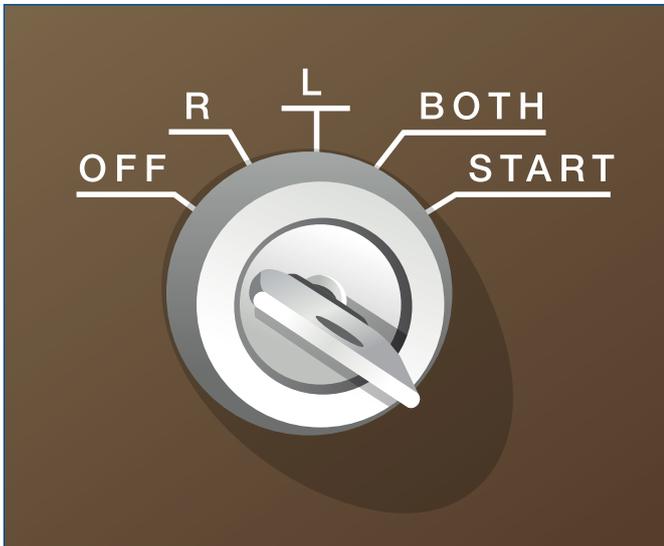


Magneto Check Basics

For something as basic to piston-engine operation as magneto checks, it is surprising how much misunderstanding exists. It is essential that pilots understand aircraft magneto systems. Here is a reminder of the basics.

Practically all current piston-engine aircraft have dual ignition systems, ie, two sets of spark plugs, each set supplied with electrical power by its own associated magneto (which is normally designated 'left' or 'right'). The engine controls will include some form of switch system with which the magnetos can be switched on and off, individually or together. The type of switch varies from aircraft to aircraft, but is usually either a set of toggle switches (one for each magneto) or a rotary switch (which may be key operated). The rotary switch has four settings, eg, OFF, RIGHT, LEFT, and BOTH.



A typical key magneto switch used in many light aircraft.

Now for some standardisation of terminology – an important aspect because we are certain this is where some of the confusion arises. Magneto checks are normally carried out only on the ground, and there are three distinct types.

Dead cut check – One magneto is switched off in order to see if the engine will run on the other one. If not, the result will be a dead cut.

Live mag check – Both magnetos are switched off momentarily in order to ensure that the engine does cease running. If it continues to run then one of the magnetos must be continuously electrically live.

Mag drop check – Each magneto is switched off in turn to ascertain and compare the drop in rpm that occurs when running on each individual magneto.

Dead Cut and Live Mag Checks

There appears to be some confusion between the dead cut check and the live mag check. This may be because both are usually done at the same point in the aircraft checklist,

and also because the live mag check should in fact produce a 'dead cut'.

Dead cut checks and live mag checks are usually done around 1000 rpm. Dead cut checks are normally carried out at some stage before the engine runup, and again just before shutdown.

Live mag checks are carried out at both these times, at neither of these times, or just during the pre-shutdown check. There are different opinions on this, so consult the information supplied by the engine/aircraft manufacturer, or the owner/operator of the aircraft you are using.

Before Runup

The primary purpose of the dead cut check after start up is to ensure that both magnetos are delivering sufficient electrical energy to the spark plugs – an important fact to establish before carrying out the mag drop check. Why is it important? Imagine for a moment that one magneto is completely dead and that this was not discovered before the runup. With the engine at high power, you carry out a mag drop check and – instant silence! Now this is not the way to treat an engine, but if you are a normal human being you are probably about to do something worse to it. The usual reaction to the silence is to immediately switch the magnetos back on, and this is when the engine can suffer substantial damage.

A live mag check after start up can uncover more subtle dangers, and if one magneto is found to be live when switched off, then the flight must not proceed. For one thing, it will not be possible to carry out a meaningful mag drop check during the runup. The real danger, however, lies in the possible causes of the magneto being live. These may be benign, but they could also include a loose lead, which could arc and start a fire.

Some manufacturers may advise against the live mag check, stating that it could cause damage to the engine. This would be the case if the switch was held too long in the OFF position or the check was done at an rpm setting that was too high.

Before Shutdown

The main purpose behind both dead cut and live mag checks before shutting the engine down is to enable early discovery of any fault that may have developed during the flight. Such a fault is better discovered at this stage than during the pre-runup check on the next flight. In addition, there is a good safety reason for the live mag check before shutdown; if one magneto is live, then the propeller can be lethal until the fault is rectified. Even though you may treat the propeller as 'live' at all times (and you do, don't you?) there are others who may not.

