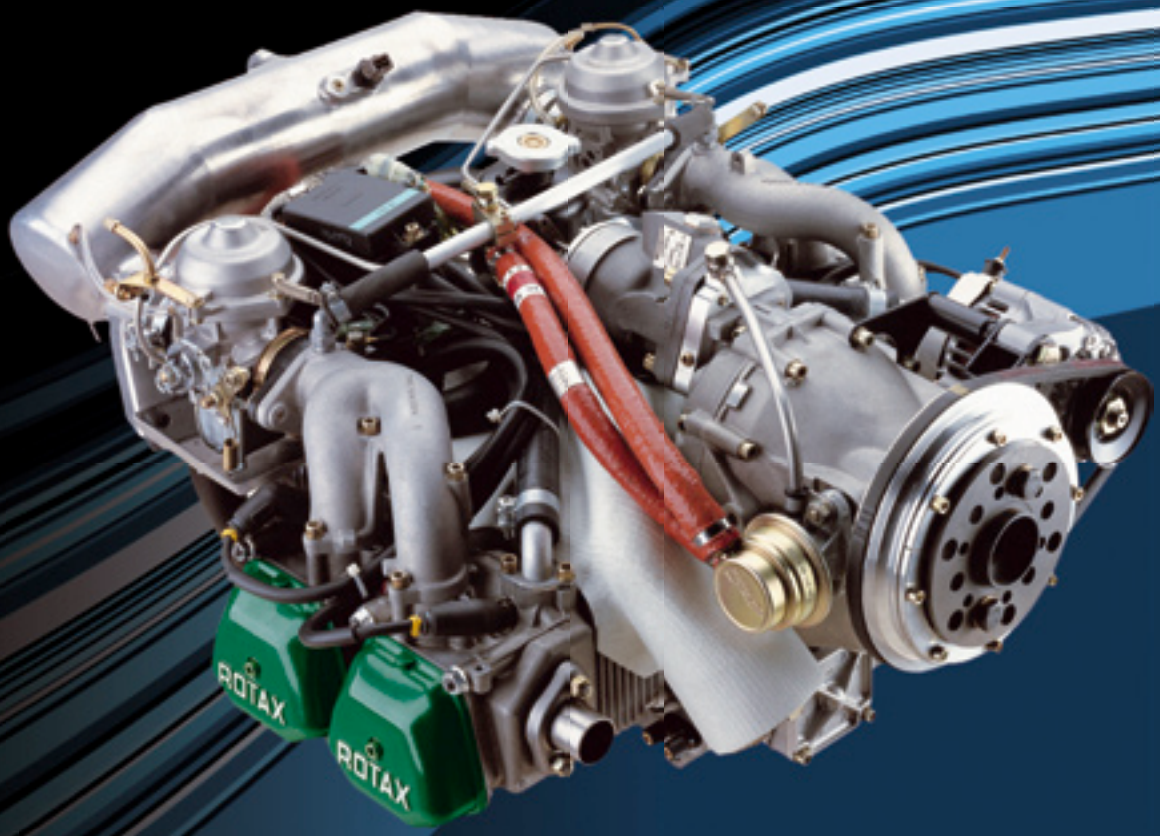
ROTAX®
AIRCRAFT ENGINES

MAINTENANCE MANUAL

(LINE MAINTENANCE) FOR ROTAX® ENGINE TYPE 912 SERIES



ROTAX® **912 ULS 3** WITH OPTIONS

part no.: 899373

⚠ WARNING

Before starting any maintenance work, please read the Maintenance Manual, as it contains important safety relevant onformation. Failure to do so may result in personal injuries including death. Consult the original equipment manufacturer´s handbook for additional instructions!

Approval of translation has been done to best knowledge and judgement - in any case the original text in german language is authoritative.

SECTION 00-00

INTRODUCTION

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4) Introduction

We are pleased you decided to purchase a ROTAX aircraft engine.

This section describes the maintenance of engine type 912 Series.

◆ NOTE: The 912 Series includes all engines such as the 912 A, 912 F, 912 S, 912 UL, 912 ULS and 912 ULSFR.

Before carrying out maintenance work on the engine, read the Maintenance Manual carefully.

If any passages of the Manual are not clearly understood or if you have any questions, please contact an authorized Distribution or Service Center for ROTAX-aircraft engines.

4.1) Remarks

The purpose of this Maintenance Manual is to acquaint maintenance service staff approved by the local aviation authorities with some basic maintenance and safety information for service work.

To ensure competent maintenance and servicing, please also refer to the documentation provided in the Operators Manual, Installation Manual, technical directives and Illustrated Parts Catalog.

For additional information on engines, maintenance or parts, you can also contact your nearest authorized ROTAX-aircraft engine distributor.

4.2) Engine serial number

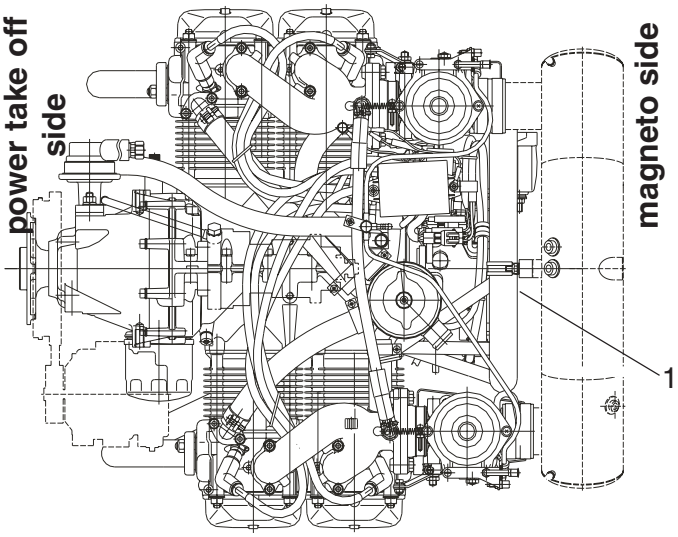

Fig. 1

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When making inquiries or ordering parts, always indicate the engine number (1), as the manufacturer makes modifications to the engine for product improvement. The engine number is on the ignition cover, on the left, opposite the electric starter. See Fig. 1.

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4.3) Conversion table and abbreviations

Units of length:

1 mm = 0.03937 in

1 in = 25.4 mm

1 ft = 12 in
= 0.3048 m

Units of area:

1 cm^2 = 0.155 sq in (in^2)

1 sq in (in^2) = 6.4516 cm^2

Units of volume:

1 cm^3 = 0.06102 cu in (in^3)

1 cu in (in^3) = 16.3871 cm^3 (in^3)

1 dm^3 = 1 l

1 dm^3 = 0.21997 gal (UK)

1 gal (UK) = 4.5461 dm^3

1 dm^3 = 0.26417 gal (US)

1 gal (US) = 3.7854 dm^3

Units of mass:

1 kg = 2.2046 lb

1 lb = 0.45359 kg

Density:

1 g/cm^3 = 0.016018 lb/ft^3

1 lb/ft^3 = 62.43 g/cm^3

Units of force:

1 N = 0.224809 lbf

1 lbf = 4.4482 N

Units of pressure:

1 Pa = 1N/m^2

1 bar = 100 000 Pa (1000 hPa)

1 bar = 14.5037 lbf/in^2 (psi)

1 lbf/in^2 (psi) = 0.0689 bar

1 in HG = 33.8638 hPa

Units of power:

1 kW = 1.341 hp

1 hp = 0.7457 kW

1 kW = 1.3596 PS

1 PS = 0.7355 kW

Units of temperature:

K = °C - 273.15

°C = (°F - 32) / 1.8

°F = (°C x 1.8) + 32

Units of velocity:

1 m/s = 3.6 km/h

1 ft/min = 0.3048 m/min
= 0.00508 m/sec

1 m/s = 196.85 ft/min

1 kn = 1.852 km/h

1 km/h = 0.53996 kn

spec. fuel consumption:

1 g/kWh = 0.001644 lb/hph

1 lb/hph = 608.277 g/kWh

Units of torque:

1 Nm = 0.737 ft lb
= 8.848 in lb

1 ft lb = 1.356 Nm

1 in lb = 0.113 Nm

Cable cross-section: AWG - mm^2

Conversion table - Wire Gauge: AWG - mm^2

AWG	4	6	8	10	12	14	16	18	20
mm^2	21,2	13,3	8,35	5,27	3,31	2,08	1,31	0,82	0,519

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Abbreviations and terms used in this Manual:

*	Reference to another section (only in the Illustrated Parts Catalog)
@	at
	The drop symbol indicates use of sealing agents, adhesives or lubricants. (only in the Illustrated Parts Catalog)
	center of gravity
rpm	Revolutions per minute
912 A	see OM (Type designation)
912 F	see OM (Type designation)
912 S	see OM (Type designation)
912 UL	see OM (Type designation)
912 ULS	see OM (Type designation)
912ULSFR	ROTAX® 912 ULS Version France
914 F	see OM (Type designation)
914 UL	see OM (Type designation)
A/C	Aircraft
ACG	Austro Control GmbH
A/F	across-flat dimension
ASB	Alert Service Bulletin
CCW	counter-clockwise
CW	clockwise
DCDI	Dual Capacitor Discharge Ignition
DOT	Department of Transport
EASA	European Aviation Safety Agency
IM	Installation Manual
EGT	Exhaust Gas Temperature
IPC	Illustrated Parts Catalog
FAA	Federal Aviation Administration
FAR	Federal Aviation Regulations
OM	Overhaul Manual
h	hours
OM	Operators Manual
ISA	International Standard Atmosphere
JAA	Joint Aviation Authorities
JAR	Joint Aviation Regulations
AD	Airworthiness Directive
MS	magneto side
N	new part (only Illustrated Parts Catalog)
nB	as necessary (only Illustrated Parts Catalog)
NDT	Non-Destructive Testing
n.a.	not available
Rev.	Revision
s.v.	still valid (only Illustrated Parts Catalog)
S/N	Serial Number
SB	Service Bulletin
SI	Service Instructions
SL	Service Letter
SMD	Surface Mounted Devices
TNr.	Part No.
TSN	Time Since New
TSO	Time Since Overhaul
VFR	Visual Flight Rules
MM	Maintenance Manual
XXX	shows the serial component number

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5) Safety notice

This Manual has been prepared as a guide to correctly service and maintain all ROTAX 912 aircraft engines.

This edition was primarily published to be used by aircraft mechanics who are already familiar with all service procedures relating to ROTAX made aircraft engines.

Please note that the instructions will apply only if proper hand tools and special service tools are used.

This Manual uses technical terms which may be slightly different from the ones used in the Illustrated Parts Catalog.

It is understood that this Manual may be translated into another language. In the event of any discrepancy the German version is prevail.

The content depicts parts and/or procedures applicable to the particular product at its time of manufacture. It does not include dealer modifications, whether authorized or not by BRP-Rotax, after manufacturing the product.

In addition, the sole purpose of the illustrations throughout the Manual, is to assist identification of the general configuration of the parts. They are not to be interpreted as technical drawings or exact replicas of the parts.

The use of ROTAX parts is most strongly recommended when considering replacement of any component. Authorized ROTAX distributor assistance should be sought in case of doubt.

The engines and the corresponding components identified in this document should not be utilized on product(s) other than those mentioned in this document.

Torque wrench tightening specifications must be strictly adhered to.

Locking devices (ex.: locking tab, self-locking fasteners, etc.) must be installed or replaced with new ones, where specified. If the efficiency of a locking device is impaired, it must be replaced.

It is your responsibility to be completely familiar with the safety instructions including warnings and cautions described in this Manual. These warnings and cautions advise of specific operating and servicing methods that, if not observed, can cause a serious engine malfunction or cause the engine to lose power in flight which can result in loss of life, injury or damage to equipment.

It is, however, important to understand that these warnings and cautions are not exhaustive. BRP-Rotax could not possibly know, evaluate and advise the user of all conceivable ways in which service might be done or of the possible hazardous consequences of each way.

Although the mere reading of such information does not eliminate the hazard, your understanding of the information will promote its correct use. Always use common shop safety practice.

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This information relates to the preparation and use of ROTAX aircraft engines and has been utilized safely and effectively by BRP-Rotax. However, BRP-Rotax disclaims liability for all damage and/or injuries resulting from the improper use of the contents. We strongly recommend that any service be carried out and/or verified by a highly skilled professional mechanic, see 05-00-00, sec. 2.2.

Specifications are given in the SI metric system with the USA equivalent in parenthesis.

BRP-Rotax reserves the right at any time, and without incurring obligation, to remove, replace or discontinue any design, specification, feature or otherwise.

5.1) Symbols used

This Manual uses the following symbols to emphasize particular information: This information is important and must be observed.

▲ WARNING: Identifies an instruction which, if not followed, may cause serious injury including the possibility of death.

■ CAUTION: Denotes an instruction which, if not followed, may severely damage the engine or other component.

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

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5.2) Maintenance Concept

The maintenance functions detailed in this Manual fall into two categories: Line Maintenance and Heavy Maintenance.

Repairs above and beyond the extent of the work described in these two Manuals are not considered as maintenance work and may only be carried out by authorized overhaul companies.

- **Line Maintenance** (Section 00, 05 and 12):

  The scope of line maintenance consists of removal, installation and adjustment of engine components (including part wear). All procedures in this Manual are to be considered line maintenance.

◆ NOTE: Where applicable, you will be referred to the Heavy Maintenance Manual for work above and beyond line maintenance.

- **Heavy Maintenance** (separate Manual, part No. 899603)

  The Heavy Maintenance Manual covers in detail work steps for the removal, installation and repair of components where such work exceeds the limits of standard "Line Maintenance".

◆ NOTE: This Manual must be used in conjunction with the Line Maintenance Manual on which it is based.

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5.3) Technical documentation

These documents form the instructions ensuring continued airworthiness of ROTAX aircraft engines:

- Installation Manual 912 Series
- Operators Manual
- Maintenance Manual 912 Series (Line+Heavy 912/914 MM)
- Overhaul Manual 912 / 914 Series
- Illustrated Parts Catalog 912 / 914 Series
- Alert Service Bulletins
- Service Bulletins
- Service Instructions
- Service Letters

Any reference to a document refers to the latest edition issued by BRP-Rotax, if not stated otherwise.

The information contained is based on data and experience that are considered applicable for skilled mechanics under normal conditions.

Due to the fast technical progress and fulfilment of particular specifications of the customers it may occur that existing laws, safety prescriptions, constructional and operational regulations cannot be transferred completely to the object bought, in particular for special constructions, or may not be sufficient.

The illustrations in this Manual are mere sketches and show a typical arrangement. They may not represent in full detail or the exact shape of the parts which have the same or similar function. Therefore deduction of dimensions or other details from illustrations is not permitted.

- All necessary documentation is available from the ROTAX Distribution- and Service Centers.
- For the latest documentation, refer to SB-912-000 and see the official homepage **www.rotax-aircraft-engines.com**. Many of the necessary documents are also available as free downloads in pdf format.

◆ NOTE: The Illustrations and Documents in this Manual are stored in a document data file/graphic data file and are provided with a consecutive irrelevant number.

This number (e.g. 00277) is of no significance for the content.

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Return shipment:

When returning the engine or its components (e.g. propeller gearbox) to an authorized overhaul or repair company, ensure that the necessary documentation (log book, maintenance records etc.) are enclosed.

5.3.1) Use for intended purpose

- The engine ROTAX 912 A/F/S is intended for use in certified aircraft. In case of doubt the regulations of the national authorities or the respective sportive federations have to be observed.

– Certified aircraft engine 912 A/F/S is tested as per aeronautical standards for safety and time between overhaul. It was developed to conform to the latest technological standards and rigorously tested.

◆ NOTE: Engine 912 UL is not certified. These engines have not received any aeronautical standards or regulatory safety or durability testing, and conform to no aircraft standards. These engines are for use in experimental, uncertificated aircraft and vehicles only in which an engine failure will not compromise safety. However these engines confirm to BRP-Rotax quality standards.

The operator assumes all risk of use, and acknowledges by this use that he/she knows this engine is subject to sudden stoppage.

- Use for intended purpose also includes observation of the operational, maintenance and repair conditions prescribed by the manufacturer. This will also increase the service life of the engine.

▲ **WARNING**: **Never** run the engine without propeller, this inevitably causes engine damage and is an explosion hazard.

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5.3.2) Instruction

Engines require instructions regarding their application, use, operation, maintenance and repair.

Technical documentation and directions are useful and necessary complementary elements for personal instruction, but can by no means substitute theoretical and practical instructions. These instructions should cover explanation of the technical context, advice for operation, maintenance, use and operational safety of the engine.

- This engine must only be operated with accessories supplied, recommended and released by BRP-Rotax. Modifications are only allowed after consent by the engine manufacturer.
- After engine standstill (longer than 2 months) observe without fail the instructions for engine “out of use”. Protect fuel- and carburetor system against contamination.

■ CAUTION: Spare parts must meet with the requirements defined by the engine manufacturer. This is only warranted by use of GENUINE ROTAX spare parts and/or accessories (see IPC) or suitable equivalent in the manufacturer’s opinion otherwise, any limited warranty by BRP-Rotax is null and void (see Warranty Conditions).

Spare parts are available at the authorized ROTAX Distribution- and Service Center.

Any warranty by BRP-Rotax becomes null and void if spare parts and or accessories other than ORIGINAL-ROTAX spare parts and/or accessories are used (see latest Warranty Conditions).

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7) Table of amendments

Approval*

The technical content is approved
under the authority of DOA Nr. EASA.21J.048.

