

A Dark, Stormy Night

by Matt McDaniel

While this story does not revolve around a Cirrus flight, flying any airplane provides an opportunity for lessons that can be applied to the aircraft we fly. This is a story of one such experience.

In the mid-1990s, I worked as an independent flight instructor near my hometown in southern Indiana. One of my students, a local business owner, owned a Cessna 177 Cardinal. John was pursuing his private pilot certificate in the “professional student” manner (he had nearly 300 hours logged, but had not yet completed the required written exam or the minimum solo flight requirements). Nonetheless, he was a good student and pilot and quite good at flying his airplane. Our story begins with the second half of an instructional cross-country flight.

We had flown earlier that day from our home base in Columbus, Ind. (BAK) to Jackson, Mich. (JAC), a two-hour flight. Our return flight would be at night. A warm front had moved in more quickly than expected and we were now facing MVFR and IFR conditions. We decided to fly home on an IFR flight plan, so John wouldn't miss work the next day.

John and I began to plan for our return trip; John would fly back home direct, using VORs and pilotage navigation. His Cardinal was equipped with a yoke-mounted GPS, but using it was not appropriate for his instruction on this flight. For this flight, it was relegated to my yoke.

According to the weather briefing, we could stay in

VFR conditions for the majority of the flight home. However, there were forecast ceilings along or near the route, ranging from 1,500 to 15,000 feet with isolated areas of even lower weather. There would likely be about 30 to 60 minutes where we would be in IFR conditions due to altitude requirements. But, it would be fairly “soft” IFR and there were several good escape routes (back to JAC, due east or west, through the IFR area to VFR conditions about 50 miles behind the front).

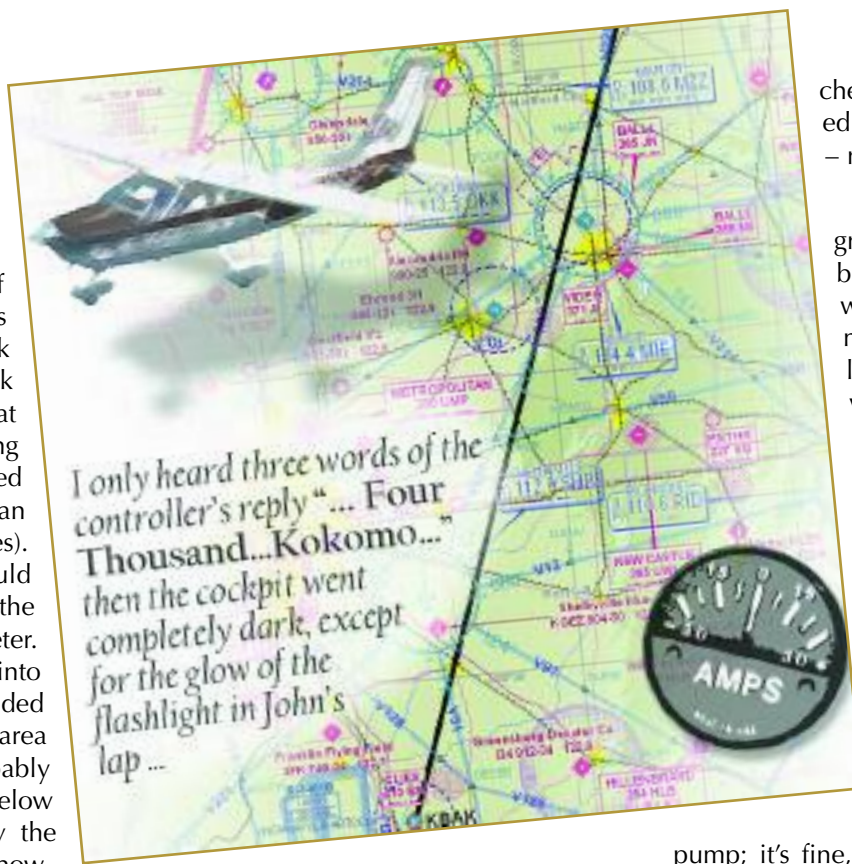
With the flight plan filed, we loaded up and headed out. We climbed to 6,000 feet and headed southwest. Before long, we started to get into the bases of the clouds. I told John to request 4,000 feet, which was approved. We noticed the intercom cutting in and out, but didn't think it was anything more than annoying because there had been some previous intermittent problems with the intercom and the pilot's push-to-talk switch.

About 30 miles northeast of Ft. Wayne, Ind. (FWA) we were back in the clouds – this time at 4,000 feet. We requested 3,000 feet and approved. While that was the wrong altitude for direction, light traffic that night allowed the controller to approve our request. At 3,000 feet, we were VFR again and John resumed his navigation and checkpoint identifying duties.

