

The Trailing Edge

January 2023

Over-Voltage Ignition Woes

I'm jealous of all your Bearhawk adventures. My VC-180 flying has been spotty at best. I can't really blame that on a particular cause but perhaps a series of events that conspired to keep the Skywagon firmly rooted in its hangar at KCVB. After our VERY bumpy trip to the left coast over the July holiday and with the recurrence of the "Continental Cough" experienced on the relocation flight last January I flew the airplane sparingly and locally a few times while attempting to reason-out the potential causes of the "momentary" power loss events and develop a strategy to address the issue. As you may recall, I first encountered the phenomenon during the final leg of the trip to bring the airplane to its Texas home. It was, for all the world, like someone or something had simultaneously grounded both ignition systems for a second or two. It was just one "blurp" and then everything appeared normal. Using my best sense of denial, I called it a potential carb ice incident. Then, on the final leg of the return home on the July trip, it happened again...twice. Had me scanning for landable terrain over the vast expanse of West Texas. Again, the two events resolved themselves before I had time to do any troubleshooting and we made it all the way to KCVB with no further recurrence of the problem. Needless to say, Ms. ex-Kommandant's (and my) confidence in the airplane took a serious hit. Local (albeit short) flights here in TX did not have any recurrences of the puzzling behavior.

In November I turned my attention back to the ailing Skywagon and realized that the annual had expired on 31 Oct, co-incident with the expiration of my flight physical...and, I also "discovered" that my flight review (performed by you) expired on 30 Sep! Now, firmly grounded by the "triple play" of currency delinquencies, I could focus on the engine issue. After discussions with Continental expert Mike Grimes, other 180-drivers, and anyone else that would listen, I decided to attack the "fuel" leg of the fuel-air-ignition triumvirate responsible for internal combustion. During my engine overhaul in 2015 I made a conscious decision not to overhaul or change the engine "accessories" or "appliances". This was mostly a cost avoidance maneuver. Only the prop and governor were overhauled due to possible contamination from the camshaft lobe disintegration. Perusing the logbook showed that the carburetor had not been looked at since the previous overhaul by Mattituck Airbase in 1991. Thus, it was an easy decision to purchase a re-built unit to eliminate possible intermittent fuel starvation issues that could cause the observed issue. That was installed with the help of former PP Trooper Opie Dodson. Ground runs were encouraging but, of course, I couldn't fly the airplane. I spent November, amongst other activities, finding a local Aviation Medical Examiner. Here we are in December and Opie and I completed the annual inspection. The weather in and around south-central Texas was pretty bad for most of the month due to low ceilings and fog, but Opie and I finally were able to get together a couple of weeks ago to try and do a joint FCF and 61.56 flight review.

We planned a short (50nm) trip to Fredericksburg (T82) after a pattern or two to make sure the engine was behaving. Turning crosswind on the first takeoff the engine "stumbled" as I was leveling at pattern altitude. This lasted about 5-10 seconds and was similar behavior to that I had observed with a fouled plug. So, we completed the pattern and did a high-power run-up to see if it would stumble again. It ran perfectly so we taxied to the runway for a second attempt. This time, after turning on course to T82 at about 2000 ft AGL, it did it again! Return to the pattern and land with no incident. During the pattern an airborne mag check seemed to indicate that the SureFly Ignition Module (SIM) unit in the left mag position was causing the rough running. Another mag check, another perfect run. I asked Doug if he thought we should try again to do some trouble shooting in the pattern and he agreed (we ARE flight testers, are we not?). Shortly after reaching full power and about 300 feet of takeoff run the demon raised its ugly head again and I said, "Let's put it in the hangar and discuss this". (At least this counted for the "simulated" emergency portion of my Flight Review.)

Thereupon I commenced an attack on the "ignition" leg of the system, focusing on the SIM and mag. There are few maintenance procedures that can be done on the SureFly unit other than check the timing and wiring connections. Similarly, the magneto in the right position had little troubleshooting available. Further, when I installed the electronic ignition a couple of years ago, I overhauled both mags to new specs (and put one on the shelf) so I was confident it was in good shape...and had actually run smoother than the SIM during the airborne mag check. Now it was time to "phone a friend" who, in this case, was a nice lady in Tech Support at SureFly headquarters here in Texas. After listening to my sad story, she asked me, "Do you have a 28-volt airplane?". "Um, yeah..." I replied. Well, it appears

that the company had experienced engine “stumbling” issues from several customers with 28-volt electrical systems. The problem had been traced to engines with “noisy” spikes in voltage supplied to the SIM. The SIM was designed to operate on a voltage range of 8-30 volts. Above 30 volts a self-protection circuit would cause the unit to “turn off and reset”. While the voltage spikes were very brief, the protection circuit was able to respond to them before the aircraft voltage regulator could reign in the spike. Her solution? They developed a “Power Control” unit which consists of a potted circuit board integrated with a finned heat sink and accompanied by an electrolytic capacitor about the size of a mini-Coke can. She shipped me the kit free of charge. I mounted the components on the firewall behind the SIM and wired it IAW the supplied Service Instruction. The circuit is designed to limit the voltage at the SIM to no more than 17 volts giving plenty of “headroom” for voltage spikes before triggering the protective circuit. I assume the capacitor “smooths” voltage variations as it is placed in parallel with the SIM power and ground.

So, why now after running well for the previous two years? Another logbook dive showed that the OEM alternator (built by Ford) was of the same vintage as the carburetor. In retrospect, I had begun noticing that higher and higher RPM settings were required to keep the unit on-line and that the “alternator whine” noise had been increasing in the intercom. These things could be construed as deteriorating performance by the alternator and could be a source of the voltage spikes. “Hello, Aircraft Spruce? Send me a Plane-Power Alternator replacement unit”. While I was waiting for the alternator to arrive, I ordered and installed a new ignition switch to replace the...you guessed it...OEM from 1979. The switch was highlighted in the Slick Magneto troubleshooting guide as it is the only place where the two ignition systems come together, and a worn or faulty switch could cause intermittent grounding of one or both systems. Hmm, those P-leads look kinda ratty. Spruce has P-lead assemblies pre-manufactured and tested by Bogert Aviation (yup, same folks who build the towbars).

On the 119th Anniversary of the Wright Brothers’ short flight, Opie and I again slipped the surly bonds. We flew for about a half hour as he had another aviation requirement in the afternoon. The engine ran flawlessly and (probably in my imagination) seemed to pull more strongly on takeoff and climb. Also, blissful silence on the intercom...except for Opie’s comments on my flying skill. We called both the FCF and Flight Review complete and for the first time in 90+ days I am current, qualified, and with a “good” engine. Was 30 minutes a good enough test? Probably wouldn’t meet the testing criteria taught at the World-Famous Test Pilot School, but time will tell and I plan to expand the envelope over the next few flights to rebuild my confidence in my fixes. If the problem recurs? Well, the only leg remaining in the internal combustion stool is oxygen (air). Frankly I can’t think of a way to test that one....

- Gary Aldrich

