throttle (WOT) ISA inch Hg line shows the manifold pressure at the relevant engine rpm at wide open throttle under ISA (International Standard Atmosphere) conditions.

NOTE: AVGAS with its normally high RON does not show any knock effects.

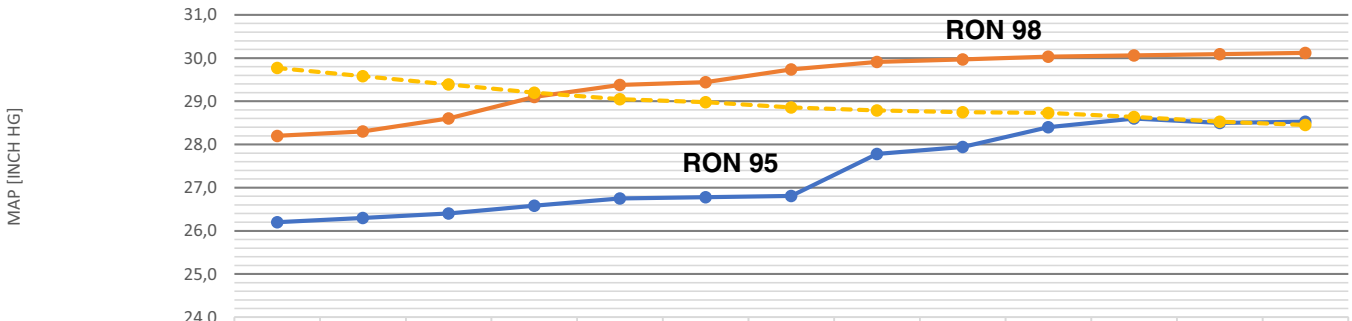
NOTE: In the case of different fuel types being mixed together, the lower of the RON numbers must be applied.

NOTICE Operate the engine as per RON value shown in the graph below.

Use the following graph to determine appropriate power and MAP settings and fuel type to ensure maximum engine durability with regard to detonation effects.

NOTE: In the area above the RON 95 inch Hg line or the RON 98 inch Hg line first knock events may occur at the relevant RPM. These lines do show analysis and data of representative and typical aircraft installations.

Performance and manifold pressure (MAP) settings for ROTAX® 912 S/ULS for fuel type RON 95 and RON 98:



Prop. speed	1029	1235	1440	1646	1811	1893	2016	2099	2140	2160	2263	2387	2469
Engine speed	2500	3000	3500	4000	4400	4600	4900	5100	5200	5250	5500	5800	6000
RON 95 inch Hg line	26,2	26,3	26,4	26,6	26,8	26,8	26,8	27,8	27,9	28,4	28,6	28,5	28,5
RON 98 inch Hg line	28,2	28,3	28,6	29,1	29,4	29,4	29,7	29,9	30,0	30,0	30,1	30,1	30,1
WOT ISA inch Hg	29,8	29,6	29,4	29,2	29,1	29,0	28,9	28,8	28,8	28,7	28,6	28,5	28,5

PROPELLER SPEED / ENGINE SPEED [RPM]

RON 95 inch Hg line RON 98 inch Hg line WOT ISA inch Hg

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3.4.2) OEM information

- It is strongly recommended to install a MAP gauge to allow proper monitoring and adjustments at engine operation
- Procedures for aircraft not fitted with a MAP (Manifold Pressure) gauge. E.g. with fixed pitch propeller it is strongly recommended to reduce the WOT position by approx. 100 rpm (after reaching safe altitude). The exact definition is dependent on the aircraft installation and needs to be defined and published in the AFM / POH (pilot operating handbook)
- Power settings as per AFM / POH (pilot operating handbook) must be within ROTAX® performance and manifold data in relation to the provided graphs

NOTE: If in doubt use higher octane fuels. Recommend minimum RON 98 fuel in AFM / POH (pilot operating handbook) for high load applications.

