

# SERVICE INFORMATION

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KODIAK RESEARCH LTD. NASSAU, BAHAMAS

## FRICITION TORQUE CHECK FOR ROTAX 912 / 914 SERIES ENGINES WITH SLIPPER CLUTCH INSTALLED

3 KUL 97 - Revision 1  
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### (A) INTRODUCTION

THIS INFORMATION IS INTENDED TO ASSIST THE AIRCRAFT DESIGNER, MANUFACTURER AND BUILDER/OPERATOR TO ACHIEVE CORRECT OPERATING CONDITIONS AND ASSEMBLY FOR THE ENGINE AND CONSEQUENTLY OPTIMUM PERFORMANCE AND RELIABILITY.

### (B) TECHNICAL DATA AND GENERAL INFORMATION

IN ADDITION TO THIS INFORMATION PLEASE REFER TO:

- ⇒ OPERATORS MANUAL
- ⇒ ENGINE DATA SHEET
- ⇒ SPARE PARTS LIST
- ⇒ ENGINE INSTALLATION MANUAL
- ⇒ 912 F MAINTENANCE MANUAL
- ⇒ 912 F OVERHAUL MANUAL
- ⇒ 914 F MAINTENANCE MANUAL

## IMPORTANT INFORMATION

### SUBJECT

Proper inspection and maintenance including friction torque checks of gear reduction units on Rotax 912 A, F and UL series engines, and Rotax 914 F and UL series engines with slipper clutch installed.

### REASON

Regular friction torque checks are an important maintenance procedure on Rotax 912 and 914 series engines. These checks are of special importance when a constant speed propeller and propeller governor is installed.

Random field investigations have revealed that proper inspection and maintenance of gear reduction units on Rotax 912 / 914 series engines with slipper clutch is not being carried out as per the engine maintenance manual(s).

### COMPLIANCE

All owners, and operators of Rotax 912 UL, A, and F engines and 914 UL and F engines with slipper clutch installed.

### PRINCIPALS OF OPERATION

The gear reduction units found on the Rotax 912 A, 912 F and 914 F engines incorporate an overload clutch to limit damage in the event of a propeller strike and an axially incorporated torsional load absorber. This combination of slipper clutch and torsional load absorber may be installed on Rotax 912 UL and 914 UL series engines as an optional accessory. Please see Note #1.

The torsion load absorber consists of a dog hub (*Fig. 1 - # 3*) with helical dogs (*Fig. 1 - # 1*) mated with the propeller drive dog gear (*Fig. 1. - # 2*). The helical dogs on the hub are kept in contact with the corresponding dogs on the propeller drive gear by over 1100 pounds of axial spring load from a series of disk springs (*Fig. 2 - # 16*). 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 (*Fig. 1 - # 1*).

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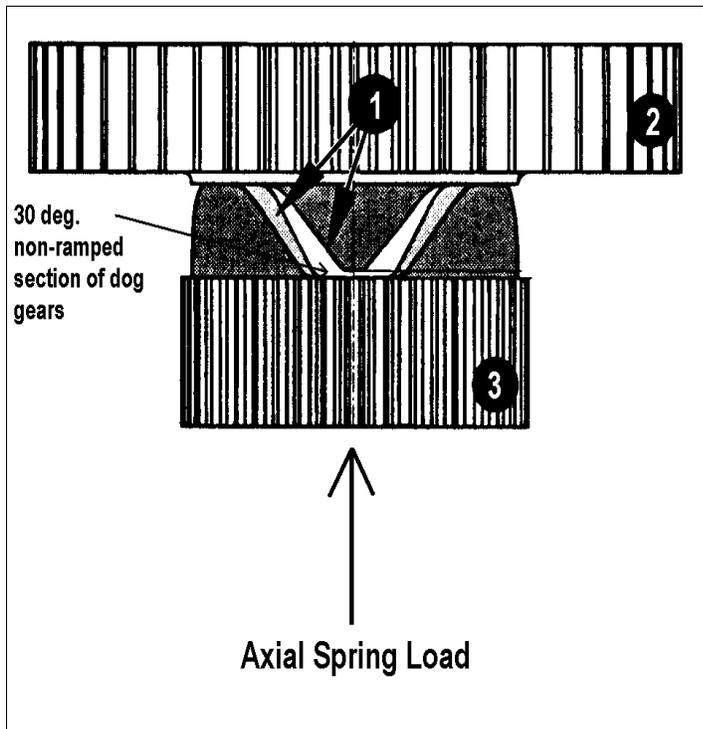


Figure 1. - Dog Hub & Propeller Dog Gear

The maintenance schedule found in Section 12.2 of the Maintenance Manual For Rotax Engine Type 912 F and in Section 12.2 of the Maintenance Manual For Rotax Engine Type 914 F, states that the axial spring load must be verified by means of a friction torque check every 100 hours.

