Stan/Eval Newsletter
CIVIL AIR PATROL
UNITED STATES AIR FORCE AUXILIARY
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Maxwell AFB, AL 36112

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Table of Contents

Maintaining CFI Currency (Maj Sam Samarasinghe MOWG)..... 2

Thoughts on Engine Monitoring (Capt D. Pinella KYWG) 2

Systems Safety (Maj M. Banner, FLWG)..... 4

Maintaining CFI Currency (Maj Sam Samarasinghe MOWG)
CFIs are required to meet the recent experience requirements as listed in 61.197 (https://www.ecfr.gov/current/title-14/section-61.197). Most of you may be meeting 61.197(b)(2)(iii) by participating in a Flight Instructor Refresher Course every 24 months.

As a CAP Instructor Pilot, you may be able to use the Wings program to meet 61.197(b)(2)(v) instead by satisfying the following:

- 61.197(b)(2)(v)(A) - Holds a flight instructor certificate and meets the appropriate flight instructor recent experience requirements of this part
- 61.197(b)(2)(v)(B) - Has satisfactorily completed at least one phase of an FAA-sponsored pilot proficiency program in the preceding 12 calendar months; - Your annual F5 counts as 5 of the 6 requirements to complete a Wings phase. Completing a Basic Knowledge 1 activity would get you a Wings phase. You should always be able to have a Wings phase within the preceding 12 calendar months.
- 61.197(b)(2)(v)(C) - Has conducted at least 15 flight activities recognized under the FAA-sponsored pilot proficiency program, during which the flight instructor evaluated at least 5 different pilots and has made the necessary endorsements in the logbooks of each pilot for each activity. - Any proficiency flights where you serve as an instructor pilot may have an applicable Wings activity, e.g.A100125-08 and A070405-07 would work for most of our proficiency profiles, there are more available. Every annual CAPF 5 that a check pilot conducts is a Wings activity.
  - https://www.ezwings.net/givecreditorganizationscivilairpatrol.html.

You can get credit for any flight activities that you have done over the past 12 months, if you haven't already. Having that credit within 12 months of the flight, it counts towards your recent experience end date requirement for 24 months.

Rather than attending a 16-hour course every 24 months, consider participating in the Wings program. It demonstrates that you are actively instructing, and it also encourages you to treat the recency experience requirement as an ongoing currency requirement rather than a 24-month requirement. You have a rolling 24-month period and if you meet the Wings requirement again before you hit 24 months since your last renewal, then you may go ahead and update your recent experience end date again. This gives you the opportunity to keep your CFI current without having to do anything extra.

You will need to provide a DPE or FAA ASI documentation of your Wings activities. You can get this report from FAASafety.gov - https://www.faasafety.gov/cfi/pub/cfiCreditsValidated.aspx. You can file an IACRA application for REED and select Wings.

Thoughts on Engine Monitoring (Capt. D. Pinella KYWG)
Over the years as a CFI, I've observed that pilots generally fall into one of three groups when it comes to monitoring engine instruments during taxi and flight:

1. Pilots who actively monitor engine parameters and verbalize what they are seeing.
2. Pilots who monitor engine parameters but do so silently.
3. Pilots who rarely or never monitor engine parameters.

The third category is obviously unacceptable. However, in the CAP environment, the second category also presents a problem. As a CFI or CAP Check Pilot, I can't determine whether you're actively monitoring the engine if I don't hear you verbalize it. If I don't hear the callouts, I must assume the monitoring isn't being performed.

One of the habits that separates proficient pilots from less disciplined pilots is continuously monitoring the health of the engine, not just by glancing at the gauges, but by actively interpreting what those indications mean. One of the best ways to reinforce this habit is to verbalize what you are seeing throughout the flight.

As CAP pilots, we should make it a habit to make callouts such as:

- "Oil pressure and oil temperature are in the green."
- "Cylinder head temperatures are stable."
- "Fuel flow is appropriate for our current power setting."
- "Electrical system is normal."
- "All engine indications are in the green."
- “Vacuum is in the green”
- Etc.

These brief callouts accomplish several things. They demonstrate to your passengers, instructor, or Check Pilot, that engine monitoring is an active, continuous process rather than an occasional glance at the display. They also help keep the pilot mentally engaged with the engine's condition, making it more likely that subtle changes or abnormal trends will be recognized before they become significant.