- Proper choice for propeller type in order to avoid fixed pitch propellers manufactured with too much pitch

NOTICE

Manifold absolute pressure gauge must be fitted to aircraft with in-flight adjustable or constant speed propellers! Ensure calibration of the whole measurement chain to provide accurate readings (e.g. compare with pressure value on ground).

3.4.3) Operator information

- Strictly follow the operating envelope of AFM / POH (pilot operating handbook) for the relevant fuel type used.

NOTE: Ensure pilots familiarization with and proper application of the provided manifold data graphs. See section 3.4.1.

Correct procedure for in-flight variable pitch and constant speed propellers to avoid unnecessary load on the engine:

Step	Procedure
1	To increase power, increase propeller speed [rpm] first, then increase MAP with the throttle lever. 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.

3.4.4) Maintenance information

Ground adjustable propellers configured with too much pitch and incorrectly controlled in flight adjustable propellers.

Deviation/effect	Possible cause
Excessively high engine load with low RPM.	Check ground adjustable propellers configured with too much pitch, and incorrectly controlled in-flight adjustable propellers. Check for correct fuel usage and remind Operator to be sure of correct fuel type usage and to avoid overloading the engine.

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3.5) Engine load

3.5.1) Background information

Depending on the usage of the aircraft, the engine may be exposed to different load patterns.

The following points are considered as high load applications:

- High drag or heavy aircraft such as floatplanes and amphibious aircraft
- Glider towing (as there are repeated climbs with high load)
- Flight school operation as the following situations might occur on a regular basis:
  - High load due to frequency of starts and touch-and-go's
  - Errors of students in stress situations like e.g. violation of allowed operating envelope, improper use of carb heat and propeller pitch
  - Simulated engine failure on twin engine applications
  - Training of emergency procedures

NOTE: Using minimum RON 98 fuels provide excellent contribution to minimizing the probability of detonation damages, especially in high load applications.

NOTE: Fixed pitch propellers manufactured with too much pitch, ground adjustable propellers configured with too much pitch and incorrectly controlled in-flight adjustable propellers may cause overload as well for the engine. Please refer to section 3.4. for ROTAX® performance and manifold data charts.

Performance recommendations:

Step	Procedure
1	Restrict engine speed over 5500 rpm to 5 min maximum (as detailed in the Operators Manual (OM) 912/914 Series).
2	Choose take off RPM at WOT (wide open throttle) according to the selected fuel (refer to section 3.4.1).
3	Choose RPM for continuous operation of engine at WOT according to the selected fuel (refer section to 3.4.1).

3.5.2) OEM information

In doubt use higher octane fuels. Recommend minimum RON 98 fuel in AFM / POH (pilot operating handbook) for high load applications.

3.5.3) Operator information

In case of contradiction or doubts opt for minimum RON 98 fuels.

3.5.4) Maintenance information

Check for proper fuel usage and remind operator.

3.6) Airbox temperature

3.6.1) Background information

Hot air conditions favor detonation effects. Such conditions could be caused by:

- Fresh air intake receiving hot air (e.g. carburetor heat on - see as well section 3.7, engine installation)
- Incorrect use of carburetor heat (see as well section 3.7)
- Poor engine installation, leading to excessive heat up of intake air

NOTICE

The engine installation will greatly affect certain aspects such as, intake air temperature, fuel mixture and running temperatures. For proper instruction see latest Installation Manual (IM) of the respective engine type.

3.6.2) OEM information

- Minimize heat up of intake air (without activated carburetor heat) under cowling by proper firewall-forward design and engine installation. This could cause exceeding of limits of operation (e.g. CHT and EGT) and thus lead to a higher possibility of engine damage

NOTE: Good installations are able to achieve less than 5° C (delta between carburetor entrance and ambient temperature) at max. continuous power.

