The turbo switch on the 914

… or what is the mystical devil thing actually there for?
Quite a few people have had to buy a new crankshaft to operate the switch.

Introduction

Many pilots who sit in the cockpit of a Rotax 914 Turbo for the first time discover a strange switch.
It is usually labeled „Turbo“. Provided with a cap or cover, sometimes even blued.

If you ask the pilot what this switch is, he can often only recite what is written in the flight manuals or what was explained to him during the briefing.
… is no problem - nobody has ever operated the switch…

Here are two examples

from the Diamond HK 36 TTC flight manual
Oscillation of boost pressure and speed

1. turbo control - OFF
2. propeller adjustment lever - slight actuation, thus slight change in speed for bleeding
3. turbo | control unit - ON

If the operating status does not stabilize:

1. turbo control - OFF
2. power lever - keep boost pressure within the permissible range
3. propeller adjustment - keep speed within the permissible range
4. land at the nearest suitable airfield and determine the cause of the malfunction

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On request you will then get answers like:

- this switches off the turbo [1)]
- this switches on extra power when towing
- you might still be able to get over a summit if you are prepared to sacrifice the engine

…. i.e. answers that clearly state that you don't actually know the system and that nobody has really explained to him what you actually do with the switch.

The interested pilot may go on a research trip after the poor information and consult the Rotax 914 operator's manual and find the following im

** Operators Manual for ROTAX Engine Type 914 Series, Issue 3, Revision 0 dated 01.08.2019 **

4.3) Periodical rise and drop of boost pressure and speed (boost pressure control is surging)

Periodical rise and drop of boost pressure and speed

Switching off the servo motor momentarily or permanently, must be recorded by the pilot in the logbook, stating the exact time and duration of switching off.

ATTENTION

If this action does not stabilize operation, switch off servo completely. If need be, reduce engine speed until boost pressure and speed are within the operating limits again.

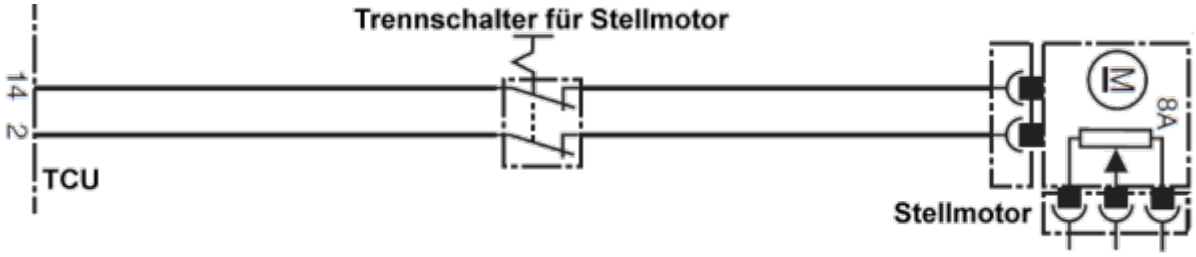
Orange caution lamp of TCU is not blinking	
Possible cause	**Remedy**
Pressure control is not possible.	Limited flying operation. Switch off servo motor for a moment (max. 5 sec).
	After a short regulating time operation should stabilize.

The old, German-language operating manual for the 914 contained the following text:

Periodical rise and drop of boost pressure and speed (boost pressure control is surging)
Orange caution lamp of TCU is not blinking.
Switch off servo motor for a moment (max. 5 sec.). After a short regulating time operation should stabilize.
CAUTION:
If this action does not stabilize operation, swith off servo motor completely.
If need be, reduce engine speed until boost pressure and speed are within the operating limits again.
Limited flying operation, as boost pressure control is no more possible.
Switching off the servo motor momentarily or permanently, has to be recorded by the pilot in the logbook,
stating the duration, exact time and duration of switching off.

.... I see .....
This looks better and also explains a lot.
The installation manual with the corresponding circuit diagram provides even more clarity:

Disconnect switch for servomotor
The isolating switch is used to briefly switch off the servomotor if the boost pressure regulator oscillates.
A stable operating state should then be established after a short control time.



… so far, so good….

