CIVIL AIR PATROL
U.S. AIR FORCE AUXILIARY

Texas Wing

Cessna 172S Introduction

CAP TXWG Cessna 172S Introduction
OPR: DOV. V1 Aug. 2024

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This document is reference material only. Aircraft POH, 14 CFR & CAP Regulations take precedence.
Special thanks to CAP California Wing.

1. Introduction

1.1. This pamphlet will focus on post-2015 model year Cessna 172Ss in Civil Air Patrol. The vast majority of Cessna 172Ss have G1000 but there are some non-G1000 172Ss. The non-G1000 are usually between the model years 1999-2001 in CAP. CAP does have many older 172 models in the N, P, and R series as.

1.2. For context, CAP did not purchase any 172s between 2002-2015. This will be relevant later for checklist design and procedures. A Form 5 Evaluation in any 172S G1000 will count for all 172s round-dial or G1000. As PIC, it is still your responsibility to understand each type you are flying and understand the individual serial number specific pilot's operating handbook.

1.3. Even between 2015 to present, the evolution of the 172 continues and there are differences you need to be aware of.

1.4. This guide will not cover mandatory G1000 topics or 172 specifics that your instructor needs to cover. That is for separate teachings, but this guide covers many of the missed items by many pilots transitioning.

1.5. As the most produced aircraft in history, the overwhelming majority of pilots have probably flown a Cessna 172 before. This guide will cover common things unique to CAP or features available only on newer production model 172s.

2. Generations

2.1. Because there are so many versions of G1000 172s in CAP, it's important that you understand the type you are going to fly the most. Given the reality that you might have to fly a non-local aircraft occasionally, you should understand the basics of the others and know what resources to check before flying. If you know the model year ahead of time, at least you'll have an idea of what to expect.

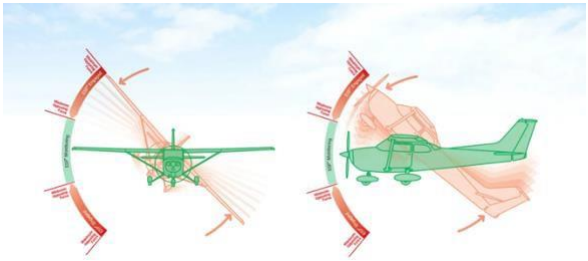
2.2 Due to the cycle of aircraft procurement, none of the CAP owned Cessna 172s with G1000 have the KAP140 Autopilot. However, many of CAP's older round-dial 172Ss from 1999-2001 have a single-axis KAP140.

2.3. C172Ss from model years 2015-2017 will have the original G1000 with GFC700 autopilot. For IFR, it will likely have newer style software for Vectors to Final. Most have WAAS. Some have pilot input Holding Patterns.

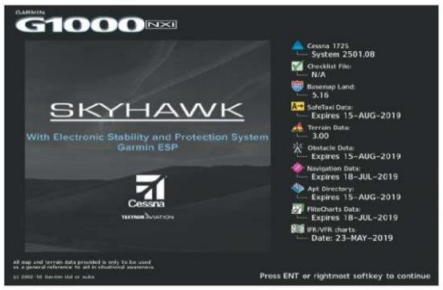
2.4. C172Ss from 2016 and newer have the Safe Flight Angle of Attack Indicator installed. This is now standard equipment for 172s. More on this device later.

2.5. In 2017, Garmin introduced the G1000 NXi. It is mostly the same but features dual core processors versus the older single core. There are subtle but significant improvements. The GFC700 is still the autopilot in use from 2007 to present (as of 2024).

2.6. In 2019, Garmin added the feature called Electronic Stability Protection or ESP. An important distinction is that there are G1000 NXi without ESP and G1000 NXi with ESP. ESP and NXi are not interchangeable terms. All new G1000 aircraft after 2019 will have ESP.



2.7. In 2022, Cessna removed the Vacuum system and traditional standby instruments. Instead, a Garmin GI 275 is installed. All new aircraft after 2022 will have this feature. There are quite a few differences between each generation of G1000 and we'll cover them as much as possible. But you must still refer to individual POHs and STCs. Speaking generally, CAP does not purchase significant upgrade packages on the G1000 aircraft to bring them all up to the newest features. You should have familiarity with all you might encounter.



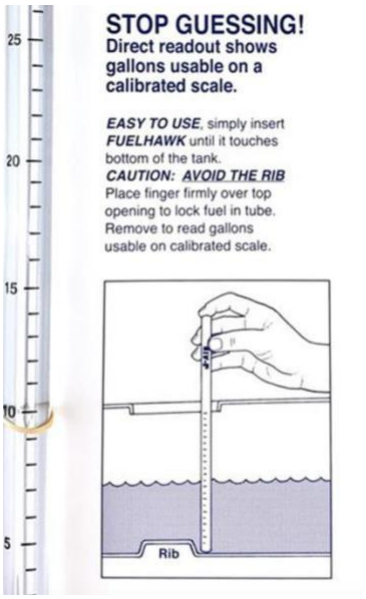
With ESP (reference)

Without ESP (reference)

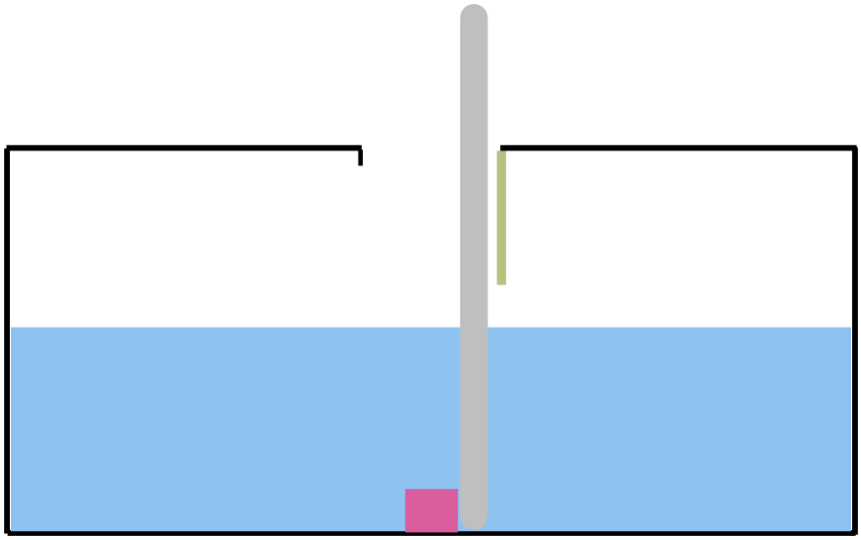
3. Fuel Onboard

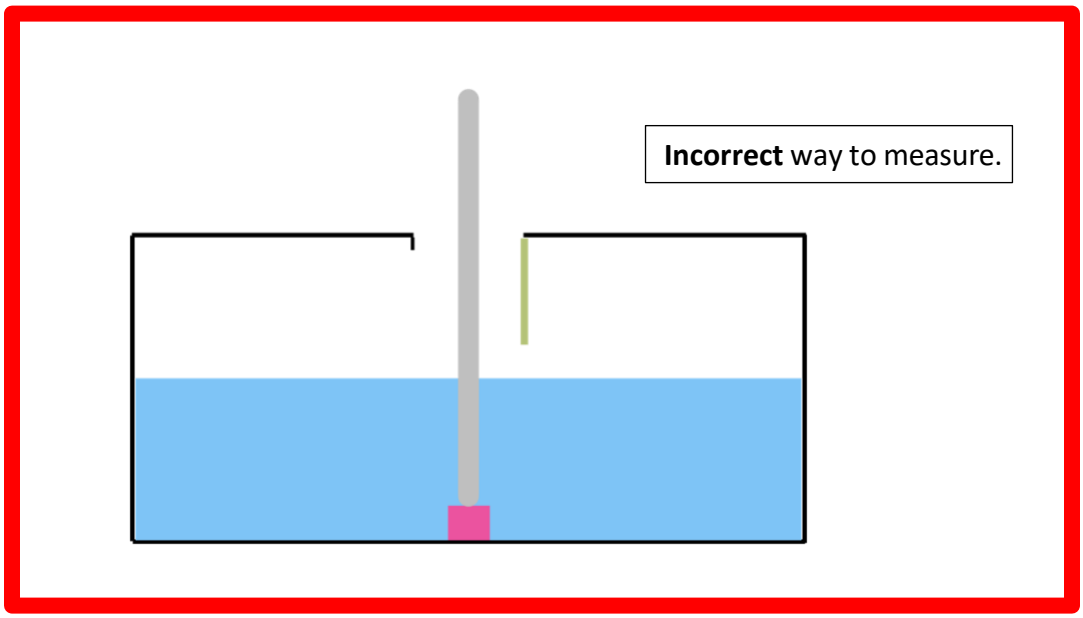
3.1. Determining the actual amount of Fuel onboard can be done in one of several ways. Some will work better than others.

