Raven Flight -Knock It Off-Lead Electrical Failure!

By Dan Berry Chapter 648 Technical Counselor

That was my radio call after completing a pass over the Longmont airport flying lead with our RV formation team, the Rocky Mountain Ravens with a four ship flight.

The team did their job, as briefed, getting in a loose route formation and asking what I needed.

Following rule 1, Fly The Airplane, and confirming again, my Amp Meter was ZERO and my Volt Meter was indicating 12.3V, I had a hard failure.

All I needed was an airport which I had underneath me about a ¼ mile to the south. It was a civilized training day with all the touch-and-go C172 Heavy students in the pattern. A downwind instructor actually gave me permission to cut in front of them on a direct base to 11 and land. Headed towards the runway, all traffic clear and accounted for, I had the overwhelming urge to do some trouble shooting. However, that clearly violates Rule 1, Fly The Airplane. My WWII grandfather was my primary instructor. Rule 1 runs deep in my thoughts and actions.I had a runway below, clear traffic, a usable flying machine. I decided to stay the course, relax, fly a close pattern and land. Troubleshooting is much easier in front of the hangar.

Cycling the Alternator and Field breakers did nothing. All wires under the panel were secure and in good condition. Time to pull the cowl.

First clue I found was some discoloration inside the cowl near the alternator. Second clue was that the electrical terminal boot had black residue on it, so I thought.

Upon further investigation I realized it was a hole. It made no sense that the cowling rubbed a hole in the boot, I knew I had plenty of clearance with 675 hours and many conditional inspections with this configuration.

I pulled on the boot and it crumbled in my hand along with a nut attached to the burned off battery buss output post threaded stud. The hole was from a burn through event.

It started making sense.

The B-Nut vibrated loose, opening a gap between the B-Nut Stud Nut and the Wire Terminal End. This allowed arching and sparking to occur, every spark burned metal from the stud until it broke off, a very effective arch welder/plasma cutter event. The boot contained the sparks until it burned through.

Upper Boot with Burn Through compared to the lower New Boot

Looking inside the burned metal inside the boot

The melted away Wire Terminal, Stud and Nut

What went wrong? I installed my BandC L40 alternator per the supplied instructions and included hardware. I called BandC, I am not the first person with this issue and it requires the alternator to be returned for factory repair. Time and money, 1 week, $150 later all was repaired.

The instructions for the L40 simply say “Install the large gage wire from the Battery Master Contactor on the copper post labeled “B”. This is often referred to as the BNut. No torque values declared and no lock washer supplied.
I prefer to use a torque value and did find 50 in-lb in other BandC documents.

Hartzell Alternator Models ES-6904 Owners Manual requires inspection for Arc Marks near the BNut/Output post AND requires a Split Lock washer in the hardware stack with a torque of 40-50 In-lbs.

My current installation now has a split washer, required torque AND I added a strip of Torque Stripe Seal to visually inspect any movement of the hardware stack all under a new electrical terminal boot.

Lastly an inspection line to my Annual Conditional Inspection and anytime I have my cowling off the airplane.

Avoid being a flying arc welder, keep your BNut tight.

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