This SI revises SI-912 i-001R5/SI-915 i-001/SI-912-016R10 and SI-914-019R10 dated 20 December 2017

SERVICE INSTRUCTION

Selection of suitable operating fluids for ROTAX® Engine Type 916 iSc B, 915 i A/B (Series), 912 i (Series), 912 and 914 (Series)

ATA System: 12-10-00 Operating fluids

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 engines of type:

Engine type	Serial number
916 iSc B	all
915 i A (Series)	all
915 i B (Series	all
912 i (Series)	all
912 (Series)	all
914 (Series)	all

1.2) Concurrent ASB/SB/SI and SL

None.

1.3) Reason

Introduction of the new engine type 916 iSc B. Adaptions/revisions in the tables for the released fuels according to local standards. Removal of fuel brand-names which are already compliant to local standards.

1.4) Subject

Selection of suitable operating fluids for ROTAX® engine type 916 iSc B, 915 i A/B (Series), 912 i (Series), 912 and 914 (Series).

1.5) Compliance

Corresponding Maintenance Manual of engine type ROTAX® 916 iSc B, 915 i, 912 i, 912 and 914 (Series), current issue.

⚠ WARNING Non-compliance with these instructions could result in engine damages, personal injuries or death.

1.6) Approval

The technical content of this document is approved under the authority of the DOA ref. EASA.21J.048.

d06544.fm

Copyright - BRP-Rotax GmbH & Co KG. All rights reserved.

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 (MM)

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 the are listed on the ROTAX website: www.flyrotax.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

2.1) Material- cost and availability

None.

Copyright - BRP-Rotax GmbH & Co KG. All rights reserved.

3) Lubricant

3.1) General

Foreign particles formed during combustion are suspended in the engine oil. Together with oil components that are not sufficiently resistant to heat, these foreign particles can cause parts such as pistons, piston rings, exhaust valves, etc., to seize and lead to problems.
On turbocharged engines, failing to ensure an adequate cool-down period prior to shut-off may lead to particle deposits and cause damage to bearings and seals. Hard oil residues can obstruct parts of the oil system and lead to damage.

- In addition to insufficient cool-down periods, the use of unsuitable oils and not obeying oil change intervals can especially cause such damage.
- Long-term operation with an engine that is too cold and/or operating too long with an overly rich fuel mixture can cause water and fuel contamination in the oil, reducing its lubrication capacity.
- Furthermore, long down times with oil that contains water and contaminants can cause corrosion damage, especially on the bearings, with serious consequential damage.

The criteria for correct engine oil selection are:

- Correct oil viscosity for cold starts and sufficient oil pressure at high temperatures.
- Good gear wear protection.
- Avoidance of clutch slipping due to use of additives.
- Insufficient oil flow capability causes too much volume to remain in the engine, leading to low oil level in the external oil tank. This can only be detected during testing with an oil level indicator installed on the oil tank.
- Ability to withstand combustion products containing lead, which enter the oil during AVGAS operation.
- High oil temperature durability. This is especially important for the turbo engine due to the risk of oil carbon buildup on the bearing and sealing seats of the turbocharger. The oil carbon buildup (coking) can also flake off and block/restrict the oil return passage.

Conclusions

- If possible, operate the listed engine types using unleaded or low-lead fuel. (AVGAS 100 LL is not considered low leaded in this context.).
- Only use engine oils tested and released according to the ROTAX® standard (RON 424), see section 3.2.
- Due to high stresses in the reduction gears, oils with gear additives such as AeroShell Oil Sport Plus 4 are highly recommended.
- Because of the incorporated friction clutch, oils with friction modifier additives are unsuitable because this could result in clutch slipping during standard operation.
- Avoid oils strictly specified for use in Diesel engines. These may not be suitable due to insufficient high temperature properties and additives that may affect the operation of the overload clutch in the gear box.
- On turbocharged engines, always conduct a cool-down run before shutting down in accordance with the relevant Operators Manual (OM).
- Pay special attention to engine operation tips (see section 6).

Copyright - BRP-Rotax GmbH & Co KG. All rights reserved.

