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The Safety Chain

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This issue of the Safety Chain is aimed toward pilots, however, the information can apply to everyone, especially members who drive an automobile which uses an ammeter as the gauge for monitoring the electrical system of the vehicle. So here is your first question. Would you drive a car if the battery is dead and had to be jump started every time you shut the engine down? Me, no. I would get the thing fixed. The car I drive now even traps the key in the ignition when the battery is dead. So, how about an aircraft? Next question, is it against the FARs to fly an aircraft with a dead battery? After all, there are aircraft flown everyday that do not have electrical systems. I will let you research the answer to this question.

What I really want to speak about is not so much about dead batteries, but the electrical system itself. This system may be the one least understood, and maybe the most neglected systems. In cars we have "idiot" lights, older cars had ammeters. In aircraft we have a low voltage light and an ammeter gauge for monitoring the aircraft's electrical system.

When I was an instrument student, there were many instruments that I needed to learn to scan. The gauges I concentrated the most on were the flight instruments. But what about the engine performance instruments such as the oil temperature and oil pressure gauges, the vacuum gauge, the ammeter? You mean these must be included in my scan as well? Yes! These gauges can give you a lot of information during your flight as well. For example, what might be indicated by the following: oil pressure about normal and the oil temperature higher than normal? You might be running low on oil and this is possibly why the oil temperature is higher than normal.

We can glean information about our electrical system as well. Not all aircraft use the same electrical voltages. For example, the Piper Warrior I flew in the past has a 12-volt system. The Cessna aircraft I have flown has a 24-volt system. Different voltages, however, the basics about these systems are the same. Both aircraft have batteries and alternators. The Piper Warrior has a 14-volt alternator while the Cessna as a 28-volt alternator. Alternators always have a higher voltage than the battery which forces the battery to recharge while the engine is running. The battery is for starting the engine, the alternator for recharging the battery and supplying electrical energy to the radios and other aircraft systems, but not for the ignition system which supplies electrical energy to the spark plugs.

Now, how do we know if the battery is charging, charged or discharging? The ammeter can tell you which of these three states. The ammeter in the aircraft can tell you the answer. The scale on the ammeter as shown in Figure 1 has a negative side, a positive side and zero (0) in the middle of the scale. So, how do we interpret the indications?



Figure 1. A Typical Ammeter

If the needle is to the left of zero, the battery is discharging. If the needle is to the right of zero, the battery is charging. And, if the needle is on zero, the battery is charged. Simple enough. So, after starting the engine in the aircraft, the needle should move to the right for a short time and then return to or maybe just to the right of the zero. While the needle is to the right the battery is charging. When the needle returns to the zero position (or sometimes just to the right of the zero) the battery is completed its charge cycle and is now fully charged again.

But, what if we saw something that looks like this condition: the needle moves to the left momentarily and then returns to zero or goes to a positive indication and then returns to zero again? Is this a normal indication? Actually, no. There may be something wrong with the charging system. Anytime the needle goes to the negative (minus) side the battery is discharging. When the engine is running and everything is working normal, this should not happen. Get it checked out.

What if the needle stays to the right for your entire three hour flight? Is this normal? Well, again, no. This means the battery is staying in a constant charge cycle. The battery should be fully charged in a short amount of time. Now, the length of time depends on the age of the battery. Older batteries may take longer to recharge than newer batteries. Again, if you see this indication get it checked out.

As VFR pilots we are taught to mostly look outside of the aircraft. After all, this is what VFR flying is about. But, as VFR pilots we do need to scan the engine instruments every so often, not just during our pre-takeoff checklist making sure everything is in the green.

The next time you are flying, add some loading to the aircraft electrical system after you start the engine. Turn on the pitot heat, watch the effect on the ammeter, turn on the landing light, watch the effect on the ammeter, the same with the radios.

Although the ammeter is a very simple electrical gauge, it can tell you a lot about the condition of alternator and battery in the aircraft you are flying.

Semper Vigilans