In addition, there is an avionics power switch, (avionics master) that permits separation of all avionics from the primary bus, a valuable practice during engine start to reduce the risk of damaging avionics from possible, potentially harmful voltage fluctuations. Another useful piece of information is exactly what items are protected by each CB. If, for instance, the CB marked NAV LT trips, the problem could be rooted in a few possible areas: the navigation lights, the control-wheel map light, the electroluminescent panels, the low-vacuum warning light, the wiring to any of those items, or the CB itself. Experimentation will produce sufficient information quickly enough for you to make intelligent decisions.

First, turn off all the items under the control of that circuit breaker, then, after a two-minute cooling period, reset the CB by pushing it in. Wait for a minute or two and if it pops again, the problem is either in the wiring or the CB itself, both of which are beyond the pilot's in-flight capability to repair. If nothing happens, activate one of the systems and wait another minute or two. If still nothing happens, turn it off, activate a different system, and wait. Chances are pretty good that eventually you will activate the faulty system, which will cause the CB to trip a second time.

It is worth noting that a glitch in a system occasionally will cause a CB to trip, and upon troubleshooting the CB will not trip a second time—so much the better. This procedure should be followed whenever there's a trip of any CB that protects more than one piece of equipment. One item of information that is essential to making intelligent load shedding decisions, which is omitted from many schematics, is what constitutes essential equipment.

"Nonessential equipment," as it applies to the electrical system, refers to equipment that should be turned off in the event of alternator failure. CFIs, when discussing alternator failure, tend to say, "...and of course then you turn off all nonessential equipment." Unfortunately, many CFIs never actually get around to telling you how to determine what is nonessential.

Certainly, if you are flying along listening to stereo music and have a portable coffee maker plugged into the cigarette lighter outlet, there is some fairly obvious nonessential equipment being used. How about the situation where you are flying IFR at night and the closest airport with weather good enough for an approach is more than an hour away? The solution to the problem is to manipulate usage of the electrical equipment to assure you will not exceed the capability of the battery for the time you anticipate using it. That means you will have to begin thinking of each piece of equipment in terms of its necessity at any given moment, as well as how much amperage it will require to use it.

Take, for instance, a battery rated at 40 amps per hour. Theoretically, it will support a continuous system load of 40 amps for one hour. If you expect your flight to last one hour, you have 40 amps at your disposal during that hour. That implies you may use whatever equipment you want, provided you never exceed a total of 40 amps demand at any given time for one hour.

I wonder if Charles Darwin was thinking of batteries when he said, "There is no subject, however complex, that with patient and intelligent thought, will not become even more complex." Remember that this is purely theoretical; in reality things just don't work that neatly. For one thing, it presupposes the battery was fully charged and