- In case of using a non-ROTAX® genuine airbox consider the negative effect on mixture distribution
- Avoid improper cowling design that supplies hot air to the engine and/or restricts airflow causing inadequate cooling
- Respect maximum allowable temperatures of engine components in all operating conditions of flight to avoid operational problems. Always design engine installations to respect all parameters and limitations.

NOTE: A suitable documentation of these airbox temperature measurements might be inquired in case of warranty application due to detonation.

3.6.3) Operator information

- Check at preflight check for any restrictions in air intake
- Follow the OEM's instructions in AFM / POH (pilot operating handbook) with regards to airbox temperature (if proper instrument is installed), see as well section 3.7

3.6.4) Maintenance information

- Check for modifications and restrictions in air intake
- Visual check of airbox for restrictions, leakages, cracks and improper connections
- Check for proper function of air temperature sensor(s)

3.7) Carburetor heat

3.7.1) Background information

Elevated temperatures of intake air can cause detonation events (see section 3.12), especially in combination with high engine loads.
A similar effect is present when the carburetor heat system is activated along with high engine loads e.g. during touch&go with carburetor heat on.

Field experience has shown that:

- Depending on the specific implementation of the carburetor heat the amount of temperature rise of the intake air can be significantly above the operating limits
- Improper maintenance or improper adjustment of the whole carburetor heat mechanism can lead to inadvertent activation of the carburetor heat system (flap not fully closed, Bowden cable not adjusted,...)

NOTE: Using minimum RON 98 fuel does significantly minimize the detrimental effects of improperly applied carburetor heat on engine longevity - but will however not completely eliminate it.

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3.7.2) OEM information

- Design of carburetor heat system to meet but not exceed the actual requirements
- Measurements on actual temperature rise in all applicable ambient and operating conditions
- Precisely specify the carburetor heat usage and limit its duration to the necessary minimum via AFM / POH (pilot operating handbook) to educate the operator
- Pay attention to bypass of carb heat
- Proper carb heat linkage design to avoid mis-actuation in case of (e.g. thermal expansion, engine movement within the shock mounts, etc.)

3.7.3) Operator information

- Follow the OEM's instructions in AFM / POH (pilot operating handbook) with regards to carburetor heat
- In case of flight school operation: educate instructors and students about the importance of proper and minimized carburetor heat usage

3.7.4) Maintenance information

- Ensure proper actuation of carb heat system (e.g. proper adjusted Bowden cable and flap)
- Check carburetor heat, Bowden cable clearance and function

3.8) Coolant temperature / cylinder head temperature

3.8.1) Background information

Diligent monitoring of coolant temperature / cylinder head temperature has a significant impact on proper engine operation (see relevant Operators Manual (OM)); the respective limits have to be met under all operating conditions of the engine.

NOTE: For information on engines with suffix 01, see Service Bulletin SB-912-066 / SB-914-047, current version.

3.8.2) OEM information

Proper engine installation must meet all requirements within the Installation Manual (IM), including special attention to the following:

- Proper coolant system ventilation
- Check temperatures, including cylinder wall temperatures at first installation

NOTE: A suitable documentation of these cylinder wall temperatures measurements have to be provided in case of warranty application due to detonation.

- Check for estimated operating environments in different climates (hot day check)

3.8.3) Operator information

- Check for normal coolant temperature / cylinder head temperature
- Follow procedures of preflight check (coolant levels, blocked radiator)
- Consider partially covered radiator for winter
- Follow the instructions in the AFM / POH (pilot operating handbook) for operation in different climates

3.8.4) Maintenance information

Insufficient cooling capacity (e.g. low coolant level, semi blocked radiator for winter, coolant pressure loss, proper coolant type).

- Check for proper function of cap of expansion tank
- Check for proper venting of overflow bottle

3.9) Ignition timing

3.9.1) Background information

For proper combustion the correct spark plug grade / heat range and ignition timing is important.