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no.	section	page	date of change	remark for approval	date of approval from authorities	date of issue	signature
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SECTION 05-00

TIME LIMITS / MAINTENANCE CHECKS

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2) Maintenance

2.1) General note

In this section the maintenance of engine 912 Series is described. The description is subdivided into sections and description of function of the various systems. Some overlapping maintenance instructions are treated as generally valid information at the beginning of this section.

The information given in the Maintenance Manual is based on data and experience which are considered to be applicable for a skilled mechanic under normal working conditions. The guidelines given in the Maintenance Manual are useful and necessary supplements to training. They, however, cannot substitute competent theoretical and practical personal instruction.

Maintenance of engines and systems requires special knowledge and special tools. Use only mallet (plastic or rubber) for dis- and re-assembly of parts of the engine.

We particularly emphasize that parts and accessories not supplied as genuine ROTAX parts are not verified for suitability by BRP-Rotax and thus are not authorized for use. Installation and/or use of such products may possibly change or negatively influence the constructive characteristics of the engine. For damages resulting from use of non-genuine parts and accessories ROTAX refuses any liability.

Non-authorized modifications as well as the use of components and auxiliary components not corresponding to the installation instructions exclude any liability of the engine manufacturer.

Besides our instructions in the documentation supplied, also respect the generally valid safety and accident preventive directives and legal regulations.

The procedures and limits in this Manual constitute the manufacturer's official recommendation for engine operation.

2.2) Authorized personnel

It is a requirement that every organization or individual will possess the required special tooling, training or experience to perform all tasks outlined. Any task outlined herein may be performed if the organization or individual has met the following conditions:

- **Requisite knowledge of the task as a result of:**

  Type-specific authorization training for the applicable ROTAX engine which is approved by the national aviation authority.

  "OR"

  - Experience in performing the task and
  - Formal instruction from a BRP-Rotax authorized training facility or

    "On-the-job" instruction by a BRP-Rotax or authorized BRP-Rotax Distributor representative.

  Including:

- Suitable work environment to prevent contamination or damage to engine parts or modules.
- Suitable tools and fixtures as outlined in the ROTAX Maintenance Manual.
- Reasonable and prudent maintenance practices are utilized.
- And the Requirements of the applicable regulatory authority regarding maintenance procedures are met.

Maintenance organizations and individuals are encouraged to contact BRP-Rotax through its worldwide distribution network for information and guidance on any of the tasks outlined herein. Maintenance directories are available from the ROTAX authorized distributor organization. See 00-00-00 sec. 5.3.

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2.3) Procedure notes

When carrying out maintenance and service work, respect without fail the safety regulations.

▲ WARNING: Principally ensure the following at **each maintenance event**

- Ignition **„OFF“** and system grounded,
- Disconnect battery
- Secure engine against unintentional operation.

At maintenance work which requires ignition „ON“ and battery connected, take care of the following:

- Secure the propeller against unintentional turning by hand

and

- Secure and observe propeller zone.

This precautionary measure serves to avoid any injuries in case of an unintentional start of the engine. Non-compliance can result in injuries or death.

■ CAUTION: The ignition is **switched on**, as long as the ground-cable (P lead) is not properly connected to ground.

At maintenance of cooling-, lubricating and fuel system take care without fail that no contamination, metal chips, foreign material and/or dirt enters the system.

▲ WARNING: Always allow engine to cool down to outside air temperature before start of any work.

Severe burns and scalds may result if this is not respected.

Before re-using parts disassembled, clean, check and refit them per instructions.

■ CAUTION: Generally, all metal parts are cleaned with a suitable cleaning agent.

Before every re-assembly check assembled components whether parts are missing. Only use adhesives, lubricants, cleaning agents and solvents indicated in the maintenance instructions. If not respected, damage may be the consequence.

▲ WARNING: Exactly observe the tightening torques for screws and nuts. Overtightening or too loose connection could cause serious engine damage.

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▲ 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.

■ CAUTION: Never loosen or tighten screws and nuts with pliers but only with the specified tools.

■ CAUTION: If during disassembling/reassembling the removal of a safety item (e.g. safety wiring, self-locking fastener, etc.) should be necessary, it must be always replaced by a new one.

Once loosened, **always** replace self-securing nuts.

Use clean screws and nuts only and inspect face of nuts and thread for damage. Check the contact faces and threads for damages. In case of doubt, use new screws and nuts.

At reassembly of the engine, replace all sealing rings, gaskets, securing elements, O-rings and oil seals.

At disassembly of the engine, mark the components as necessary to avoid any mix-up. Take care of these marks, don't ruin them.

2.4) Trouble shooting

In the Operators Manual, possible problems are listed. At the same time, a brief description of the necessary remedial action is given.

See section 12 in the Operators Manual for engine type 912 (Series).

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2.5) Consumable materials

▲ WARNING: Use only the specified or **technically equivalent** materials for all maintenance work.

The material specified have been tested for a long time and are suitable for all operating conditions indicated by the manufacturer.

▲ WARNING: At handling of chemicals, comply with all the customary regulations and specifications of the producer, including the expiry date and instruction.

No.	part no.	Description, Application ..... Qty.
1	899785	**LOCTITE 221 violet,** medium-duty screw securing agent ... 10 ml (0.003 gal (US))
2	897651	**LOCTITE 243 blue,** medium-duty screw securing agent ... 10 ml (0.003 gal (US))
3	898441	**LOCTITE 2701,** heavy-duty screw securing agent ..... 5 ml (0.001 gal (US))
4	899789	**LOCTITE 603 green,** oil-tolerant grouting product, high-strength ..... 10 ml (0.003 gal (US))
5	897511	**LOCTITE 380 black,** grouting product, high-strength, fast-hardening ..... 20 ml (0.005 gal (US))
6	899784	**LOCTITE 574 orange,** surface sealing compound ..... 50 ml (0.013 gal (US))
7	n.a.	**LOCTITE 518 red,** surface sealing compound, can be used instead LOCTITE 574
8	899791	**LOCTITE 5910 black, ...** 50 ml (0.013 gal (US)) surface sealing compound, can be used instead LOCTITE 574 and LOCTITE 518
9	297434	**LOCTITE Anti-Seize 8151,** for the prevention of fretting corrosion ..... 50 g (0.11 lb)
10	297433	**MOLYKOTE G-N,** Lubricating paste ..... 100 g (0.22 lb)
11	897166	**MOLYKOTE 44 medium,** long-term lubricant for shaft seals ..... 100 g (0.22 lb)
12	897330	**Lithium-base grease,** to prevent leakage current ..... 250 g (0.55 lb)

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13	**897870**	**K&N Filter oil 99 - 11312,** for optimum filter efficiency and protection against moisture ..... 14.8 ml (0.004 gal (US))
14	**297368**	**SILASTIC 732** multi-purpose one-component silicon-based sealing compound ..... 310 ml (0.082 gal (US))
15	**897186**	**SILICONE HEAT CONDUCTION COMPOUND** Application of the heat conduction compound will reduce heat transfer resistance. The grease-like, temperature-resistant silicon compound fills cavities between components and the cooling element (e.g.: spark plug - cylinder head), which otherwise do not contribute to heat conduction. ..... 150 g (0.33 lb)
16	**297710**	**PU glue** for shock absorption ..... 310 ml (0.082 gal (US))
17	**n.a.**	**Multi-purpose grease LZ** Generally useable, neutrally colored multi-purpose grease, water resistant and highly adherent. Useable for temperatures from -35 °C to +120 °C (-31 °F to +248 °F) and can be subjected to mechanical loads.
18	**n.a.**	**Preservation oil MobilArma 524** Water insoluble preservation oil on a hydrocarbon base with additives. The pour point is below -18 °C (-3 °F).
19	**n.a.**	**Very fine emery cloth SR 4600 A - very fine standard** Is sold by the meter and used for Manual removal of smaller rust spots or oxidation, especially for optimum ground connections. It is highly suitable for removing LOCTITE from surfaces or threads to make them metallic clean. Before reapplying LOCTITE, clean surfaces with nitrothinner or degreasing agent (CASTROL ZA 30 or OMV-SOFT SOL). When using solvents, observe the safety regulations for persons and environment.
20	**898570**	**Screw securing paint .....** 20 ml (0.005 gal (US))

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21 n.a. Cleaning agents

■ CAUTION: Use only approved cleaning agents (e.g. gasoline, kerosine, varsol, etc.) for cleaning all metal parts.

Do not use lye-based cold cleaner or degreasing agents. Do not clean coolant or oil hoses with aggressive solutions. Clean off sealing compound residue with sealant remover.

Soak combustion chamber, piston and cylinder head with cleaning agent and remove combustion residues with a bronze brush. Very good results have been achieved with "Clenvex 2000". It is a solvent - cold cleaner, free of halogen, on the basis of selected fuel fractions with tensides and is biologically disposable.

Never use caustic or corrosive cleaning agents.

22 n.a. MICRONORM abrasive

This abrasive is suitable for local and gradual very fine treatment of steel parts with rust film (propeller shaft). The MICRONORM abrasive contains no noxious matter, is approved by the relevant authorities and guarantees optimum cleaning. The granulates used are of sizes 40 to 60 μ. It is possible to achieve a surface roughness of 0.5 to 1 μ, which represents fine processing of surfaces.

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2.6) Acceptable methods, techniques and practice

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

This Manual "Advisor 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.

2.6.1) Securing elements

■ CAUTION: Self-locking nuts, cotter pins, tab washers and safety wires must be replaced each time they have been removed.

Respect without fail all additional indications regarding securing and sealing means and lubrication of fixation elements. Adhere to specified tightening torques.

Nut securing

When using a self-locking nut, take care that the polyamide insert ring on nuts according to DIN 985 as well as the securing element on nuts according to DIN 980 is positioned towards outside.

Lock washer

See Fig. 2.

◆ NOTE: When fitting lock washers, the curved-up ends (1) must point towards the screw head or nut.

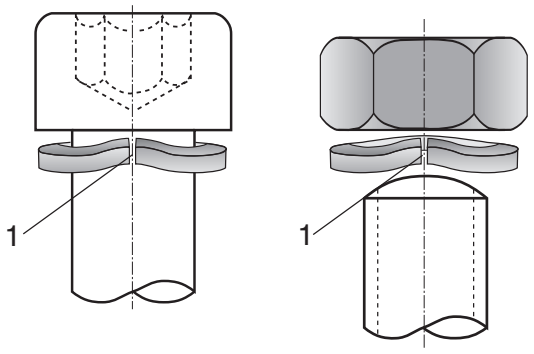

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Fig. 2

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SECTION 05-10

TIME LIMITS

1) General note

These checks, related to limited periods of operation, are planned to help avoid engine troubles by the use of preventive maintenance.

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NOTES

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2) Time limits for engine operation

The time limit for engine operation will be specified by the TBO.

▲ WARNING: After reaching this time limit, the engine has to be shipped to an authorized ROTAX overhaul facility.

For an overhaul, the engine must be removed from the aircraft, be cleaned, preserved and all openings to be closed to prevent entering of contaminants.

■ CAUTION: A general overhaul is due after a **defined period of operation** or after a **specified calendar life** since initial start of operation (whichever comes first).

Engine Type description	engines affected engine S/N	TBO Time Between Overhaul(1
912 A	up to and incl. 4,076.191	600 h or 10 years, whichever comes first(1
912 A	from 4,076.192 up to and incl. 4,410.065	1000 h or 10 years, whichever comes first(1
912 A	from 4,410.066 up to and incl. 4,410.471	1200 h oder 10 years, whichever comes first(1
912 A	from 4,410.472	1500 h oder 12 years, whichever comes first
912 F	up to and incl. 4,412.585	1000 h oder 10 years, whichever comes first(1
912 F	from 4,412.586 up to and incl. 4,412.816	1200 h oder 10 years, whichever comes first(1
912 F	from 4,412.817	1500 h oder 12 years, whichever comes first
912 S	up to and incl. 4,922.776	1200 h oder 10 years, whichever comes first(1
912 S	from 4,922.777	1500 h oder 12 years, whichever comes first
912 UL	up to and incl. 4,152.666	600 h or 10 years, whichever comes first(2
912 UL	from 4,152.667 up to and incl. 4,404.717	1200 h oder 15 years, whichever comes first(2
912 UL	from 4,404.718	1500 h oder 15 years, whichever comes first
912 ULS	up to and incl. 4,427.532	1200 h oder 10 years, whichever comes first(2
912 ULS	from 4,427.533	1500 h oder 12 years, whichever comes first
912 ULSFR	up to and incl. 4,429.714	1200 h oder 10 years, whichever comes first(2
912 ULSFR	from 4,429.715	1500 h oder 12 years, whichever comes first

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For the TBO of the specific engine type/version refer to the table below.

(1 Extension of the TBO is possible and will be specified by a Service Bulletin (SB) for the respective engine type. For extensions already effective refer to the engine log book or release certificate.

(2 Extension of the TBO is possible and will be specified by a Service Instruction (SI) for the respective engine type. For extensions already effective refer to the engine log book or reports of operation.

(3 Extension or exceeding of the TBO by 5 % or 6 months is allowed whichever comes first.

The shipment to an authorized ROTAX overhaul facility must include the following:

- Engine log book
- Maintenance records of the engine (i.e. all maintenance check lists, and reports of operation, of maintenance, of findings and of oil analyses).
- The engine assembly as per supply volume. Additionally all added-on parts as in the supply volume such as carburetors, filters, fuel pump, external generator, sensors, ignition unit, electric starter, oil tank, vacuum pump, hydraulic governor.
- Indication of total engine operating hours (TSN) and where applicable, engine operating hours since a previous overhaul (TSO)

◆ NOTE This information must be supplied to allow the service history of components to be traced.

- Data about the type of aircraft used
- Useful remarks and observations concerning the engine.

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3) Time limit for rubber parts

The following components and systems must be replaced every 5 years:

- venting hose of the carburetors
- all rubber hoses of the cooling system
- all rubber hoses of the fuel system
- all rubber hoses of the lubrication system which are part of the engine supply volume and if they are not in the maintenance schedule of aircraft manufacturer.
- carburetor sockets
- diaphragm on both carburetors
- rubber hoses on compensating tube
- V-belt

■ CAUTION: This time limit must be followed **independently** and **in addition** to the visual inspections (05-20-00, sec. 2.2) of the respective components.

4) Time limit for the coolant

Coolant must be replaced as per manufacturer's instructions, at the latest during overhaul or when the engine is replaced.

5) Annual inspection

A 100 hr. inspection is to be carried out periodically after every 100 hours of operation **or every 12 months**, whichever comes first. See 05-10-00, sec. 2.

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NOTES

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SECTION 05-20

SCHEDULED MAINTENANCE CHECKS

1) General note

This section lists the periodic inspections which must be carried out after a specified periods of operation.

Periodic inspections are those which must be performed at 50, 100, 200, 600 hr. intervals in accordance with 05-20, sec. 2.

This means for instance that **every 100 hr.** of operation or 1 year whichever comes first, a 100 hr. check must be carried out.

100h / 300h / 500h / 700h / 900h / 1100h	->	100 hr. inspection
200h / 400h / 800h /1000h	->	200 hr. inspection
600h	->	600 hr. inspection

Additionally, a 25 hr. inspection must be performed at 25 hours of operation of a new or overhauled engine. This applies to both new engines and overhauled engines.

◆ NOTE: This maintenance schedule contains a column for a 50 hr. check. This check is recommended by the manufacturer but not essential, with the exception of oil change when operating with leaded AVGAS.

The manufacturer also recommends the following inspections whenever maintenance is carried out (where not already prescribed by the airframe manufacturer, as possible malfunctions could have negative effects on engine operation on engine operation.

- Inspection of the engine cowling, checking for discoloring and warping (danger of overheating).
- Inspect / re-tighten the exhaust fixation on the cylinder head after the first 2 hours of operation.
- Inspection of the exhaust unit (risk of fracture, wear on the cylinder head, where necessary, replaced application of LOCTITE Anti Seize).
- Inspection of the fuel filter in the airframe. Check for foreign bodies, check sealing-material and that there is no loose fragmented material (could cause the engine to misfire).
- Inspection of the battery. Check acid concentration for each cell (could cause problems on starting the engine).
- Check for oil contamination. Analyse the oil. Analysis of the oil provides additional information on the condition of the engine/possible wear.
- Inspect all radiators and lines for damage. Check for discoloration - and cracks.
- Check that the propeller is undamaged and runs true. Carry out dynamical balancing including verification of propeller track.

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1.1) Maintenance schedule procedures (maintenance check list)

- All stated checks are visual inspections for damage and wear, unless otherwise stated.
- All listed work must be carried out within the specified period.

  For the intervals between maintenance work, a tolerance of ±10 hr. is permissible, but these tolerances must not be exceeded. This means that if a 100 hr. check is actually carried out at 110 hr., the next check will be due at 200 hr. ±10 hr. and not at 210 hr. ±10 hr.
- If maintenance is performed before the prescribed interval, the next maintenance check is to be done at the same interval (e.g. if first 100 hr. check is done after 87 hours of operation, the next 100 hr. check must be carried out after 187 hours of operation).
- Checks are carried out as per the maintenance check lists, where type and volume of maintenance work is outlined in key words.

  The lists must be photocopied and filled out for each maintenance check.

  The respective check (e.g. 100 hr. check) must be noted on the top of each page of the maintenance check list.