John had just identified one of his night checkpoints (an airport beacon, at a lighted, grass-runway airport near Ft. Wayne, Ind.). Then, the full stack of King digital radios flickered off, and back on. In the time it took John and me to look at each other, the flickering stopped and all seemed normal (including a scan of the electrical gauges). I told John we would keep a closer eye on the ammeter and voltmeter. We then went back into the clouds and I reminded John that this was the area where we would probably not be able to stay below the clouds and to fly the assigned heading, for now.

A minute later, the flickering started again. But, this time it wasn't just the radios; it was basically everything electrical. My immediate reaction was to crane my head around John to see the ammeter, which was showing a full-scale battery discharge. Without a word, I reacted and began shutting off equipment. I left only the No. 1 radio, the intercom and the transponder turned on. The GPS had diverted to its battery back-up power as a result of the power surges. I squawked 7600 on the transponder, assuming everything electrical would be gone very shortly.

John began to panic. He yelled that he couldn't read the instruments to fly the airplane. I reached for my military-style gooseneck flashlight, turned it on and shoved it between his legs, pointed squarely at the attitude indicator. I yelled back, "John, don't freak out on me, look at the attitude indicator and keep us upright. I have to talk to ATC before we lose everything here. FLY THE PLANE, JOHN! Pretend you are under the hood and keep this thing upright. Don't worry, I will NOT let you kill me today!"



To make matters worse, while I was trying to explain the situation, Ft. Wayne Approach Control was handing us off to Indianapolis Center. Indy wasn't sure of our situation and asked us to confirm our squawk and any requests. I managed to hear Indy suggest we land at Muncie, Ind. (MIE) and issue us a vector for the ILS approach there. That sent my mind scrambling. Muncie had the worst weather on our route, forecast as low as occasional 500-foot ceilings and one-mile visibilities.

I refused the vector and told ATC to vector me toward a VFR airport – NOW! I was concerned we would lose all electrical soon and be unable to do the approach into MIE. That is right when the electrical system decided to go. I only heard three words of the controllers reply – Four Thousand... Kokomo... then the cockpit went completely dark, except for the glow of the flashlight in John's lap.

That didn't sound (or look) good to John, at all. He told me he wanted to turn the plane around. I asked why. He explained that he wanted to return to the last airport he had seen, which was one of his VFR

checkpoints. He wanted to be on the ground – right now!

"John, that was a grass airport, remember? Do you really want to land there at night with no landing light? I know I don't want to! Listen to the engine a minute. Sounds as smooth as ever, doesn't it? Remember what a magneto is? That engine will keep running with no electrical system whatsoever. The attitude indicator is being powered by an engine-driven vacuum

pump; it's fine, too. We have over three hours of gas in the tanks. FLY THE PLANE, John. I think the controller wants us at 4,000 feet and he said 'Kokomo.' That is southwest of us and hopefully far enough west to get us on the other side of this weather. So, calm down, turn west and climb to 4,000 feet; we are going to be just fine."

John calmed down and did what I asked. I could have taken the controls at any time, but I wanted John to keep flying for two reasons. One: He needed something (anything) to occupy his mind. Two: He needed the confidence boost that he could, indeed, fly under pressure. I punched Kokomo (OKK) into the GPS and got a heading of 240 degrees and a distance of 40 miles. I told John to turn to 240 and we'd be there in about 20 minutes.

I then put 7700 into the transponder hoping that the electrical system would flicker on again and give ATC one radar sweep of our position. A few minutes later, it did just that. At which point, the radio lit up and Indy said to us, "Cardinal 34287, nice to see you again. Call Grissom Approach on 121.05 and good luck." So, we called Grissom. The

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radio was flickering badly again and their reply was garbled. We heard, "... weather at Kokomo, 2,700 overcast ... alternate ... Grissom Air Force Base ... advise field ...," then, nothing. It was dark and quiet again and John was just sitting there, flying the plane by the glow of a flashlight. A student pilot flying in solid instrument conditions, at night, like he was some sort of veteran pilot – that made me smile in the darkness.

I told John it was time to form a plan. Assuming OKK's weather was actually 2,700 feet overcast, we should be able to find it if we descended to, say, 2,500 feet. I checked the charts for obstructions and finding none over this flat Indiana farmland, I told John to go down to 2,500 feet. He did so, as we continued to talk about our plan. I told him to turn off the master switch, hoping that when we turned it back on, we'd get a few seconds of power for the landing light and/or flaps. I mentioned that if we passed OKK without seeing it, we would turn north toward the Air Force Base and look for it and then descend no lower than 1,500 feet, if necessary

(towers in the area were charted as high as 1,335 feet). So, we pressed on at 2,500 feet, still in solid instrument conditions.