It is especially important to monitor trends rather than simply verify that everything remains "green." Rising CHTs, increasing oil temperature, unexpected fuel flow changes, or abnormal EGT indications may provide early warning of developing problems long before an operating limitation is exceeded.

Even when flying solo, consider verbalizing your engine scan from time to time. Speaking the observations aloud reinforces the discipline of evaluating each parameter instead of merely looking at the display.

We should practice disciplined engine management throughout every phase of flight. By consistently verbalizing engine indications, we demonstrate good cockpit discipline, improve situational awareness, and help develop pilots who are proactive rather than reactive. Utilizing this discipline will serve you well outside of CAP, such as the airlines if that is your goal, and not least, cadets will see and absorb your habits.

Fly safely!

Systems Safety (Maj M. Banner, FLWG)

"To stay alive . . . you had to learn systems, especially the emergency systems, ask questions of the engineers, study the damned pilot's handbook . . ." – From Yeager: Autobiography, by Gen Chuck Yeager, 1985

Knowledge of aircraft systems and emergency procedures is essential for appropriately controlling an aircraft under normal and abnormal flight conditions. In an emergency, a pilot must be able to maintain flight control, navigate to and land at the nearest airport if needed, communicate the situation to air traffic control (aviate, navigate and communicate) and resolve the system's malfunction. In my experience, (as a civilian flight instructor and Civil Air Patrol check pilot examiner / instructor pilot) the majority of pilots seem apathetic about learning aircraft systems as well as emergency procedures caused by malfunctioning systems. They couldn't be bothered by doing their homework by studying the *Pilot's Operating Handbook* (POH) for their aircraft and related information found within the *Pilot's Handbook of Aeronautical Knowledge* (FAA–H–8083–25C, chapter 7). This is a potential flight safety matter because a lack of systems knowledge limits a pilot's ability to diagnose and resolve in-flight systems malfunctions.

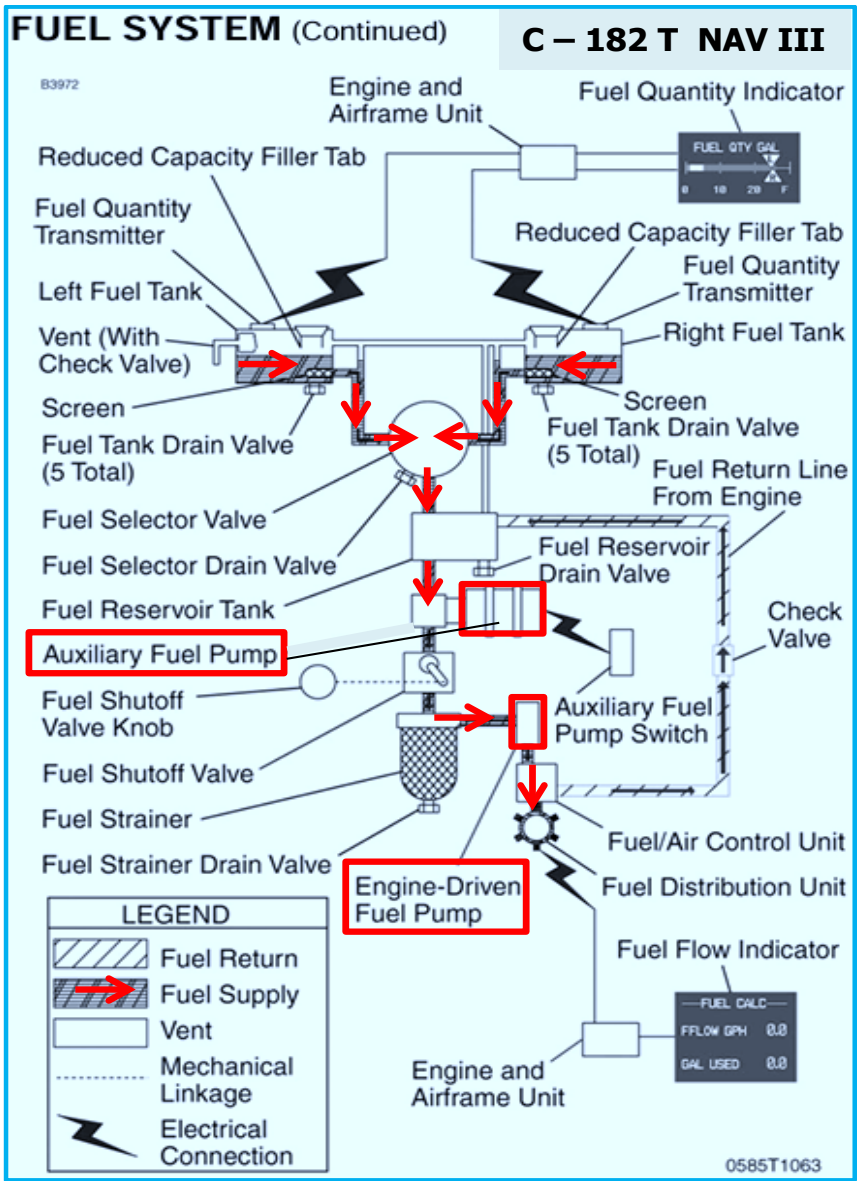
Pilots should at least have a basic operational understanding of major systems such as the *fuel and electrical systems* in Cessna 182T NAVIII and 172S NAVIII airplanes flown by CAP.