  All the maintenance work carried out must be initialled in the "signature" area by the aircraft mechanic performing the task.
- After maintenance, the completed check lists must be entered in the maintenance records. The maintenance must be confirmed in the log book.
- All discrepancies and remedial action must be recorded in a report of findings to be generated and maintained by the company authorized to carry out maintenance work - It is the responsibility of the aircraft operator to store and keep the records.
- Replacement of equipment (e.g. carburetor, fuel pump, governor...) and execution of SB (LTA) must be entered in the log book, stating S/N, TSN and date.

2) Check List / Maintenance Schedule

2.1) Identification

AIRCRAFT

Registration number _____
Aircraft make _____
Aircraft model and S/N _____
Time since new _____
Propeller brand _____
Propeller model and S/N _____

ENGINE

Engine type _____
Engine S/N _____
TSN (time since new) _____
TSO (time since overhaul) _____
Used operating fluids:
- coolant _____
- mixture ratio _____
- fuel _____
- oil _____

AIRCRAFT OPERATOR

Name _____
Contact _____
Address _____
_____
_____
Tel. / fax / e-mail _____

MAINTENANCE FACILITY

Maintenance workshop _____
Address _____
_____
_____
Tel. / fax / e-mail _____
Certificate _____

This check is applicable (circle one) 25h* 50h 100h 200h 600h

Next check due at: _____ hr. (TS__)
(engine h)

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* shaded column for the first 25 h (new or overhauled)

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2.2) Maintenance Schedule

Perform the following maintenance tasks at the intervals shown in the maintenance check list.

Legend: X = do the task
blank = no task required
* = after first 25 hr. for new engines or overhauled engines
** = recommended inspection (see 05-20-00, sec. 1)

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Points of Inspection	Inspection					Signature
	25*	50**	100	200	600	
2.2.1) Engine cleaning						
a) Engine cleaning See 12-00-00, sec. 2.1	X	X	X	X	X	
2.2.2) Visual inspection of the engine						
a) General visual inspection of the engine for damage or abnormalities. Check cooling air duct and cooling fins of the cylinders for obstruction, cracks, wear and good condition. Take note of changes caused by temperature influence.	X	X	X	X	X	
b) Visual inspection of the temperature sensor and the oil pressure sensor. Inspect for tight fit and good condition.	X	X	X	X	X	
c) Inspect all coolant hoses for damage, including leakage, hardening from heat, porosity, loose connections and secure attachment. Verify routing for kinks and restrictions such as restricted elbows. See 12-00-00, sec. 2.2	X	X	X	X	X	
d) Carry out visual inspection of leakage bore at the base of the water pump for signs of leakage. See 12-00-00, sec. 2.2	X	X	X	X	X	

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Points of Inspection	Inspection					Signature
	25*	50**	100	200	600	
e) Inspect the expansion tank for damage and abnormalities. Check coolant level, replenish as necessary. Inspect radiator cap. Inspect protection rubber on expansion tank base for secure fit. See 12-00-00, sec. 3.1 - 3.4	X	X	X	X	X	
f) Inspect the overflow bottle for damage and abnormalities, including Verify coolant level, replenish as necessary. Inspect line from expansion tank to overflow bottle for damage, leakage and clear passage. Inspect venting bore in cap of overflow bottle for clear passage. See 12-00-00, sec. 3.5	X	X	X	X	X	
g) Inspect all oil lines for damage, leakage, hardening from heat, porosity, security of connections and attachments. Verify routing for kinks and restrictions including restricted elbows. See 12-00-00, sec. 2.2	X	X	X	X	X	
h) Inspect all fuel lines for damage, leakage, hardening from heat, porosity, secure connections and attachments. Verify routing for kinks and restrictions including restricted elbows. In the case of steel fuel lines (912F, 912S and/or optional), also check for any cracks and/or scuffing marks. See 12-00-00, sec. 2.2	X	X	X	X	X	
i) Inspect the wiring and its connections for secure fit, damage and signs of wear. See 12-00-00, sec. 6.1	X	X	X	X	X	

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Points of Inspection	Inspection					Signature
	25*	50**	100	200	600	
2.2.3) Checking the engine suspension						
a) Inspect engine suspension and fasteners for secure fit, including damage from heat, deformation, cracks. See 12-00-00, sec. 2.3	X	X	X	X	X	
2.2.4) Engine external parts						
a) Inspect screws and nuts of all external parts for tight fit. Inspect safety wiring, replace as necessary.	X	X	X	X	X	
2.2.5) Checking the propeller gearbox						
a) Check the friction torque in free rotation on gearboxes with overload clutch Actual friction torque _____Nm (in.lbs.) See 12-00-00, sec. 7.1	X	X	X	X	X	
b) Gearboxes of series 3 (with overload clutch)and use of leaded fuel more than 30 % of operation. Inspect overload clutch. See 05-50-00, sec. 2.2 and SB-912-033					X	
c) Checking the propeller gearbox (with overload clutch) See 12-00-00, sec. 7.2 (1 only applicable for engine type 912 S/ULS/ULSFR)		alle 800 h(1				
d) Checking the propeller gearbox (without overload clutch) See 12-00-00, sec. 7.2 (2 only applicable for engine type 912 UL/ULS/ULSFR)		alle 400 h(2				

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Points of Inspection	Inspection					Signature
	25*	50**	100	200	600	
2.2.6) Oil level check, magnetic plug						
a) Before checking the oil level, rotate propeller several times by hand counter clockwise (looking from the front at the propeller) to ensure that oil has been pumped back from the engine to the oil tank. This process is completed when air flows back to the oil tank. This air flow can be perceived as a murmur (gurgling) when the cap of the oil tank is open. See 12-00-00, sec. 5.1	X	X(1	X	X	X	
b) Check the magnetic plug See 12-00-00, sec. 5.4	X	X(1	X	X	X	
2.2.7) Oil change						
a) Remove oil drain screw from oil tank. Drain used oil and dispose of as per environmental regulations. See 12-00-00, sec. 5.2	X	X(1	X	X	X	
b) Remove old oil filter from engine and install new oil filter. Lubricate mating sealing ring of new oil filter with engine oil and tighten new filter lightly by hand. After the engine test run, tighten again by hand. See 12-00-00, sec. 5.3	X	X(1	X	X	X	
c) Cut old oil filter without producing any metal chips and inspect filter mat. Findings: _____ _____ See 12-00-00, sec. 5.3	X	X(1	X	X	X	
d) Replace sealing ring of oil drain screw on oil tank. Screw in oil drain screw and tighten to 25 Nm (18.5 ft.lb). See 12-00-00, sec. 5.2	X	X(1	X	X	X	
e) Refill oil tank with approx. 3 litres of oil. For oil quality, see Operators Manual and SI-912-016, latest edition See 12-00-00, sec. 5.2	X	X(1	X	X	X	
(1 In the case of operation with leaded fuel e.g.: AVGAS 100LL. See Service Instruction SI-912-016.						

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Points of Inspection	Inspection					Signature
	25*	50**	100	200	600	
2.2.8) Flushing the cooling system						
a) Flushing the cooling system where conventional coolants are used. See 12-00-00, sec. 3.3	with replacing the coolant					

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Points of Inspection	Inspection					Signature
	25*	50**	100	200	600	
2.2.9) Checking the air filter						
a) Checking the air filter See 12-00-00, sec. 2.4	X	X	X	X	X	
2.2.10) Inspecting carburetor sockets and drip tray						
a) Inspect the carburetor sockets for damage and abnormalities, checking for cracks, wear and good condition. Take note of changes caused by temperature influence. See Chapter 13 of Heavy MM, part no. 899603				X(1	X	
(1 See SB 912-030, latest edition Otherwise inspect the carburetors every 50 h.						
2.2.11) Checking the carburetors						
a) Checking the idle speed. See 12-00-00, sec. 4.2	X	X	X	X	X	
b) Checking the ventilation of the float chambers Any trouble with the float chamber ventilation impairs engine and carburetor function and must therefore be avoided. Check that the passage of the ventilation lines is free and that no kinks can arise.	X	X	X	X	X	
c) Check for free movement of the carburetor actuation (throttle lever and starting carburetor). Check that the bowden cable allows the full travel of the throttle lever from stop to stop. See 12-00-00, sec. 4.3	X	X	X	X	X	
d) Removal/assembly of the two carburetors for carburetor inspection. See Chapter 13 of Heavy MM, part no. 899603				X	X	
e) Check carburetor synchronization. Mechanical or pneumatic synchronization. See 12-00-00, sec. 4.1.1	X	X	X	X	X	

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Points of Inspection	Inspection					Signature
	25*	50**	100	200	600	
2.2.12) Checking the V-belt tension						
a) On configurations with auxiliary generator, check the attachment and the V-belt tension. See 12-00-00, sec. 2.6	X	X	X	X	X	
2.2.13) Spark plugs						
a) Remove all spark plugs, check the heat range designation, clean, check electrode gap and adjust if necessary. Check electrode gap and adjust as necessary. Replace as required. See 12-00-00, sec. 6.2	X	X(1	X			
b) Replacing spark plugs. ■ CAUTION: Clean spark plug seating area. Apply heat conduction compound to spark plug thread. See 12-00-00, sec. 6.2			X(1	X	X	
(1 only applicable for engine type 912 S/ULS/ULSFR						
2.2.14) Spark plug connectors						
a) Check that resistance spark plug connectors fit tightly on the spark plugs. Minimum pull-off force is 30 N (7 lb).	X			X	X	
2.2.15) Checking the compression						
a) Check the compression by the differential pressure method. Test pressure ___ hPa (psi) Pressure drop cyl. 1 _____ cyl. 2 _____ (% or fraction) cyl. 3 _____ cyl. 4 _____ See 12-00-00, sec. 2.5				X	X	

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Points of Inspection	Inspection					Signature
	25*	50**	100	200	600	
2.2.16) Engine test run						
a) Start the engine and run to operating temperature. Ignition check at 4000 rpm engine speed. Speed drop without ignition circuit: A _____ rpm B _____ rpm Inspect carb heat system. Hit the preheating and make a note of speed drop. Speed drop B _____ 1/min Preheating "OFF", engine idle running and make a note of idle speed running _____1/min After engine test run, re-tighten the oil filter by hand. See 12-00-00, sec. 2.8	X	X	X	X	X	
2.2.17) General note						
a) All Service Instructions and Service Bulletins are complied with.	X	X	X	X	X	

Returning engine to service

On the engine identified as per point 2.1, on the _____ the ____hr. Check at _____hr. (TSN__,TSO__) was carried out according to recommendations of the engine manufacturer and was recorded in the Engine Log book.

_____
(location) , (date)

_____
(Aircraft mechanic)

_____
Inspector

_____
(certificate no).

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SECTION 05-50

UNSCHEDULED MAINTENANCE CHECKS

1) General note

Special checks must be carried out immediately in the event of an engine fault (e.g. abnormal operation as defined in the Operators Manual) which impairs the airworthiness of the engine.

▲ WARNING: In the course of special checks specify if **additional checking** for components (e.g. hydraulic governor) is applicable.

After each special check/repair work, an engine test run and a leakage check must be conducted.

▲ WARNING: Observe without fail all the specified instructions.

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NOTES

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2) Special checks

2.1) Checking the propeller gearbox/engine.

Check the engine after ground contact or unintended propeller stoppage.

2.1.1) Propeller gearbox with integrated overload clutch

- Inspect the engine for damage. If any damage is detected, inspect, repair or overhaul the whole engine in accordance with the BRP-Rotax instructions for continued airworthiness.

  Inspect all systems for correct functioning.
- Inspect additional equipment (external alternator, governor, ignition unit, coolant and oil hoses) for damage.
- Observe the directives of the aircraft manufacturer.
- Remove the gearbox and roller bearing of the propeller shaft.

  The whole gearbox must be inspected, repaired or overhauled in accordance with the BRP-Rotax instructions for continued airworthiness.

  Carry out detailed inspection of all gearbox components.

  NDT for cracks on gearbox housing, propeller shaft and gear set.
- Inspect drive for governor and vacuum pump (if fitted).
- Observe the manufacturer's instructions for the governor.
- Inspect the crankshaft on the power take off side for out-of-roundness. See 72-00-00, sec. 3.9.15 of the Heavy Maintenance Manual, part no. 899603.

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2.1.2) Propeller gearbox without integrated overload clutch

- The whole engine must be inspected, repaired or overhauled in accordance with the BRP-Rotax instructions for continued airworthiness.

  Detailed inspection of affected engine components.

  NDT for cracks in the crankshaft, gearbox housing, fly wheel hub, propeller shaft or gear set.

  The crankshaft must be overhauled.

- Inspect additional equipment (external alternator, hydraulic governor, ignition unit, coolant and oil hoses) for damage.
- Observe directives of the aircraft manufacturer.

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2.2) Checking of the overload clutch

In the event of lead deposits and/or if slipping is suspected, it will be necessary to check the overload clutch.

◆ NOTE Slipping of overload clutch is apparent if at engine speed rise, the propeller speed does not increase at the same rate.

- Lock the crankshaft. See 12-00-00 sec. 2.7.
- Remove the propeller as per manufacturer's instructions.

■ CAUTION: Danger of damage to the engine suspension!

Depending on the engine installation (e.g. in the case of extremely lightweight engine suspension), the gearbox must be removed and the test carried out on a suitable mounting attachment.

- A specially prepared lever (e.g. length 1.5 m (4.92 ft), see Fig. 3) is fitted on the propeller flange and the breakaway torque measured with a spring scale.

◆ NOTE: Because of difficult measurement of the slipping torque the breakaway torque is measured.

Repeat the measurement several times to get a stable value.

The breakaway torque is calculated on the basis of the spring force (F) measured in N and the length of the lever arm (L) used at the normal distance from it in m (N x m = Nm).

- Release the crankshaft, see 12-00-00 sec. 2.7.

The value determined must be between 600 and 800 Nm (369 and 590 ft.lb.).

◆ NOTE: The engine should have been running shortly before the inspection (max. 1 day before), as otherwise, the clutch can 'dry out', resulting in a higher torque.

■ CAUTION: Do not exceed 800 Nm (590 ft.lb.) otherwise gearbox damage can occur.

- If the value is greater or smaller than the limit value, the whole gearbox must be inspected, repaired or overhauled in accordance with the BRP-Rotax instructions for continued airworthiness.

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If the torque is below or above this value, inspect, repair or overhaul the propeller gearbox in accordance with the ROTAX instructions for continued airworthiness.

- Detailed inspection of all gearbox components.

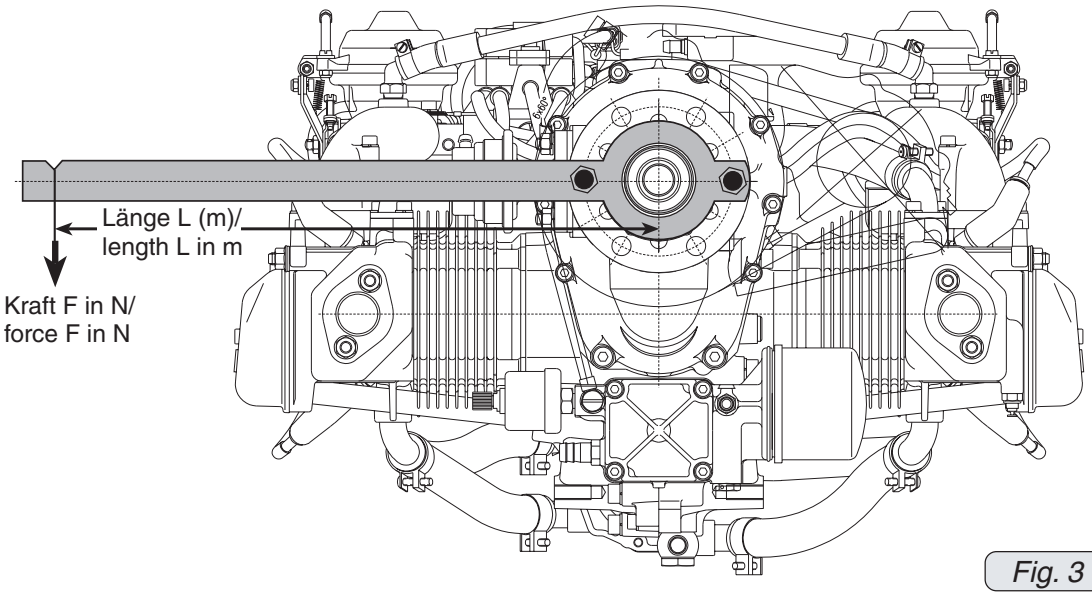

Fig. 3

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2.3) Examination after engine failure

In order to find possible causes of the failure, it is important to pass on all available data. Observations on the aircraft and the engine suspension can also be of help. It is important to pay particular attention to any of the following engine phenomena to facilitate troubleshooting.

Engine runs erratically and misfires

May be caused by a failure in the fuel system (fuel supply, vapour locks, contamination, float chamber venting, false air intake due to defective carburetor flange, carburetor icing), or in the ignition system (shorting cable, electronic module, spark plugs, wrong spark plug connection, grounding defect, charging coil etc.).

Engine running out of round

May be caused by a failure in the ignition system or a fault in the carburetor (fuel supply, contamination in float chamber or float needle valve, float chamber venting, false air intake due to defective carburetor flange, engine temperature too low, too lean carburetor jetting due to conditions prevailing in intake silencer).

Cylinder head temperature too high

A rise in cylinder head temperature above normal operating limits (see Operators Manual) is a clear signal for a failure in the cooling system:

- not enough coolant, bad venting, return valve is not working,
- radiator contaminated, radiator cap leaking, pressure relief valve is not working,
- malfunction of water pump.