The axial spring load of the torsional load absorption mechanism can be easily checked without disassembly of the gear reduction unit. *This is accomplished by conducting the friction torque check described in this Service Information and in Section 12.3.6 of the Maintenance Manual For Rotax Engine Type 912F or Section 12.3.7 of the Maintenance Manual For Rotax Engine Type 914F.*

The torsional load absorption mechanism is designed so as to allow a certain amount of radial movement 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 (See Fig. 1). Rotax 912 A series engines with serial numbers up to 4.410.066 and Rotax 912 F series engines with serial numbers up to 4.412.586 are equipped with dog hubs that allow approximately 30 degrees of radial movement. Rotax 912 A series engines with serial numbers greater than 4.410.066, and Rotax 912 F series engines with serial numbers greater than 4.412.586 are equipped with dog hubs that allow approximately 15 degrees of radial movement. All 914 serial production engines with a slipper clutch installed are equipped with dog hubs that allow approximately 15 degrees of radial movement.

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 propellers and propeller governors 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.

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Within this 15 or 30 degree range of radial movement, 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 15 or 30 degree range 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 (Fig. 2 - # 26). These shims increase the tension on the disk springs (Fig. 2 - # 16), increasing the axial spring load. Please refer to Section 14.4.14 of the Maintenance Manual For Rotax Engine Type 912F or Section 14.4.14 of the Maintenance Manual For Rotax Engine Type 914F for complete instructions regarding the adjustment of disk spring tension.

**The adjustment of disk spring tension is considered a normal maintenance measure.**

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

### Note #1

Use of the friction torque method to measure axial spring load is only valid on Rotax 912 / 914 series engines with a slipper clutch / torsional absorption mechanism installed. The slipper clutch is an option on Rotax 912 UL series engines. Most 912 UL series engines in service do not have the slipper clutch system installed. Rotax 912 series engines without a slipper clutch installed still have a torsional load absorption mechanism. This mechanism is similar in design to the system used with the slipper 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 most Rotax 912 UL series engines.

Rotax 914 UL engines may have a slipper clutch installed. 914 UL 2 and 914 UL 4 engines may have the clutch installed as optional equipment. In the 914 UL 3 engine, the slipper clutch is installed as standard equipment. Again if the engine does not have a slipper clutch installed, the friction torque check can not be used.

Therefore this Service Information applies in whole only to those 912 and 914 series engines with a slipper clutch installed.

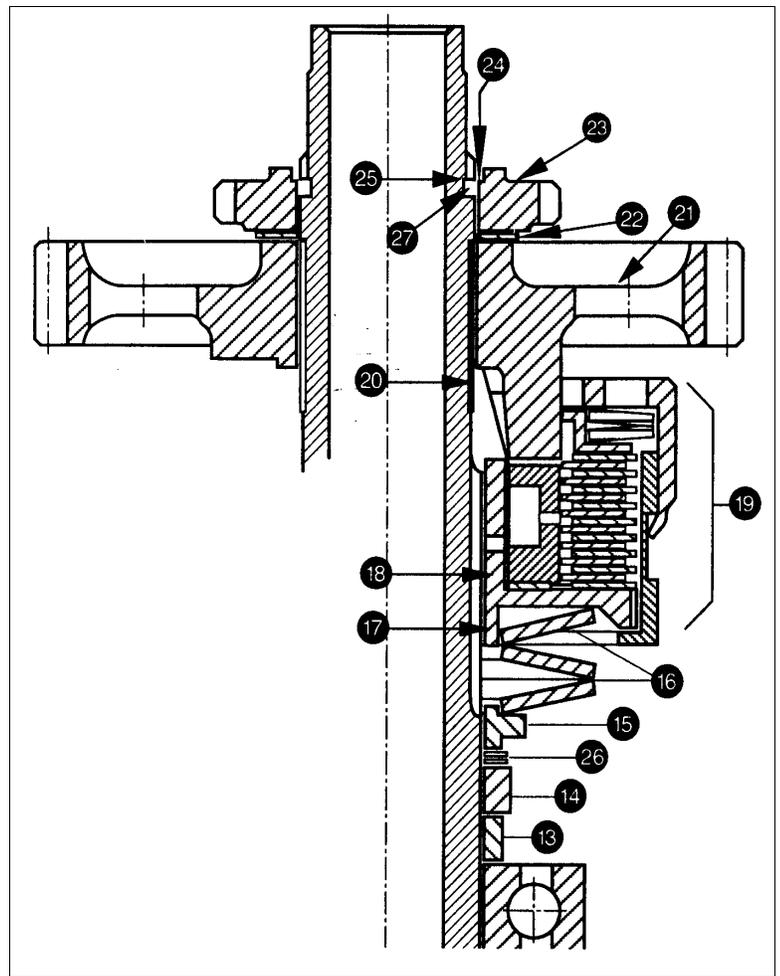


Figure 2. - Propeller Shaft Assembly with Slipper Clutch.