3.2. If the Fuel in either tank is less than Topped Off or Full, we need a way to measure. One method is to use a commercially available fuel measuring stick or known as dip stick. On the 172S, there is a structural rib below the opening of the fuel tank. If you place it on top of the rib, you will get a much lower fuel amount measured. Please place the stick behind the rib to get to the true bottom of the tank.



Correct way to measure.

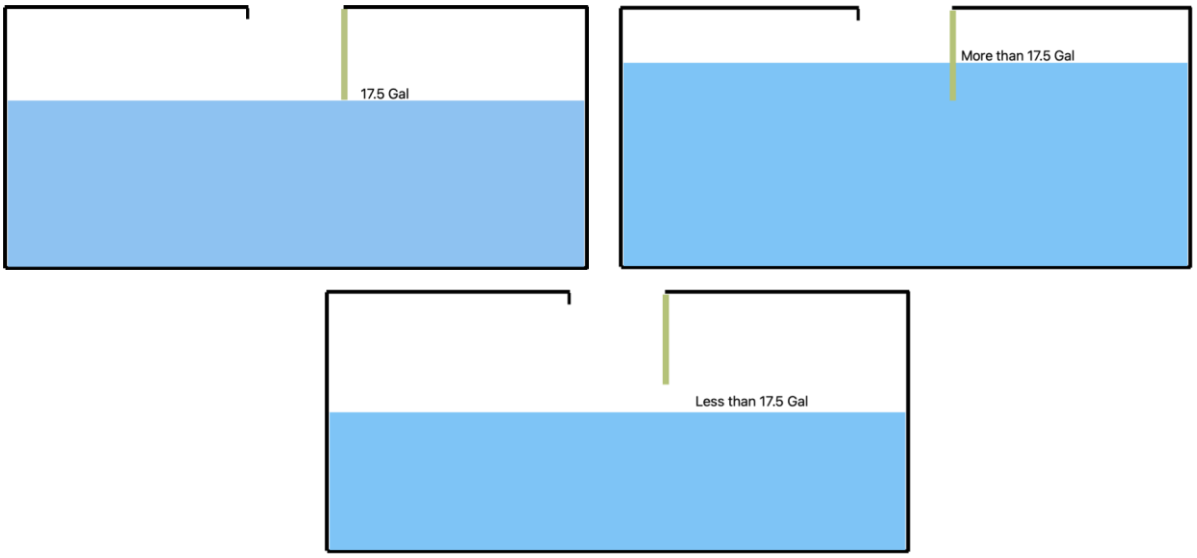




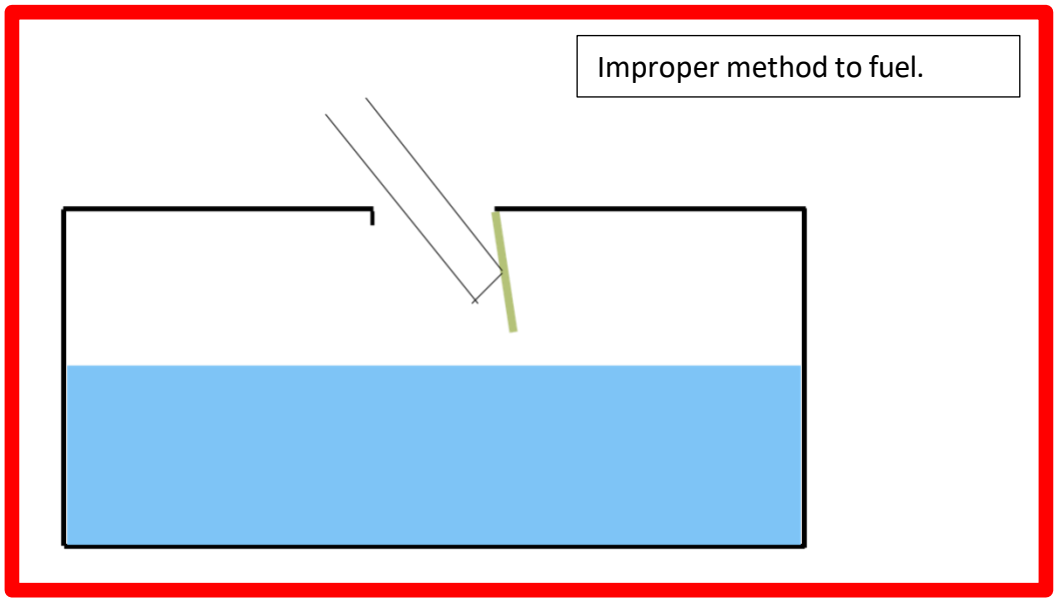
Incorrect way to measure.

3.3. A less reliable method but common at many flight schools is to use the installed filler indicator tab inside the fuel tank. If right at the bottom of the indicator tab, it is 17.5 gallons of usable fuel. If both tanks are equally at 17.5 gallons, that gives 35 gallons of fuel.

3.4. However, if the fuel is above or below this tab mark, and not topped off, you don't know exactly how many gallons are onboard without measuring.



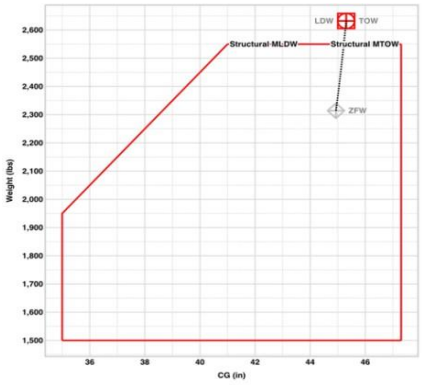
3.5. Another potential risk is the indicator tabs can become bent. If this happens, it may no longer be indicating a proper amount. It's common for this to become bent during fueling. Please ensure the fuel nozzle is not resting up against the indicator tab while fueling.



4. Fuel vs Useful Load

4.1. There is no standard fuel load to keep the 172S models at. This will depend on local area. Common fuel loads encountered are Topped Off Full, Tabs (35 Gallons), or 40 Gallons. Additionally, the 172S has the same Maximum Takeoff and Landing weights. This is in contrast to the 182T with different weights.

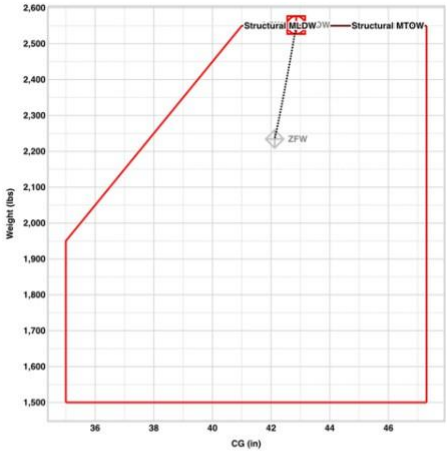
4.2. A habit that may lead to being over fueled is not being physically present during the fueling. If asking for a fueler to do the fueling from a truck, you should be there to remind them of the exact amount right there. Asking for fueling remotely has led to a fueler not understanding or hearing. The term "Tabs" may not be universally understood between every fueler. If not asking for a Top Off to full, giving an exact gallon amount is preferred to avoid over or under filling. This means measuring what's already in each tank and subtracting from the desired amount.