Fuel system

Learning the operation of an aircraft's fuel system is safety critical. A tragic and fatal example of not taking time to learn fuel system operation involved an Army Air Force World War II ace fighter pilot and Medal of Honor recipient Maj Richard Bong. Following takeoff in a Lockheed P-80 Shooting Star jet fighter in 1945 and at low altitude, his engine's main fuel pump failed causing the engine to flameout. Subsequently, the airplane crashed and Maj Bong was fatally injured. In his book, Gen Yeager contended Maj Bong had not sufficiently studied the jet's POH and, consequently, neglected to switch ON the engine's auxiliary or back-up fuel pump prior to takeoff which could have prevented the engine flameout and fatal crash.

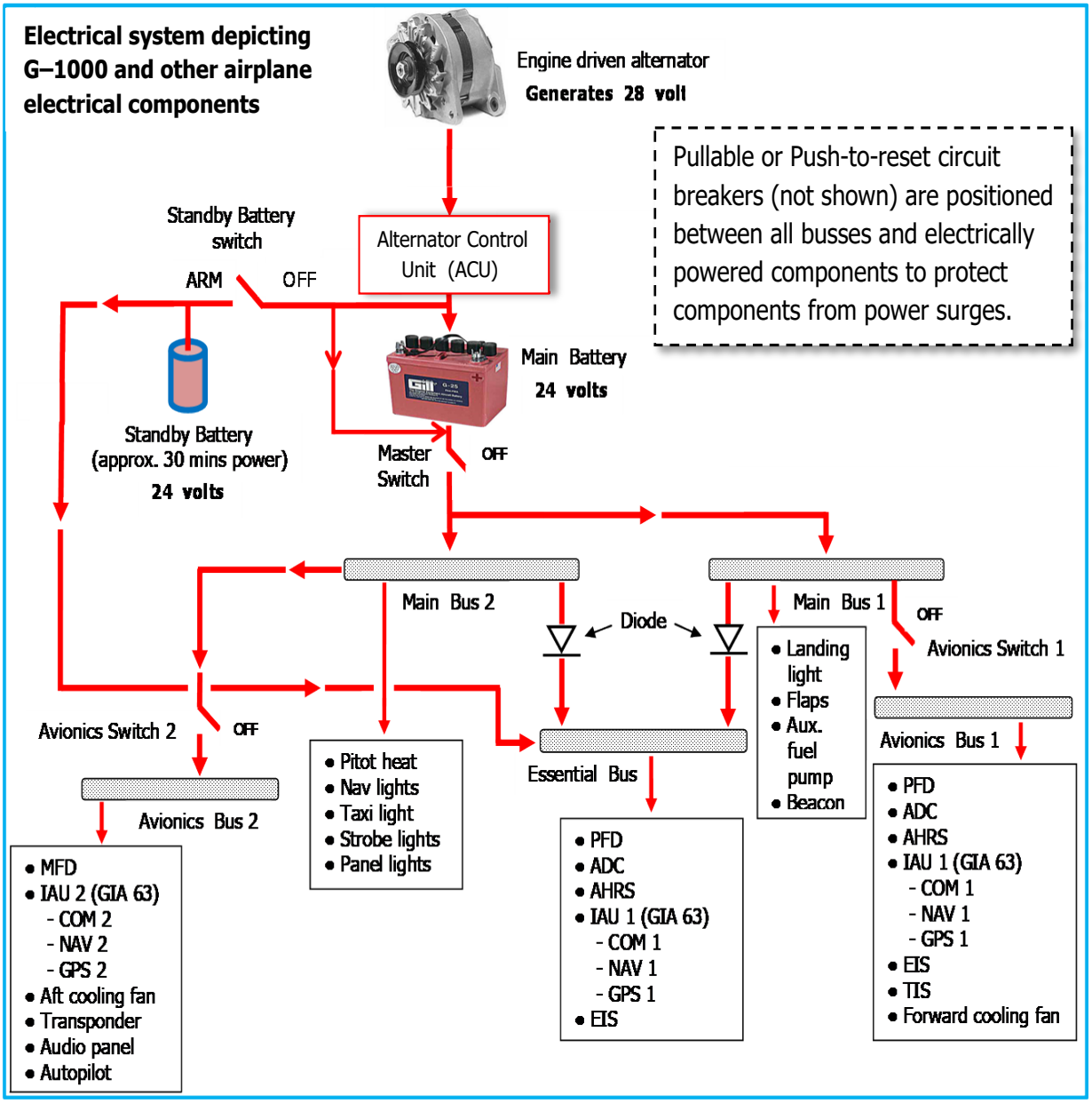
Regarding fuel systems in Cessna 182 T NAV III and 172 S NAV III airplanes, pilots need to understand the significance of the system's *two fuel pumps: an engine-driven fuel pump and an auxiliary fuel pump*. As shown on the fuel system diagram below, the engine-driven fuel pump and auxiliary fuel pump are arranged in-series. Independently, both pumps are capable of generating sufficient force to aspirate fuel from the wing fuel tanks and force it through the fuel/air control unit, fuel distribution unit, narrow fuel lines and fuel injector nozzles located in each of the engine's cylinders. The engine-driven fuel pump operates automatically by providing fuel flow to the engine while the auxiliary fuel pump needs to be switched "ON" by the pilot. The latter pump has three functions: *used for engine priming for starting; used in the event of in-flight failure of the engine-driven fuel pump and used for fuel vapor suppression* (see POH Cessna 182 T NAV III and 172 S