Unintended engine stoppage by seizing

May be caused by a failure in the lubrication system. Oil pressure too low or no oil pressure due to oil shortage, contamination or bad venting of the oil system, defective oil pump. This often causes the camshaft bearings and/or the conrod bearings to seize up. The entire assembly must be dismantled, inspected and repaired.

- The whole engine must be inspected, repaired or overhauled in accordance with the BRP-Rotax instructions for continued airworthiness.
- Inspect all systems for correct functioning.
- Detailed inspection of affected engine components.

▲ WARNING: If one of the above failures should arise even only for a short time, a detailed inspect is necessary. Localize trouble and rectify.

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2.4) Returning engine to service after submerging in water

An engine which has been submerged in water must be inspected, repaired or overhauled in accordance with the BRP-Rotax instructions for continued airworthiness.

Inspect all systems for correct functioning.

Carry out detailed inspection of affected engine components.

■ CAUTION: The engine must be marked clearly "Engine submerged in water".

2.5) Inspection in extreme climatic conditions

Flying in deserts or areas with heavily contaminated or dusty air causes increased wear on all components. For this reason, shorter maintenance intervals are recommended.

■ CAUTION: Every 25 h checks of air filter, coolant radiator and oil cooler are necessary.

Flying in areas with extreme climatic conditions or in extreme altitudes requires adjustment of the carburetor jetting and of the cooling system. To do this, it is necessary to contact the aircraft manufacturer and an authorized ROTAX distributor.

2.6) Exceeding of max. admissible engine RPM

◆ NOTE: Any exceeding of the max. admissible engine RPM must be entered by the pilot into the engine log book stating duration extent of overspeeding and pertinent detail.

- If the limit was exceeded for max. 1 minute up to 6200 rpm:
  - Check that the push-rods are straight.
- If the limit was exceeded for more than 1 minute:
  The whole engine must be inspected, repaired or overhauled in accordance with the ROTAX instructions for continued airworthiness.
  - Check that the push-rods are straight.
  - Inspect all systems for correct functioning.
  - Detailed inspection of affected engine components.
- If the speed of 6200 rpm was exceeded:
  The whole engine must be inspected, repaired or overhauled in accordance with the ROTAX instructions for continued airworthiness.
  - Check that the push-rods are straight.
  - Inspect all systems for correct functioning.
  - Detailed inspection of affected engine components.

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2.7) Exceeding of max. cylinder head temperature

◆ NOTE: Any exceeding of the max. admissible cylinder head temperature must be entered by the pilot into the engine log book, stating duration extent of excess temperature and pertinent detail.

■ CAUTION: If the maximum cylinder head temperature is exceeded, other limits are also often exceeded, e.g. oil temperature. Please observe the relevant instructions.

2.7.1) Max. temperature exceeded up to 180 °C (356 °F) - briefly

If the max. permissible cylinder head temperature is exceeded briefly up to 180 °C (356 °F):

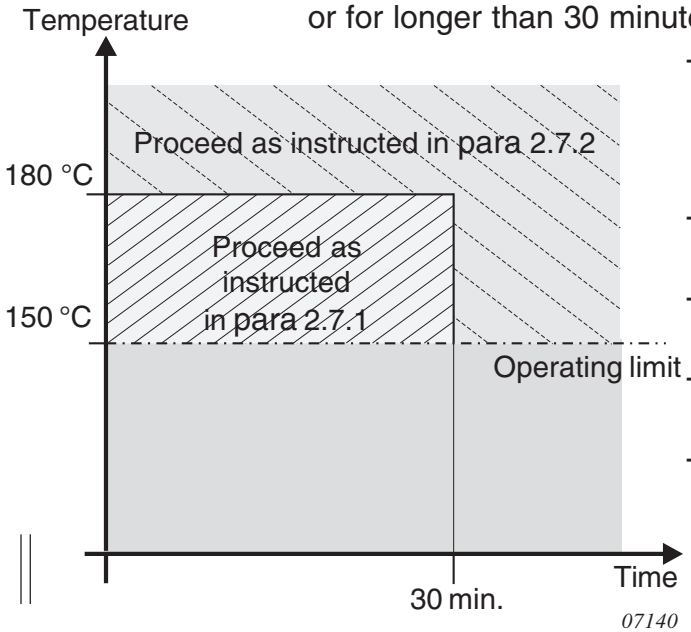
- The whole cooling system must be inspected, repaired or overhauled in accordance with the instructions for continued airworthiness.
- Inspect all further systems for correct functioning.

Carry out detailed inspection of the affected engine components such as

- Leakage check on the cooling system.
- Check that the cylinder head attachment is fitted securely. If the cylinder head nut is loose, proceed as instructed in the following sec. 2.7.2.
- Check all coolant fittings (feed/outflow) for secure fit.

2.7.2) Excess temperature of over 180 °C (356 °F) and/or for longer than 30 min.

If a cylinder head temperature above 180 °C (356 °F) is reached and/or for longer than 30 minutes:



- The whole cooling system must be inspected, repaired or overhauled in accordance with the instructions for continued airworthiness.
- Inspect all further systems for correct functioning.
- Detailed inspection of affected engine components.
- Check compression by carrying out a differential pressure check.
- All cylinder heads and cylinders must be removed and subjected to a detailed check including hardness testing.

See 72-00-00 in the Heavy Maintenance Manual.

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2.8) Exceeding the max. permissible oil temperature

◆ NOTE: Any exceeding of the max. admissible oil temperature must be entered by the pilot into the engine log book, stating duration extent of excessive temperature and pertinent details.

■ CAUTION: If the max. permissible oil temperature is exceeded, other limits are often exceeded, too, e.g. the cylinder head temperature. Please observe the relevant instructions.

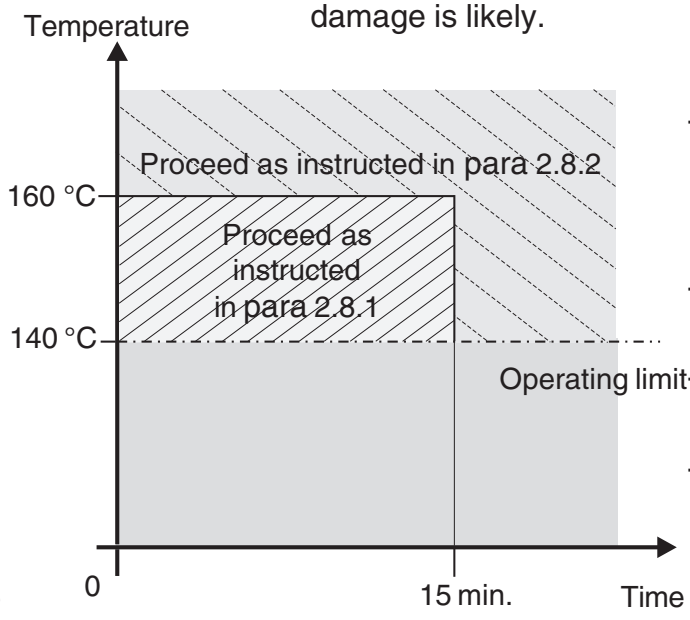
2.8.1) Excess temperature over 140 °C (284 °F)/max. 15 min.

With oil temperature in excess of 140 °C (284 °F) for max. 15 min., the cause must be located.

- The whole cooling system must be inspected, repaired or overhauled in accordance with the instructions for continuing airworthiness.
- Inspect all further systems for correct functioning.
- Inspect oil level in the oil tank.
- Inspect oil cooler for contamination and check the entire oil circuit for correct functioning.
- Check that oil lines are routed correctly and undamaged.
- Cut oil filter housing and inspect filter mat for foreign matter.
- Carry out oil change.

2.8.2) Excess temperature over 160 °C (320 °F)

With oil temperature in excess of 160 °C (320 °F) consequential damage is likely.



- The whole cooling system must be inspected, repaired or overhauled in accordance with the ROTAX instructions for continued airworthiness.
- Inspect all further systems for correct functioning.
- Detailed inspection of affected engine components.
- Cut oil filter housing and inspect filter mat for foreign matter.

2.9) Oil pressure below minimum value

◆ NOTE Any exceeding of the min. admissible oil pressure must be entered by the pilot into the engine log book, stating duration extent of excessive pressure and pertinent details.

■ CAUTION: If the oil pressure falls below the minimum value, other limits are often exceeded, e.g. the oil temperature. Please observe the relevant instructions.

2.9.1) Oil pressure below minimum oil pressure on the ground

If noticed **on ground**, immediately stop the engine and determine the cause.

- Inspect the complete lubrication system, trace cause and rectify. See SI-912-005, latest issue.

2.9.2) Oil pressure below minimum permissible oil pressure up to max. 0.5 bar (7.25 psi)/max. 1 min. in flight

If the oil pressure falls below the minimum value up to max. 1.5 bar (21.75 psi) and for max. 1 min., the cause must be determined.

- Inspect all oil lines for restrictions and clear passage.
- Verify oil quantity.
- Inspect pressure sensor.
- Inspect indicating instrument to specifications of the manufacturer, replace as required.
- Verify function of the pressure relief valve.
- If no cause for the low oil pressure is found after the above checks, carry out an oil change.
- If after the previous checks and oil change the oil pressure is still too low, repair or overhaul the engine in accordance with the BRP-Rotax instructions for continued airworthiness.
- Inspect all systems for correct function.
- Detailed inspection of affected engine components.

■ CAUTION: Replaced the oil cooler inclusive oil lines and before the reinstallation of the engine the complete lubrication system (inclusive oil tank) must be flushed.

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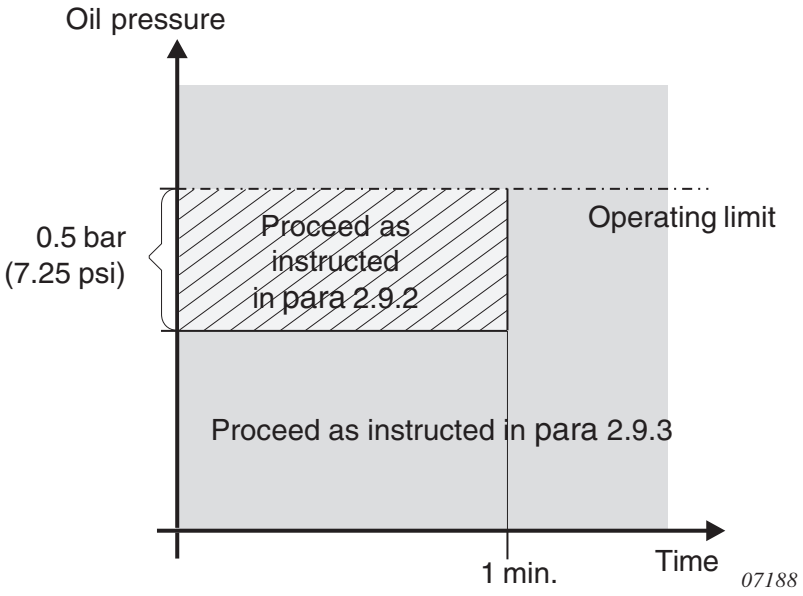
2.9.3) Oil pressure below minimum permissible value more than 0.5 bar (7.25 psi) in flight

Consequent damage can be expected if the oil pressure falls below the minimum value more than 0.5 bar (7.25 psi).

- The whole cooling system must be inspected, repaired or overhauled in accordance with the BRP-Rotax instructions for continued airworthiness.
- Inspect all further systems for correct functioning.
- Detailed inspection of affected engine components.
- Cut oil filter housing and inspect filter mat for foreign matter.



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2.10) Oil specification not respected

◆ NOTE: An entry by the pilot in the engine log book of all pertinent details is required.

If by error engine was serviced with oil, which does not correspond with oil specification in the Operators Manual and the engine has been in operation for **less than 5 hours**, the following measures must be taken:

- Oil change.

See Fig. 4.

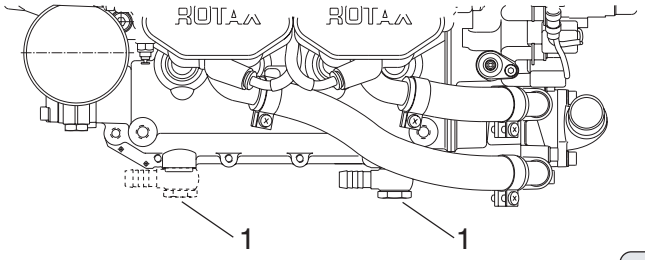

Fig. 4

- Remove the lowest positioned banjo bolt or plug screw (1) and drain the remaining oil from the crankcase. Screw in banjo bolt or plug screw. Tightening torque 35 Nm (25.81 ft.lb).
- Replace oil filter.
- Drain oil completely from oil cooler.
- Refill oil tank with oil as specified, refer to Operators Manual.
- Purge air from oil system. See 12-00-00, sec. 5.2.2.
- Run engine for approx. 1 hour and replace oil and oil filter once more, as stated above.

If the engine has been operated **longer than 5 hours** with engine oil not corresponding with specification in the Operators Manual the following work is required.

- Remove propeller gearbox.

  The gearbox must be inspected, repaired or overhauled in accordance with the BRP-Rotax instructions for continued airworthiness.
- Detailed inspection of all gearbox components.

◆ NOTE: An entry by the pilot in the engine log book of all pertinent details is required.

d04144

2.11) Spark plug not in accordance with specification

If by error any of the spark plugs were installed which are not according to specification of the engine manufacturer and/or not genuine ROTAX parts, the following verification will be necessary.

- Mark position of the spark plugs (e.g. cyl. 1 top) and remove all spark plugs.
- Inspect the spark plugs for damage (formation of melt beads, burn off).

  At heavy melt beads or bad burn off, inspect the piston dome and cylinder wall by borescope. If parts are damaged, repair or overhaul the engine in accordance with the BRP-Rotax instructions for continued airworthiness.
- Inspect all systems for correct function.
- Detailed inspection of affected engine components.
- Inspect spark plug thread for damage (especially at bad burn off).
- Inspect of pressure differential. Max. allowance, **10 %** pressure loss since the last check.
- Change oil and oil filter.

d04144

2.12) Engine runs sluggishly

See Fig. 5.

Carry out inspection only on cold engine and before 1st start.

▲ WARNING : Ignition "OFF" and system grounded! Disconnect negative terminal of aircraft battery.

- Remove spark plug connector and remove 1 spark plug from each cylinder.
- Torque must be determined with a suitable jig.

  To do this, determine the maximum occurring torque on the propeller shaft necessary to move the whole crank drive.

  The torque must be max. 150 Nm (110.64 ft.lb).

▲ WARNING : At exceeding of the given value do not start engine before trouble is found and rectified.

- Carry out detailed inspection of the affected gearbox components.
- Carry out detailed inspection of crank drive.

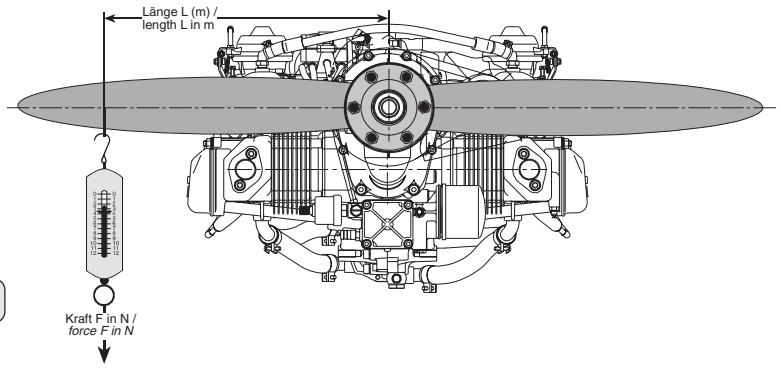

Fig. 5

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2.13) Reporting

According to the regulation of EASA part 21A.3 / FAR 21.3 the manfacturer shall evaluate field information and report to the authority. In case of any relevant occurrences that may involve malfunction of the engine, the form on the next page should be filled out and sent to the responsible authorized ROTAX distributor.

◆ NOTE: The form is also available from the official ROTAX AIRCRAFT ENGINES Homepage

www.rotax-aircraft-engines.com

in electronic version.

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ROTAX®

AIRCRAFT ENGINES

CUSTOMER

SERVICE INFORMATION REPORT

OPER. Control No.		
ATA Code		
1. **A/C Reg. No.**		

Enter pertinent data	**MANUFACTURER**	**MODEL/SERIES**	**SERIAL NUMBER**
2. AIRCRAFT			
3. POWERPLANT	ROTAX		
4. PROPELLER			

5. SPECIFIC PART *(of component)* CAUSING TROUBLE

Part Name	MFG. Model or Part No.	Serial No.	Part/Defect Location

6. ENGINE COMPONENT *(Assembly that includes part)*

Engine/Comp. Name	Manufacturer	Model or Part No.	Serial Number

Engine TSN	Engine TSO	Engine Condition	7. Date Sub.

8. Comments *(Describe the malfunction or defect and the circumstances under which it occurred. State probable cause and recommendations to prevent recurrence.)*

Optional Information:

Check a box below, if this report is related to an aircraft

☐ Accident; Date ☐ Incident; Date

DISTRICT OFFICE

OPERATOR DESIGNATOR

REP. STA. ☐ OPER ☐ MECH ☐ AIR TAXI ☐ MFG ☐ ACG ☐ COMMUTER ☐ OTHER ☐

SUBMITTED BY:

TELEPHONE NUMBER: ( )

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SECTION 12-00

MAINTENANCE OF THE SYSTEMS

1) Table of contents

SECTION 12
MAINTENANCE OF THE SYSTEMS

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2) General note

The section "Maintenance of the systems" is associated with other sections. It serves only as a supplement to and further explanation of the maintenance check list. See 05-20-00, sec. 2.2.