	Weight (lbs)	Limit (lbs)	CG (in)	FWD / AFT Limits (in)
BEW	**1,724**	-	**42.2**	**35.0 / 47.3**
Payload	590	826	-	-
Zero Fuel Weight	**2,314**	**2,550**	**44.9**	**38.6 / 47.3**
Fuel Tanks	318	318	-	-
Ramp Weight	2,632	**2,558**	**45.3**	-
Taxi Fuel	0	-	-	-
Takeoff Weight	2,632	**2,550**	**45.3**	-
Fuel To Destination	0	-	-	-
Landing Weight	2,632	**2,550**	**45.3**	-

> Example of topped off 53 Gal with three 180-pound persons and no baggage. **Overweight**.

4.3. Compared to older 172s, the newer 172Ss with G1000 typically have a higher basic empty weight to accommodate the weight of the avionics. So, weight is a significant factor. It will be very uncommon to utilize all four seat positions. Three persons is possible but there will be many scenarios that three persons may be overweight. There will even be scenarios in that two persons could be overweight.

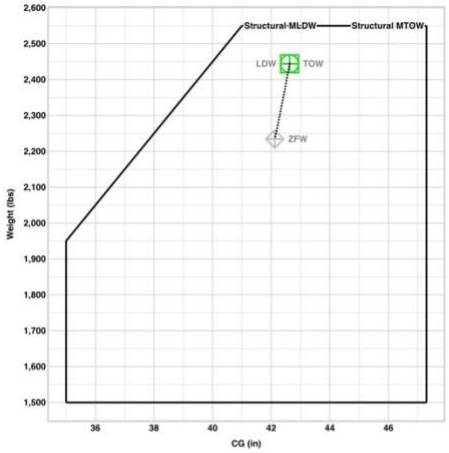


	Weight (lbs)	Limit (lbs)	CG (in)	FWD / AFT Limits (in)
BEW	**1,724**	-	**42.2**	**35.0 / 47.3**
Payload	510	826	-	-
Zero Fuel Weight	**2,234**	**2,550**	**42.1**	**37.8 / 47.3**
Fuel Tanks	318	318	-	-
Ramp Weight	**2,552**	**2,558**	**42.9**	-
Taxi Fuel	0	-	-	-
Takeoff Weight	2,552	**2,550**	**42.9**	-
Fuel To Destination	0	-	-	-
Landing Weight	2,552	**2,550**	**42.9**	-

4.4. A note about cargo. It's standard to have quite a bit of weight in the baggage compartment. Standard equipment includes a survival kit, cameras with cases, spare headsets, oxygen tank, and miscellaneous supplies. Each aircraft's Aircraft Information File (AIF) should have a list for Loose/Removable Equipment. The weight for the equipment may or may not be listed.

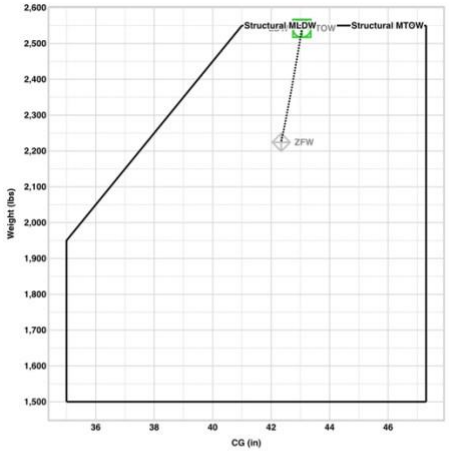
> Example of topped off 53 Gal with two 230-pound persons at 30 pounds of baggage. **Overweight**.

4.5. While there are some scenarios that fuel topped off full can work, there are many situations it will not. Watch your weight and balance carefully.



	Weight (lbs)	Limit (lbs)	CG (in)	FWD / AFT Limits (in)
BEW	**1,724**	-	**42.2**	**35.0 / 47.3**
Payload	510	826	-	-
Zero Fuel Weight	**2,234**	**2,550**	**42.1**	**37.8 / 47.3**
Fuel Tanks	210	318	-	-
Ramp Weight	**2,444**	**2,558**	**42.6**	**39.9 / 47.3**
Taxi Fuel	0	-	-	-
Takeoff Weight	**2,444**	**2,550**	**42.6**	**39.9 / 47.3**
Fuel To Destination	0	-	-	-
Landing Weight	**2,444**	**2,550**	**42.6**	**39.9 / 47.3**

Example of fuel at Tabs (35 Gal) with two 230-pound persons and 50 pounds of baggage. Comfortably under MTOW.



	Weight (lbs)	Limit (lbs)	CG (in)	FWD / AFT Limits (in)
BEW	**1,724**	-	**42.2**	**35.0 / 47.3**
Payload	500	826	-	-
Zero Fuel Weight	**2,224**	**2,550**	**42.3**	**37.7 / 47.3**
Fuel Tanks	318	318	-	-
Ramp Weight	**2,542**	**2,558**	**43.0**	**40.9 / 47.3**
Taxi Fuel	0	-	-	-
Takeoff Weight	**2,542**	**2,550**	**43.0**	**40.9 / 47.3**
Fuel To Destination	0	-	-	-
Landing Weight	**2,542**	**2,550**	**43.0**	**40.9 / 47.3**

Example of fuel at Tabs (35 Gal) with three 180-pound persons and 50 pounds of baggage. Just barely under MTOW.

5. Fuel Totalizer

5.1. The pre-defined values for the Fuel Totalizer on the 172S are 53 or 35 gallons. You can add or subtract from there.

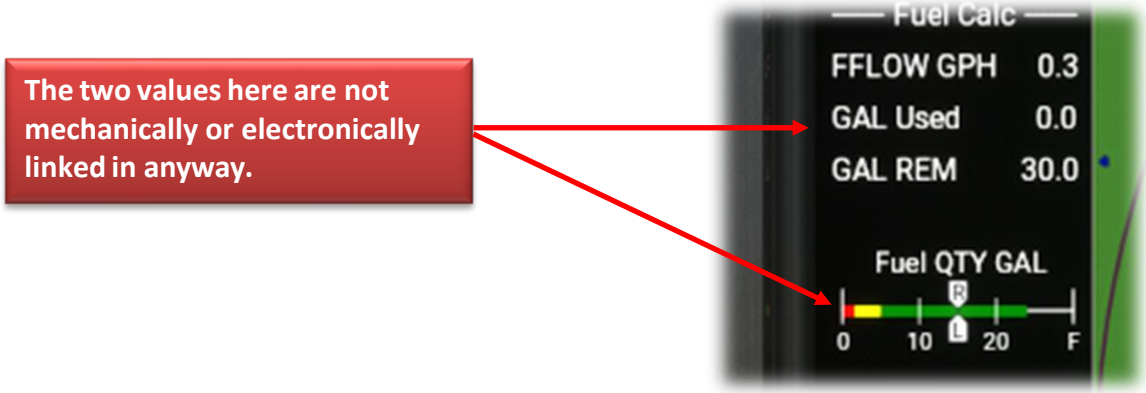
5.2. If not topped off full, the only effective method to knowing exactly how much fuel to set into the totalizer is measuring manually. This means taking out the dip stick and measuring the gallons in each tank. The bottom of the filler indicator tab is only accurate if both tanks are exactly at that one value.

5.3. As a reminder, this Totalizer is **completely independent of the fuel quantity gauges**. You must input an accurate GAL REM (gallons remaining) into the totalizer otherwise its indications are meaningless.

5.4. The G1000 totalizer is decently accurate on Gallons Used. It measures the real-time GPH and will count gallons used. This means it measures the low number of gallons used during taxi, the higher amount used during takeoff, and the various low and high-power settings during maneuvers. This is unlike manual fuel totalizers that you have to input a GPH and it counts from avionics power up no matter what power setting or actual fuel flow.

