



**Stan/Eval Newsletter
CIVIL AIR PATROL
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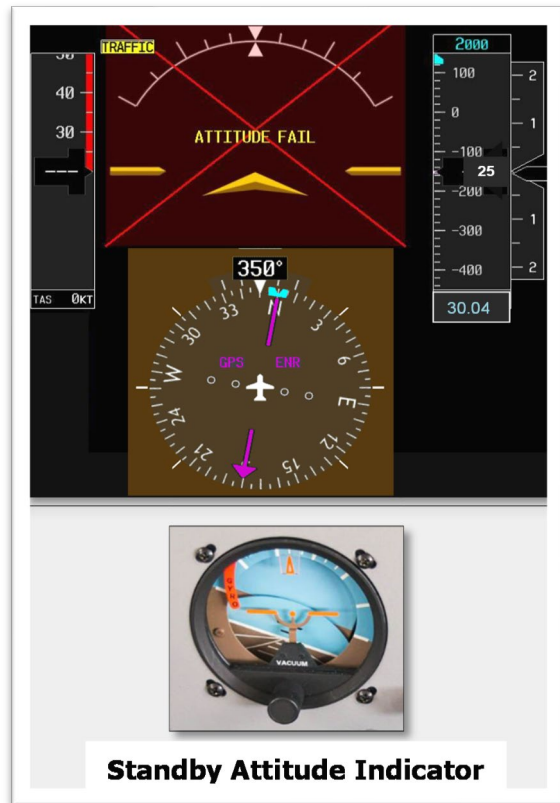
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Determining Airworthiness Using the KOEL (Maj M. Banner, FLWG)

Following engine start in a Cessna 182T, during day Visual Flight Rules (VFR) conditions, you find that all flight instruments on the primary flight display (PFD) are operational except the attitude indicator display field is covered with a red X signifying its failure. To make matters worse, the round-dial standby attitude indicator is also inoperative indicated by a red gyro flag on its left side (see figure). Is the airplane airworthy for a VFR day or night flight? Is it airworthy for flying under Instrument Flight Rules (IFR) day or night? How can a pilot in command (PIC) determine the answers to these significant equipment questions? The Kinds of Operation Equipment List (KOEL), a list of equipment that must be operational for aircraft airworthiness, provides the answers to these and similar questions. The KOEL is not the same as a Minimum Equipment List (MEL) – a list of instruments, equipment and procedures that allows an aircraft to be operated under specific conditions with inoperative equipment. Nor does a KOEL supersede or replace Federal Aviation Regulation (FAR) Part 91 which specifies the minimum equipment required for flight. Rather, a KOEL adds the manufacturer's requirements for additional equipment beyond what FAR Part 91 requires. For example, although 91.205 does not require a G1000 manual in the aircraft, the KOEL for the C182T NAVIII does.



In the author's experience as a CAP check pilot examiner and civilian flight instructor, many seem unaware of the KOEL concept, don't understand the KOEL's operational significance, don't know what it specifies, don't know where the KOEL is located, and don't understand how to use it. This is in part because many older aircraft that we trained in don't have a KOEL. For older aircraft you must rely on FAR Part 91 and the aircraft equipment list to determine what is required. FAA Advisory Circular 91-67 states a KOEL specifies the required equipment for aircraft airworthiness for the four flight conditions: VFR day, VFR night, IFR day and IFR night. FAR 91.7 states: "No person may operate a civil aircraft unless it is in an airworthy condition . . . pilot in command . . . is responsible for determining whether that aircraft is in a condition for safe flight." Further, this regulation designates that the PIC shall discontinue the flight when unairworthy mechanical, electrical, or structural conditions occur.