◆ NOTE: For reasons of clarity, only headlines and keywords are listed in the Maintenance Schedule. Please refer to the following pages for further explanation if needed.

As far as possible, the content has been arranged according to system.

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2.1) Engine cleaning

■ CAUTION: Do not use easily inflammable liquids or caustic cleaning agents for cleaning the engine.

If necessary, the engine must be cleaned with due care. Repair leaks as required before cleaning. Always clean engine in cold state.

Use of a commercially available cold cleaning agent for the engine is recommended. See 05-00-00, sec. 2.5.

Never clean an engine with a high pressure cleaner. This is detrimental to the electrical installations and shaft seals. Oxidation of the various components and their failure are the consequence.

After each cleaning procedure, dry all electrical components such as battery, ignition unit, spark plug connector, clamp connections etc. by use of compressed air to prevent leakage current.

■ CAUTION: When cleaning the engine, the dissolved residues of fuel, oil and other environment-contaminating agents are rinsed off. Collect the cleaning water and dispose of it in accordance with applicable environmental regulations.

d04145

2.2) Leakage check

Visual inspection of the whole engine for leaks.

◆ NOTE: If a leak is suspected following check is possible:

Operate the engine until the temperatures have stabilized for a period of 5 min. Switch off ignition and secure engine against unintentional operation. Secure aircraft against unauthorized operation. After shut down of engine no liquid must drip down within 1 min.

If the leakage bore, located at the base of the ignition housing, is dripping oil, the oil seal on the water pump shaft may be defective and must be replaced. In the case of coolant drips at the leakage bore, the coolant mechanical seal must be replaced.

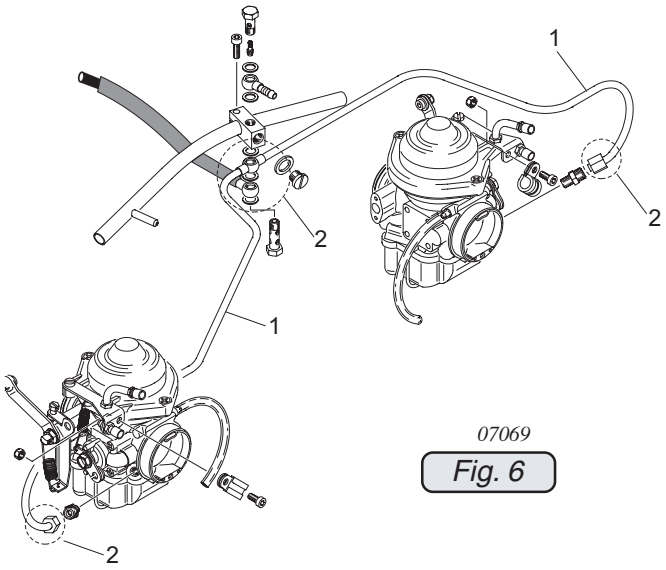

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Fig. 6

Inspect fuel lines, their connections and screw fasteners. Look for scuffing marks. Inspect isolating flange of fuel pump for leaks.

Detailed visual inspection specially on steel fuel lines (1) in the area of connections (fittings) (2) for leaks and cracks is necessary. See Fig. 6.

Inspect all oil feed lines from the oil tank to the oil cooler and to the engine. Also inspect the oil return line from the crankcase to the oil tank. Check the pressure oil line from the oil pump to the governor flange of the governor and the suction oil line from the turbocharger to the oil pump.

Check coolant hoses and connections and fittings for leakage. Examine the surrounding area to see if there are any leaks!

If leaks are visible, locate the cause and remedy the fault.

Check all hoses, particularly in the area of the hose clamps and hose connections, for porosity, damage and kinks. If damage is detected, replace hose immediately.

■ CAUTION: Avoid overstretching the fixing elements. Tighten as far as possible by hand.

d04145

2.3) Checking the engine suspension

▲ WARNING: Exactly observe the tightening torques for screws and nuts. Overtightening or too loose connection could cause serious engine damage.

Verify the engine suspension points on the crankcase for tight fit and damage including cracks.

Inspect the surroundings of engine attachment on crankcase and gearbox. If there is discoloration of the crankcase around the attachment points (black ring), there may be loose attachments.

Inspect engine isolating mounts including for heat damage, wear and cracks.

d04145

2.4) Checking the air filter

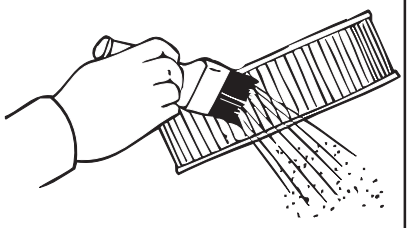
See Fig. 7 and 8.

Carry out visual inspection of dry air filter after prescribed maintenance interval. Clean dirty air filter as described in aircraft manufacturer's Maintenance Manual.

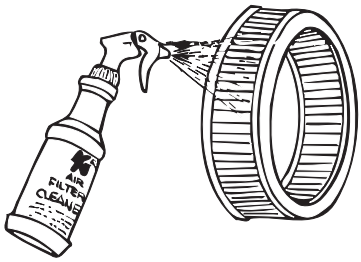
■ CAUTION: In the event of dust formation, clean air filter at correspondingly shorter intervals. If filter mat is damaged, replace air filter.

■ CAUTION: A dirty filter insert will not only reduce the engine performance but might also promote premature wear of the engine.

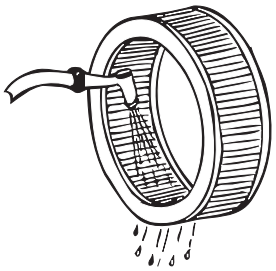
00182 *Fig. 7*



Lightly tap and brush off surface dirt.



Spray K&N filter cleaner onto filter surface and leave to soak for approx. 10 min.



Rinse air filter with low pressure water from inside to outside and let element dry naturally.

Cleaning the dry air filter

■ CAUTION: Never use gasoline, steam, caustic liquids, strong detergents, particle cleaning agents or high pressure cleaners during this step.

After soaking period, flush with cold water from inside to outside, shake off and let it dry naturally.

■ CAUTION: Do not dry over naked flame, with compressed air or with hot air gun.

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After cleaning, lubricate the individual filter elements evenly with K&N filter oil spray or K&N filter oil, part no. 897870, to achieve optimum filtering effect.

◆ NOTE: Each filter pleat must be sprayed with oil.

After 5 to 10 min. the filter will be soaked with oil, noticeable by the uniform red coloring.

■ CAUTION: Never use gear oil, diesel or engine oil, as they attract humidity.

■ CAUTION: Each air filter must be secured by clamp attachment and a wire securing element. See 05-00-00, sec. 2.6.1. Filter connection must be free of oil.

Replacing the dry air filter

Only use dry type air filters which are specified by the aircraft manufacturer.

■ CAUTION: Attach new air filter, free of grease, at connection faces, and wire-secure against loss.

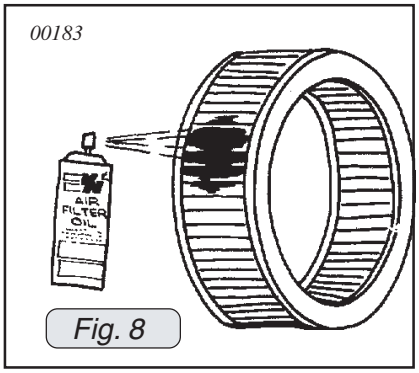

Fig. 8

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2.5) Checking the compression

See Fig. 9.

▲ WARNING: Ignition switch for both ignition circuit in "OFF" position.

Testing is carried out using the **differential pressure test procedure**.

■ CAUTION: For this test, you will need the following equipment:
Compressed air supply of approx. 6 bar (87 psi), and a testing device consisting of two pressure gauges, an orifice jet (2)* of 1 mm (0.04 in) inner diameter and 3 mm (0.12 in) length and an adaptor to connect line to tapped spark plug thread.

PROCEDURE:
Bring engine to operating temperature. Move crankshaft to ignition TDC position. Unscrew the bottom spark plug in each case to prevent dirt particles penetrating the engine. Screw adaptor (1) into the spark plug thread and connect up the two pressure gauges with the orifice jet (2) between them. Now put constant pressure (4) on the line (3) and take readings at pressure gauge (5). The maximum permissible pressure drop is 25 %, e.g. from 6 to 4.5 bar (87 psi to 65 psi).

If the value is below 4.5 bar (65 psi), inspection, repair or overhaul must be carried out in accordance with the BRP-Rotax instructions for continued airworthiness.

- Detailed inspection of affected engine components.

◆ NOTE: In the course of fault-tracing a **compression check** can also be performed:

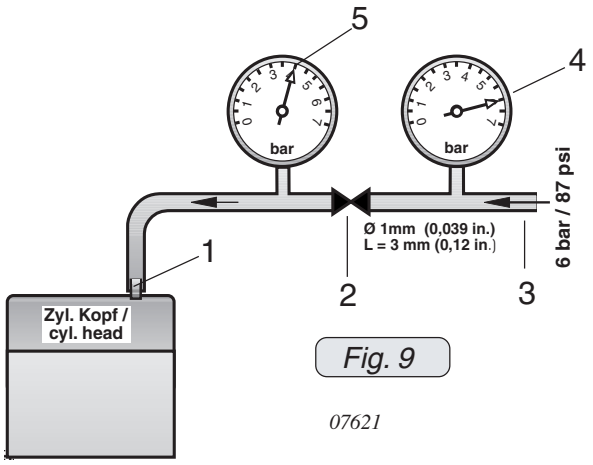

Fig. 9

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* or equivalent e.g. orifice diameter 0.040 in., long 0.0250 in., 60 degree approach angle according to AC43.13, latest edition.

A compression tester is required to check compression. The compression should be between 9 and 12 bar (130 and 174 psi).

PROCEDURE:
Bring engine to operating temperature (engine oil temperature between 30 to 70 °C (90 - 160 °F)). Unscrew and remove top spark plugs.
Press compression tester over the spark plug hole and use the starter to turn the engine over with open throttle until maximum pressure is reached.
Successively take readings on all four cylinders and compare results.
Individual readings for the cylinders must not differ by more than 2 bar (29 psi).

If the value is below 6 bar (87 psi), inspection, repair or overhaul must be carried out in accordance with the instructions for continued airworthiness.

- Detailed inspection of affected engine components.

d04145

2.6) Checking the V-belt tension

See Fig. 10 and 11.

In the case of configurations with additional auxiliary generator, inspect attachment and V-belt tension.

To adjust the belt tension, loosen the hex. screw (1) M10 and the two M8 allen screws (2) and (3). Press the alternator upwards and tighten allen screw (3). Then tighten screws (1) and (2).

Tightening torque for screws M8 its 22 Nm (195 in.lb) and

for screw M10 35 Nm (25.8 ft.lb).

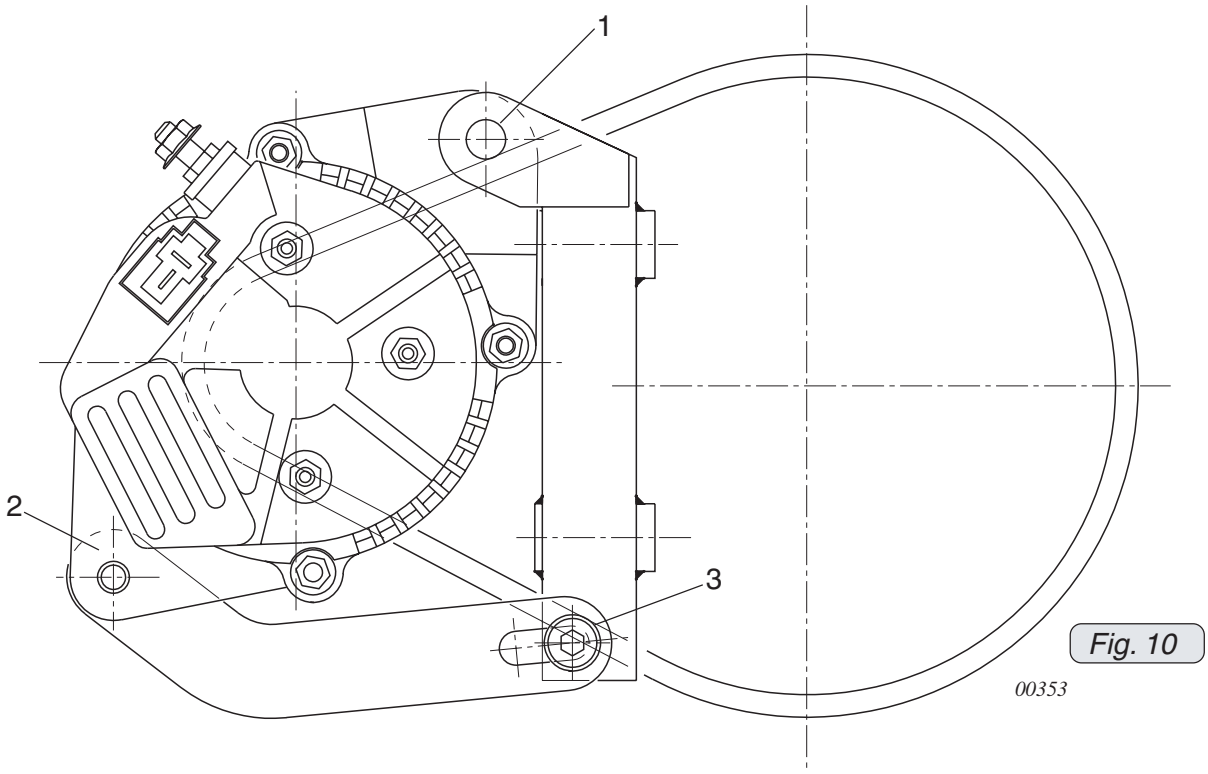

Fig. 10

Inspect V-belt tension as per drawing below.

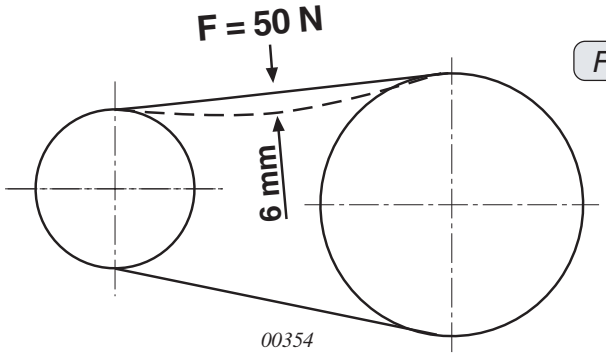

Fig. 11

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2.7) Locking the crankshaft

See Fig. 12 and 13.

Remove the plug screw (1) M8 x 20 and sealing ring from the crankcase half (cyl.2/4). Turn crankshaft/propeller shaft until the pistons of cyl. no. 1 and no. 2 are in T.D.C position. and lock crankshaft in this position with the crankshaft locking screw (2) part no. 240880.

◆ NOTE The crankshaft locking screw is part of the standard tool kit supplied with each engine.

To facilitate finding of the correct crankshaft position, turn the crankshaft to have the 4-digit number (3) cast in the fly wheel hub (4) align with the edge (5) of the ignition housing.

The required recess position of the crankshaft can be additionally verified by looking through the crankcase recess (6) with a flash light.

Screw the crankshaft locking pin into the crankcase. While doing so, move the crankshaft to and fro slightly with the ring spanner until the locking screw engages in the recess (6) of the crankshaft, and tighten to 10 Nm (88.48 in.lb).

After completion of work/check:

Remove the crankshaft locking screw (2) and refit crankshaft plug screw M8 x 20 (1) along with a new sealing ring with a torque of 15 Nm (133 in.lb).

To check, use wrench SW 24 to rotate the crankshaft at hex. screw (7) on the magneto side.

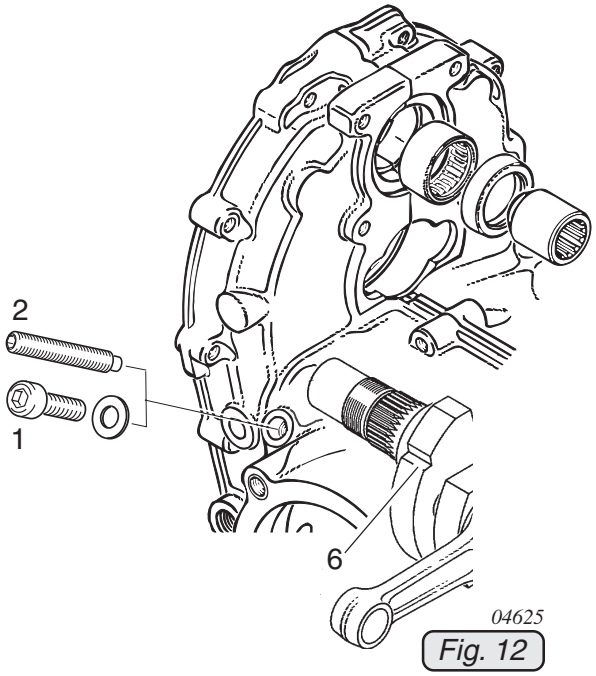

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Fig. 12

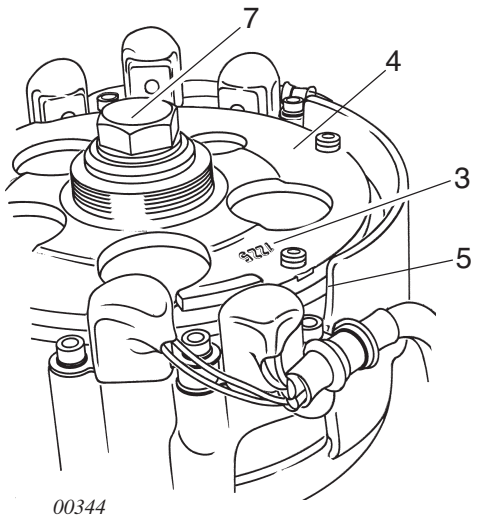

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Fig. 13

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2.8) Test run of engine

▲ WARNING: Always observe the engine from a safe place while it is running. Check that the cockpit is occupied.