Engine ----> System ----> RST Fuel or Gal REM

5.5. The GAL USED will subtract from the manually input GAL REM in real time. The GAL REM becomes only as reliable as the manually input number though. If the manual Fuel Quantity gauges show a significantly lower number from the GAL REM during straight and level unaccelerated flight, then ask why and consider a possible fuel leak or maybe user error.



6. Kinds of Operation Equipment List

6.1. The aircraft utilizes a KOEL or Kinds of Operations Equipment List. This list is in AFM or POH Section 2 Limitations. You will see different types of equipment and types of operation such as Day/Night VFR/IFR. The "1" means it is required for the operation. The "0" means it is not required. For airworthiness, you must comply with this list. There are often notes or comments associated so please check thoroughly.

6.2. This does not outright replace Part 91 requirements for airworthiness. You must still comply with 91.205 and any deferrals per 91.213 in addition to the KOEL. PIC discretion to not fly based on safety considerations is still within the PIC's purview.

CESSNA
MODEL 172S NAV III
GFC 700 AFCS

SECTION 2
OPERATING LIMITATIONS

KINDS OF OPERATIONS EQUIPMENT LIST

System, Instrument, Equipment and/or Function	KIND OF OPERATION				COMMENTS
	VFR DAY	VFR NIGHT	IFR DAY	IFR NIGHT	
PLACARDS AND MARKINGS					
1 - 172S Nav III - GFC 700 AFCS POH/AFM	1	1	1	1	Accessible to pilot in flight.
2 - Garmin G1000 Cockpit Reference Guide	1	1	1	1	Accessible to pilot in flight.
AIR CONDITIONING					
1 - Forward Avionics Fan	1	1	1	1	
2 - PFD Fan	0	0	0	0	
3 - MFD Fan	0	0	0	0	
4 - Aft Avionics Fan	1	1	1	1	
COMMUNICATIONS					
1 - VHF COM	0	0	1	1	
ELECTRICAL POWER					
1 - 24V Main Battery	1	1	1	1	

7. Regulatory Compliance for Beacon Light

7.1. The KOEL for the 172S will mention the Beacon Light as "0". But the KOEL does not replace all the associated FARs regarding airworthiness. You must comply with everything to include ADs, KOELs, FARs, etc.

11 - Aircraft Position (NAV) Lights	0	1	1	1
12 - STROBE Light System	1	1	1	1
13 - BEACON Light	0	0	0	0
14 - TAXI Light	0	0	0	0

7.1.1. In multiple FAA letters of interpretation, some have asked if the Beacon light is required or not. The FAA's viewpoint is that yes, the Beacon is required. There's a lot more to the background and logic but just realize the KOEL is not the end of the story for airworthiness.

7.2. Sources: FAA Reply to Thomas D Letts on December 2017, FAA Reply to Daniel Murphy on January 11, 2011.

7.3. Below are two excerpts:

> Accordingly, the FAA considers the aircraft's rotating beacon and strobe lights to be part of the aircraft's anticollision light system. As § 91.205(a) specifies that the instruments and equipment required by that section be "in operable condition" both the rotating beacon and strobe lights would need to be operable for the requirements of § 91.205 to be met.

> Accordingly, operation of an aircraft using only the aircraft's strobe lights after placarding its red rotating beacon as inoperative and making an entry in the aircraft logbook would not be permitted unless such action is authorized by a waiver.[3]

8. Essential Bus and Standby Battery

8.1. As loss of electricity is more consequential, an extra battery is onboard in addition to the main battery. This standby battery cannot power everything though. Only items on the Essential Bus can be powered through the Standby Battery.

8.2. The expectation is you memorize what exactly is on the Essential Bus, but especially more important for IFR pilots.

8.3. A common scenario is the legality of flying with an inoperative or weak standby battery. The KOEL mentions for Day VFR as a 0. And many pilots would likely feel it's an acceptable risk. The question becomes for Night or IFR. The KOEL just has a * to refer to Note 1. Note 1 mentions it is required per EASA (European) regulation. There is no mention of FAA. It mentions it being recommended. PIC discretion on risk assessment should be used in these circumstances.

COMMUNICATIONS					
1 - VHF COM	0	0	1	1	
ELECTRICAL POWER					
1 - 24V Main Battery	1	1	1	1	
2 - 28V Alternator	1	1	1	1	
3 - 24V Standby Battery	0	*	*	*	* Refer to Note 1.
4 - Main Ammeter	1	1	1	1	
5 - Standby Ammeter	0	*	*	*	* Refer to Note 1.

NOTE

1. The European Aviation Safety Agency (EASA) requires the 24V Standby Battery and Standby Ammeter to successfully complete the pre-flight check before operating the airplane in VFR night, IFR day, or IFR night conditions in Europe. Correct operation of the 24V Standby Battery and Standby Ammeter is recommended for all other operations.

8.4. Another note, the Essential Bus does not power an avionics fan. The plane will be very quiet with just the Standby Battery being on. On the ground, do not accidentally forget to turn it off and walk away from the plane. Not only will the battery eventually deplete but the PFD is not being cooled for a long duration.

8.5. The GI-275 on the newer G1000s has its own internal battery. It's supposed to run for at least 60 minutes.

8.6. For planning considerations, if the alternator fails, the main battery should power everything for a period of time. Turning off non-essential items would certainly help extend the main battery. Once the main battery runs out, the standby would power the essential bus. The GI-275, if installed, would run on its own battery once the main battery ran out. If the standby battery also runs out, the engine will still run. You just have no engine instruments. If vacuum-driven standby instruments are installed, they would run as normal throughout.

8.7. The standby battery is supposed to run the essential bus for at least 30 minutes.

8.8. On just the essential bus, you lose quite a few things. There'll be no transponder, no ADSB, no Flap movement, only one Nav receiver is available. GPS 1 should be powered through the PFD though. If IFR, you need to come up with a plan quickly and with limited ATC assistance.

9. Crosswind Component

9.1. Some newer 172Ss have a maximum demonstrated crosswind velocity that is variable. This is unlike older 172s with just a 15-knot crosswind number.

9.2. A POH revision to some 172S serial numbers in 2010 changed the demonstrated crosswind. The majority, if not all, of CAP's 172Ss with G1000 should be on this newest POH revision.

MAXIMUM DEMONSTRATED CROSSWIND VELOCITY

Takeoff, Flaps UP	20 KNOTS
Takeoff, Flaps 10°	20 KNOTS
Landing, Flaps 10°	20 KNOTS
Landing, Flaps FULL	15 KNOTS

Figure 5-4

5-14 U.S. 172SPHBUS-02

9.3. When taking off at either Flaps UP or 10°, the maximum demonstrated crosswind velocity is 20 knots. When landing at Flaps 10, the maximum demonstrated crosswind velocity is 20 knots. When landing Flaps Full, the demonstrated crosswind velocity is 15 knots.

9.4. CAP Regulation 70-1 mentions an aircraft is prohibited to operate above the maximum demonstrated crosswind velocity. Without more context, this would permit flying into 20 knots of crosswind by regulation. However, as of this document's publication, CAP-USAF has directed that no aircraft should operate above 15 knots no matter the POH demonstrated crosswind on all Air Force Assigned Missions. These would be A or B mission symbol flights.

9.5. However, on Corporate or C mission symbol flights, flights into 20 knots of crosswind in the 172 are not prohibited, as noted in the flap setting chart. With that said, PIC caution should be heavily exercised with respect to the crosswind no matter the regulatory restrictions. You should never feel compelled to fly into crosswinds beyond your personal self-proficiency or comfort.

10. Seatbelts

10.1. There are various versions of seatbelts on the C172Ss. Some are the more traditional seatbelts. Some will have Amsafe airbag type seatbelts. When buckling the seatbelts with airbags, make sure you position the airbag in the proper direction to ensure inflation the correct way. Some aircraft that were originally installed with the Amsafe airbag seatbelts have had them replaced with traditional style seatbelts. Replacement should be reflected in the Weight and Balance datasheet and other documentation.