Typically, the KOEL is found in an airplane's pilot operating handbook (POH) / Information Manual - Limitations. For example, for Cessna 172S NAVIII (G1000) and Cessna 182T NAV III (G1000) airplanes, see Section 2, Operating Limitations in the POH. Airman Certification

Standards (ACS) for the Private and Commercial Pilot certificates state that pilots should be knowledgeable of the KOEL for aircraft airworthiness reasons (see Airworthiness Requirements sections in ACS). Although not included as part of a manufacturer’s checklist for flight operations, the KOEL should be considered an additional “checklist” for determining airworthiness prior to flight in addition to FAR Part 91, the aircraft equipment list, AD’s, and any other limitations in the POH.

Garmin G1000 equipped airplanes usually incorporate four back-up or standby flight instruments: standby attitude indicator, standby airspeed indicator, standby altimeter and the magnetic compass. A frequently asked question is what flight instruments are required for VFR and IFR day and night conditions? To address this question, one of the pages of the KOEL (for a Cessna 182T NAVIII with the GFC 700 automatic flight control system (AFCS) or autopilot) is reproduced on the right. A red dashed-line box is drawn around the “KINDS OF OPERATIONS”

CESSNA MODEL 182T NAV III GFC 700 AFCS		SECTION 2 OPERATING LIMITATIONS			
KINDS OF OPERATIONS EQUIPMENT LIST (Continued)					
System, Instrument, Equipment and/or Function	KIND OF OPERATION				COMMENTS
	VFR DAY	VFR NIGHT	IFR DAY	IFR NIGHT	
NAVIGATION AND PITOT-STATIC SYSTEM					
1 - G1000 Airspeed Indicator	1	1	1	1	
2 - Standby Airspeed Indicator	0	0	1	1	
3 - G1000 Altimeter	1	1	1	1	
4 - Standby Altimeter	0	0	1	1	
5 - G1000 Vertical Speed Indicator	0	0	0	0	
6 - G1000 Attitude Indicator	0	0	1	1	
7 - Standby Attitude Indicator	0	0	1	1	
8 - G1000 Directional Indicator (HSI)	0	0	1	1	
9 - G1000 Turn Coordinator	0	0	1	1	
10 - Non-stabilized Magnetic Compass	1	1	1	1	
11 - VHF Navigation Radio (VOR/LOC/GS)	0	0	A/R	A/R	As Required Per Procedure.
12 - GPS Receiver/Navigator	0	0	A/R	A/R	As Required Per Procedure.
13 - Marker Beacon Receiver	0	0	A/R	A/R	As Required Per Procedure.
14 - Blind Altitude Encoder	A/R	A/R	1	1	As Required Per Regulations.
15 - Clock	0	0	1	1	
16 - GFC 700 AFCS	0	0	0	0	

section which indicates the four aforementioned flight conditions. Listed below this section are specific instruments/systems and four columns corresponding to the four flight conditions. To the right of each instrument/system is either a “1”, meaning the instrument/system is required, or a “0”, meaning the instrument/system is not required for airworthiness for a particular kind of flight operation (in some KOEL’s there can be a number other than 1 to indicate the number required for airworthiness).

All four back-up instruments (underlined) are required to be operational for IFR day and night conditions, while the magnetic compass is required to be operational for all flight conditions. The standby attitude indicator (powered by a vacuum pump system), standby airspeed indicator and standby altimeter are not required to be operational for VFR day and night flights. FAR 91.205 states an attitude indicator is required for IFR day and night flight. It does not specify two attitude indicators are required. Accordingly, many pilots have asked me why two attitude indicators are required to fly a Cessna 172S NAVIII and C182T NAV III during IFR day and night conditions? Answer: The manufacturer's KOEL for both aircraft states two attitude indicators (standby attitude indicator and PFD attitude indicator) are required for airworthiness for IFR day and night flight. The PIC is obliged to follow the manufacturer's operational guidelines in addition to FAR Part 91.205. Regarding the attitude indicator on the PFD, although it is not required for VFR day or night conditions, some (including the author) prefer having an operational attitude indicator on the PFD during VFR night conditions.