3.9.2) OEM information

- As OEM make sure that the ROTAX® genuine spark plugs and heat conduction compound is applied to the threads of the spark plugs

NOTE: Do use correct quantity of heat conduction compound. Excessive use of heat conduction compound could lead to the effect of contributing to detonation.

- In a pre-delivery inspection make sure that spark plugs / spark plug connectors and trigger coils are not damaged and are working fine

3.9.3) Operator information

None.

3.9.4) Maintenance information

- Inspect for incorrect spark plug grade / heat range and change spark plugs together with use of heat conduction compound on the spark plug threads as per latest Maintenance Manual Line (MML) of the respective engine type

NOTE: Do use correct quantity of heat conduction compound. Excessive use of heat conduction compound could lead to the effect of contributing to detonation.

- Inspect for proper pick-up position and gap. See latest Maintenance Manuals for proper setting of trigger coils

3.10) Lean fuel / air mixture

3.10.1) Background information

The fuel/air mixture does also influence the whole combustion process. Especially lean conditions do have very negative effect and can be caused by various factors.

3.10.2) OEM information

- Use proper ROTAX genuine air filter
- Make sure proper jetting is used
- Ensure adequate fuel delivery according to the specifications in the latest Installation Manual (IM) of the respective engine type
- Use ROTAX® genuine airbox
- Do not install non-approved mixture leaning devices

3.10.3) Operator information

None.

3.10.4) Maintenance information

- Check air filters according to the latest Maintenance Manual of the respective engine type
- Perform correct maintenance of carburetors according to the latest Maintenance Manual of the respective engine type
- Check airbox according to the latest Maintenance Manual of the respective engine type

3.11) Exhaust gas CO testing / HC testing

3.11.1) Background information

All ROTAX® aircraft engines are bench tested and have a relevant carburetor factory calibration.

NOTE: At factory 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 (IM), 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 (for allowed RPM at wide open throttle please refer to section 3.4.1) with the engine cowl fixed in flight position and engine at full operating temperature.

In order to obtain further information for mixture distribution or to make statements, a CO and/or HC measurement at the individual cylinders would be useful.

3.11.2) OEM information

- Perform testing at first engine installation
- Re-test at modification of the exhaust system

3.11.3) Operator information

None.

3.11.4) Maintenance information

In case of maintenance of the exhaust system make sure to perform CO and/or HC measurement according to the relevant Aircraft Maintenance Manual.

3.12) Ambient conditions

3.12.1) Background information

The engines are operated in various areas of the world and therefore the prevailing ambient conditions (pressure and temperature) are strongly depending on location and climate zone of usage.

NOTICE Do not operate the engine above the limits of the graph in section 3.4.

3.12.2) OEM information

- Check for estimated operating environments in different climates and precisely specify via AFM / POH (pilot operating handbook) to educate the operator
- Consider the ambient conditions in the charts in the AFM

3.12.3) Operator information

- Follow the instructions in the AFM / POH (pilot operating handbook) for operation in different climates

3.12.4) Maintenance information

- Perform correct maintenance for the specific climate according to the relevant Aircraft Maintenance Manual

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3.13) Instrumentation

3.13.1) Background information

ROTAX® strongly recommends additional to minimum required instrumentation as per Installation Manual (IM) the installation of:

- A manifold absolute pressure gauge
- An airbox temperature sensor (see as well section 3.6)

3.13.2) OEM information

Follow the ROTAX® recommendation to install:

- A manifold absolute pressure gauge
- An airbox temperature sensor

Precisely specify the use of instrumentation via AFM / POH (pilot operating handbook) to educate the operator.

3.13.3) Operator information

- Follow the instructions in the AFM / POH (pilot operating handbook) for operation and proper reading of instrumentation and the specified limits

3.13.4) Maintenance information

- Check the proper function of the instrumentation and their sensors according to the relevant Aircraft Maintenance Manual. Perform proper calibration of whole measurement chain

3.14) Balancing of the propeller assembly

3.14.1) Background information

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.

