

Ask the CFI

What really happens when the alternator fails?

Private and commercial pilot training includes some basic information on systems failures and what to expect in case of an electrical malfunction but there is no substitute for experiencing the real thing. I can now speak from experience after an alternator failure on a recent cross country flight and it wasn't quite what I expected.

On the ground before the flight there was some debate about whether or not the ammeter was actually showing a discharge or not. The ammeter is an indicator that shows if the alternator is producing enough electricity and whether the battery is receiving that electricity. The problem is the needle points to zero when the alternator is functioning correctly and during the run up for this flight the ammeter needle seemed to be, maybe, the width of a gnats finger nail to the left of zero which was so imperceptible that I put it down to my imagination.

Some aircraft have a low voltage light but in this Cessna 172 there is only an over-voltage sensor and warning light on the panel. This light will only illuminate when the over-voltage sensor automatically shuts down the alternator after detecting an over-voltage condition. So if the alternator fails for any other reason this light will not come on. In my humble opinion it would be a *lot* more useful if the light illuminated whenever the alternator was not working for any reason!

Our route for this flight took us eastbound via the Northbrook VOR, to the coast of Lake Michigan and then south along the lakefront under the class Bravo airspace, with flight following. The first indication we had of any real problem was on the ground at Gary (KGYG) trying to contact the tower after landing. It did not appear that the controller was receiving our transmission so we switched to the number two radio and tried again. That worked perfectly so we continued with that radio.

Soon after our departure from KGYG the Garmin 430 GPS began flickering. No biggie though, we were VFR in daylight and a GPS was not essential so we switched it off. With good visibility and two iPads and an iPhone, all with ForeFlight, we were confident we could find our way home. My quick thinking student powered off his iPad so we could save the battery power on that one just in case mine ran out.

At this point I was convinced we had an electrical malfunction that was most likely related to the alternator. On a day VFR flight outside of controlled airspace this is not an emergency so I didn't see any reason to land immediately and we continued onwards to Galt. We checked the circuit breakers and switched off the alternator master switch and looked for non-essential electrics we could switch off to reduce the load on the battery. But the only one we could come up with was the strobe lights. I didn't think they would make much difference but we switched them off anyway.

One by one the remaining "essential" electrics began switching themselves off! Seven miles west of Gary we got a message on the transponder that it was no longer receiving ADS-B In data and the display began flickering. That meant that we no longer had traffic information on ForeFlight so we had to be extra vigilant about looking outside for traffic. I switched the transponder off at that point because it seemed like it wasn't working correctly and would die soon anyway. I made a call to Gary tower to let them know we had a problem and they very kindly asked if we needed any help but I said no and explained our intentions were to return to Galt avoiding any class Bravo or Delta airspace. I did not request flight following because I was sure our radio was going to quit any minute and there was no point in dialing in 7600 on the transponder because that wasn't working anymore either.

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We briefly headed south to get out from under the mode C veil because we were without any transponder or ADS-B equipment but we changed our minds and decided it would take far too long to get back to Galt if we went around the outside and a more expeditious route was the best course of action in this situation.

In anticipation of the radio quitting I made a call to Galt 44 miles south of the airport, just in case anyone was interested, and explained to Galt traffic that we would most likely be NORDO (without radio) by the time we arrived in the pattern. I don't even know if our transmission was strong enough for anyone to hear us at that point but I thought it couldn't hurt.

A few miles north of DuPage the number two radio quit and right around I-90 the intercom stopped working and we were reduced to yelling and hand signals. I was honestly surprised how long all of these systems lasted on battery power alone.

There was other traffic in the pattern when we arrived and they were probably thinking why the heck we weren't making any radio calls, but at a non-towered airport they are not required so we weren't breaking any FAA rules. But we were extra careful to keep our approach and pattern as predictable as possible and tried to stay out of everyone else's way.

Abeam the numbers, even though we had briefed the no flap landing (long before the intercom died), my student still reached for the flap lever out of habit and we both had a good laugh about that! No flap landings are not easy if you don't practice them a lot on account of the additional groundspeed, unusually low angle of attack and the tendency to float, so this was a great learning opportunity for my student.

After landing safely the airplane went to the shop and is now the proud owner of a brand new alternator! All around it was a very interesting and useful experience for myself and my student. There truly is nothing like real life, scenario-based training to gain a level of understanding about what it means to be a pilot you just can't get from reading a book.

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