The airspeed indicator (item 1), the altimeter (item 3), vertical speed indicator and outside air temperature display are powered by the G1000's Air Data Computer (ADC). Failure of the ADC results in partial loss of G1000 functionality causing red X's to be displayed over the airspeed indicator and altimeter tapes. Consequently, the airplane would not be considered airworthy for night sorties, even though all standby flight instruments are operational. Note that the GFC 700 AFCS (autopilot, item 16) is not required to be operational for any operation.

Many newer airplanes have a KOEL within the limitations section of the POH. Some examples are the Cessna 172S NAVIII, Cessna 182T NAV III, Cirrus SR20 and Cirrus SR22. Other older airplanes do not have a KOEL at all. Examples are the Cessna 172P, Cessna 182P, Q and R models and the Cessna U206G. As stated in the POH's for many of these airplanes: "FAR Part 91 establishes the minimum required instrumentation and equipment . . ." for airworthiness for the above four flight conditions. For airplanes without a KOEL, the PIC must abide by equipment requirements as stated in the following FARs: 91.205 (instruments required for VFR and IFR day and night flight); 91.207 (ELT operational requirements); 91.215 (airspace transponder requirements), 91.225 (ADS – B operations), any AD's, and the manufacturer's equipment list.

If during the preflight inspection a required piece of equipment for the intended operation (as stated in the KOEL) is found to be inoperative, then the sortie must be cancelled. For example, if the navigation lights are inoperative, your night sortie must be cancelled (or find another aircraft!). The aircraft is still airworthy but not for night flight per the KOEL. If the inoperative equipment is required for all types of operation (example: the magnetic compass), the airplane must be grounded. For example, a VFR day flight is planned in a Cessna 172S NAVIII airplane. If the strobe light system was found to be inoperative during the preflight inspection, then the airplane must be grounded per the KOEL. Similarly, if the Garmin G1000 Cockpit Reference Guide is not in the airplane or not accessible to the pilot, or the Forward or Aft avionics cooling fans are inoperative, then the airplane is not airworthy and must be grounded per the KOEL. For another example, suppose for the same type airplane an inoperative landing light was found during the preflight inspection. A takeoff in VFR night conditions is planned. Because the KOEL states a landing light is required for night conditions, the airplane would not be airworthy for the night sortie. The KOEL for this airplane specifies a landing light is not required for day conditions.

The KOEL does allow flights under certain conditions to be conducted with inoperative equipment depending on the type of operation and the failed equipment. However, in the case of failed equipment where flight is still permitted, we must be sure to adhere to FAR Part 91.213. This paragraph specifies how to handle inoperative equipment that is not required for airworthiness. To use a previous example, consider the navigation lights are inoperative. The aircraft is still airworthy for day flight. However, they must be deactivated and placarded as inoperative before flight.

Specifically, for aircraft without an MEL (all CAP aircraft), 91.213(d) requires that the equipment must not be required by 91.205, an equipment list, an AD, or a KOEL. It must be either: removed, placarded, and the maintenance log updated; or it must be deactivated and placarded. Finally, the PIC must make a determination the inoperative equipment is not a hazard (e.g., the pilot must be comfortable operating without it).

Be smart and safe by abiding by the KOEL prior to flight to ensure aircraft airworthiness requirements for VFR and IFR day and night sorties.

How to Conduct a CAP MX Flight – A9/B9/C9 (Lt Col M. Duc, CAWG)

You just received your Form 5 as a new CAP pilot, and you passed with flying colors. You have also completed the SQTR for Transport Mission Pilot (TMP) and have been approved. Your Check Pilot explains as a TMP you will be able to fly personnel and equipment in support of Air Force Missions and those missions are normally Air Force Funded. You think, great, I can maintain flying currency at Air Force expense, what a deal. Days later you are requested to deliver a CAP plane to maintenance (MX) and pick up another plane to be brought home. You suddenly begin to wonder what this mission involves because it was not covered in your initial training, and you didn't really question your Check pilot.