- Ensure that all the operating fluids (engine oil, coolant, fuel) are replenished to the specified level.
- Make sure that no loose objects (e.g. tools) are left in the engine compartment.
- Inspect tight fit of propeller.
- Anchor the aircraft suitably to the ground and fix wheel chocks. Ensure that the propeller zone is clear and safe before starting the engine.

In succession:

- establish fuel supply (open fuel cock).
- activate choke.
- throttle lever to idle position.
- master switch "ON".
- ignition for both ignition circuits "ON".
- press starter switch for max. 10 sec. followed by a cooling period of 2 min.
- after engine start, observe oil pressure. Oil pressure has to be built up within 10 sec.
- let engine run for approx. 2 min. at 2000 rpm. Then first use the throttle lever to bring the engine to approx. 2500 rpm and then run through warming up period, until the oil temperature reaches 50 °C (122 °F).
- Check temperatures and oil pressure: At a steady oil temperature above 50 °C (122 °F) and oil pressure above 2 bar (29 psi) engine speed may be increased.
- ignition check as per the current Operators Manual.
- conduct a short full throttle run and check that the engine reaches the max. full power speed. Consult the pilot's operating handbook for maximum speed, as it depends on the propeller used.
- after full-load run, conduct a short cooling run to prevent formation of vapour lock in cylinder heads. This is necessary to prevent steam locks in the cooling and fuel system after shut-down.

▲ WARNING: When shutting down the engine, always switch off ignition and remove the ignition key.

- shut engine down.

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▲ WARNING: Never open radiator cap when the cooling system is hot. For safety's sake, cover cap with a rag and open slowly. Sudden opening of the cap could provoke the escape of boiling coolant and result in scalding.

- replenish engine oil and coolant as required once engine has cooled down.

■ CAUTION: If the oil filter has been replaced, re-tighten by hand after the trial run.

- Inspect engine for oil, fuel or coolant leaks and repair as necessary.

d04145

3) Cooling system

3.1) Checking the cooling system

▲ WARNING: Always allow engine to cool down to ambient temperature before start of any work.

Severe burns and scalds may result if this instruction is ignored.

▲ WARNING: Never open radiator cap when the cooling system is hot. For safety's sake, cover cap with a rag and open slowly. Sudden opening of the cap could provoke the escape of boiling coolant and result in scalding.

Carry out visual inspection of all coolant hoses for damage, leaks, hardening as a result of heat and porosity. Inspect all connections on the top and bottom of the cylinder head and on the water pump. Inspect expansion tank for damage. Inspect protection rubber at the bottom of the tank for tight fit.

Inspect the gasket of the radiator cap and check the pressure release valve and return valve for proper operation. See 12-00-00, sec. 3.4.

■ CAUTION: Use only coolant as recommended in the current Operators Manual.

Inspect coolant with densimeter or glycol tester. If necessary, replenish with coolant of same composition. Strongly discolored or thickened coolant must be replaced.

3.2) Replacing the coolant

See Fig. 14.

▲ WARNING: Never open radiator cap when the cooling system is hot. For safety's sake, cover cap with a rag and open slowly. Sudden opening of the cap could provoke the escape of boiling coolant and result in scalding.

Open the radiator cap on the expansion tank, remove the bottom attachment screw (1) (with sealing ring) of water pump and drain the engine coolant.

◆ NOTE: If the radiator is located below the engine, also detach the lowest positioned coolant hose.

Fit attachment screw (stainless steel) along with a new sealing ring. Tighten to 10 Nm (90 in.lb).

Refill newly mixed coolant into the expansion tank (highest point of the cooling system). Fit radiator cap.

◆ NOTE: Run the engine briefly and replenish with clean coolant as required.

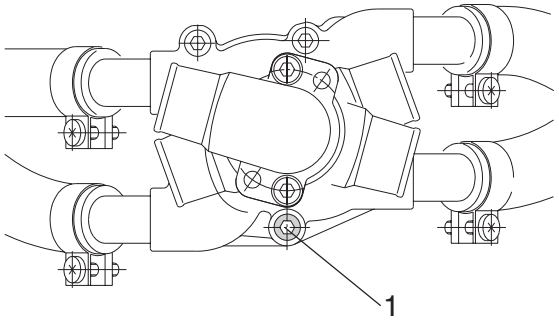

Fig. 14

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3.3) Flushing the cooling system

▲ WARNING: Never open radiator cap when the cooling system is hot. For safety's sake, cover cap with a rag and open slowly. Sudden opening of the cap could provoke the escape of boiling coolant and result in scalding.

The system is flushed using pure water at a pressure of 2 bar (29 psi).

■ CAUTION: Where water-free coolant is used, the cooling system must be drained of water correspondingly after flushing. The residual water must not exceed the max. permissible limit prescribed by the coolant manufacturer.

◆ NOTE: For the flushing, open the lowest located coolant hose (either at water pump or radiator).

Refill newly mixed coolant into the expansion tank (highest point of the cooling system).

◆ NOTE: Run the engine for a minute and replenish coolant as required.

d04145

3.4) Expansion tank, radiator cap

See Fig. 15 to 17.

To equalize pressure in the cooling system, an expansion tank is required. If the pressure in the system rises above 1.2 bar (17.4 psi) as the coolant warms up, the pressure relief valve (1) opens and the coolant can flow into the expansion tank via the line (5). When the coolant cools down, the return valve (2) opens and the coolant is sucked back.

◆ NOTE: At older engines a radiator cap with opening pressure of 0.9 bar (13.0 psi) can be installed see SI-25-1997 "Running Modification", latest issue.

Inspect the rubber seal (3), the pressure spring (4) and the two valves incorporated in the radiator cap for damage and leaks. If necessary, replace with a new original radiator cap with 1.2 bar (17.4 psi) (6) opening pressure.

Inspect sealing surface (7) and tube connection (8) of the expansion tank. Carry out visual inspection of tank for damage and scuffing marks.

◆ NOTE: The radiator cap must be tightened on block.

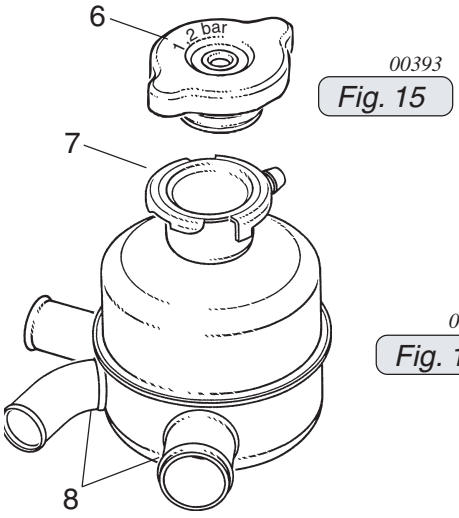

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Fig. 15

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Fig. 16

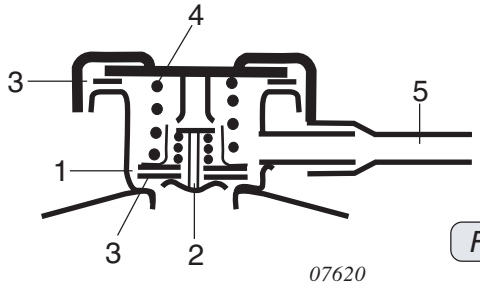

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Fig. 17

Legend:

1 pressure relief valve
2 return valve
3 rubber seal
4 pressure spring
5 connection to overflow bottle
6 opening pressure of the radiator cap
7 sealing surface
8 tube connections

d04145

3.5) Overflow bottle

See Fig. 18.

Inspect the bottle for damage. Check the venting bore (1) in the screw cap (see Service Bulletin SB-912-039, "Modification of the overflow bottle", latest issue). Inspect bracket (2) for the safety wire. Check hose connection (3).

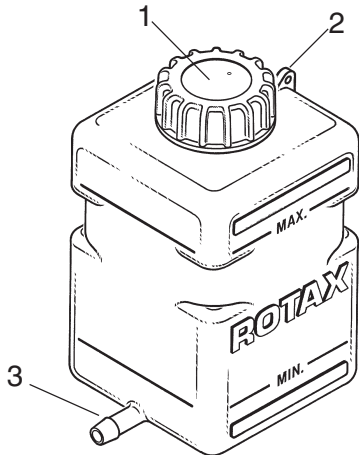

Fig. 18

3.6) Accessories (including radiator, radiator hoses, hose clamps, cooling air ducts).

■ CAUTION: Equipment is to be inspected in accordance with the Maintenance Manual of the aircraft manufacturer.

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NOTES

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4) Fuel system

4.1) Carburetor synchronization

4.1.1) Checking the synchronization at idle speed

See Fig. 21 and 22.

For smooth idling, synchronization of the throttle valves is necessary. When synchronizing, slacken both bowden cables.

Detach the resonator hose (3) of the compensating tube (2) to separate the two air intake systems. In this condition, no significant difference in the engine running should be noticeable.

4.1.2) Mechanical synchronization

See Fig. 19 and 20.

For synchronous basic throttle adjustment (mechanical synchronization) proceed as follows.

Adjust the two bowden cables for simultaneous opening of the throttle valves.

Remove cable fixation (4) on throttle lever (1).

Release return spring (5) from its attachment on the throttle lever (1).

Return the throttle lever (1) to its idle stop position (3) by hand. There should be no resistance during this procedure.

Unscrew idle speed adjustment screw (2) until it is free of the stop.

Insert a 0.1 mm (0.004 in) feeler gauge (gap X) between the idle speed adjustment screw (2) and the carburetor idle stop (3), then gently turn the idle screw clockwise until contact is made with the 0.1 mm (0.004 in) feeler gauge. Pull out the feeler gauge and then turn each idle speed adjustment screw (2) 1.5 turns in clockwise direction.

Gently turn each idle mixture screw (6) (clockwise) until it is fully inserted and then reopen by 1.5 turns counter clockwise.

Hook the return spring (5) back up to the throttle lever (1) in its original position. Check that the throttle valve opens fully automatically.

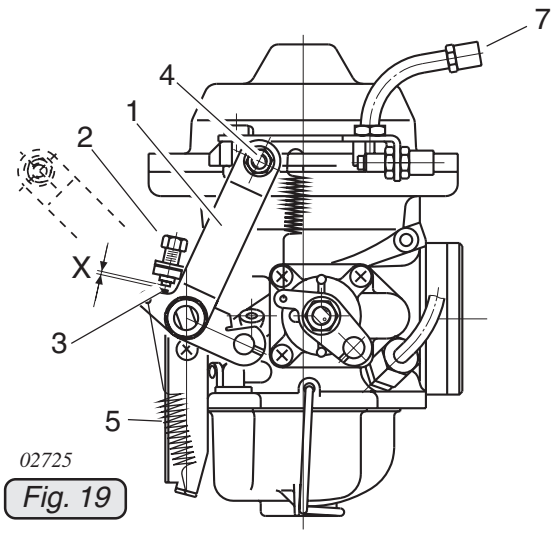

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Fig. 19

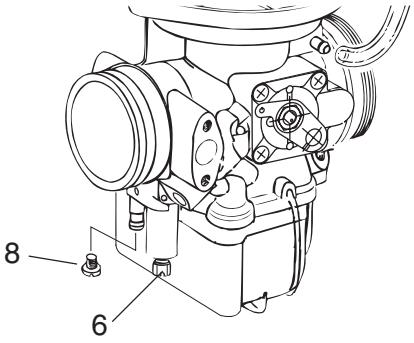

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Fig. 20

Carry out the above procedure on both carburetors.

◆ NOTE: The mechanical carburetor synchronization is sufficiently exact.

You must at this point place the throttle lever in the cockpit to the idle stop position. It is an advantage at this point to enlist the help of an assistant to ensure that the throttle lever remains in this position during the next steps of the synchronization process.

As soon as the throttle lever in the cockpit remains is in the idle stop position, move the throttle lever (1) to the carburetor idle stop position and, using the cable fixation (4), secure the bowden cable accordingly. As soon as the two carburetor bowden cables are installed (throttle lever in cockpit in idle position), you must check that the idle speed adjustment screw (2) rests fully on the idle stop (3) without pressure.

■ CAUTION: An idle speed which is too low will result in gearbox damage, and if the idle speed is too high, the engine is harder to start.

Start the engine and verify the idle speed. If the idle speed is too high or too low, adjust accordingly with idle speed adjustment screw (2).

Check the true running of the engine. If necessary, adjust with the idle mixture screw (6). See 12-00-00, sec. 4.2.

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4.1.3) Pneumatic synchronization

See Fig. 21 and 22.

◆ NOTE Mechanical synchronization has already been carried out.

◆ NOTE Not possible with drip tray fitted. If a pneumatic synchronization is absolutely necessary, remove the drip tray and refit it after adjustment.

The two carburetors are adjusted to equal flow rate at idling with a suitable flow meter or vacuum gauges (1).

There are two possible connection methods.

Option 1. Remove hex. screw (6) M6 x 6 from the intake manifold (7) and connect the vacuum gauge(s)(1).

Remove the compensating tube (2) with attached hoses (connection between intake manifolds) and plug the connections in the intake manifolds.

Option 2. Remove the compensating tube hose (2) from the push on connection (5) after removing the tension clamp (4).

Using the push on connection (5), install a flexible rubber hose (8) leading to the vacuum gauge (1), using the tube hose. Install the other flexible rubber hose leading to the vacuum gage. See Fig. 21.

Before proceeding any further, secure the aircraft on the ground using wheel chocks and ropes.

▲ WARNING: Secure and observe the propeller zone during engine operation.

Start the engine and verify the idle speed. If necessary correct as per 12-00-00, sec. 4.1.2.

If a setting of more than 1/2 turn is required, repeat mechanical synchronization to prevent too high a load on the idle stops.: If the idle speed is too high, the maximum the idle screw can be unscrewed is complete turn.

If no satisfactory result can be achieved, inspect the idle jets for contamination and clean if necessary

■ CAUTION: Also check for translucent, jelly-like contamination. Inspect for free passage.

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Once the proper idling speed has been established, it is necessary to check the **operating range above the idle speed**.

First establish that the engine is developing full take-off performance or take-off rpm when selected in the cockpit. Then the setting of the operating range (idle to full throttle) can be checked or adjusted.

Procedure:

Start and warm up engine (See Operators Manual). Select full power and check that both pressure gauges are registering the same readings. If the same reading is not made on both gauges, shut down the engine and check that carburetor actuation effects full travel and that starting carburetors (choke) are in the full off position.

If necessary, fit/modify the carburetor actuation as required to achieve full power on both carburetors.

Once full power has been established on both carburetors, retard the throttle and observe the pressure gauge settings. The pressure gauges should show the same reading for both carburetors. Discrepancies must be compensated for by adjusting the off idle adjustment (7) (see Fig. 19). The carburetor with the lower indication must be advanced to match the higher one.
This is done by shutting down the engine and loosening the locknut on the bowden cable and screwing the off idle adjustment in by 1/2 turn, then tightening the locknut and re-testing the engine.

Final idle speed adjustment may be required by resetting the idle speed adjustment screws (2), see Fig. 19 accordingly. Equal adjustment must be made on both carburetors.

Any major adjustments required necessitate replaced verification of all parameters mentioned in this procedure.

Install compensation tube assy. on engine in reverse sequence of removal. Any minor differences in balance at idle speed will be compensated for.

■ CAUTION: Follow the instructions of the instrument manufacturer.

Refit the screw plug M3,5 x 5 (pos. 8/Fig. 20) and hex.screws M6 x 6 (pos. 6/Fig. 22).