3.2) Operation with unleaded and low-lead fuel (less than 0.1 g/liter lead content)

NOTICE

When operating primarily on unleaded fuels or MOGAS, the maintenance intervals remain unchanged in regard to the published maintenance schedule found in the currently valid Maintenance Manual for the engine type.
In case of severe operating conditions (operation in cold/hot weather areas, interference by dust and/or salt), the time between maintenance intervals must generally be shorter, and in particular, the frequency of oil changes must be increased regardless of the type of fuel mainly used (MOGAS or AVGAS).

Engine oils tested according to RON 424* for use with our ROTAX® engine types 916 iSc B, 915 i A/B Series, 912 i Series, 912 and 914 Series (use of unleaded fuel or MOGAS):

Brand	Description	Specification	Viscosity
SHELL®	AeroShell Oil Sport Plus 4 [1) 2)]	RON 424*	SAE 10 W-40

[1)] with new formulation

[2)] in red bottle

* **RON 424**: The ROTAX® Norm 424 (RON 424) is a BRP-Rotax internal standard, which describes the specification, performance parameters and testing methods of lubricants specifically designed to be used with ROTAX® Aircraft Engines. It is only available on special request via the ROTAX® Authorized Distributor and will not be disclosed to third parties without prior consent.

NOTE: The previous formulation of AeroShell Oil Sport Plus 4 can still be used until its expiration date.

NOTE: The coefficient of viscosity indicates the tendency of oil to flow but it is not necessarily a quality code. Country specific deviations of the viscosity are possible.

d06544.fm

Copyright - BRP-Rotax GmbH & Co KG. All rights reserved.

3.3) Operation with leaded AVGAS fuels

Perform maintenance checks according to the latest Maintenance Manual.

More frequent oil changes will assure timely removal of residues and oil sludge thus avoiding increased wear or operating troubles.

Engine oils tested according to RON 424* for use with our ROTAX® engine types 916 iSc B, 915 i A/B Series, 912 i Series, 912 and 914 Series (use of leaded AVGAS):

Brand	Description	Specification	Viscosity
SHELL®	AeroShell Oil Sport Plus 4 [1) 2)]	RON 424*	SAE 10 W-40

[1)] with new formulation

[2)] in red bottle

* **RON 424**: The ROTAX® Norm 424 (RON 424) is a BRP-Rotax internal standard, which describes the specification, performance parameters and testing methods of lubricants specifically designed to be used with ROTAX® Aircraft Engines. It is only available on special request via the ROTAX® Authorized Distributor and will not be disclosed to third parties without prior consent.

NOTE: The previous formulation of AeroShell Oil Sport Plus 4 can still be used until its expiration date.

NOTE: The coefficient of viscosity indicates the tendency of oil to flow but it is not necessarily a quality code. Country specific deviations of the viscosity are possible.

Copyright - BRP-Rotax GmbH & Co KG. All rights reserved.

4) Coolant

4.1) General

NOTICE

Waterless coolant based on propylene glycol is not permitted for engine types 916 iSc B, 915 i A/B Series and 912 i Series.

All engine types 916 iSc B, 915 i A/B Series, 912 i, Series, 912 and 914 Series have liquid cooled cylinder heads and ram air cooled cylinders. The function of the coolant is to protect the cylinder heads from over-temperature by means of heat dissipation. Protection against corrosion of the engine components and freezing of the coolant is achieved with appropriate additives.

In principle, 2 different types of coolant are permitted:

- Conventional coolant based on ethylene glycol with 50% water content
- Waterless coolant based on propylene glycol (not allowed for 916 iSc B, 915 i A/B Series and 912 i Series)

4.2) Conventional coolant

Conventional coolant (with about 50% water content) has a specific thermal capacity that is higher than waterless coolant. It gives excellent corrosion protection, especially for aluminum, and protection against freezing.

NOTE: For exact monitoring of the coolant temperature, a limit has been set. This is necessary because standard coolant based on ethylene glycol such as BASF Glysantin in a 50/50 proportion mixture can boil at a temperature as low as 120 °C (248 °F). Refer to the current Installation Manual for more information and instructions.

NOTICE

The certification and determination of the correct coolant type must be conducted by the aircraft manufacturer. As each aircraft type has different characteristics, testing must be done to determine the most suitable coolant and instrumentation for each aircraft type.