NAV III). Employing the auxiliary fuel pump for priming prior to engine start is self-evident and documented on the engine-starting checklist. For in-flight engine failure, as stated in the airplane's POH Emergency Procedures section, the pilot should perform five steps immediately, one of the steps is: *"Fuel Pump Switch – ON"* (auxiliary fuel pump). This implies that the engine-driven fuel pump has failed. By switching ON the auxiliary fuel pump, fuel flow to the engine is restored to maintain engine operation. As an example, while flying a Cessna 172 S NAV

III with a flight student, there was a sudden loss of engine power, and the fuel flow indicator (see above figure) was reading nearly zero. Accordingly, the auxiliary fuel pump was switched ON, and we were able to land the airplane at a nearby airport. Subsequently, an A&P mechanic determined the engine-driven fuel pump had broken while in flight. By understanding fuel system operation and immediately switching ON the auxiliary fuel pump, engine power was restored, and we landed safely, averting an off-airport landing mishap.



Fuel vapor in a fuel injection system occurs when liquid fuel boils inside the narrow fuel lines turning into gas vapor. The trapped vapor can inhibit or block fuel flow within narrow fuel injector lines to the engine's cylinders. This can occur on hot days and when operating at high altitudes. Excessive fuel vapor accumulation is associated with fuel indicator fluctuations greater than one gallon per hour as displayed on the Engine Indicator System (EIS) on the left side of the MFD. This can lead to engine power surges and possible loss of engine power. To clear the fuel system of vapor and stabilize fuel flow, the auxiliary fuel pump should be switched ON.