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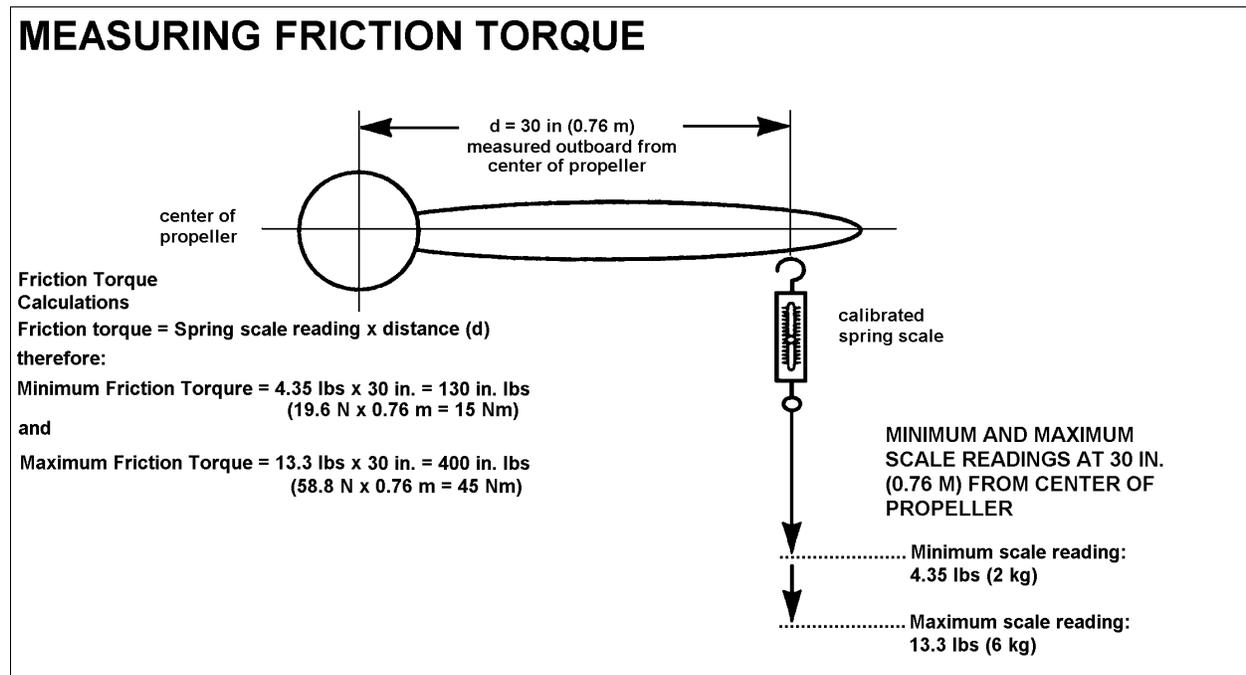
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### FRICITION TORQUE CHECK

As discussed above, the friction torque check is used to determine the amount of axial spring load present in the gear reduction unit. The friction torque check can be carried out as follows:

1. Insure that both ignition circuits are grounded to prevent accidental engine start.
2. Install the crankshaft locking pin.
3. 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 amount of movement allowed by the dog gears in the torsion load absorption unit.
4. Attach a calibrated spring scale to the propeller 30 in. (0.76 m) from the center of the propeller. Measure the force required to pull the propeller through the 15 or 30 degree range of rotation. (See Fig. #3.)
5. Calculate friction force by multiplying the reading obtained on the spring scale by the distance the scale is attached from the center of the propeller. Rotax specifies a friction force of 130 to 400 in. lb (15Nm to 45Nm). See Fig. 3 for sample calculations.
6. Remove crankshaft locking pin.



**Figure 2 - Measuring Friction Torque**

For additional information regarding the friction torque check, please refer to Section 12.3.6 of the Maintenance Manual For Rotax Engine Type 912F or Section 12.3.7 of the Maintenance Manual For Rotax Engine Type 914F.

### RECOMMENDATION

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 a slipper clutch installed. Owners, operators and maintenance personnel should insure that appropriate friction torque checks are carried out. Any gear reduction units failing the friction torque check should be serviced immediately. Please refer to Sections 14.4.10 through 14.4.15 of the Maintenance Manual For Rotax Engine Type 912F or Sections 14.4.10 through 14.4.15 of the Maintenance Manual For Rotax Engine Type 914F for complete gear reduction unit service instructions.

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### **SUMMARY**

- Some operators are not performing the proper inspections and maintenance procedures for Rotax 912 and 914 series engines with slipper clutches installed including the friction torque check.
- 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 slipper 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 every 100 hours of operation to insure 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.
- Most Rotax 912 UL series engines do not have a slipper clutch installed. The friction torque check is not valid for engines without a slipper clutch installed.

## **WARNING!**

**FAILURE TO COMPLY WITH THIS RECOMMENDATION COULD RESULT IN  
ENGINE DAMAGE AND PERSONAL INJURY OR DEATH!**