

WARBIRD NOTES #14 3 Apr 98 (25)
CHECKING THE MAGNETOS DURING RUN-UP

The reason for this bulletin becomes increasingly obvious when the many different ways of checking the “mag drop,” the most

basic of engine checks, are observed. Taught from the very beginning of an aviator's career, the disparity of intents and results is simply amazing to observe. Along with the answer to the question afterwards, “Well, what'da you think?”

Before we really get into the subject, we probably should touch upon the commonly misunderstood question of which magneto we're actually checking during this test. Obviously when the switch is on BOTH we're operating both magnetos, and when it's on OFF both magnetos are grounded and the engine quits. Now, however, to the interesting part - for some! When you position the switch to LEFT remember that the RIGHT magneto is grounded and you are operating on, and checking the performance of, the LEFT magneto. And vice/versa. While on the subject here, another truism, the LEFT magneto fires the rear (four letters) plugs and the RIGHT magneto fires the front (five letters) plugs. From reading some log book write-ups I'm afraid these simple facts aren't universally understood by everyone operating these airplanes.

The reason we check the furthestmost position first on the magneto switch during the run-up is the possibility of returning the switch only one click when we intended to return it to BOTH. If we selected the nearest position for the first check, we could later end up taking off on one mag if we happened to only return the switch one click when we had intended to return to BOTH. By the way, I'm only sharing the “why” here with you, nothing more. I guess you can do whatever you want if you have a strong need to be different.

Something to keep in mind for the rest of your career, “when” you inadvertently move the magneto switch to OFF – when you'd only intended to move it to LEFT – resist the temptation to immediately return the switch to the proper position. I deliberately used “when”, not “if”, because I don't know of anyone who hasn't made this mistake at least once! If you fall victim to the almost irresistible impulse to attempt to cover up your mistake you'll only succeed in drawing unwanted attention to the mistake, I guaran-dang-tee it! I'd guess that in every instance I've seen it's resulted in a healthy backfire! What you need to do is “don't flinch”, just say to yourself that this is another case of “big deal - so what”! Leave the switch off, get your hand well away from it and put it to use in retarding the throttle to the idle position. Allow the RPM to fall naturally to the idling speed of approximately five hundred RPM. Then you can return the mag switch to BOTH and allow the engine to regain its footing at idle. Now you can restore the power and return to the check you had originally set out to do. You'll need to practice this or at least strongly think about it in order to be able to resist the temptation to “flinch” when it happens to you. And it will!

Now, regarding the time you'll need to spend on one magneto while accomplishing this check. The military maintenance manuals for a number of these engines and airplanes all indicate that operating on one magneto during this check for periods of up to one minute is not considered excessive or likely to damage the equipment. This is decidedly in contrast to the conventionally held wisdom (read “old wives' tales”) that this will damage the engine. I don't really think that anyone needs to leave it on a single magneto anywhere near this long in order to determine everything he/she needs to know. This is not an exact thing, so get what you need to know (all that's needed is for the RPM to stabilize), then go back to BOTH. Some pilots might prefer to gently “tap” the tachometer's glass face to eliminate any possible tach binding. If you do this, be aware that the glass can be broken by an excessive knuckle force. On the other hand, the “click - click” drill isn't really going to tell you all that's needed, either. Jack Sandberg used to just sort of “flip” through the magnetos when he was doing this preflight check. He allowed almost no time for the mags to exhibit any “drop”, in my mind it'd have detected a “dead” mag and that's about the best I could say.

I'm going to describe the mag check procedure we use for the B-25 here, since that “single pilot” operation lends itself to a good way to describe the whole procedure. If you haven't referred

to Warbird Notes #8 (Field Barometric Power Check) lately, then you need to look at it first since the power check is done immediately prior to, and along with the mag check. As soon as you notice the sustained RPM on that check you can then begin the mag check. Look at the RPM drop, the rather instant drop you'll see first is what can be referred to as the "fast" drop. Then you can turn you head and briefly look at the nacelle and/or prop dome to determine if any excess engine shaking is noticed. Then, return you attention to the tachometer and notice any further drop in RPM since you first looked at it. This is usually known as the "slow" drop. Now repeat the procedure for the LEFT mag. The maximum allowable drop is given in the pilot's flight manual. While we're on the subject, it probably isn't necessary in this particular situation but on any two pilot airplane you need to call out the engine and switch positions as you select them, so that the other pilot can direct his attention to the appropriate engine. I.e., "#2 - RIGHT - BOTH - LEFT - BOTH". While doing this, note the engine temperatures and pressures for correct indications.