Electrical system



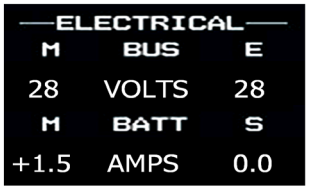
Diode: Directs electrical current in one direction only; PFD: primary flight display; MFD: multi-function display; AHRS: attitude heading and reference system; ADC: air data computer; IAU: integrated avionics unit (computer); EIS: Engine indicating system (displayed on PFD / MFD); TIS: traffic information service

Pertaining to a failed alternator, if the pilot notices the alternator field circuit breaker is open (popped), what should be done? Answer: To restore alternator operation, push in the circuit breaker to reset it. If the circuit breaker opens again, *do not push it a second time*. (This applies to resetting all circuit breakers.) Alternator operation may also be restored by cycling the master switch OFF and then back ON.

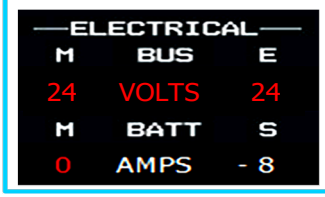
The above figure is an easy-to-understand version of the complex electrical system in Cessna 182 T NAV III and 172 S NAV III airplanes. It depicts the system's components and operational concepts. For more detailed analysis of the electrical system, see the POH for both airplanes. Cessna 182 T NAV III and 172 S NAV III airplanes are equipped with a 28-volt, direct current (DC) electrical system. An engine belt-driven alternator capable of generating up to 95 amperes powers the system. ("Volt" is a measurement for electrical potential in a system; an "Ampere" or "Amp" is a unit of electrical current flow in a system.) Additionally, a 24-volt main battery and a 24-volt standby battery are included in the system. Electrical power is supplied to two primary buses named Main Bus 1 and Main Bus 2, as well as to buses providing power to G-1000 system components, i.e., Avionics Bus 1, Avionics Bus 2 and the Essential Bus. (see electrical system figure) (A "bus" is a power distribution point from which the alternator or battery power is connected to circuit breakers and then to electrical system components.)

Engine Indicating System (EIS) found on left side of Multi-Function Display (MFD), below is the electrical power section positioned on the bottom of the EIS.

Normal operation



Abnormal operation

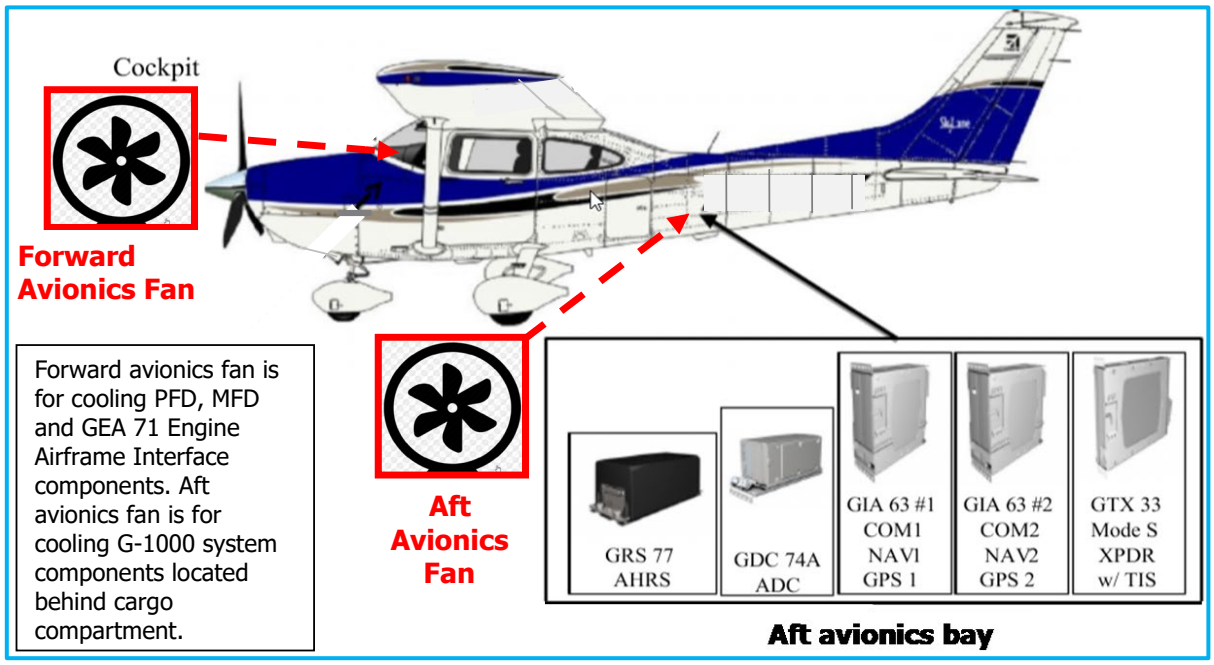


Voltage to the Main (M) and Essential (E) busses and Ampere charging or discharging to the main (M) and standby (S) batteries are shown.