10.2. When you are finished flying for the day, DO NOT buckle the Amsafe airbag seatbelt into the holder. It may seem courteous and makes it neater to attach the seatbelt on. However, when attached, the seatbelt is drawing electricity from the hot battery bus to stay armed. The power drain is relatively minimal, but it does mean the airbag is armed if the aircraft is being towed.

10.3. By being powered by the hot battery bus, the airbags are always armed when buckled. This lets them work if the forced landing emergency checklist is followed and all electrical switches are turned off. The airbag is still armed and able to inflate.

11. Tachometer

Tachometer	----	----	----	2100 to 2500 2100 to 2600 2100 to 2700 RPM	2700* to 3000 RPM
Sea Level 5000 Feet 10,000 Feet					

11.1. The green arc on the tachometer actually changes based on altitude. The red arc will always stay the same. But between the green and red is a white arc. When at pressure altitudes below 5000 ft, the green and white meet at 2500 RPM. From 5,000-10,000 ft, the green and white meet at 2600 RPM. Once above 10,000 ft, the white arc disappears, and the green meets the red arc at 2700 RPM. These are the POH/AFM numbers. The numbers shown below are from the G1000 Pilots Reference Handbook which differ slightly. For comparison, the round-dial 172 tachometers attempted to do the same thing but in a different format

Descending below 4700 ft

Ascending through 5300 ft or descending below 9700 ft

Ascending through 10,300 ft

11.2. The intent of the changing arc colors is to show relatively where 75% power is. You will see a reference to 75% power many times in the POH. While exceeding 75% power in cruise is not a limitation, it is not recommended. More on that later in the guide.

CRUISE

1. Power - 2100 - 2700 RPM (no more than 75% power recommended)

11.3. These RPM values are actually not perfectly 75% power, especially with non-standard temperature. You must reference the POH Section 5 to see the actual percentage. Actual 75% may be into the white or lower than the upper band of the green.

CONDITIONS:
2550 Pounds
Recommended Lean Mixture

Pressure Altitude Feet	RPM	20°C BELOW STANDARD TEMP			STANDARD TEMPERATURE			20°C ABOVE STANDARD TEMP		
		% MCP	KTAS	GPH	% MCP	KTAS	GPH	% MCP	KTAS	GPH
2000	2550	83	117	11.1	77	118	10.5	72	117	9.9
	2500	78	115	10.6	73	115	9.9	68	115	9.4
	2400	69	111	9.6	64	110	9.0	60	109	8.5

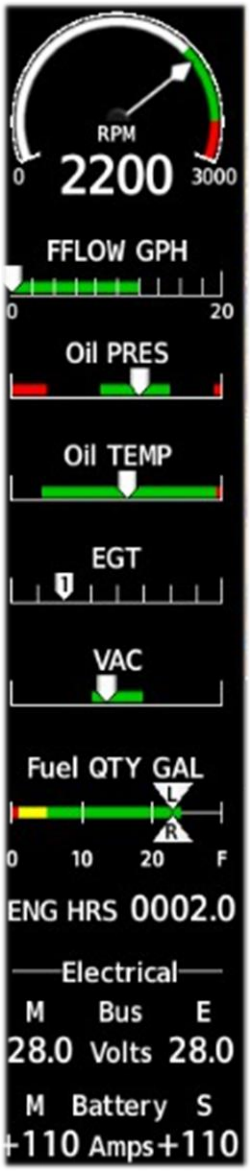
11.4. No matter the percentage of power, you should still never exceed the red line limit of 2700 RPM. Over 2780 RPM, the tachometer will flash red.

12. Vacuum and Tach Time

12.1. The Vacuum and Tach Time is on the front screen on the 172. This is unlike the 182 or 206 G1000.

12.2. If on newer aircraft with GI 275 standby, there is no vacuum system and thus no gauge to display.

Original G1000 EIS



G1000NXi EIS

G1000NXI with GI-275 EIS
Note the lack of vacuum system.

13. Climb Power

13.1. There is only one climb power setting on the 172S, Full Throttle.

13.2. Below 3,000 ft, the mixture should be left Full Rich. Above 3,000 ft, the mixture can be leaned to maximum RPM.

13.3. The airspeed for climb will vary depending on circumstances. 75-85 KIAS is recommended. Slower airspeeds for better climb performance might be warranted due to terrain or airspace. But watch your CHTs when climbing in this manner for long periods of time.

CESSNA
MODEL 172S NAV III
GFC 700 AFCS

SECTION 4
NORMAL PROCEDURES

ENROUTE CLIMB

Normal enroute climbs are performed with flaps up, at full throttle and 75 to 85 KIAS for the best combination of performance, visibility and engine cooling. The mixture should be full rich during climb at altitudes up to 3000 feet pressure altitude. Above 3000 feet pressure altitude, the mixture can be leaned as needed for increased power or to provide smoother engine operation.

If it is necessary to climb more rapidly to clear mountains or reach favorable winds at higher altitudes, the best rate of climb speed should be used with Maximum Continuous Power (MCP). This speed is 74 KIAS at sea level, decreasing to 72 KIAS at 10,000 feet.

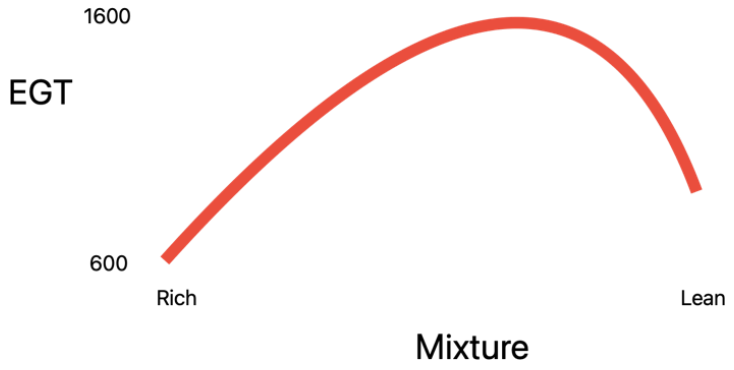
If an obstruction dictates the use of a steep climb angle, the best angle of climb speed should be used with flaps UP and MCP. This speed is 62 KIAS at sea level, increasing to 67 KIAS at 10,000 feet. This type of climb should be of the minimum duration and engine temperatures should be carefully monitored due to the low climb speed.

14. Leaning

14.1. In cruise, there are many ways to lean the engine. As a handy tool, the G1000 has a Lean Assist feature in trying to finesse the fuel flow with reference to the EGT.

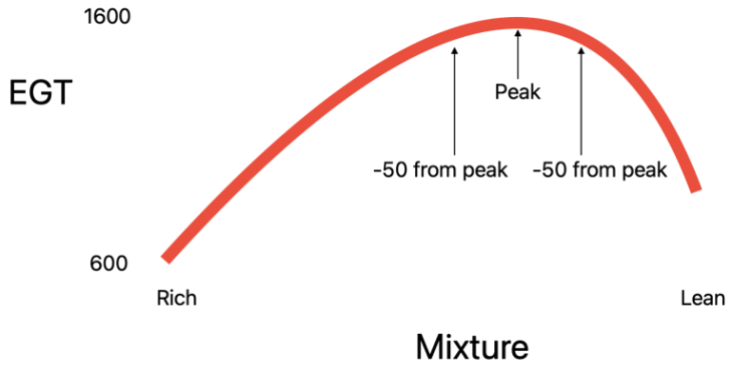
14.2. For those with significant experience leaning based on EGT on other systems, the Lean Assist may be intuitive. But without a solid understanding, it can be quite confusing if one does not understand the theory.

14.3. We'll do a small review. As mixture is leaned, the EGT will rise and then drop. The top of the curve is what we refer to as Peak EGT.