Now, just what were we looking for or checking while accomplishing this check? First, if you see absolutely no RPM drop on the mag you select, don't congratulate yourself or the mechanic, if it stays absolutely the same it means that you have a bad "P" lead and that switch has no effect on the system. In other words, that mag is hot and unable to be grounded! Get it fixed – all engines are going to have some amount of drop on a single mag.

Although it might be true that you usually are unable to "fix" something from the cockpit, you should be able to adequately describe the characteristics of the "mag drop" later to the mechanics. This, hopefully, might minimize the time they have to spend on trouble shooting. Military manuals for these purposes indicate that when the "drop" is excessive, (1) generally the fast drop is indicative of a fouled/bad plug(s) or a defective ignition harness. On the other hand a slow drop (2) is generally indicative of faulty timing (magneto or distributor) or incorrect valve adjustment. I.e., fast-fouled, slow-timing. If you have a fairly definite idea that you have a fouled spark plug you can try one of several time honored methods of clearing it out. A method given some credence over the years is to operate the engine at field barometric manifold pressure and aggressively lean it until it is very nearly ready to die. Attempt to burn it out in this fashion for a period of time, observing the CHT, of course. Then enrichen it and do the mag check again. Be cautious since it will rapidly overheat in this condition. Another thing we used to do in a attempt to cure a fouled plug was to do the procedure immediately above and then simultaneously (1) enrichen it, (2) depress the primer switch, (3) depress the carburetor alcohol switch and (4) retard the throttle to idle quickly. All this was an attempt to "thermal shock" the offending sparkplug, "hopefully" loosening its lead deposits.

Comparing the amounts of the two "drops" is a part of the check, they should be roughly comparable to one another. Let me quote from a particular manual I just have to have handy here as an example only. "The normal drop is 75 while the maximum drop is 100, with a difference between the two mags of not to exceed 40." In other words, if you see only a 10 drop on one and a 100 drop on the other, then there's probably something wrong, even though both are permissible according to that particular airplane's manual.

We should mention somewhere here that we used what was referred to as a "running mag check" on the airline. This entailed a complete standing mag check upon the originating run-up, as discussed (ad-nauseum) in this article, then a quick lower power one on all subsequent stops of that flight. The "running mag check" involved finding a convenient taxiway while taxiing out, then running both engines up to approximately 1900 RPM on the R-1820 DC-3's or 2100 RPM on the Convairs. Sometimes one might have to ride the brakes slightly to avoid an unwanted acceleration. Then quickly cycle the mag switches through all the appropriate positions before gaining too much speed. In truth, while it was FAA approved, this procedure probably would have accomplished little more than to detect a "dead" mag! But it remained in existence for as long as I flew the "piston pounders" at North Central Airlines.

The preceding paragraph reminds me of something else we need to discuss here, an manifold pressure that is provides an adequate internal cylinder pressure for a valid mag check. However,

if less is used, the firing of the spark plug is probably not going to be indicative of much of anything.

If you haven't been routinely doing an "idle mag grounding check", you need to start right now - on your very next flight! You owe that much to the mechanics working around your airplane - or anyone else for that matter! If the magneto doesn't stop firing when you turn the switch off, then all that's needed for a terrible accident is for someone to just move the prop blade a little bit with a "hot mag". Someone "pulls the props through" before starting, right? Or you turn or "bump" the prop through a number of blades with the starter? Be a big surprise - either way - to discover a "hot mag" when you didn't know it, right? Three times during my career I've seen the engine fail an "idle mag grounding" check. Just a quick word of advice, though, do it at idle - otherwise you may get a fair backfire if you're up at a thousand RPM or so. Also, minimize the time spent with the ignition off, as soon as you can tell that it's grounded the magneto, return the switch to BOTH in order to minimize any possibility of a backfire.

Some have advanced the theory that they didn't want to do the "idle grounding check" right after start - until the engines had warmed up. I think that they are confusing two different scenarios here, sometimes an engine doesn't want to keep running right after start and you might have to "squirt" it with the primer a few times while it's cold. However, this has absolutely nothing to do with the "idle grounding check" - in any way! This check can be done at anytime, start, middle or shutdown, it doesn't make any difference at all. Just another "old wives' tale," I guess. We did agree to do it right after start on the B-17 while all four are running because so many times the inboards are cut when turning off the runway upon terminating. That way we've gotten it at least once during the flight, even though it'd be preferable to do it just prior to shutdown upon termination. One point here, scavenging, in the near future this all may shortly become a moot point since we are contemplating leaving all the engines running, then to do a complete scavenging at 1100-1200 RPM immediately prior to shutdown.

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