*“FLY THE PLANE, JOHN!
Pretend you are under the hood and keep this thing upright.
Don't worry,
I will NOT let you kill me today!”*

Ten miles from OKK, we broke out of the clouds. But it was not 2,700 feet overcast. It was clear and the stars were out, although the visibility was still no better than five miles. You could almost see the tension release! Another five miles and the rotating beacon at OKK came into sight, as did the military beacon at the Air Force Base. However, neither airport had its runway lights on. I told John to flick the master switch back on. When he did, I clicked the mic switch seven times and the runway lit up right in front of us. On short final, I flipped on the landing light and selected the flaps to 10 degrees (rea-

soning that 10 degrees was the normal takeoff setting for this plane and it would be nice to have them set should we need to go around). That was as much as the battery had left and the landing light immediately went dark. John just gave me a look of resignation and kept flying (I'd made him practice night landings with the landing light "INOP" before, so at least this wasn't another first for him). We made an acceptable landing under the circumstances.

On the landing rollout, the runway lights went out (they were pilot-controlled, but on a timer to save energy). We had no radio power left to turn them back on and had a very tough time finding a taxiway on which to exit the runway (almost turning into the grass twice). Finally we found the taxiway, cleared the runway and SLOWLY taxied toward the FBO's illuminated fuel sign.

The lineman at the FBO was happy to see us as Grissom Approach had called to see if we had landed yet. We immediately called Grissom to tell them we were safe and to thank them and all the controllers for their help. In our hotel room that night, I jotted notes about our experience in my logbook, while John called his girlfriend. I can't speak for John, but I slept like a rock that night!

What went wrong?

The alternator bracket had developed a crack that allowed the alternator to vibrate severely. The vibration had shaken the grounding and field wires loose, causing the aircraft's electrical system to intermittently short out. That explained the flickering and blinking we were seeing in the electronics. Simultaneously, the battery was subjected to changing loads of severe draw and maximum charge (until we shut off the master switch). According to

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the mechanic, it was a good thing we did that when we did, because the battery had overheated at some point and was spilling boiling acid into the battery box.

What lessons can we learn from this story?

- Fly the plane first. Aviate, navigate, communicate. If there is more than one pilot on board, divide the tasks at hand to maximize your available resources (even if one pilot happens to be a student).
- Always have and know your "outs." This is probably the single most important part of situational awareness in an emergency requiring a diversion. Where are you going to go? What can you expect on the way there?
- Don't blindly follow ATC. Make sure they are sending you to an area with weather, terrain and facilities that are appropriate to your situation. Shooting a 500-and-1 approach with major electrical problems is not where you want to be!
- Know your aircraft. Understand its systems and their limitations and operations. It is knowledge you can use to diagnose and react to problems. It is critical when trying to squeeze the last little bit of performance out of a compromised or malfunctioning system.
- Use current charts. IFR for instrument flights and VFR for ALL flights. In this story, I was flying IFR but using the superior terrain and obstruction presentation of a

VFR sectional chart to determine exactly how low I could descend into a given area.

- Carry a real flashlight at night. One with D-cell batteries and a strong beam, which can be used hands-free. Over a decade later, the same flashlight that John used on this flight is still in my flight bag.
- Practice weird emergencies. Memorize critical procedures that do not allow you time to run a checklist. Consistent training is the only thing that will teach your mind to go into reaction mode when the pressure is otherwise overwhelming.
- If you carry a handheld GPS for this sort of emergency, have it up and running all the time. Make sure that when the ship's power fails, the GPS will divert to its own batteries without powering down. There is no way I would have had time to pull that GPS out of a flight-bag and get it working under the circumstances. It was ready all the time and was a major component in getting us to a VFR airport as quickly as possible.

In retrospect, what could, should or would we have done differently?

- After getting us going toward our emergency airport and turning off the Master, I should have left it off. While that would have created other complications at the end of the flight, it would have lessened the chance of electrical problems getting worse or electrical fires starting.

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- Declare an emergency. In all the excitement of the situation, the thought of making the declaration never crossed my mind. Maybe the controller asked? If so, it was lost in our mangled communications. As it was, they and we were both treating it as an emergency regardless of my failure to verbalize it to ATC.
- We should certainly not have bothered with the flaps on landing. They probably depleted the energy we could have used for the landing light. Ideally, I think I would have left everything electrical off altogether.

COPA

About the Author: Matthew McDaniel is the owner of Progressive Aviation Services (www.progaviation.com). He has worked as a Cirrus-specific instructor for more than four years. He also flies a Boeing 717 for a national airline and holds type ratings to command three other airliners and several versions of the Cessna Citation business jet. He has well over 2,000 hours in the SR-2X, 3,700 hours instruction-given and 7,500 hours total. He can be reached at matt@progaviation.com or (414) 339-4990.