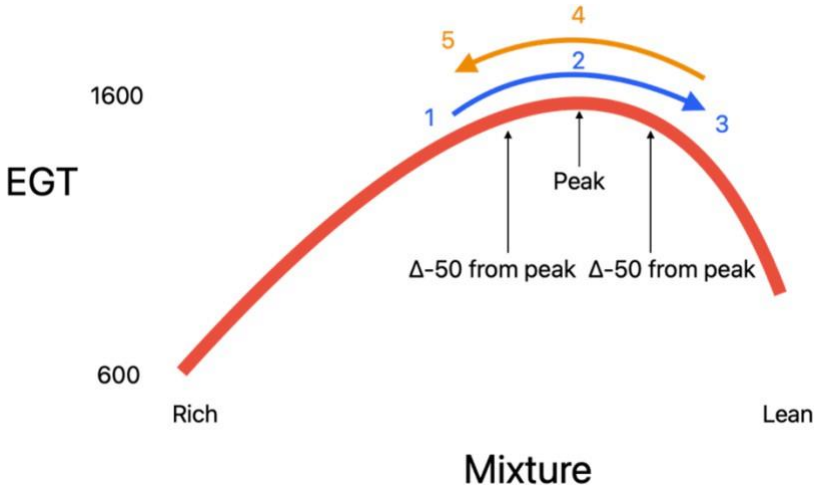
14.4. When we refer to rich or lean side of peak, we mean a position to the left or right side of that example curve.

14.5. When we lean, we typically start on the rich side. We don't know exactly where the peak will be so we're looking for the rise then the dip. Once it dips, we're on the lean side.



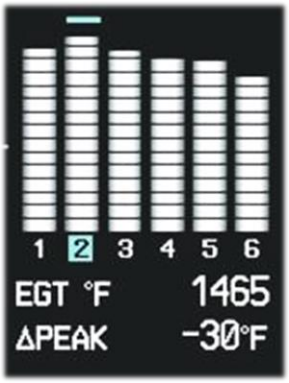
14.6. Once on the lean side, we need to move the mixture back to the rich side. Exactly how rich will depend on several factors.

14.7. The AFM/POH has three stated positions for leaning with reference to EGT. Recommended lean is 50° Rich of Peak EGT. Best Economy is Peak EGT. You are not absolutely required to be at these values but have a reasoning.



14.8. The Lean Assist function on the G1000 is looking for any drop in the EGT number. If one were to use the proper technique, it would show peak EGT (a steady rise then drop). The G1000 displays a minus based on the first drop of EGT. The G1000 has no context of why the EGT dropped, it just registers the first drop. The G1000 has no context if you are lean or rich of peak. It only shows a Delta (Δ) number based on that first drop in EGT. You must understand the theory behind leaning for EGT and use the Lean Assist as a tool.

14.9. Are you on the left or right side of the curve in the examples from before. If all you saw was this, you have no way to know what side you're on. You have to use some other external cues to determine that. Position of the mixture is the key giveaway. If you just leaned it out to get the peak and haven't enriched at all, you're probably on the lean side. If you moved the mixture back to the rich side and the Delta (Δ) moved towards 0 and back negative, you're probably on the rich side.



14.10. Take your time when doing this. POH says it should take at least one minute. False peaks can occur below real peak EGT due to doing it too fast. If this happens, enrichen then press assist again to restart.

NOTE

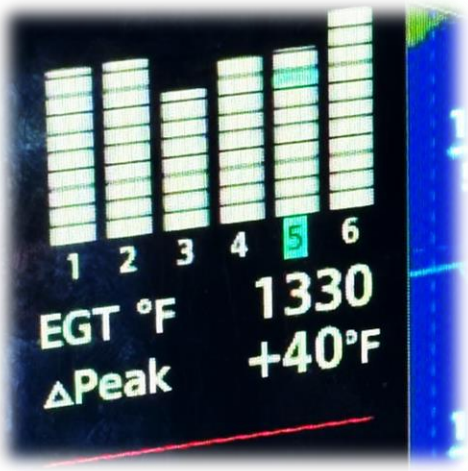
The 172S engine manufacturer, Textron Lycoming, has not approved operation of the engine at fuel flow rates (mixture settings) less than necessary to reach peak EGT in the leanest cylinder (the first cylinder to reach peak EGT). Use FULL RICH mixture when operating the engine above 75% power.

14.11. When you lean out, the fuel flow should be somewhat close to the AFM/POH Performance Section 5 numbers. Typical cruise fuel flows are 7-10 GPH for 45-75% power. If way below the GPH at normal power, you're probably on the lean side.

14.12. The AFM/POH text above is describing "Lean of Peak" when mentioning fuel flow rates less than necessary to reach peak EGT. If you were to cause damage by not following the POH, you may have to answer some uncomfortable questions. There are many third-party resources that mention Lean of Peak being beneficial in limited circumstances, but the POH/AFM has that very specific text for the Cessna 172Ss.

14.13. Advice is to stay Rich of Peak and watch the CHTs. The "recommended" lean does not guarantee great CHT temperatures in all conditions. You will have to get to the Lean of Peak side momentarily when doing normal cruise lean and that's fine but don't stay there.

14.14. In a perfect world, you should never see a positive number for the ΔPeak. However, you must remember the Lean Assist is only looking for the first "drop" in EGT.

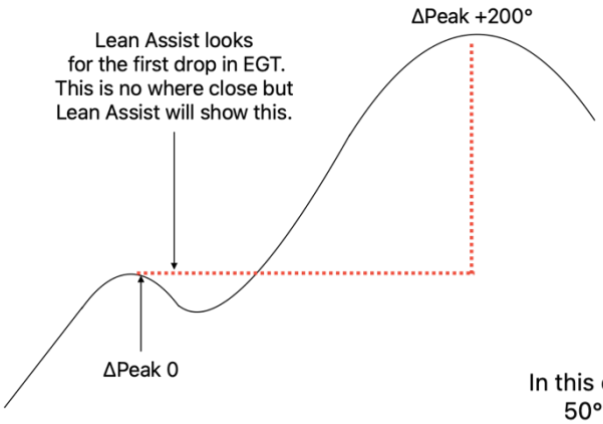


14.15. It has no context as to why the EGT number dropped. Again, in a perfect world, it drops with those curves shown earlier. But if the mixture is leaned too quickly, the EGT may never reach true highest peak before the EGT drops again. Then as you richen, you get the actual highest EGT which will be higher than the first drop noted.

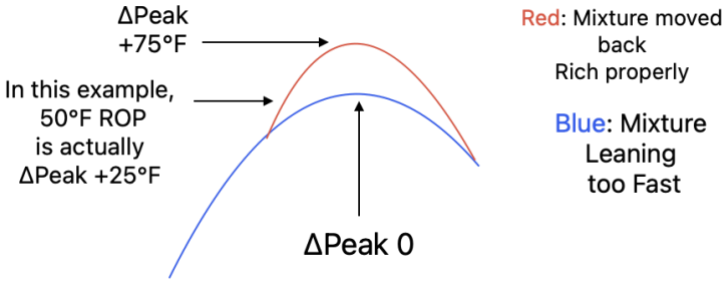
14.16. Also, if anything causes EGT drop while doing lean assist, it's going to show a peak because the EGT dropped. Remember, it has no context as to why the EGT dropped. It just assumes that's the peak. Some common reasons might be reducing throttle during this process, leaning then enrichening before peak, leaning too quickly, etc.

14.17. If you get a positive number, you could press Assist to redo it again. Go slower and try to get a real peak. A few degrees positive (talking plus 10-20° maximum) might just be close enough or you can mentally adjust by that much.

14.18. Another note, you don't have to use the Assist function. You're welcome to just watch the EGT numbers and note the highest number shown. Then do mental math to subtract 50° if you wanted 50° rich of peak. Example could be 1450° is highest temperature noted before it drops, then shoot for 1400° on the rich side as you enrichen.



If these situations happen, consider redoing the Lean Assist. Go back very Rich and press Assist to get a blank ΔPeak and Lean until peak then go Rich.



15. CHT Management

15.1. The biggest factor Lycoming has identified for potential wear on the engine is higher sustained CHTs. There are some non-intuitive factors on the 172S to consider with respect to the CHT.

