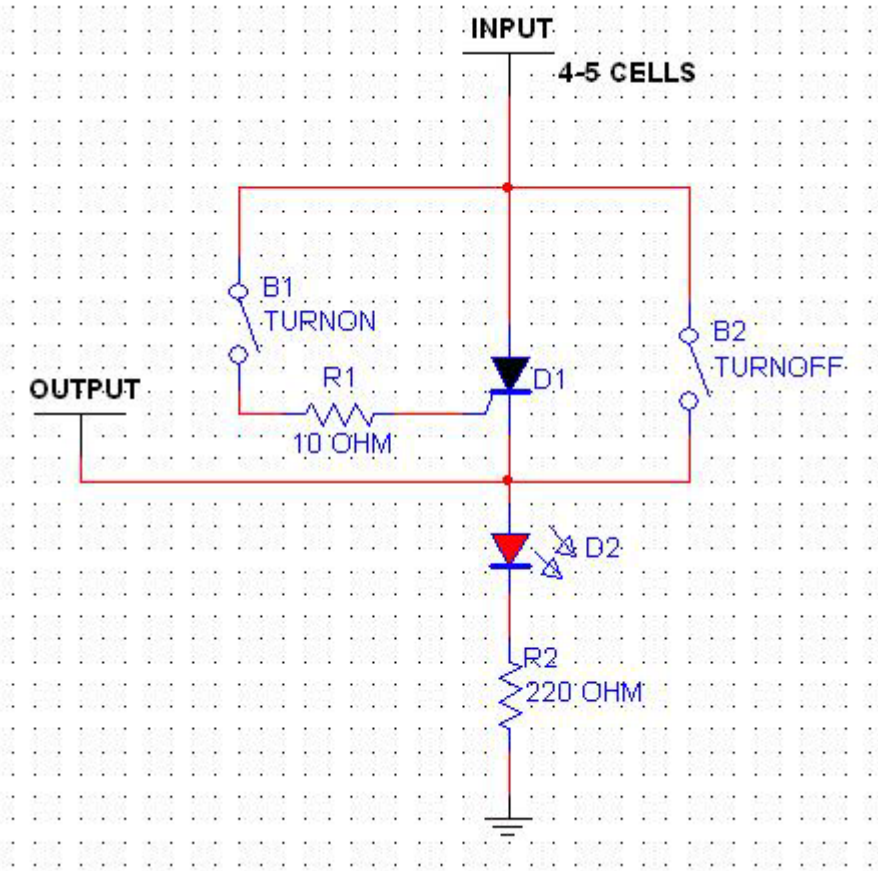
Build This: Failsafe Power Switch

Starting this month and with any luck every month after this we are going to publish a ***Build This*** column featuring a new device for you to make every month. We are starting with a failsafe power switch for your model.

The power switch of your model is a critical aspect of the model electronics system; if it fails you are in trouble! The switch we have designed is much more reliable than a standard mechanical switch because it has no mechanical elements that can fail resulting in a no-power situation and thus could prevent a major crash. The switch is based on a silicon controlled rectifier, or SCR. Basically it is controlled diode, it allows current to flow in only one direction, but it has the be “triggered” to do so. There are three leads on an SCR, the gate, anode and cathode. The anode and cathode are just like a normal diode, but the gate allows it to function as a switch. After it is triggered, it will continue to allow current to flow until the load is removed, at which point it will reset.

We will use a standard radio power switch (B1) to control our failsafe switch. The radio switch will turn the SCR on; the pushbutton (B2) will turn it off. The schematic of the device is shown below:



In the above schematic, your battery's positive input will be connected where the input is designated, and the negative of the battery will go to ground, represented at the bottom of the schematic. The output (positive switched voltage) to your receiver) is connected to the left, and the ground is again connected to the negative output lead.

The switch works quite simply. When B1 is switched on, a current flows to the gate of the SCR, because the closed radio switch creates a circuit delivering voltage to the gate through limiting resistor R1. When the SCR sees this current, it turns on and allows current to flow through the SCR, and the LED will turn on. The LED circuit is required because it presents a small load on the SCR (~20mA) keeping the SCR activated. The LED also tells you when the circuit is on and delivering power to your model. When B2 is pressed and B1 is no longer closed, the SCR is bypassed and current flow is interrupted through the SCR while the button is down. This stops the SCR from conducting current and your model will now be off, and the LED will turn off as well.

The parts list for this project, as well as PCB layout and schematic is going to be posted on Woodland Davis Aero Modelers website and our company site www.Anderson-Aurand.com All the schematic and PCB files are created in a free PC program from www.expresspcb.com The software is a free download and we encourage that you get it. We are going to offer pre-etched and drilled PCB's for sale; otherwise you can simply print and etch the files using materials available at Radio Shack. The finished unit should be packaged in heat shrink so the electronics won't short on anything. You can mount the LED outside to have a visual indicator of it's operation from outside the plane. This unit is intended for a voltage of 2.5 to 60 volts and a maximum load of 8 amps. This unit should be more than what is needed by even the IMAC plane I designed it for: A 27% EXTRA 300S plane with 6 digital servos. Because I'm using dual batteries I'm going to use a separate switch on each battery pack since there were already 2 power switches installed in the plane when I got it. Be advised that having a high-current power switch is no longer needed since there is no significant current flowing through the mechanical switch, less then 20mA or so.

How to use the completed unit:

-Turn on the main power switch (radio switch)
-Make sure LED is ON and that radio functions correctly
-Fly normally knowing that even if you turn off the radio switch or it fails into an open condition the radio equipment will remain on until current is interrupted though the SCR by B2.

To power down simply turn off main radio switch and momentarily press the N.O button (B2) to turn the radio off. The LED should turn off confirming the radio is now off.

Parts List:

2 x N.O SPST Pushbuttons – RS 275-1547
SCR – RS 276-1067 (Good for 8 amps + and 75 amps surge)
Red LED – RS 276-330
220-Ohm Resistor – RS 271-1313
10-Ohm Resistor – RS 271-1301
Heatshrink Tubing – Preferably clear
18 Gauge wire (or larger depending on your needs)
Radio Switch (to match your radio gear plugs)

We hope that this project proves popular and useful; it is a much more reliable alternative to the outdated mechanical power switch.

Bare PCB (drilled, plated-thru holes) - $10
Complete Kit (PCB, and all parts less radio switch) - $17
Assembled and Tested Unit (Including radio switch) - $25

- Next month's project: Onboard Glow Driver

- 8-bit Microcontroller based unit
- Control your glow plug based on throttle stick position
- EPROM memory saves your settings
- Easy, 1-button set up
- LED indicators of onboard glow plug state and programming conditions
- Under $35.00 kit form - $45.00 ready to install

-Ken Anderson
-Matt Aurand