ELECTRICAL FAILURES IN AN ALL-ELECTRIC AIRCRAFT

What are your options if you find yourself in a similar situation in your all-electric Cirrus? They do exist, although many pilots might assume otherwise, but there are important considerations. This discussion focuses on full electrical failures only, without regard to the multiple bus electrical system in Cirrus aircraft. The nature of partial electrical failures makes them too varied for this limited-scope discussion. Remember, as rare as full electrical failures might be, they do happen. In fact, they might be pilot-induced in response to an electrical fire or other electrical system malfunctions. Given the above:

What items will fail (and what to consider)?

- All electrical flight instruments (attitude indicator, turn coordinator & HSI/DG). In a PFD-bird, this will include the entire PFD and the back-up attitude indicator.
- Flaps (plan on a no-flap landing).
- Trim (plan on an out-of-trim landing).
- The engine instruments and MFD (no direct indication of MP or RPM, this will be true "seat of the pants" flying).
- All COMM and NAV equipment, transponder & autopilot. (Do you know where you are and how to get where you need to be? Are all charts accessible and ready for use? Can you use them and hand-fly at the same time?)
- Your headset's ANR, if it's powered from the aircraft's electrical system (its going to get noisy).

What items will remain?

- Pitot-static instruments (airspeed indicator, altimeter, VLSI or the back-up airspeed indicator & altimeter only in PFD-birds).
- Flight controls.
- Power.
- A wet compass (not as useless as you might think).
- A well trained and calm pilot (hopefully).

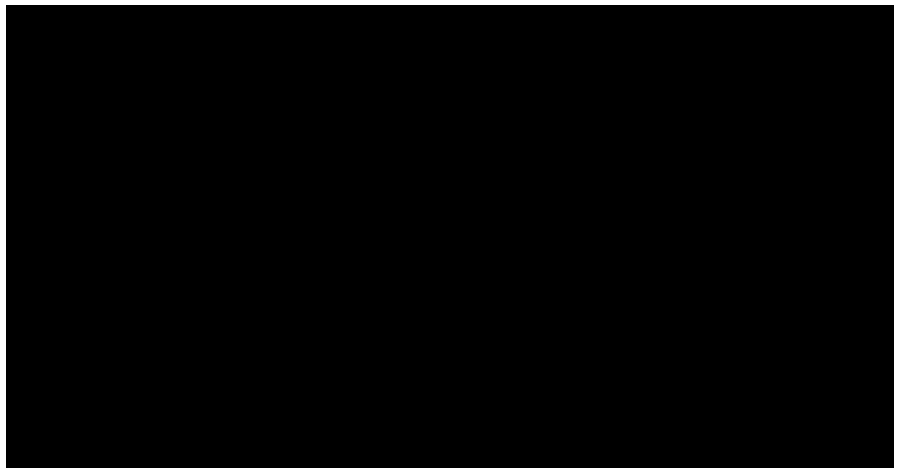
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Take a look at the two lists above and picture yourself in a predicament similar to the one John and I shared, but with only the instruments I've listed working. Would you be comfortable IMC, at night, with no attitude indicator or turn coordinator? Me neither. So, what items can you carry to help in such a situation?

- A hand-held radio with: A fully charged battery, an external antenna hook-up (otherwise range will be very minimal), a way to hook your headset and a push-to-talk through it.
- A hand-held GPS hard-wired to your aircraft's electrical system but backed up with its own battery.
- A battery-powered ANR headset.
- A backup attitude-indicating system, such as a PDA-displayed attitude indicator or a GPS unit that displays a "panel page" with "flight instruments" displaying GPS-derived information (such as the Garmin 196, 296 and 396 units).

Overall Considerations:

- Backup equipment won't do you any good if stowed or turned off. Before entering IMC, make sure you get backup equipment ready.
- Practice using your emergency equipment and procedures. The place to learn to fly the aircraft with reference to a GPS panel page is NOT during an actual emergency. That is a VERY challenging task and should be learned through consistent flight training with your CFI. The same is true for properly hooking up and using other emergency equipment, such as a hand-held COMM. radio.
- Know how to use your compass. It might be the difference between success and failure. Fly on a south heading, if feasible. The compass will LEAD your turns from a south heading, and thus give you the fastest and most accurate indication that the plane is turning. Without any electrical equipment or any hand-held backup equipment, this will be all you have. Be aware of other turning, acceleration and deceleration errors associated with a compass.
- Always know where the nearest VFR conditions are and how to get there, keeping terrain and obstructions in mind.



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