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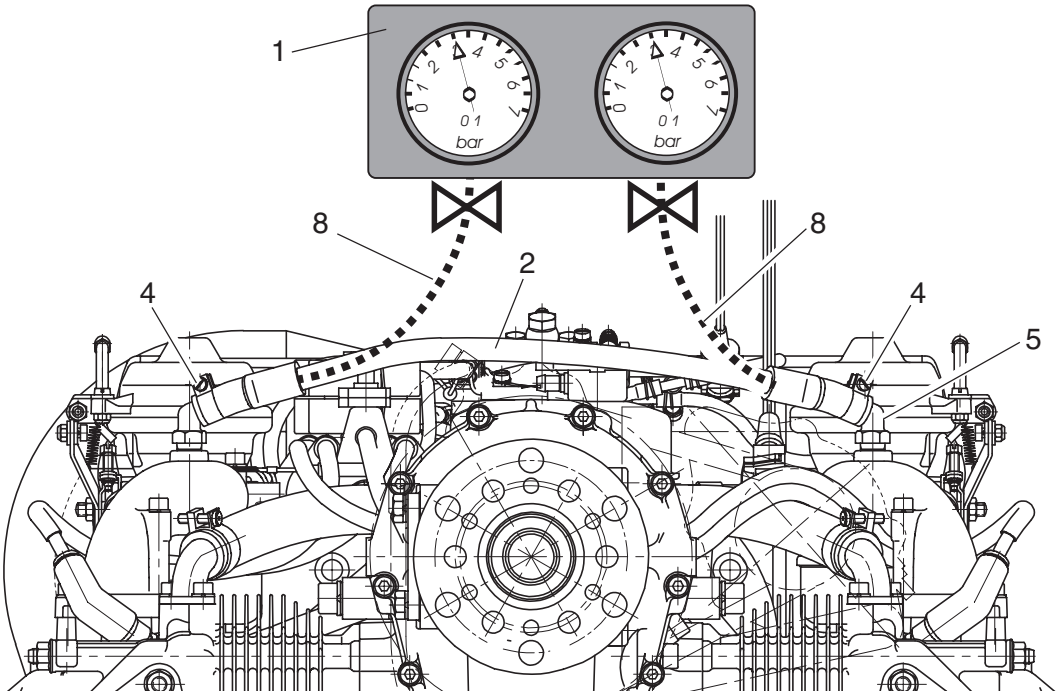

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Fig. 21

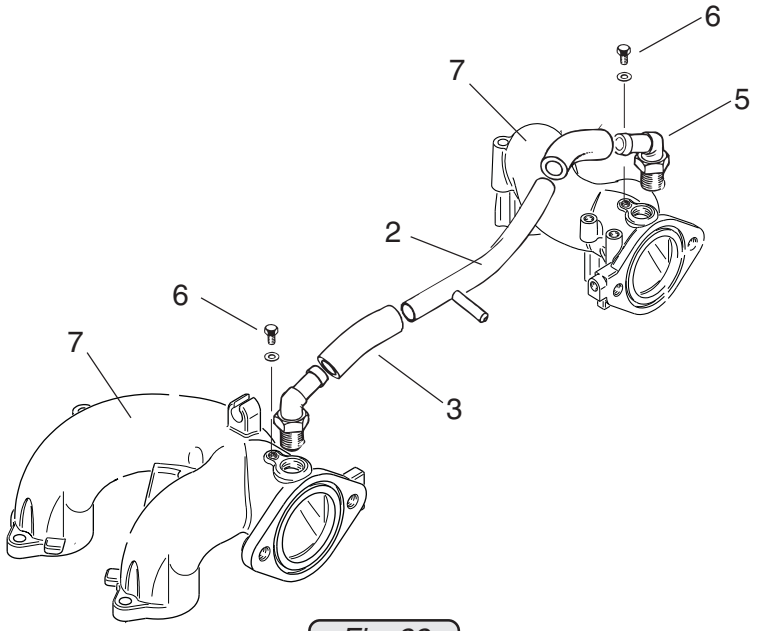

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Fig. 22

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4.2) Idle speed adjustment

See Fig. 23 and 24.

General note:

■ CAUTION: If satisfactory idle speed adjustment cannot be achieved, inspection of the idle jet or additional pneumatic synchronization will be necessary.

Always carry out idle speed adjustment when the engine is warm.

- Basic adjustment of the idle speed is first effected using the idle speed adjustment screw (1) of the throttle valve. See para 4.1.2.

Optimizing engine running:

Necessary only if not taken care of at synchronization.

Close idle mixture screw (2) by turning clockwise to screw in fully and then opening again by 1.5 turns counter clockwise.

Starting from this basic adjustment, the idle mixture screw (2) is turned until the highest motor speed is reached. The optimum setting is the middle between the two positions at which an rpm. drop is noticed. Then readjustment of the idle speed is carried out using the idle speed adjustment screw (1) and if necessary, by slightly turning the idle mixture screw again.

◆ NOTE: Turning the idle mixture control screw in clockwise direction results in a leaner mixture and turning counter clockwise in a richer mixture.

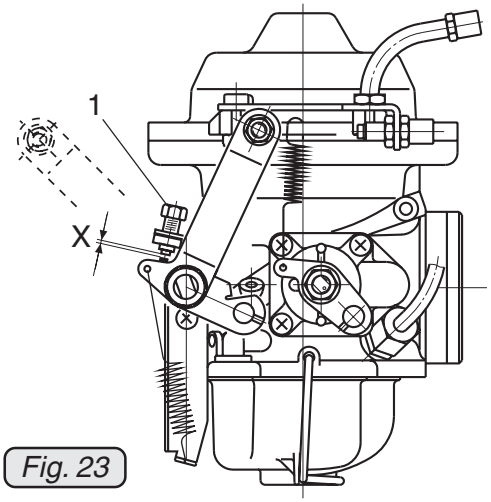

Fig. 23

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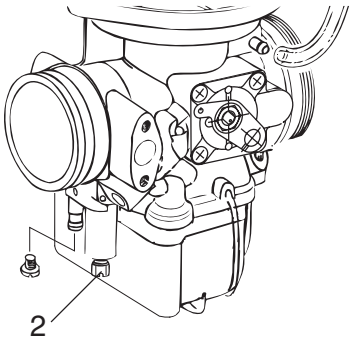

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Fig. 24

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4.3) Checking the carburetor actuation

See Fig. 25.

Route bowden cables in such a way that carburetor actuation will not be influenced by any movement of engine or airframe, thus possibly falsifying idle speed setting and synchronization.

◆ NOTE: Each carburetor is actuated by two bowden cables. At position (1) connection for throttle valve, and at position (2) connection for choke actuation.

▲ WARNING: Adjust bowden cables so that the throttle valve and the choke actuation of the starting carburetor can be fully opened and closed. Bowden cables and lever must not jam!

▲ WARNING: With carburetor actuation not connected, the throttle valve is fully open. The initial position of the CD carburetor is **full throttle**! So never start the engine with the actuation disconnected.

Inspect bowden cables and levers for free movement. Bowden cable must allow full travel of lever from stop to stop. Adjust throttle cables to a clearance of 1 mm (0.04 in).

Inspect and lubricate linkage on carburetor and carburetor joints with engine oil.

Inspect return springs (3) and inspect engagement holes for wear.

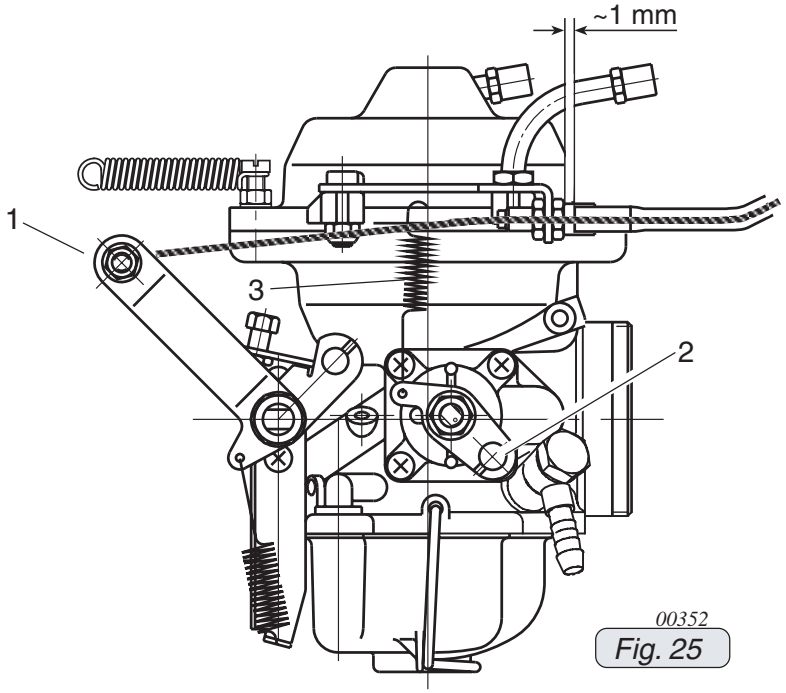

Fig. 25

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NOTES

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5) Lubrication system

5.1) Oil level check

See Fig. 26.

▲ WARNING: Always allow engine to cool down to ambient temperature before start of any work.

Severe burns and scalds may result if this instruction is ignored.

▲ WARNING: Switch off ignition and remove key! Disconnect negative terminal of aircraft battery.

Before checking the oil level, make sure that there is not excess residue oil in the crankcase.

Prior to oil level check, turn the propeller several times by hand in direction of engine rotation to pump all the oil from the engine to the oil tank.

This process is completed when air flows back to the oil tank. This air flow can be perceived as a murmur (gurgling) when the cap of the oil tank is removed.

The oil level in the oil tank should be between the two marks (max./min.) on the oil dipstick, but must never fall below the min. mark. See Service Bulletin SB-912-040, "Introduction of a new oil dipstick", latest issue.

Replenish oil as required:

■ CAUTION: For longer flights replenish oil to max. mark to warrant more oil reserve.

During standard engine operation, the oil level should be mid-way between the max. and min. marks, as at higher oil level (over servicing), oil will escape via the venting passage see also SI-27-1997,"oil level check", latest issue.

Difference between "max." and "min." - mark = 0.45 l (0.95 liq.pt).

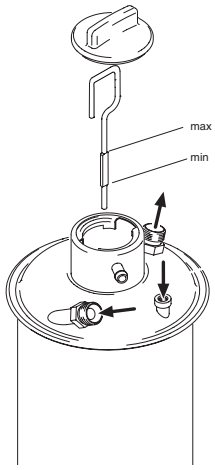

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Fig. 26

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5.2) Oil change

For detailed information see SI-912-010 "oil change", latest issue, and Fig. 27.

◆ NOTE: It is advisable to check the oil level prior to an oil change as it informs about oil consumption.

◆ NOTE: Run engine to warm oil before beginning oil change procedure.

▲ WARNING: Careless draining of hot engine oil may cause scalds. Dispose of used oil and filters respecting the environmental regulations.

- Crank engine by hand to transfer the oil from the crankcase. See sec. 5.1 Oil level check.
- Remove safety wire and oil drain screw (1) from the oil tank, drain the used oil and dispose of as per environmental regulations.
- Remove and replace oil filter at each oil change.
- Oil lines and other oil connections are not normally removed.

■ CAUTION: Observe the following to prevent possible unintentional voiding of the oil system and damage to the valve drive:

- Draining the suction lines, oil cooler and return line is not necessary and must be avoided, as it results in air entering the oil system.
- Replacement of the oil filter and the oil change should be effected quickly and without interruption to prevent a draining of the oil system and the hydraulic tappets.
- Fit the oil drain screw (1) with safety wire.

■ CAUTION: Only use brand name oil in accordance with the latest Operators Manual and SI-912-016, "Selection of suitable operating fluids" latest issue.

- Pour in approx. 3 l (0.8 gal (US)) of fresh oil.

■ CAUTION: The engine must not be cranked when the oil system is open. Attention must also be paid to this before first commissioning (e.g. when assembling the propeller after correct venting of the oil system).

- After carrying out the oil change, the engine should be cranked by hand in the direction of engine rotation (approx. 20 turns) to completely refill the entire oil circuit.
- Compressed air must not be used to blow through the oil system (or oil lines, oil pump housing, oil bores in the housing).

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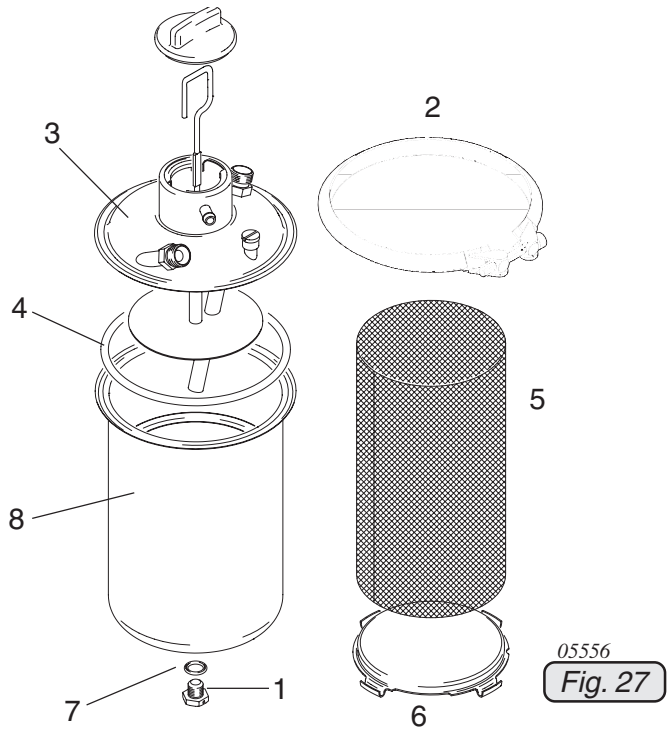

Fig. 27

5.2.1) Cleaning the oil tank

◆ NOTE: This procedure is optional and requires venting of the oil system. See sec. 5.2.2.

It is only necessary to clean the oil tank and the inner parts if there is heavy oil contamination.

- Oil tank cleaning procedure:
- Detach the profile clamp (2) and remove the oil tank cover (3) together with the o-ring (4) and the oil lines.
- Remove the inner parts of the oil tank such as the baffle insert (5) and the partition (6).
- Clean oil tank (8) and inner parts (5, 6) and check for damage.

■ CAUTION: Incorrect assembly of the oil tank components can engine faults or engine damage.

Fit drain screw (1) M12 x 12 with a new sealing ring (7) tighten to 25 Nm (18.5 ft.lb) and safety wire.

- Reassemble the oil tank by following the same steps in reverse order.

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5.2.2) Venting the oil system

See Fig. 28.

Venting the oil system is necessary

- before each first start up
- after reinstallation (e.g. after overhaul)
- after maintenance work during which the lubrication system was opened and voided.

■ CAUTION: Venting of the oil system is extremely important for operation and service life of the engine and therefore the procedure must be followed meticulously. It must be carried out in accordance with SI-912-018 "Purging the lubrication system", latest issue.

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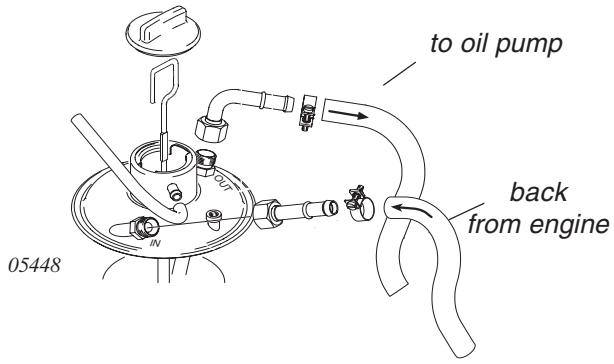

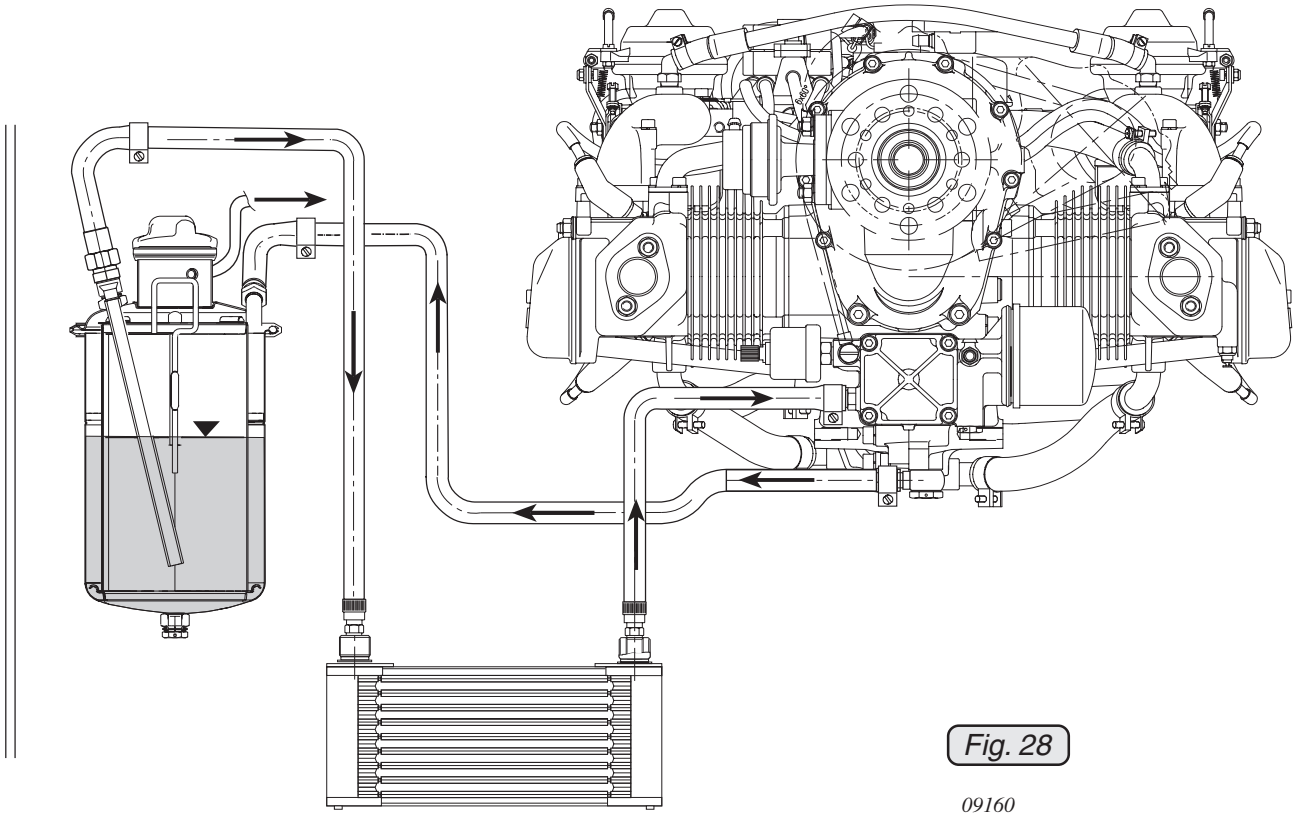

Fig. 28

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5.3) Oil filter replacement and inspection of the filter insert

▲ WARNING: Always allow engine to cool down to ambient temperature before start of any work.