Does this sound familiar? It happened to me. I am sure I am not the only CAP pilot out there with the same questions. The checkout program for most CAP pilots focuses mainly on getting qualified to fly the plane and pass a check ride. In that regard, we normally do a good job, however, preparing a pilot for something as important as a Maintenance Flight is another thing. Ask yourself how familiar you are with 14 CFR 91.407 - Operation after maintenance, preventive maintenance, rebuilding, or alteration. How about CAPR 130-2? Many CAP pilots, unless they are owners, are not familiar with this section of 14 CFR. If you are doing any MX flights, you should read this portion of the CFR carefully and review CAPR 130-2. Your license could depend on it.

Here are some thoughts on how to conduct a successful A9 mission. This is my technique and not a CAP standard because I don't believe you will find any CAP procedures. A lot of this you may already know but if not, here is what I have learned:

1. Schedule your mission in WMIRS; normally an A9 but it could also be a B9, or C9. Allow plenty of time for the mission. If you think the oil change will take 1 hour...think again.

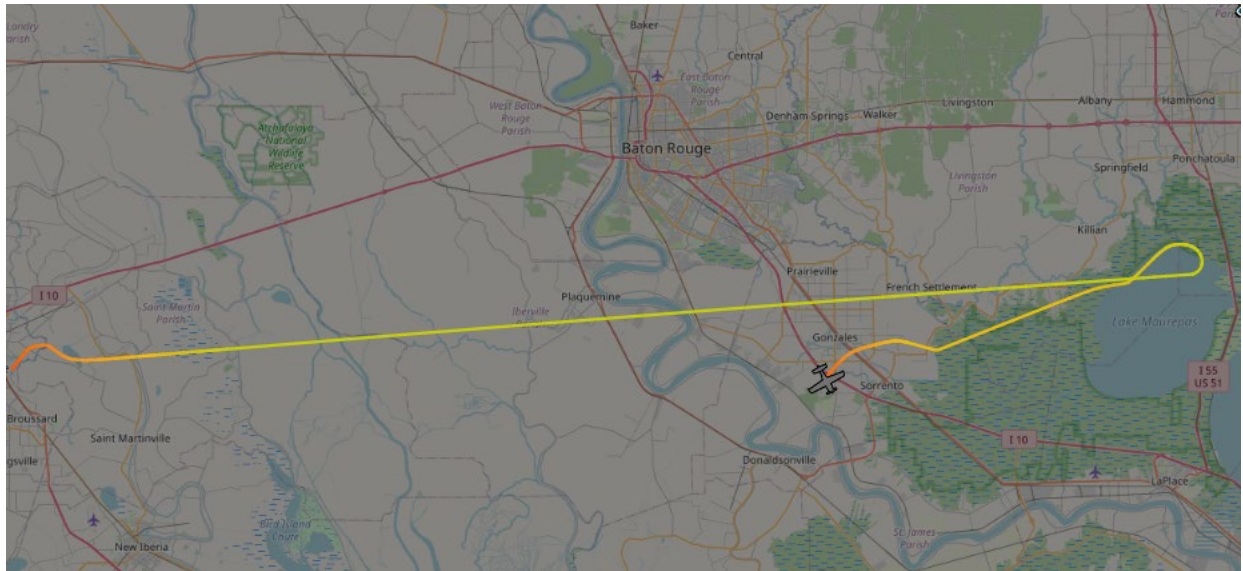
Many of our pilots are also in a hurry and forget the big items (AROW) that could lead to an FAA violation!!

