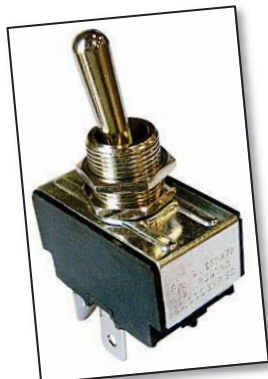


Perfect is the enemy

of good. I often need to tell myself that when working on my Velocity. My overhead panel is off-center by an eighth of an inch. My doors are not as well fit as I would like them to be. I have not been diligent about saving weight. I'm OK with all those things; I can keep moving forward. But there is one thing that has held up my progress, and I'm not settling for less than perfect: Switches.



Basic toggle switch

Here's the issue: I don't like aircraft switches. In almost every airplane I've been in – from the Cessna 172 I earned my pilot's certificate in to a B-747 – the switches are terrible. They are usually little metal toggle switches or plastic rockers. They're generally too small, poorly labeled, and/or impossible to see in the dark.

In a bumpy cockpit, it's too easy to reach for one switch and end up hitting another. The labels rub off or fade over time and are not backlit. There's usually no indicator – other than switch position – to tell you if a given switch is ON or OFF. More importantly, a pilot can't tell at a glance what SHOULD be ON or OFF.

I wanted to change all that. In between other projects this past year, I went on an intermittent quest for the perfect switch. Below are my non-negotiable switch requirements:

Required Equipment

Searching for the Perfect Switch

by Reiff Lorenz

First, the basics: 12 volt DC, panel mountable, under \$20, and from a source that's likely to still be selling the same switch in 10 years when I need more.

This was the easiest criteria. There are several switches that work, including [Aircraft Spruce's](#) tried-and-true toggle.

It must be backlit. In most planes, locating the right switch is difficult enough in the daylight. I hate to admit how often I turn on the pitot heat when landing my Mooney at night. It's in a row of



Basic backlit rocker switch

switches along with the strobe lights, landing light, and fuel pump – all of which should be ON when approaching after dark. I'm not going to take the time in the pattern to figure out which of those switches should be

OFF, so I turn them all ON. I don't want this problem in my next plane.

Again, it's easy to find switches that meet this requirement. Here's a backlit rocker that I'm sure works well. These cost around \$7 - \$8 each.

The switch must be large enough to have a label (on the switch) that I can read from a fully upright position. I don't want the switch labels printed on the panel, and I don't want to have to bend over to read them. I want to be able to add, remove, and rearrange the switches as necessary without needing to send the panel out to a screen-printing shop.

As the number of criteria increases, the number of switch possibilities decreases dramatically, and the cost goes up. These backlit, screen-printed rockers from Aveo cost around \$40 each after you account for the price of the mechanism, the faceplate, the mounting tray, and the connectors.



Aveo switches come pre-printed with many aviation functions.

Despite the expense, I seriously considered the Aveo switches. Unfortunately, Aveo's standard switch faceplate labels don't include all the equipment I need. To use these, I would have needed to create custom rocker labels at a screen-printing shop, which would have added to their already outrageous cost, so I kept looking.

It must be easily user-labelable in a permanent way. I don't want to have to send the switches to a service to be printed, engraved, or colored. I want to be able to re-label them at home, if necessary.

The push-button switch in this photo, for example, has a removable clear plastic faceplate. A label for this button could easily be created on a laser printer and inserted under the cap.

In addition to a backlit label, the switch should have a built-in light that indicates when it is ON. Even better, the indicator light needs to be colored so there's an indication of IF it should be ON. **Green** for switches that should be on continuously during flight, like the avionics master and position lights. **Yellow** for switches that should not be on all the time, like

the fuel pump and pitot heat. **Red** for items that you only want on in special circumstances, such as emergency power.

The adjacent photo shows a switch that has dual lights. Presumably, one light could be on all the time and backlight a label, and the other could indicate when the circuit is active. There isn't an easy way to label this particular model, but it shows that dual-light switches do exist.