The Mag Drop Check

The mag drop check is carried out to ascertain if either magneto is equally capable of sustaining ignition at typical in-flight power settings.

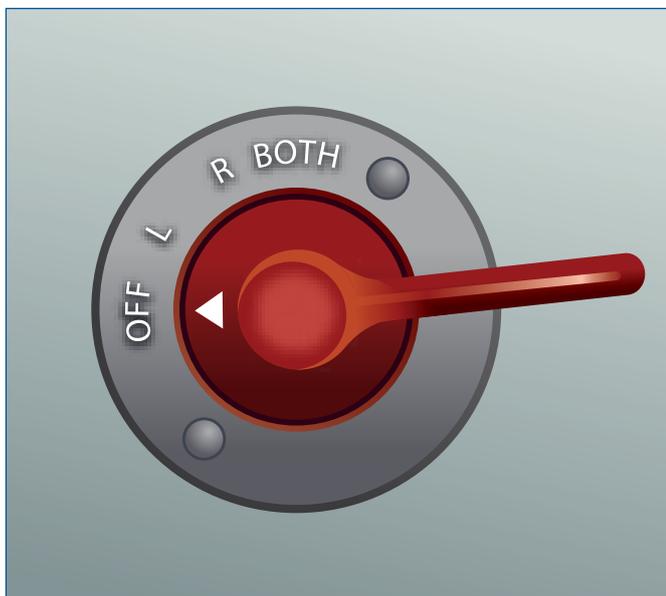
The particular rpm setting at which the check is done is not very important for the purposes of the check, but other engine handling considerations will usually mean a recommendation from the engine or aircraft manufacturer for an rpm setting from the low end of the cruise power range. From the magneto checking point of view, the important aspect is that the check on any particular aircraft should be done consistently at the same rpm, so that any trend can be monitored. There is little to be gained, for example, in comparing today's 150 rpm drop at 2000 rpm with yesterday's 100 rpm drop at 1700 rpm.

... if one magneto is found to be live when switched off, then the flight must not proceed.

For horizontally opposed engines, the amount of rpm drop is not as important as the difference in the drop between the two magnetos. A drop of 175 rpm on each should be of no concern, if the drop is smooth, is similar for each magneto, is consistent with previous engine runs, and is within the range stated by the manufacturer. How much variation can you accept between the two rpm drops? The answer will vary – and you should check the manufacturer's handbook – but 50 rpm difference, at most, would be a typical figure. Once again, trend monitoring may give a better guide to the health of the two ignition systems.

Magneto Checking Techniques

The dead cut and live mag checks are done at low rpm setting and should do no harm to the engine. Once the desired effect (continued running for dead cut, engine cutting for live mag) has been noted, however, proceed without undue delay to the next switch setting.



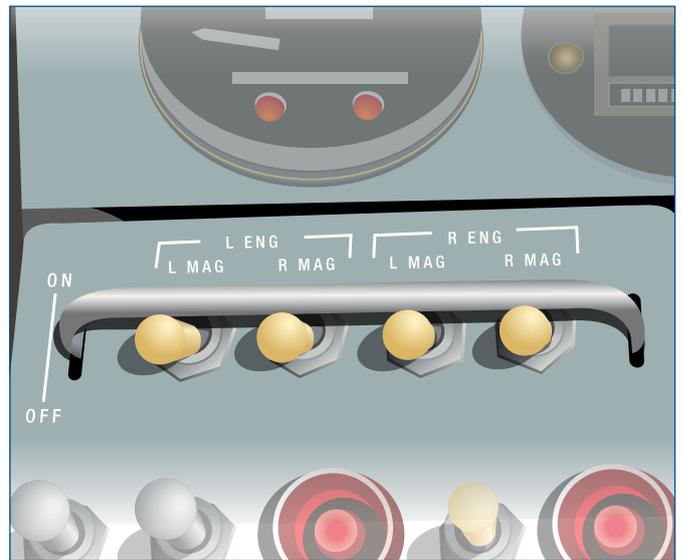
A rotary type magneto switch used in a Piper Super Cub.