2. Schedule 3 missions: one for delivery, one for a test flight (optional) of the aircraft you are picking up, and one for the return home. Why 3 missions? Did you read 91.407 above!!
3. If the MX facility is more than 50 miles away...plan a XC based on your qualifications (VFR/IFR)
4. Find out who the MX officer is for your mission, not your local FRO, usually the wing MX officer.
5. Call the MX facility the day before and before departing be sure the plane is ready or will be ready for your planned arrival time. If you are being picked up by another crew, get the phone number of the PIC.
6. On the day of your mission
 - a. Make sure all the documents are on board and do a thorough AROW check.
 - b. In addition to the AROW check, make sure all MX logbooks are on board.
 - i. Prop Log
 - ii. Engine Log
 - iii. Aircraft Log
7. Get your release from the wing MX FRO before departure.
8. After successfully delivering the plane to MX, close out WMIRS and notify your FRO. If the plane is staying for an extended period, let the aircraft custodian know so the aircraft status is changed to Non-Mission Ready (NMC) status. This is recorded in WMIRS.
9. If you are picking up an aircraft, be sure to do a complete AROW check and verify all the MX logbooks are on board (see 6 above). I use my phone camera to record all MX logbook endorsements. If you have time, you could also update the AIF (pencil in changes) but that is not an FAA requirement.
10. Remember 91.407.
11. Call your FRO when you are ready for the test flight. Remember it is another sortie and must be released as any other flight.
12. Some MX issues require a test flight. However, you have the right as PIC to do a test flight for any MX done to the aircraft. After the test flight, simply follow the guidance in 14 CFR 91.407 and make a logbook endorsement in the airplane logbook. After you have determined the aircraft is airworthy (your responsibility, not the MX shop), you and any authorized passengers can fly the plane back. Remember there are CAP (not FAA) restrictions on carrying cadets after certain MX functions. Be sure you follow CAPR130-2 guidance. Your Squadron OPS MX officer should also be aware of these restrictions.
13. After you get home, close out your flight as you normally do and include the successful mission in WMIRS.

These are my thoughts on A9 missions, feel free to add, delete or ignore anything you think is not important, but whatever you do.... slow down and do it right!

End of a Cirrus (LtCol P. Kerr LAWG)

A pilot departed Lafayette Regional Airport, LA (LFT/KLFT) on a cross country flight in a Cirrus SR22. As some point the aircraft developed engine problems in the New Orleans Class B airspace. He decided to turn around and head for Louisiana Regional (KREG) where a Cirrus Service Center exists. New Orleans told him to descend twice as he headed for KREG. He ended up at 700' AGL, unable, in his judgement, to make the field. He decided to shut down his struggling engine and deploy the parachute. The aircraft landed in a small pond, and he literally walked to shore on the dry wing (I thought only I had such bad luck!). The pilot was uninjured, and the plane received very little impact damage—unfortunately it ended up in the water and I am told, has been declared a total loss due to water damage.



So here is my simple point in all of this: An emergency exists whenever the safe outcome of a flight is in doubt—your doubt as PIC is all that matters! It does not matter what anyone else thinks. If you, as pilot in command, are concerned about completing a flight safely, I suggest that it is your obligation to declare an emergency. I have to think, had this pilot declared and told New Orleans he was unable to descend until a safe landing was assured, he could have stayed at altitude until landing was assured and he might have landed safely and without further damage at KREG (his engine is toast—the block split). I am not second guessing him—I am simply asking you to think about complying with ATC instructions versus declaring an emergency. ATC will provide priority handling to you if they know you are concerned about the airworthiness of your aircraft, but only if you tell them. No equivocating is necessary: “I am declaring an emergency” is all you need to say. Yes, they will start asking questions but whether and when to answer is up to you. Aviate-Navigate-Communicate is, and always will be, the priority! From the moment you declare you can violate whatever regulations, including ATC instructions, you need to while you deal with your emergency. Hard stop. Period.

Let me tattle on myself: I am a wimp! If the aircraft I am flying becomes un-airworthy and there is any doubt in my mind I can safely land, I DECLARE AN EMERGENCY. Yes, I know my declaration might inconvenience others—Not Sorry. I have been flying for decades and have

declared an emergency only a handful of times, most recently when my gear failed to retract properly in September. The gear pump kept running and I had a Gear Unsafe light. I selected gear down and got three greens, but the red gear unsafe light remained illuminated. Was I pretty sure my landing would be uneventful: absolutely. Was there any thought in my mind the gear might fail on landing? Let me say it this way: I asked my wife to move to an aft facing seat just in case we had a rapid deceleration on landing—yes, I doubted ever so slightly my landing would be uneventful. I keyed the mike and eliminated one big stressor on me: I declared an emergency and stopped wondering whether I should!

