



AIRCRAFT ENGINES

# SERVICE INSTRUCTION

## FRICITION TORQUE CHECK OF PROPELLER GEAR WITH OVERLOAD CLUTCH ON ROTAX® ENGINE TYPE 912 AND 914 (SERIES) SI-06-1997 R1

### Repeating symbols

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

- ▲ **WARNING:** Identifies an instruction, which if not followed, may cause serious injury or even death.
- **CAUTION:** Denotes an instruction which if not followed, may severely damage the engine or could lead to suspension of warranty.
- ◆ **NOTE:** Information useful for better handling.

### 1) Planning information

#### 1.1) Engines affected

All versions of the engine type:

- 912 Series
- 914 Series

if equipped with an overlaod clutch in the propeller gear.

#### 1.2) Concurrent ASB/SB/SI and SL

In addition to this Service Instruction the following additional Service Instruction must be observed and complied with:

- Service Instruction SI-912-015 / SI-914-018,  
„Increase of disk spring pre-tension in the gearbox“, current issue.

#### 1.3) Reason

Field experience has revealed that inspection and maintenance of gear reduction units on ROTAX® 912 and 914 (Series) is not being carried out according the Maintenance Manual.

Revision of information and various adaption of layout

#### 1.4) Subject

Friction torque check of propeller gear with overload clutch on ROTAX® engine type 912 and 914 (Series)

#### 1.5) Compliance

- daily check of engine in accordance with the relevant Operator's Manual
- according Maintenance plan in the relevant Maintenance Manual

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

#### 1.6) Approval

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

#### 1.7) Manpower

Estimated man-hours:

Engine installed in the aircraft - -manpower time will depend on installation and thus, no estimate is available from the engine manufacturer.

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**1.8) Mass data**

Change of weight - - - none

Moment of inertia - - - unaffected

**1.9) Electrical load data**

No change

**1.10) Software accomplishment summary**

No change

**1.11) References**

In addition to this technical information refer to current issue of

- Operator's Manual (OM)

- Maintenance Manual (MM)

**2) Material Information**

**2.1) Material - cost and availability**

Price and availability will be supplied on request by ROTAX<sup>®</sup> Authorized Distributors or their Service Centers.

### 3) Accomplishment / Instructions

#### Accomplishment

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

- ROTAX<sup>®</sup> -Airworthiness representative
- ROTAX<sup>®</sup> -Distributors or their Service Centers
- Persons approved by the respective Aviation Authority
- *Persons with type-specific training (applicable only for non-certified engines)*

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

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

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

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

#### 3.1) Instructions

##### 3.1.1) Principal of Operation

The gear reduction units found at the Rotax 912/914 series incorporate an overload clutch to limit damage in the event of a propeller strike and an axially incorporated torsional load absorber.

|| ◆ **NOTE:** All **certified** engines type 912A, 912F, 912S and 914F are equipped with an overload clutch.

|| **UL engines** of the types 912 UL 3, 912 ULS3, 912 ULSFR3 and 914 UL3 are also equipped with the overload clutch. On all other engines the overload clutch can be installed as an option.

The torsion shock absorber consists of a dog hub (3) with helical dogs (1) in engagement with the propeller drive dog gear (2).

The helical dogs on the hub are kept in contact with the corresponding dogs on the propeller drive gear by over 11 00 pounds of axial spring load from a number of disk springs (4). Engine power is transmitted to the propeller drive dog gear by the gear mounted on the crankshaft. The propeller drive dog gear then transmits engine power to the propeller shaft via helical dogs and the splined dog hub (1).

The small amount of movement allowed by the helical dogs and propeller drive gear provides the torsional load absorbing and dampening necessary to protect the engine and gear reduction unit from instantaneous torsional loads that can occur at start up, shut down, and during rapid power changes. This system also helps to match the power impulses of the engine to the propeller load and dampen out torsional vibration.

The proper operation of the torsional load absorption mechanism is dependent on the axial disk springs applying the correct spring force on the helical dogs. With normal operation, the amount of force supplied by these springs will reduce over time. Frequent high instantaneous torsional loads, and extremely low engine idle speeds can increase the rate of spring force reduction. Constant speed propeller and propeller governor may also put additional loads on the torsional load absorption mechanism increasing the rate of spring force reduction.

Reduced spring force will allow excessive movement of the helical dogs, reducing the effectiveness of the torsional load absorption mechanism and creating abnormal wear on gear reduction unit components. The increased movement of the helical dogs will also cause the remaining axial spring load to decrease more rapidly. Therefore proper monitoring of the axial spring load is an important aspect of gear reduction maintenance.

|| ◆ **NOTE:** The axial spring load of the torsional load absorption mechanism can be easily checked without disassembly of the gear reduction unit.

The torsional load absorption mechanism is designed so as to allow a certain amount of radial movement (backlash) of the propeller shaft before the helical dogs on the hub begin to contact the ramp surface of the dogs on the propeller drive gear.

Within this radial movement (mainly 30°, partly also 15°), the only torque required to turn the prop shaft, is the torque required to overcome the friction of the hub dogs moving across the non-ramp section of the propeller drive gear. The torque required to move the prop shaft through this radial movement will decrease as the axial spring load applied by the disk springs decreases.

A drop in the friction torque measured indicates a reduction in the axial spring load and may indicate the need for further gear reduction unit inspection and maintenance to restore the correct axial spring loading. If the gear reduction unit fails the friction torque test, indicating insufficient axial spring load, the axial spring load can be restored by adding shims to the propeller shaft assembly. These shims increase the tension on the disk springs, increasing the axial spring load.