(In the following discussion, when we refer to a rotary type switch, we assume it to have the layout shown in our illustration of a key-operated switch. The lever-operated switch illustrated, from a Super Cub, has R and L in the opposite sequence, and our comments would need to be transposed.)

Dead Cut and Live Magneto Checks

Combining both dead cut and live mag checks, the sequence for a **rotary type switch** should be:

- BOTH (normal)
- LEFT (no dead cut – engine runs on left mag)
- RIGHT (no dead cut – engine runs on right mag)
- OFF – momentarily (engine stops – there are no live mags)
- BOTH (back to normal)



Toggle switches

For **toggle switches**, it doesn't matter which mag you test first, but again do the checks without undue delay:

- First magneto OFF (no dead cut – engine runs on second mag)
- and ON (back to normal)
- Second magneto OFF (no dead cut – engine runs on first mag)
- and ON (back to normal)
- Both magnetos OFF – momentarily (engine stops – there are no live mags)
- and ON (back to normal)

The live mag check may be omitted if it is against manufacturer's recommendations. In this case, remember to check for a live magneto when doing the mag drop check.

Magneto Drop Check

The mag drop check must be done differently from the other checks. It is done at a higher rpm setting – and at no stage are both magnetos switched off. Also, as the size of the rpm drop is being noted and remembered by the pilot for comparison,

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there will be a tendency – and a need – to run the engine for a longer period on each individual magneto. This is fine, indeed the time should be sufficient for the rpm to stabilise. At the other end of the scale, however, do not run on one magneto for extended periods, as the fouling of the dead set of spark plugs with fuel and oil may reach an unacceptable level.

The other major difference between a mag drop check and the other two checks is in the sequence of switching.

For a rotary type switch it should be:

- BOTH (normal)
- LEFT (rpm drops, after a few seconds note reading)
- BOTH (pause)
- RIGHT (rpm drops, after a few seconds note reading)
- BOTH (back to normal)

For toggle switches:

- First magneto OFF (rpm drops, after a few seconds note reading)
- and ON (back to normal)
- Pause
- Second magneto OFF (rpm drops, after a few seconds note reading)
- and ON (back to normal)

The reason for returning to BOTH with a rotary switch (and an equivalent pause with both magnetos ON for a toggle switch system) is primarily to let the engine stabilise at normal rpm. This gives each magneto a common starting point, making comparison of the two rpm drops valid. Also, the short period on BOTH lets the oil and fuel burn off the first set of spark plugs that were shut down.

Finally, a caution for those who carry out mag drop checks using rotary switch systems. When moving from BOTH to RIGHT, the switch must pass through the LEFT position; it is easy to overshoot to OFF. Our advice is that you practice the switching sequence with the engine not running until you get the feel of the switch installation. If you do inadvertently overshoot to the OFF position during runup, try to overcome the natural reaction of immediately switching it back on. Having to restart the engine is not as embarrassing as having to rebuild it.

Conclusion

In summary, pilots should carry out both dead cut and live mag checks, both after start and before shutdown.

The rpm setting at which mag drop checks can be carried out should be consistent for each individual aircraft and should follow the manufacturer's recommendation. In the absence of a recommendation from the manufacturer, pilots should follow recommendations from the owner or the operator of the aircraft they are using. ■



Young Eagles News

A record number of 18 applications were received for the 2008 Ross Macpherson Memorial Scholarships. The five winners are each entitled to \$2000 worth of flying through their local aero club.

The scholarships were awarded to:

- Nicholas Ashley** – Canterbury Aero Club
- Shelley Hasseldine** – Marlborough Aero Club
- Nicholas Monk** – New Plymouth Aero Club
- Andrew Hayes** – Tauranga Aero Club
- Ben Reid** – North Shore Aero Club



Back row: Shelley Hasseldine, Andrew Hayes.
Front row: Nicholas Ashley, Nicholas Monk, Ben Reid, Kevin Lloyd.

All five scholarship winners attended the Flying NZ National Championships held in Timaru, 7 to 9 February 2008, where they competed for the Pickard Memorial Trophy. The Young Eagles spent a day increasing their aviation knowledge with Leader Kevin Lloyd.

In the afternoon they sat an aviation questionnaire and a general knowledge questionnaire to determine the trophy winner, who was Andrew Hayes from Tauranga. On Saturday, the Young Eagles were treated to a flight over the South Canterbury region. ■