Was I “harassed” upon landing? Given a “number to call?” Required to file a report? No, no, no! I was followed to the ramp by a parade of trucks and asked a few questions by the airport police on the FBO ramp. My only regret about the whole experience was that I didn’t ask the police officer to give me a few minutes to walk over and personally thank the men and women in the crash-fire-rescue trucks!

Back to when to declare an emergency: quoting Barry Schiff: “An emergency exists whenever the safe outcome of a flight is in doubt. It is when our mouths become dry, adrenaline flows, and a knot forms in the pit of our stomach. It is when we should not hesitate to do whatever is necessary to resolve the problem.” So, if ever you doubt the outcome of a flight, please activate the PTT switch and repeat after me: “I am declaring an emergency.”

Technically Advanced Aircraft (TAA) and Complex Aircraft

Long, long ago, in the mists of time, the FAA determined that you needed 10 hours of training in complex aircraft to get a commercial rating. So, in the march to the commercial ticket you had to fly with a CFI until they were convinced you could fly a complex aircraft without killing yourself, your passengers or damaging the aircraft. The FAA definition of a complex aircraft was any aircraft with flaps, a constant speed propeller and retractable gear (see FAR Part 61.1). This made sense as most people would have to operate such an aircraft in commercial operations. However, after the dinosaurs died out, glass panels became prevalent in commercial operations. So, it was important that commercial applicants could also fly glass aircraft. So, the FAA defined a TAA as an aircraft with a PFD, MFD with moving GPS map, and a coupled autopilot (see FAR Part 61.129 paragraph j). Given the importance of TAA’s, the FAA changed the requirements for commercial applicants from 10 hours of complex training time to ten hours of training in a complex aircraft and/or a TAA (so you could do 5 hours in a complex and 5 hours in a TAA or 10 hours in either one) (see FAR 61.129 (a)(3)(ii)).

All that is great and a real step forward, but here in CAP we can confuse the two. In eServices, the complex qualification is just that. You can’t claim the complex qualification based on TAA time. When you do a Form 5 in one of our Cessna straight legged G1000 aircraft which are TAA, you cannot claim the complex qualification in eServices. To obtain or renew the complex qualification, you must do a Form 5 or abbreviated Form 5 in a complex aircraft.

Profile 7, 11, & 12 Proficiency

Staying proficient is a key part of our safety culture in Civil Air Patrol. Not only does it contribute positively to our safety statistics, but it also ensures that we are mission ready and capable. Especially for Mission Pilots, to be current, but not proficient, lessens our ability to effectively carry out missions. The same can be said for Transport Mission Pilots and Cadet Orientation Pilots. Nationally, we are well on our way to completing the proficiency initiative from General Phelka. But as we all know, proficiency is not a one-shot deal but a continuous effort.

Profile 7 provides an excellent guide to staying proficient for both VFR and IFR pilots. Not only does it require the successful accomplishment of basic maneuvers and procedures in an aircraft, but it includes ground training. This emphasizes the importance of both ground and air work to maintain proficiency. We may have already completed our Profile 7, but we can use the guidance contained in that profile to maintain proficiency in all our flying. Participation in the Wings program helps us do both ground and air-work to maintain proficiency.

Maintaining proficiency is a key objective of our safety culture. We should also be working on increasing our proficiency by expanding our training. VFR pilots might consider working on an instrument rating. Private pilots should consider adding a commercial rating. Commercial pilots should consider an ATP. There are lots of ratings and add-on's out there which in themselves may not be that important to you, but the training that's involved can make you a better pilot. Let's all be ready for the next big mission.

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@vawq.cap.gov. You can view past issues [here](#).