Why is it important to know the voltage outputs of the alternator and the two batteries? For example, if 24 volts shows on the EIS for the Main Bus (M) and Essential Bus (E), what does that mean and does the pilot need to be concerned? (see figure on bottom right) When the voltage for either the M or E buses is below 24.5 volts, the numeric value and volts text turns red. This warning indication, along with the LOW VOLTS annunciation, indicates the alternator is not operating. Normally, the alternator produces 28 volts, as shown under *Normal operation* on the right. Accordingly, to determine alternator malfunction, the pilot needs to know the voltage outputs of the alternator and batteries. Also, note during normal alternator operation the main battery (M) is receiving/charging 1.5 Amps from the alternator while the standby battery (S) indicates 0 Amps, implying it is charged. For the abnormal situation, note 0 Amps under the main battery and minus 8 Amps under the standby battery. This means the main battery is not providing sufficient electrical power, and the standby battery only is discharging by providing 8 Amps to power the electrical system (see airplane's POH, Emergency Procedures section).

It is also important to understand the functions of the Essential Bus and two diodes. In the event of alternator failure, the main battery supplies electrical power to the M and E buses until the M bus volts decrease from 24 to less than 20 volts. When this occurs, the *previously armed standby battery, as done prior to engine start, automatically comes on-line to supply power to the Essential*

Bus only for approximately 30 minutes. This bus provides power to five vital G-1000 system components considered to be essential for flight to the nearest airport, i.e., PFD, ADC, AHRS, IAU 1 and EIS. IAU 1 contains one COM radio, one NAV radio, and one GPS receiver (see electrical system figure). To conserve standby battery electrical power, *two diodes prevent electrical power from energizing Main Bus 1 and 2 and Avionics Bus 1 and 2*. Components powered by these buses are deemed non-essential for flight when the standby battery only provides electrical power. If components other than those powered by the Essential Bus are activated, this could signify failure of one or both diodes.



The preceding electrical system diagram shows the forword avionics cooling fan and aft avionics cooling fan powered by Avionics Bus 1 and Avionics Bus 2 respectively. These fans are essential for maintaining proper operating temperatures and preventing overheating of vital Garmin G-1000 system components (see above figure). For example, failure of the aft avionics cooling fan predisposes to overheating the AHRS resulting in opening its circuit breaker, which, in turn, results in losses of attitude and heading indicator displays, as well as rate of turn and slip-skid indicators on the G-1000 PFD. Accordingly, it is critical to verify the operation of these cooling fans prior to engine start. As stated in the POH and on the pre-flight checklist, Avionics Switch 1 (Bus 1) is to be turned on (left side of the white rocker switch) and the pilot is to listen for the operation of the *forward* avionics fan. Similarly, Avionics Switch 2 (Bus 2) is to be turned on (right side of the white rocker switch) and the pilot is to listen for the operation of the *aft* avionics fan. As stated in the Kinds of Operations Equipment List (KOEL) in the POH of the aforementioned airplanes, failure of one or both fans means the airplane is not airworthy and cannot be flown.

Learning aircraft systems
Not understanding a POH for the pilot's aircraft and regularly studying the operation of its systems is a big mistake. Pilots need to learn systems operations to safely manage in-flight systems malfunctions! Failure to learn invites catastrophe.

Articles for the National Stan Eval Newsletter
These articles have been written to present ideas, techniques, and concepts of interest to CAP aircrews rather than provide any direction. The articles in this newsletter should in no way be considered CAP policy. We are always looking for brief articles of interest to CAP aircrews to include in this newsletter. CAP has many very experienced pilots and aircrew who have useful techniques, experiences, and tips to share.

Please send your contribution to stephen.hertz@vawg.cap.gov

You can view past issues here.