

## ELECTRICAL SYSTEMS



## WHEN ELECTRICITY MISBEHAVES

**Directions:** Read each scenario below and answer the questions that follow using what you have learned about electrical systems.

1. You are flying at night, and have been in a prolonged idle power descent. The lights begin to dim every time you transmit on the radio. You then notice that a red light labelled “voltage” is illuminated. A glance at the ammeter shows a deflection towards the negative side of the gauge.

Which electrical part of your electrical system is most likely malfunctioning? Explain your reasoning.

*It is likely that alternator is no longer working correctly. If it was working the ammeter should show a positive charge, but since it is deflected to the negative side it is clear that the airplane is running on purely battery power. Under normal operation the alternator can power the electrical components in use and recharge the battery.*

*It is also possible that the low engine idle power setting is preventing the alternator from spinning quickly enough produce sufficient system power. The could be do the large amount of electrical equipment being used during a night flight combined with the normal occurrence of low voltage indications.*

What corrective actions would you take to solve the problem? Explain why you would take those actions.

*If the low engine power were suspected as the culprit, the pilot would increase engine power in order to spin the alternator more quickly to allow to create more power. If this did solve the low voltage situation, the pilot should follow the low voltage emergency procedure (powering everything down and resetting the alternator using the master switch) in attempt to restore electrical power. If this does not work, the pilot should minimize the electrical load on the system to preserve battery power. Flying at night without electrical power could turn into serious emergency so the pilot should as soon as possible.*

2. While on a flight over your local town, you and a passenger notice the smell of something burning. You scan the panel and the only thing out of the ordinary that you notice is the ammeter is pegged to the top of the positive side of the gauge.

Which electrical part of your electrical system is most likely malfunctioning? Explain your reasoning.

*It is likely that the alternator control unit (ACU) has stopped working and is allowing the alternator to run at maximum output. The burning smell could be electrical insulation melting as the circuits are becoming overloaded. The ACU normally meters the the alternator's output within safe levels and having no control could cause serious damage the electrical system or worse a fire in flight.*

What corrective actions would you take to solve the problem? Explain why you would take those actions.

*The pilot should take prompt action in preventing a potential fire by shutting the master which off and following the appropriate emergency checklist. Shutting off the master switch will cut power to the alternator and the ACU stopping the overcharge condition. They could also pull the alternator circuit breaker to ensure power is cut off the system. The pilot would then need to determine if they can make it successfully to an airport by shedding load and running on battery power, or if they will risk trying to reset the alternator in the event an extended flight would need to be made with operating electrical equipment.*



*Typically, a day flight in clear conditions would allow the pilot to fly safely without the need for electrical equipment. But if a the flight were in the clouds or at night, the pilot might have a more pressing need to keep some of the critical electrical equipment working.*

3. During a cross country flight, the circuit breaker for your second communications radio (COM2) keeps tripping or popping. During a postflight inspection, the aviation mechanic discovered that the power connector to the COM2 radio was loose. There was also some light scorching in the connector area.

Explain what you think was happening to make the circuit breaker trip during flight.

*It is likely that there is a short in the electrical system that is causing the circuit breaker to repeatedly pop. Circuit breakers are designed to trip when there is an unsafe overload on the system. It is likely that since scorching was found near the loose COM2 connector, it may have been sparking as vibrations from flying the airplane caused it to connect and disconnect during flight.*

PROPRIETARY