> *GENERAL RULES*
>
> *Never exceed the maximum red line cylinder head temperature limit.*
>
> *For maximum service life, cylinder head temperatures should be maintained below 435°F (224°C) during high performance cruise operation and below 400°F (205°C) for economy cruise powers.*

Excerpt from Lycoming Service Manual

15.2. If CHTs are exceeding 400° F in continuous cruise, you must do something to bring the temperature down. Even if you followed the AFM/POH procedure to lean and at an approved power setting, there's always a chance the CHT will exceed 400° F during routine operation.

15.3. Figuring out the CHT is not intuitive. There is no CHT display on the front EIS screen. You must go to the ENGINE – LEAN Page.

15.4. Officially, the POH says 500° F for the CHT is "normal". Almost every external source to include Lycoming will mention that 500° is far too hot for continuous normal.

POWERPLANT INSTRUMENT MARKINGS

INSTRUMENT	RED LINE (MIN)	RED ARC (LWR)	YELLOW ARC	GREEN ARC (NORMAL OPERATING RANGE)	RED ARC (UPR)
Tachometer Sea Level 5000 Feet 10,000 Feet	----	----	----	 2100 to 2500 2100 to 2600 2100 to 2700 RPM	 2700* to 3000 RPM
Cylinder Head Temperature	----	----	----	200 to 500°F	----
Oil Temperature	----	----	----	100 to 245°F	245* to 250°F

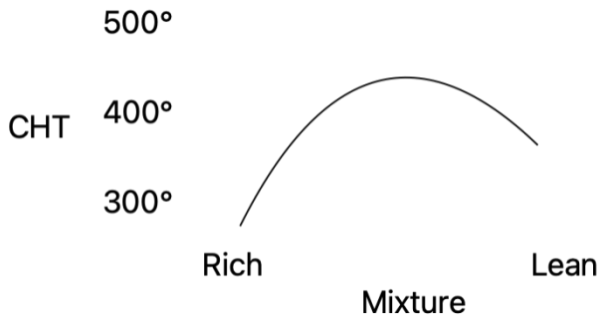
15.5. Keep in mind keeping CHTs cool involves a lot of variables. Sometimes, these variables are hard to balance.

15.6. In climb, airspeed is your primary means of managing CHT temperatures. More airspeed means more cooling air. But more airspeed also means potentially less climb rate, so a balance needs to be struck.

15.7. In cruise flight you have some decisions to make. Let's pretend you are not paying for fuel out of your own pocket but are running late. You could operate at a higher power setting. This by itself will raise CHTs. But then you could richen mixture to be at cooler CHTs. It'd be preferable to stay under 75% power or else you will need full rich mixture.

15.8. Or you could reduce power to reduce overall CHTs and lean as appropriate and accept the slower speed. Sometimes you just must accept this plane was not built for speed.

15.9. Unlike a 182 or 206, there are not nearly as many options to manage temperature. **But replacing cylinders due to improper engine management is very costly. Far more costly than a little extra fuel burned or arriving a few minutes late.**



Like EGT, CHT will change on a parabola with mixture change. Richer mixture will cool CHTs but only on one side of the arc. You may get a rise in CHT before a drop when moving rich.

16. Safe Flight Angle of Attack (AoA) Indicator

16.1. On newer 172Ss, Safe Flight AoA Indicators are installed and calibrated prior to delivery. This system is advisory only, and the traditional pneumatic stall warning horn is still installed as well.

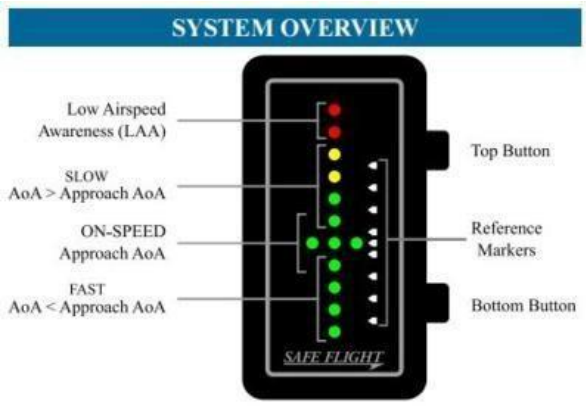
16.2. On exterior preflight, you should verify the transducer is mounted on the right wind and nothing will obstruct it's movement.

16.3. The device is mounted to the left of the magnetic compass. The wiring is coming directly from the transducer and has nothing connected to the G1000. The pneumatic stall warning horn is a separate independent system. The device's audio is also connected into the left front seat headset jack only. This means that Instructor Pilots will not hear this device from the right seat.

16.4. During high AoA, the device will create an audible crackle sound. This will only be heard by the headset in the front left seat.

16.5. The device will have a series of green, yellow, and red lights. In the green range at a certain AOA it will show three green lines across. This is called "ON-Speed" by Safe Flight. When "ON-Speed", the AoA should be very close to what you see on typical normal climbs and normal approaches. This would be 74 KIAS with Flaps UP in climb and 65 KIAS with Flaps FULL on a typical approach to land.

16.6. On the right side of the device are two buttons. These are up and down. You'll notice a small white tick mark to the right of the colors. You can move the white tick mark known as a reference marker. Most pilots will keep it aligned with the three green across but it's PIC discretion for something else such as short-field type AoAs. The CAP checklist will direct you to set the AOA Reference Marker and that's what it's talking about.



17. Rotation and Approach Speeds

17.1. The 172S has rotation speeds that can vary. For normal takeoffs, the only speed mentioned is 55 KIAS. Normal flap settings for takeoff is either UP or 10°.

17.2. 55 KIAS is noted with the "R" symbol on the PFD as well. But there are situations this may not be appropriate. It is not a mandatory speed. Also, the 182T and 206H have much more variance in takeoff speeds so please don't build a habit of relying on a fixed number for future transition training.

17.3. The worst situation is when the aircraft wants to fly but the pilot mistakenly thinks rotation must be delayed to 55 knots no matter what and pushes on the yoke. This could result in a wheel barrel condition with the propeller being closer than necessary to the ground risking a prop strike.

17.4. Approach speeds for a normal landing are in a range. With Flaps Full, 60-70 Knots. Weight is the biggest contributor to that determination. Flaps Up (No Flap), is 65-75 knots. With partial flaps, you'll have to interpolate.

NORMAL LANDING

1. Airspeed - 65 - 75 KIAS (Flaps UP)
2. Wing Flaps - AS DESIRED (UP - 10° below 110 KIAS)
   (10° - FULL below 85 KIAS)
3. Airspeed - 60 - 70 KIAS (Flaps FULL)
4. Elevator Trim Control - ADJUST
5. Touchdown - MAIN WHEELS FIRST
6. Landing Roll - LOWER NOSEWHEEL GENTLY
7. Braking - MINIMUM REQUIRED

17.5. If flying solo and fuel has burned after a long flight, you may want to be on the lower end of the airspeed. If having three persons onboard and after a short flight, maybe the upper end. Adding gust factor is an additional consideration.

17.6. A common airspeed mentioned is 65 KIAS for approach with Flaps FULL as a good starting point. But you have a range of airspeed that can be utilized depending on situation. The 172 will tend to float a lot more than the 182 or 206, if the speeds are not correct.

17.7. A note about the Flap Settings. The actual degree measurement for Flaps FULL in the 172S is 30°. The FULL setting between various Cessna types are not all the same.

17.8. There are older 172s or 182s with Flaps at 40° or varying other degree settings. On the 182T, the Full setting is 38°. This is meant to convey that the FULL flap setting depends on airframe as you learn other aircraft.

XII. Model 172S (cont'd)

Control Surface Movements	Wing flaps	Takeoff	0° - 10°		
		Landing	0° - 30° + 0°/-2°		
	Ailerons	Up	20° ± 1°	Down	15° ± 1°
	Elevator tab	Up	22° + 1°/-0°	Down	19° + 1°/-0°
	Elevator	Up	28° + 1°/-0°	Down	23° + 1°/-0°

(Neutral position is with bottom of balance area flush with bottom of stabilizer)
Rudder (Measured parallel to W.L.): Right 16° 10'± 1° Left 16° 10' ± 1°
Rudder (Measured perpendicular to Hinge: Right 17° 44' ± 1° Left 17° 44' ± 1°

18. Short Field Speeds

18.1. The Cessna and CAP checklist leave out some crucial items to consider for short-field takeoff. The checklist has an obstacle clearance speed of 56 KIAS at full gross weight. But it offers nothing about a rotation or liftoff speed. Assuming you've done the proper 10 degrees of Flaps, DO NOT try to rotate at 56 knots. You'll probably have to push the yoke forward and run into the wheelbarrow issue mentioned earlier.