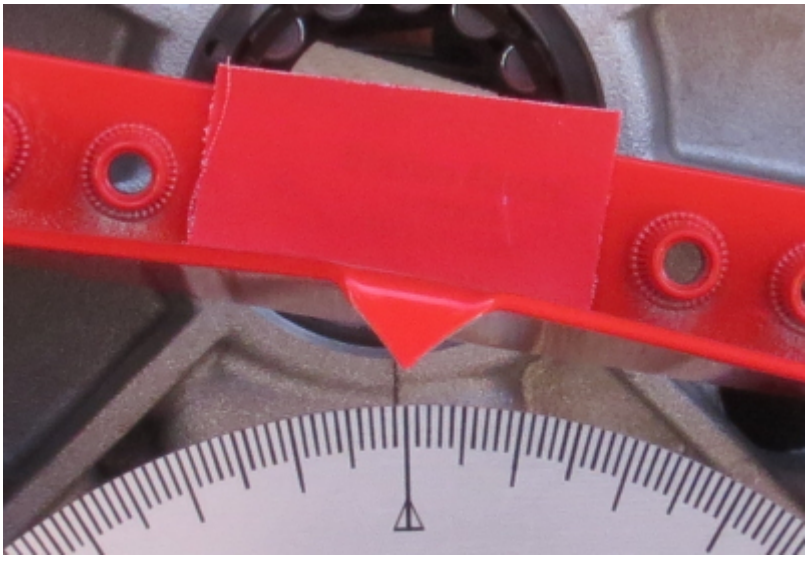
The circuit diagram now shows exactly what the switch actually switches.
The technical background is not explained in the aircraft operating manuals, but only a dubious procedure is specified.

What is really happening?

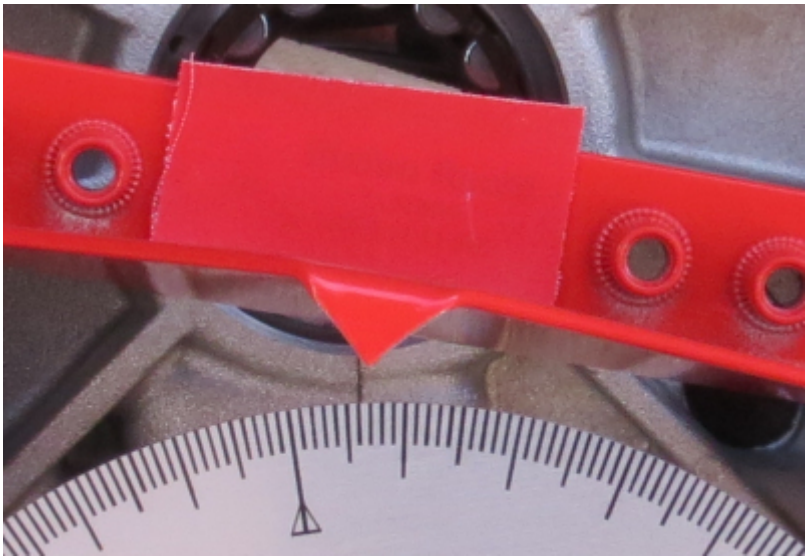
The power supply to the servo that actuates the wastegate flap in the turbocharger is interrupted.
This means that the flap does not move any more after the switch is pressed.
Now it depends on how far the flap is closed and how much throttle is applied.
If the flap is almost closed and the power setting is high, this can lead to overboost (more than 1550 mbar airbox pressure), which may cause the crankshaft to twist.

If you now check the rotation of the crankshaft n*accordingto Chapter 72-00-00 CRANKSHAFT DISTORTION INSPECTION of the Rotax Maintenance Manual Heavy 912/914 Edition 2 Revision 0, dated 28.10.2022,* you may find the following:

Piston turned to the piston stopper at cylinder 1 and the degree disk set to 0°.



Turn the piston to the piston stopper at cylinder 2 and read the position on the degree disk.



Here you can clearly see that the crankshaft between the two measured cylinders is twisted by approx. 6° and needs to be replaced.

Now some history

Of course, the first 914s already had a TCU[2)].
That was version 4.3 - P/N 966470.

Initially, there was the problem that the boost pressure and speed fluctuated more frequently.
This was solved with the switch, the installation instructions for which then found their way into the installation manual and the procedure for using the switch into the flight manuals.

Since 1999, however, the Version 4.6 - P/N 966741.
Here other maps are stored for the regulation of the airbox pressure, so that the oscillation - or sawing - of the engine almost never occurs.

In my opinion, you could save yourself the trouble of installing the switch and the subsequent unspeakable operating errors and engine damage.

If you press the switch at idle speed, the wastegate flap is completely closed and you have endless power, albeit probably only for a very short time.
Unfortunately, you then probably have a twisted crankshaft (see above).

You can't imagine how often this happens, especially in clubs that use the plane for towing.
The subsequent discussions always follow the same pattern: would have, would be, if...
Clearly, ignorance and the stories about the switch are to blame here.

A very clear recommendation is to seal the switch and include its inspection in the checklist.
If the seal is damaged, do not take the flight.
read out the operating parameters of the TCU
and check for an overboost.

**The moral of the story,
do not operate the switch!**

…. but unfortunately it's not quite that simple.

The most sensible thing to do when starting and also when checking the ignition circuits is to constantly monitor whether the boost pressure matches the power setting.

If you suspect that something is not as it should be, it is better to abort the start.

1)

and they actually mean that the turbocharger is switched off as such

2)

Turbo Control Unit

From:
https://www.kleinjung.de/rotax/ - **Ralle's ROTAX FAQ**

Permanent link:
https://www.kleinjung.de/rotax/doku.php?id=en:turbo_switch

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