Adjustment of disk spring tension should be performed if the measured friction torque falls below the specified levels.

◆ NOTE: Use of the friction torque method to measure axial spring load is only valid on Rotax 912/914 series engines with an overload clutch / torsional absorption mechanism installed.

Engines without an overload clutch installed still have a torsional load absorption mechanism. This mechanism is similar in design to the system used with the overload clutch, but the profile of the dog gears is slightly different.

For this reason the friction torque check can not be used to determine the axial spring load on engines without the combination torsion load absorption / overload clutch installed.

### 3.1.2) Recommendations

Regular inspections and checks, plus proper maintenance, are vital to the correct operation of the gear reduction unit found on the 912 and 914 series engines with an overload clutch installed. Owners, operators and maintenance personnel should ensure that appropriate friction torque checks are carried out. Any gear reduction units failing the friction torque check should be serviced immediately.

### 3.2) Summary

Some operators are not performing the proper inspections and maintenance procedures including the friction torque check for Rotax 912 and 914 series engines with overload clutches installed.

The friction torque check measures the axial spring load of the torsional load absorber found in the gear reduction unit of Rotax 912/914 series engines equipped with overload clutches.

Constant speed propellers and propeller governors may create increased loads on the gear reduction unit, increasing the rate of reduction in axial spring force load.

The friction torque check must be carried out periodical in accordance to the Maintenance plan to ensure satisfactory gear reduction unit operation.

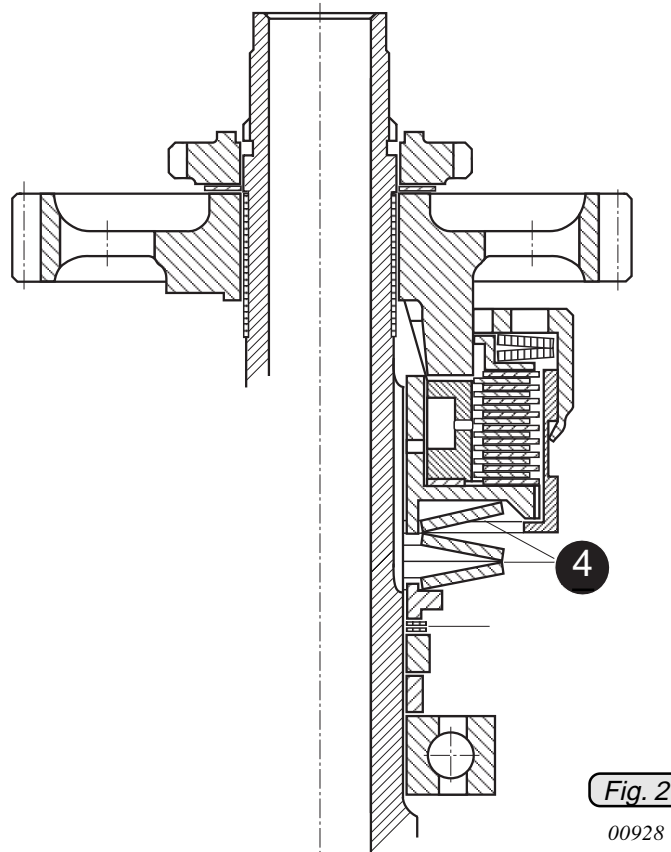
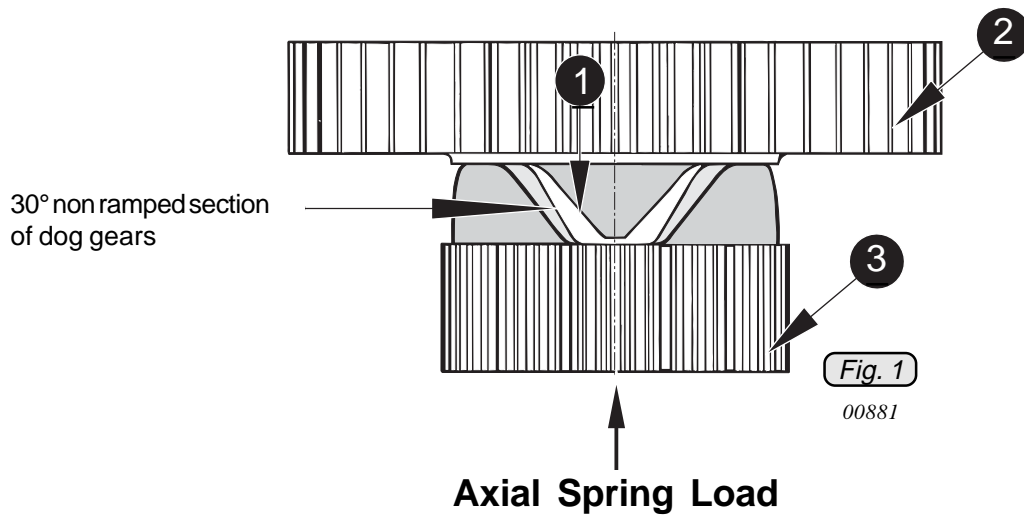
Gear reduction units failing the friction torque check must be serviced immediately to prevent premature wear or damage of gear reduction unit components.

In some cases Rotax 912 UL and 914 UL engines do not have an overload clutch installed. The friction torque check is not possible for engines without a overload clutch installed.

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

#### 4) Appendix

The following drawings should provide additional information:



◆ NOTE: The illustrations in this document show the typical construction. They may not represent full detail or the exact shape of the parts which have the same or similar function. Exploded views are **not technical** drawings and are for reference only. For specific detail, refer to the current documents of the respective engine type.