Severe burns and scalds may result if these instructions are ignored.

See Fig. 29, 30 and 31.

Unscrew oil filter with filter wrench part no. 877620*.

At every oil change, unscrew the oil filter and cut open using special tool part no. 877670* taking care not to produce chips.

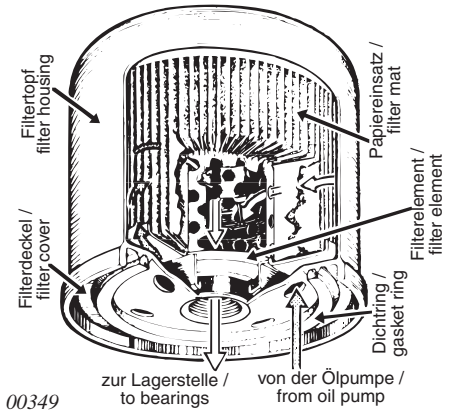

Fig. 29

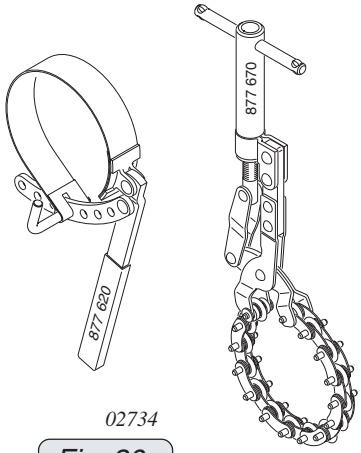

Fig. 30

Remove filter insert, cut top and bottom edges off the mat with a knife. Remove filter mat, fold up and press remaining oil out. Unroll and inspect it for metal chips, foreign matter, contamination and abrasion.

This inspection is important as it allows conclusions to be drawn regarding the internal condition of the engine and provides information about the possible cause of any damage.

* or equivalent

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■ CAUTION: The filter insert must be inspected carefully for metal chips.

Possible foreign matter: Steel chips, bronze chips, aluminium chips, sliver of bearing material, remains of sealing compound.

In the case of unclear findings, flush the oil circuit and fit a new oil filter. Afterwards conduct engine test run and inspect the oil filter once more.

If an increased amount of metal particles is found, such as brass- or bronze chips or slivers from bearing abrasion, repair or overhaul the engine in accordance with the BRP-Rotax instructions for continued airworthiness.

Inspect all systems for correct function.

Detailed inspection of affected engine components.

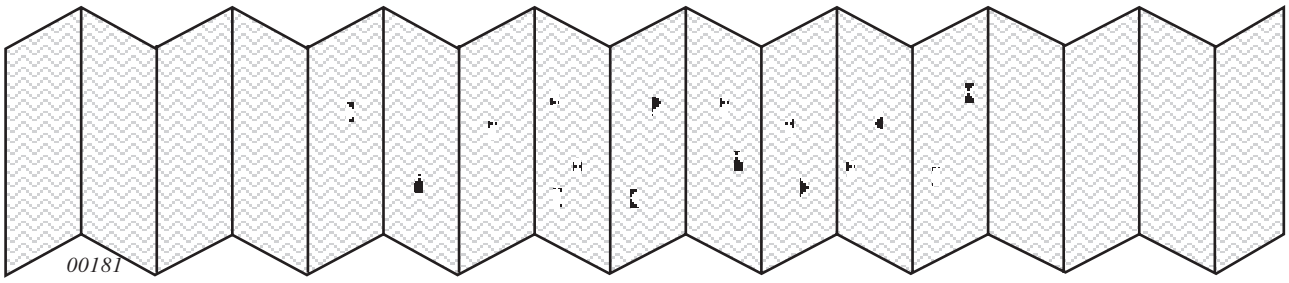
■ CAUTION: If the oil circuit is contaminated, replace the oil cooler and flush the oil circuit. See 12-00-00, sec. 5.5.

Proper judgement needs years of experience in repair of piston engines.

If the filter mat is clogged by foreign matter, the lube oil reaches the bearing points unfiltered via the by-pass valve in the oil filter.

■ CAUTION: To ensure correct functioning of the oil circuit and the forced flow lubrication, use genuine ROTAX oil filter only. Only these filters will ensure correct pressure in the by-pass valve.

Fig. 31



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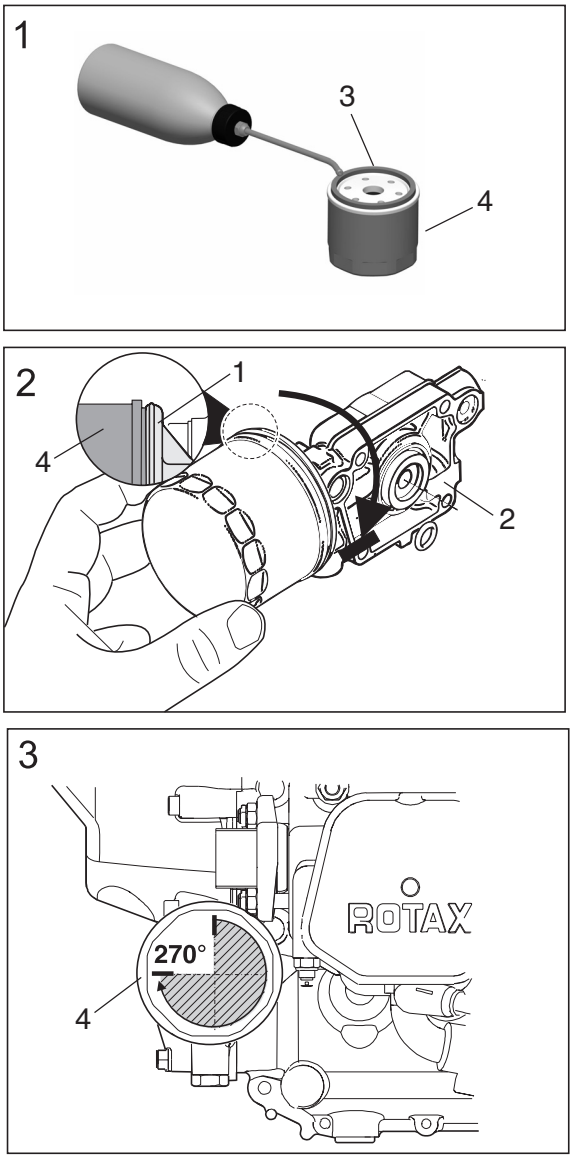
Install oil filter

See Fig. 32.

Clean the contact surface (1) of the oil pump housing (2) with a clean cloth. Apply thin film engine oil on the gasket (3) of the oil filter (4) and then install the oil filter on the engine. Screw on oil filter until oil filter gasket is seated solidly. Tighten oil filter with 3/4 turn (270°).

■ CAUTION: After test run inspect tight fit of oil filter.



1	*contact surface*
2	*oil pump housing*
3	*gasket*
4	*oil filter*

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Fig. 32

d04145

5.4) Inspecting the magnetic plug

See Fig. 33.

Remove the magnetic plug and inspect it for accumulation of chips.

◆ NOTE The magnetic plug (torx screw) is located on the crankcase between cylinder 2 and gearbox.

This inspection is important because it allows conclusions to be drawn on the internal condition of the gearbox and engine and reveals information about possible damage.

If a significant amount of metal chips is detected, the engine must be inspected, repaired or overhauled.

Steel chips in low numbers as depicted in Fig. 33 can be tolerated if the accumulation is below 3 mm (0.125 in).

In the case of unclear findings, flush the oil circuit and fit a new oil filter. Afterwards conduct engine test run and inspect the oil filter once more.

If there are larger accumulations of metal chips on the magnetic plug, the engine must be repaired or overhauled in accordance with the BRP-Rotax instructions for continued airworthiness.

- Inspect all systems for correct function.
- Detailed inspection of affected engine components.

■ CAUTION: If the oil circuit is contaminated, replace the oil cooler and flush the oil circuit. See 12-00-00, sec. 5.5.

Trace the cause and remedy.

Clean the magnetic plug and refit it. Tightening torque 25 Nm (18.5 ft.lb). Safety-wire the plug.

Fig. 33

d04145

5.5) Flushing the oil circuit

- Dismantle and flush oil lines as per instructions of the aircraft manufacturer.
- Clean the oil tank.
- Temporary oil lines (only for flushing) must be fitted so that the oil cooler is not connected. The return line is routed into a separate, clean receptacle and not back to the oil tank.

◆ NOTE Otherwise, metal chips could penetrate the radiator or oil tank during flushing.

- Fill the oil tank with approx. 3 l (0.8 gal (US)) of engine oil.

▲ WARNING: Ignition "**OFF**"and system grounded.
Disconnect negative terminal of aircraft battery.

■ CAUTION: The oil level in the tank must not drop below the end of suction pipe, otherwise air will be sucked in again.

- Crank the engine by hand on propeller in engine rotating direction to transfer the oil from the oil tank to the engine and back to the separate container. This procedure is completed when clean oil comes out of the oil return line. During the procedure periodically check oil level in the oil tank.

  Carefully drain oil, capture in a clean open container and examine closely for chips as described previously. The flushing process is completed when there are no metal chips or only negligible amounts of metal chips are detected. If necessary, repeat the flushing process.
- Reinstall clean oil lines and new oil cooler according to instructions of the aircraft builder.
- Install new oil filter and fill the system with engine oil.
- Reconnect negative terminal of aircraft battery.
- Venting of the oil system, see 12-00-00, sec. 5.2.2.

5.6) Accessories (including radiator, oil hoses, clamps etc.)

■ CAUTION: Inspect all the equipment in accordance with the Maintenance Manual of the aircraft manufacturer.

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6) Electric system

6.1) Check of wiring

- Inspect all cable connectors and their connections for tight fit, good contact, corrosion or damage and replace as necessary.
- Inspect all ground connections for corrosion and damage, replace if necessary.
- Inspect plug connections between pick-up cable, electronic module, charging and shorting cables for corrosion or damage and replace as required.
- Inspect plug connections between electronic module and ignition coils for corrosion or damage and replace if necessary.
- Verify plug connections of alternator cables with rectifier-regulator and connections of all cables on rectifier-regulator for good contact, tight fit, corrosion or damage and replace if necessary.
- Inspect grounding cables for tight fit, corrosion or damage and replace if necessary.
- Verify shielding of cable assemblies for corrosion or damage, good ground contact and tight fit, inspect the attachment of the shielding and replace if necessary.
- Inspect all 8 ignition cables to spark plug connector for corrosion or damage and tight fit and replace if necessary.

6.2) Inspection and replacement of spark plugs

See Fig. 34.

Because of the differing thermal load, particular spark plugs have been specified for each engine type.

In numerous tests the best possible heat range has been determined to make sure that the spark plug will burn off deposits but will not overheat.

■ CAUTION: Use of incorrect spark plugs can result in ignition problems and pre-ignition and consequent engine damage. See 05-50-00 sect. 2.11.

Ensure that the following spark plugs corresponding to engine type are employed and that the correct spark plug socket is used.

Engine	Part No.	Designation	Size of socket
912 UL/A/F	897255	DCPR 7E	16 mm (0.63 in)
912 ULS/S	297940	DCPR 8E	16 mm (0.63 in)

Electrode gap:

New	Wear limit
0.7 - 0.8 mm (0.027 - 0.031 in)	0.9 mm (0.035 in)

◆ NOTE: If cold start problems are encountered, the electrode gap may be reduced to 0.5 mm (0.020 in)

- Inspect all spark plugs for mechanical damage.
- Check heat range and adjust electrode gap correspondingly.

■ CAUTION: Heat conduction compound at the ground electrode (1) or the head area (2) can lead to ignition problems. Apply heat conduction compound sparingly and do not cover the first three thread coils.

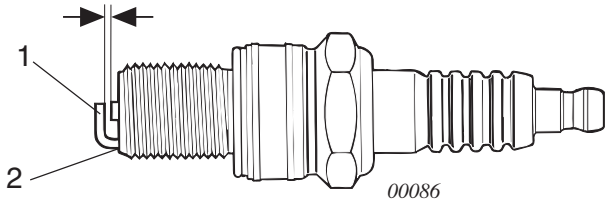

Fig. 34

Before every installation, the spark plug thread and the spark plug seat at the cylinder head should be cleaned (e.g. to remove residue of heat conduction compound) Apply small amount of heat conduction compound to spark plug thread and tighten spark plug to 20 Nm (177 in.lb) on the **cold** engine.

Heat conduction compound, see 05-00-00 sec. 2.5.

▲ WARNING: Rinse off with water in the case of contact with eyes or skin. May be harmful if swallowed.

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Always replace both spark plugs of a cylinder and do not interchange spark plugs between cylinders.

Remove the spark plugs and store them according to cylinder and position. Spark plug face reveals the following about the operating condition of the engine:

light coloured to brown:

plug and calibration of the engine are correct

velvet black:

Indicates the following:

- mixture too rich
- insufficient air intake (clogged air filter)
- engine operating temperature too low.

oily, glossy coating:

Indicates the following:

- misfiring
- too much oil in combustion chamber
- worn cylinder and piston rings

white with formation of melt beads:

Indicates the following:

- mixture too lean
- leaking valves

◆ NOTE: Operation with leaded fuels (e.g. AVGAS 100LL) can result in increased wear of the spark plugs. Reduce renewal intervals accordingly.

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NOTES

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7) Propeller gearbox

◆ NOTE: The following "free rotation check" and "friction torque check" are necessary only on certified engines and on engines with the overload clutch as optional extra.

Engines without the overload clutch (slipper clutch) still incorporate the torsional shock absorption. This design is similar to the system with overload clutch, but without free rotation.

For this reason the friction torque method cannot be applied on engines without overload clutch.

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7.1) Checking the friction torque in free rotation

See Fig. 35.

- Fit the crankshaft locking pin. See 12-00-00, sec. 2.7.
- With the crankshaft locked, the propeller can be turned by hand 15 or 30 degrees depending on the profile of the dog gears installed.

  This is the maximum amount of movement allowed by the dog gears in the torsional shock absorption unit.

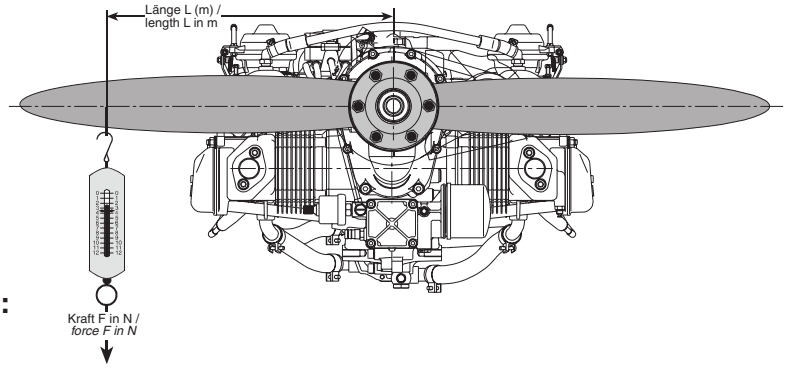
▲ WARNING: Ignition "OFF" and system grounded. Disconnect negative terminal of aircraft battery.

- Turn the propeller by hand back and forth between ramps, taking into consideration the friction torque. No odd noises or irregular resistance must be noticeable during this moment.
- Attach a calibrated spring scale to the propeller in distance (L) from the center of the propeller. Measure the force required to pull the propeller through the 15 or 30 degree range of free rotation.
- Calculate friction torque (Nm) by multiplying the force (N) obtained on the spring scale by the distance the scale is attached from the center of the propeller (L).

  The friction torque must be between 25 Nm and max. 60 Nm (18.5 to 44.3 ft.lb). See calculation example.
- Remove crankshaft locking pin and reinstall plug with new gasket. See 12-00-00, sec. 2.7.
- Reconnect negative terminal of aircraft battery.

▲ WARNING: If the above mentioned friction torque is not achieved, inspect, repair or overhaul the gearbox in accordance with the ROTAX instructions for continued airworthiness.

- Detailed inspection of all gearbox components.



For example minimum torque:
*F x L = **20** N x 0.76 m = 15 Nm*

Example of maximum torque:
*F x L = **59** N x 0.76 m = 45 Nm*

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Fig. 35

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7.2) Checking the propeller gearbox

The gearbox must be inspected, repaired or overhauled in accordance with the BRP-Rotax instructions for continued airworthiness.

Detailed inspection of the affected gearbox components in accordance 72-00-00 sec. 3.9.10 in the Heavy Maintenance Manual.

Crack testing of the propeller shaft is not normally planned, but can be carried out if cracks are suspected.

NOTES

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ROTAX®
AIRCRAFT ENGINES

PRIBYL | HEINDL WERBEAGENTUR

Motornummer / Engine serial no.

Flugzeugtype / Type of aircraft

Flugzeugkennzeichen / Aircraft registration no.

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