NOTE: Coolant should be a low silicate and nitrite free formula. Follow coolant manufacturer directions regarding mixture percentages etc..

Coolants with a mixture of 50% antifreeze and 50% of distilled water recommended by the authorized distributors (not tested from BRP-Rotax).

NOTE: The following list is based on the experiences and local recommendation by the authorized distributors. Coolant brands, with same designation, may vary from one to the other region. Please contact the local distributor for a recommendation.

Brand	Description
BASF®	Glysantin Protect Plus/G48
CASTROL®	Antifreeze All-Climate
CASTROL®	Antifreeze Anti-Boil
OMV®	OMV Coolant Plus
PETROL®	Antifreeze Concentrate / Antifreeze G 11
PRESTONE®	DEX-COOL extended life
PRESTONE®	50/50 Premix DEX-COOL extended life

d06544.fm

Copyright - BRP-Rotax GmbH & Co KG. All rights reserved.

Brand	Description
SHELL®	DEX-COOL®
SHELL®	SHELLZONE® DEX-COOL® Extended Life
TEXACO®	Havoline Extended Life Antifreeze
VELVANA®	FRIDEX G49
YACCO®	LR-35

4.3) Waterless coolant for engine types 912/914 Series

NOTICE

Waterless coolant is not permitted for engine types 916 iSc B, 915 i A/B Series, 912 i Series or for 912/914 Series with cylinder head version Suffix - 01.

NOTICE

The certification and determination of the correct coolant type must be conducted by the aircraft manufacturer. As each aircraft type has different characteristics, testing must be done to determine the most suitable coolant and instrumentation for each aircraft type.

The coolant suppliers guidelines must be adhered to when filling or re-filling coolant.

NOTE: EVANS® Cooling Systems, Inc. offers its NPG+C coolant worldwide under several names. For some recent examples, see also the next table. For any naming, specification or successor products contact your local EVANS® Cooling Systems, Inc. Official Partner.

NOTICE

EVANS® coolants are fully operational to -40 °C (-40 °F). It will not freeze and expand like conventional coolant.

Brand	Description	
EVANS®	Aero Cool 180°	Europe/Middle East
	NPG+C	China
	Evans High Performance Coolant	USA and rest of the world

4.3.1) Warnings for operating with waterless coolant

- Water or coolant containing water **must never** be added to the cooling system!
- The max. water content must not exceed 3.6 %; it can be tested using a Brix refractometer
- Any water present in the cooling system is separated out as vapor. This can cause the cooling system to fail due to insufficient coolant quantity
- If EVANS® coolant is not available locally for servicing the cooling system, a conventional coolant based on pure 100% ethylene glycol can be used temporarily. However, the coolant must be replaced again with EVANS® within the next 15 days.

NOTICE

As some conventional coolants are available in a pre-mixed formula (water added) be sure to add only 100% pure ethylene glycol if EVANS® coolant is not available.

Copyright - BRP-Rotax GmbH & Co KG. All rights reserved.

NOTICE

Regarding the temporary use of “100% pure ethylene glycol”. It should be only a temporary measure. Using the concentrate over time would cause the additives to drop out and possibly block cooling system passageways. If true 100% pure ethylene glycol were used, it would be corrosive as it would not contain any additives.

NOTICE

The above warnings are taken from the manufacturer’s users manual, however the original text and description in the users manual is binding (see: www.evanscoolant.com).

Copyright - BRP-Rotax GmbH & Co KG. All rights reserved.

5) Fuel

For ROTAX® aircraft engines different fuel types are available. See Operators Manual (OM) of the relevant engine type and/or the table in chapter 5.3.

NOTE: If none of the fuels mentioned in chapter 5.3 is available, consult the corresponding European Standard EN228 as a reference. The fuel to be assessed, has to be equal or better.

NOTE: The aircraft manufacturer has to show compliance to the relevant requirements on aircraft level regarding vapor lock as this issue is strongly dependent on the aircraft fuel system design.