3.14.2) OEM information

- Choose the proper propeller type with proper specifications for the relevant engine type and aircraft design.
- Check balancing of propeller before delivery of aircraft

3.14.3) Operator information

None.

3.14.4) Maintenance information

- Check the balancing of the propeller according to the relevant Aircraft Maintenance Manual and/or Propeller Maintenance Manual

3.15) Idle speed setting

3.15.1) Background information

To reach a smooth engine run the engine idle speed must be maintained as high as practical. The idle speed has to be set about 1400 to 1800 rpm. The engine start and stop behavior should be most efficient in this rpm-range.

3.15.2) OEM information

- There is no recommended idle speed in that relevant range that will suit for all installations due to wide variation in propeller weights/moments of inertia, engine mount design etc.

- The idle speed for the relevant aircraft needs to be specified via AFM / POH (pilot operating handbook) to educate the operator
- It is strongly recommended that there is a mechanical “stop“-position on the throttle control inside the cockpit

NOTE: This is to ensure that the throttle cannot be forced so as to bend the “stops“on the carburetors and inadvertently stop the engine or cause rough running at idle.

3.15.3) Operators information

- After engine start or after landing it is recommended to advance the throttle so, that the engine runs smoother. Ground idle should be between 1400 and 2200 rpm
- Ensure the engine is at its lowest possible idle speed (minimum of 1400 rpm) before selecting “ignition OFF”

3.15.4) Maintenance information

- Check the carburetors for bent “stops“, which inadvertently could stop the engine or cause rough running at idle.

3.16) Carburetor synchronization and maintenance

3.16.1) Background information

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.

3.16.2) OEM information

- Ensure proper synchronization at aircraft delivery

3.16.3) Operator information

None.

3.16.4) Maintenance information

Step	Procedure
1	At unusual vibration, it would be constructive to synchronize the carburetors.
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 0.5 bar (7.25 psi) to the carburetors when run in conjunction with the mechanical pump.
4	Check that the float valve is not leaking. Verify the float height is correct.

3.17) Engine starting and shutdown procedure and tips

3.17.1) Background information

Field experience has shown that starting and shutting down the 912 and 914 (Series) can be difficult, when using traditional or legacy aircraft engines techniques.

3.17.2) OEM information

- Consider the relevant engine starting and shutdown procedure and tips also in the AFM / POH (pilot operating handbook) to educate the operator

3.17.3) Operator information

Starting procedure and tips:

Cold engines	
Step	**Procedure**
1	Due to a feature of the carburetor design the throttle must be at idle (fully closed) when starting a cold engine. **This allows for more effective fuel enrichment**.
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: Engine 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.

NOTICE As ignition ON and starter may be on the same switch, pay attention for sudden start of engine at high rpm.

NOTE: To increase power, put the prop governor lever to maximum rpm speed, then increase MAP with the throttle lever. Refer also to the pilot operating handbook of the aircraft manufacturer for relevant power setting.

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Engine shutdown tips:

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	Reduce loading on the propeller and gearbox by adjusting the propeller to fine pitch (in-flight variable pitch propellers) and move throttle to idle position.
3	After cooling down run, throttle must be at idle 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.
4	914 Series: Always pay attention to cool down period to protect the turbocharger.

NOTE: To decrease power, first reduce MAP with the throttle, and then decrease rpm with the propeller control.

3.17.4) Maintenance information

None.

3.18) Summary

The execution of the Service Letter must be confirmed in the logbook.

NOTE: Work on EASA certified parts might affect the EASA Form 1 and does require appropriate documentation by authorized persons. Repairs must be entered into the engine logbook and also do apply for the EASA Form 1.

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

Translation to other languages might be performed in course of localization. In any case the original text in English language and the metric units are authoritative.

3.19) Inquiries

Inquiries regarding this Service Letter should be sent to the ROTAX® authorized distributor or independent Service Center of your area.

A list of all distributors is provided on www.FLYROTAX.com.

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