# the tachometer: an instrument to be calibrated seriously


In order to allow a precise piloting of the power train (engine + propeller) of the aircraft, one often uses a tachometer, i.e. an instrument in charge of indicating visually to the pilot the rotation speed of the power train.

The needle display being particularly well adapted to the constraints of piloting, it is found on many tachometers. The driver sees a needle moving in front of the revolutions per minute scale, allowing him to adjust the intake pressure via the throttle. This allows the pilot to adjust the intake pressure via the throttle control, and thus adapt the engine power to the propeller power at the chosen rpm.

Here is the theory.

In general, the tachometer senses the engine speed via the engine's ignition system. The ignition frequency allows the electronics to calculate the rotation frequency. But to make the needle move in front of its graduations, a galvanometer is used, i.e. a magnet and a coil. By varying the electric current in the coil, the needle moves and displays the engine speed.

While the relationship between the rotation frequency and the ignition frequency of a functional engine is not uncertain, this is not the case for the galvanometer. Indeed, according to the manufacturing dispersion in diameter of the wire constituting the coil, or the variations of composition of the alloy used, the electrical resistance will vary from one coil to another. Therefore, the position of the needle may not correspond exactly to the engine speed.

The error can be up to 20%.

The manufacturers of tachometers have of course provided a means of correcting manufacturing dispersions: this is called the calibration procedure, described in the manual attached to the instrument.

What can be the consequences of these display errors?

In the case of a propeller with adjustable pitch, the pitch is set so that the tachometer displays the desired engine speed. If you follow the display error of the instrument, you can end up with up to 20% difference in rpm, and almost as much difference in power.

The consequences on the flight performances are clearly measurable: we can have 2 machines equipped with 2 engines and 2 propellers absolutely identical, with a speed difference exceeding 10 km/h for the same engine speed indicated on the dashboard, if the tachometers are not calibrated and present differences due to their manufacture.

This is not to mention the long-term consequences on the engine, which is never used at the right speed. Depending on the error and the direction of the deviation, this is not good for its performance, fuel consumption or longevity.


If the propeller is fixed pitch, the propeller manufacturer will have to make the propeller corresponding to the indications of the tachometer, and not to the real engine parameters. This is a frequent occurrence.

How to know if you have a calibrated tachometer? The best way to check the accuracy of the instrument is to compare the data displayed with those of a digital optical tachometer showing the propeller revolutions. This type of tachometer is often found in model shops. You have to be very careful during this measurement: fasten your instrument well and be very careful with the propeller when you bring the sensor close to the rotating blades.

How to calibrate your tachometer ? In general, galva tachometers have an adjustment potentiometer at the back of the instrument. By following the instructions in the manual, you can obtain real values.


*au dos de l'instrument, au centre :*
*l'accès au potentiomètre*

So a tip: check the data on your needle tachometer very carefully - or use a digital tachometer!

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