5.1) Automotive fuels

In addition to AVGAS various automotive fuel types with different quality are available. Due to various environmental, economic and political reasons a number of fuel types with different amounts of ethanol blend are available. Therefore the maximum amount of ethanol blend is defined as follows:

5.1.1) E10 (Unleaded gasoline blended with 10% ethanol)

In addition to AVGAS and unleaded automotive fuel (Mogas) the ROTAX® 912/914 Series of engines are now approved for use with E10. Fuels that contain more than 10% ethanol blend have not been tested by BRP-Rotax and are not permitted for use.

5.1.2) Suitability of fuel system components of airframe

BRP-Rotax urges owners to confirm with their airframe manufacturer that ethanol blended fuels of up to 10% (E10) are compatible with all fuel system components.

It is the responsibility of the aircraft manufacturer to test their fuel system components and supply any further information on techniques, procedures and limitations of using ethanol blended fuel.

BRP-Rotax recommends that aircraft manufacturer and owner/operators read the following:

- FAA Advisory Circular Letter AC 23.1521-2
- FAA Advisory Circular Letter AC 33.91-1
- FAA Special Airworthiness Information Bulletin CE-07-06
- EASA Safety Information Bulletin – SIB 2009-02

These contain details regarding the use of ethanol (alcohol) blended fuels and the type certificate requirements.

It is strongly recommended that non-certified aircraft also conform to the information given in the above documents.

5.2) AVGAS fuel additives

Additives under the names of Decalin® and Alcor®, which aid the scavenging of lead deposits have not been tested by BRP-Rotax. Field experience shows that these products significantly reduce lead deposits in the combustion chamber and piston/ring assemblies and have no detrimental effect on the engine, when used in the recommended manner.
Always follow the additive manufacturers instructions especially with regard to health and safety precautions. BRP-Rotax only has field experience with Decalin Runup® and Alcor TCP® brands. Other similar additives are not recommended as BRP-Rotax cannot comment on their suitability for the 916 iSc B, 915 i A/B Series, 912 i Series, 912 and 914 Series engine types.

Copyright - BRP-Rotax GmbH & Co KG. All rights reserved.

5.3) Fuel according to local standards

The following fuels can be used.

NOTICE Use only the correct fuel for the specific climate zones.

NOTE: There is a risk of vapor lock formation if winter fuel is used for summer operation.

Engine Type 912 A/F/UL - 912 S/ULS - 914 F/UL

	Usage/Description	
	912 A/F/UL Min. RON 90	**912 S/ULS - 914 F/UL** Min. RON 95
MOGAS		
Reference standard		
European standard (date: 2017)	EN 228 Normal	
	EN 228 Super	EN 228 Super
	EN 228 Super plus	EN 228 Super plus
Local standards **(checked for compliance)**		
Canadian standard (date: 2004)	CAN/CGSB-3.5 grade 1	CAN/CGSB-3.5 grade 3

Russian standard (date: 1997/2002)	R 51105-97	R 51866-2002	R 51105-97	R 51866-2002
	Regular-91/92	Regular-Euro-92		
	Premium-95	Premium Euro-95	Premium-95	Premium Euro-95
	Super-98	Super Euro-98	Super-98	Super Euro-98

South African standard (date: 2006)	SANS 1598:2006	SANS 1598:2006
	Clean Fuels (CF2)	Clean Fuels (CF2)
US standard (date: 2020)	ASTM D4814 (min. AKI 87)	ASTM D4814 (min. AKI 91)

Ukrainian standard (date: 2007)	DSTU 4839-2007	DSTU 4839-2007
	A-92-Euro	
	A-95-Euro	A-95-Euro
	A-98-Euro	A-98-Euro

d06544.fm

Copyright - BRP-Rotax GmbH & Co KG. All rights reserved.