The clear plastic cap makes it easy to insert a laser-printed label

The label backlight and indicator light must be powered and switched independently from the device the switch controls. This was the biggest hurdle. I could find lots of switches that had a backlight

OR an indicator light. A few even had both. But almost all of them depended on the switch itself being connected to a power supply that would drive not only the device being switched, but also the lights in the switch. In most airplanes, this isn't an unreasonable assumption; bus power runs to the landing light switch, for example, and the switch is attached to the landing light. Taking a few milliamps to drive an indicator light shouldn't be a problem.



Dual lights help you find the switch and know if it is on or off

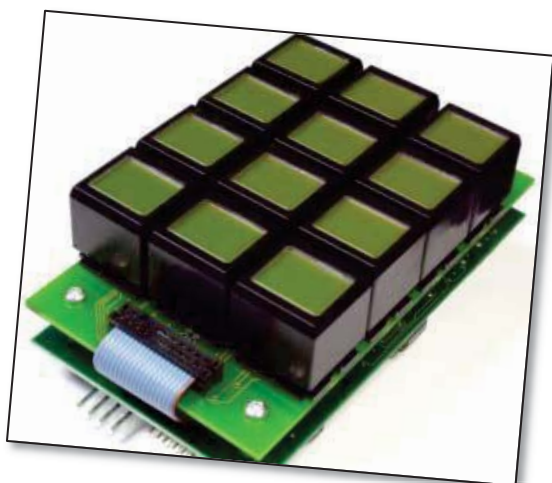
For my aircraft, though, I'm using the [Vertical Power VP-X](#). With this equipment, you don't attach the switch to bus power. Instead, the switch connects to a signal wire that carries almost no current at all. When the VP-X senses that the signal wire is grounded, it turns on the associated device. A switch with a backlight circuit hard-wired across the terminals would have two problems in this installation. First, the VP-X would always think the signal wire was grounded because the light provides a path to ground. Second, the light would never illuminate because the VP-X only sends a micro-amp down the signal wire.

A conventional dual-pole-dual-throw (DPDT) switch has six terminals on the back. If I wanted two independent lights in the switch, that would require four more terminals, two for each light. My ideal switch would need a whopping 10 terminals on the back! My requirements were starting to seem unreasonable.



Buttons with a programmable display give the builder lots of options, but they're complicated and expensive

I briefly considered using buttons with a reprogrammable display like the ones seen here. These are mini LCD screens that can backlit in different



Programmable display buttons on their control module.

colors to provide status indication. However, they cost about \$75 per button, and each group of them would require a \$400 control module. The control module would also need a relay bank (not included.) Plus, I would need to buy the programming and configuration kit for another \$850. Though a really cool solution, it easily exceeded both my budget and my engineering expertise.

Perfection

I FINALLY found these switches from manufacturer [NKK](#).

It's a basic DPDT rocker switch with a clear plastic cover.

Optional colored inserts (shown in red and green, top; and white green with labels, bottom) and laser-printed labels can slide under the

transparent rocker cap. Dual independent lamps are positioned behind the top and bottom of the switch. And yes, there are 10 electrical terminals on the back!

These switches cost around \$16 each. The only downside is that they are not stocked anywhere and must be special ordered (Delivery takes 2-3 months!). They're rated for up to 6 amps at 30 volts DC, so they'll switch most direct loads in addition to the VP-X signal handling.

Model number LW3122-F4BB-A is an ON-ON dual-pole, dual-throw switch with white inserts under the clear plastic cover and 12-volt light bulbs.

Perfect may be the enemy of the good. But if I wanted to settle for merely good, I would have bought a Cirrus!

Links:

[NKK Switches Series LW31](#)

[Available from Powell Electronics](#)



Reiff Lorenz and his wife Melissa started building their XL-RG kit in 2011 and are making slow, steady progress.



Rocker switch with dual, independently-powered lights