	Usage/Description	
	912 A/F/UL Min. RON 90	**912 S/ULS - 914 F/UL** Min. RON 95
Indian standard (date: 2008)	IS 2796:2008	IS 2796:2008
	MG 91	
	MG 95	MG 95

AVGAS		
leaded	AVGAS 100 LL ASTM D910	AVGAS 100 LL ASTM D910
unleaded	UL91/UL94 ASTM D7547	UL91/UL94 ASTM D7547

Engine Type 912 iSc/iS Sport - 915 iSc/iS A - 915 iSc B

	Usage/Description	
	912 iSc/iS Sport Min. RON 95	**915 iSc/iS A - 915 iSc B** Min. RON 95
MOGAS		
Reference standard		
European standard (date: 2017)	EN 228 Super	EN 228 Super
	EN 228 Super plus	EN 228 Super plus

Local standards **(checked for compliance)**		
South African standard (date: 2006)	SANS 1598:2006	
	Clean Fuels (CF2)	
US standard (date: 2020)	ASTM D4814 (min. AKI 87)	ASTM D4814 (min. AKI 91)
Ukrainian standard (date: 2007)	DSTU 4839-2007	
	A-95-Euro	
	A-98-Euro	
Indian standard (date: 2008)	IS 2796:2008	
	MG 95	

d06544.fm

Copyright - BRP-Rotax GmbH & Co KG. All rights reserved.

	Usage/Description	
	912 iSc/iS Sport Min. RON 95	**915 iSc/iS A - 915 iSc B** Min. RON 95
AVGAS		
leaded	AVGAS 100 LL ASTM D910	AVGAS 100 LL ASTM D910

Engine Type 916 iSc B

	916 iSc B Min. RON 98
MOGAS	
Reference standard	
European standard (date: 2017)	EN 228 Super
	EN 228 Super plus

Local standards **(checked for compliance)**	
US standard (date: 2020)	ASTM D4814 (min. AKI 91)

AVGAS	
leaded	AVGAS 100 LL ASTM D910

NOTE: The above tables list national fuel standards, but no brand names - as this would go beyond the scope of this document.

Furthermore all listed standards have been assessed with the version noted in brackets. BRP-Rotax will not pro-actively monitor the further development of those individual standards. In case of any uncertainties BRP-Rotax reserves the right to reference only to the listed version of a standard.

NOTE: The Anti Knock Index (AKI) is valid for fuels according to ASTM D4814, and for fuels which are defined by AKI instead of RON.

NOTE: AVGAS 100LL places greater stress on the valve due to its high lead content and forms increased deposits in the combustion chamber and lead sediments in the oil system.

Copyright - BRP-Rotax GmbH & Co KG. All rights reserved.

6) General engine operation requirements and operating tips

1. Keep the engine oil temperature below 120 °C (250 °F) over most of the operating period.
2. Always insure that the oil type used is adequate for climatic conditions and peak engine operating temperatures. If operational oil temperatures exceed 120 °C (250 °F), use of a mineral or petroleum based oil is not recommended.
3. For turbocharged engines ensure an adequate running cool-down period to prevent deposits by coking of oil.
4. When operating with unleaded fuels or MOGAS and when engine oil temperatures often exceed 120 °C (250 °F) use of a high quality full synthetic oil is recommended.
5. To avoid formation of condensation water in the engine oil, the oil temperature must rise at least once every operational day to at least 100 °C (212 °F).
6. Avoid extended use of carburetor air pre-heating when safe and reasonable.
7. Depending on the type of fuel used, operating conditions, and the demands of the engine mission profile it may be necessary to increase the frequency of oil changes to avoid the excessive build up of lead and other residues in the engine oil. Always adjust the engine oil change intervals to avoid excessive build up of sludge in the engine oil.

NOTICE Do not use oil additives and observe the operating limits as per the relevant Operators Manual.

Excessive engine vibration, particularly at low idle speeds, can impair the carburetor fuel metering system leading to a too rich mixture condition. This rich mixture condition can further lead to rough engine operation and excessive carbon and lead deposits.

7) Summary

These instructions (section 3) have to be followed in accordance with the deadlines specified in section 1.5.

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

Translation into other languages might be performed in the course of language localization but does not lie within ROTAX® scope of responsibility.

In any case the original text in English language and the metric units are authoritative.

8) Inquiries

Inquiries regarding this Service Instruction should be sent to the ROTAX® Authorized Distributor of your area.
A list of all ROTAX® Authorized Distributors or their independent Service Centers is provided on is provided on www.flyrotax.com.

d06544.fm

Copyright - BRP-Rotax GmbH & Co KG. All rights reserved.