18.2. The lift-off or rotation speeds are in the AFM/POH Performance Section 5. At 2550 pounds, the lift off speed is 51 KIAS.

18.3. For landing, the only approach speed is 61 KIAS with no range. No variance is published for being less than maximum landing weight. Gusty condition speed additives are covered in the POH.

CAP Checklist

Takeoff

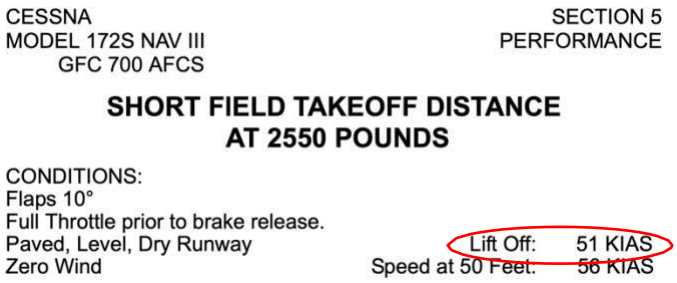
1. Flaps……UP - 10° (10° preferred)
   - •Short Field T.O……10° Flaps / 56 KIAS Until Clear
   - •Soft Field T.O……..10° Flaps/Ground Effect ASAP
2. Throttle Control……Full (push full in)
3. Mixture Control……...Rich (Above 3000ft PA, lean for max RPM)
4. Rotate……...55 KIAS
5. Normal Climb Speed……70-80 KIAS
6. Flaps……..…Retract at safe altitude (and above 60 KIAS)

No Rotation or Lift Off speed mentioned

POH

SHORT FIELD TAKEOFF

1. Wing Flaps - 10°
2. Brakes - APPLY
3. Throttle Control - FULL (push full in)
4. Mixture Control - RICH (above 3000 feet pressure altitude, lean for maximum RPM)
5. Brakes - RELEASE
6. Elevator Control - SLIGHTLY TAIL LOW
7. Climb Airspeed - 56 KIAS (until all obstacles are cleared)
8. Wing Flaps - RETRACT SLOWLY (when airspeed is more than 60 KIAS)



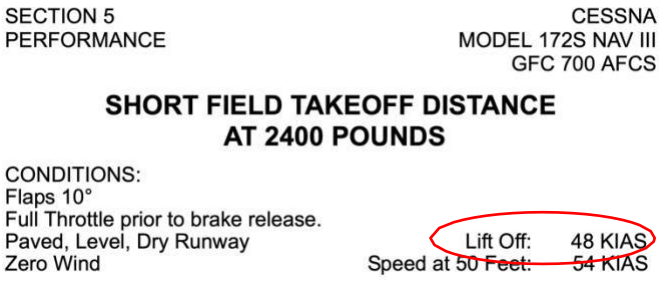
CESSNA
MODEL 172S NAV III
GFC 700 AFCS

SECTION 5
PERFORMANCE

SHORT FIELD TAKEOFF DISTANCE AT 2550 POUNDS

CONDITIONS:
Flaps 10°
Full Throttle prior to brake release.
Paved, Level, Dry Runway
Zero Wind

Lift Off: 51 KIAS
Speed at 50 Feet: 56 KIAS



SECTION 5
PERFORMANCE

CESSNA
MODEL 172S NAV III
GFC 700 AFCS

SHORT FIELD TAKEOFF DISTANCE AT 2400 POUNDS

CONDITIONS:
Flaps 10°
Full Throttle prior to brake release.
Paved, Level, Dry Runway
Zero Wind

Lift Off: 48 KIAS
Speed at 50 Feet: 54 KIAS

19. Fuel Selector and Fuel Shutoff Valve

19.1. Unlike pre-1996 Cessna 172s, there is no OFF position for the Fuel Selector on newer 172s.

19.2. There is a separate Fuel Shutoff Valve right above the Fuel Selector. Being pushed in means fuel is flowing as normal. Pulling it out will shut off fuel flow.

20. Power-On Stall

20.1. Due to how common it is switching from 172 to 182, a common question about the Power-On Stall comes up. On the 172, you will want to use Full Throttle when performing this maneuver in the vast majority of scenarios. On the 182, you will want to use less than Full Throttle.

20.2. The Private Pilot and Commercial ACS states the applicant will set the power as assigned by the evaluator to no less than 65 percent power. In the 172 performance tables, you will note that with most cruise power settings at typical altitudes and temperatures it will be much harder to achieve 65 percent power without Full Throttle.

20.3. As a tip, reducing the airspeed to approximately 55 KIAS before adding power and pitching up will make the maneuver far easier to accomplish.

SECTION 5 PERFORMANCE — CESSNA MODEL 172S NAV III GFC 700 AFCS

CRUISE PERFORMANCE

CONDITIONS:
2550 Pounds
Recommended Lean Mixture

Pressure Altitude Feet	RPM	20°C BELOW STANDARD TEMP			STANDARD TEMPERATURE			20°C ABOVE STANDARD TEMP		
		% MCP	KTAS	GPH	% MCP	KTAS	GPH	% MCP	KTAS	GPH
2000	2550	83	117	11.1	77	118	10.5	72	117	9.9
	2500	78	115	10.6	73	115	9.9	68	115	9.4
	2400	69	111	9.6	64	110	9.0	60	109	8.5
	2300	61	105	8.6	57	104	8.1	53	102	7.7
	2200	53	99	7.7	50	97	7.3	47	95	6.9
	2100	47	92	6.9	44	90	6.6	42	89	6.3
4000	2600	83	120	11.1	77	120	10.4	72	119	9.8
	2550	79	118	10.6	73	117	9.9	68	117	9.4
	2500	74	115	10.1	69	115	9.5	64	114	8.9
	2400	65	110	9.1	61	109	8.5	57	107	8.1
	2300	58	104	8.2	54	102	7.7	51	101	7.3
	2200	51	98	7.4	48	96	7.0	45	94	6.7
	2100	45	91	6.6	42	89	6.4	40	87	6.1
6000	2650	83	122	11.1	77	122	10.4	72	121	9.8
	2600	78	120	10.6	73	119	9.9	68	118	9.4

PA.VII.C.S4 Set power (as assigned by the evaluator) to no less than 65 percent power.

Task C. Power-On Stalls

References: *AC 61-67; FAA-H-8083-2, FAA-H-8083-3, FAA-H-8083-25; POH/AFM*

Objective: To determine the applicant exhibits satisfactory knowledge, risk management, and skills associated with power-on stalls.

Note: *See Appendix 2: Safety of Flight and Appendix 3: Aircraft, Equipment, and Operational Requirements & Limitations for information related to this Task.*

Knowledge: The applicant demonstrates understanding of:

PA.VII.C.K1 Aerodynamics associated with stalls in various airplane configurations, including the relationship between angle of attack, airspeed, load factor, power setting, airplane weight and center of gravity, airplane attitude, and yaw effects.

PA.VII.C.K2 Stall characteristics as they relate to airplane design, and recognition impending stall and full stall indications using sight, sound, or feel.

PA.VII.C.K3 Factors and situations that can lead to a power-on stall and actions that can be taken to prevent it.

PA.VII.C.K4 Fundamentals of stall recovery.

Risk Management: The applicant is able to identify, assess, and mitigate risk associated with:

PA.VII.C.R1 Factors and situations that could lead to an inadvertent power-on stall, spin, and loss of control.

PA.VII.C.R2 Range and limitations of stall warning indicators (e.g., aircraft buffet, stall horn, etc.).

PA.VII.C.R3 Stall warning(s) during normal operations.

PA.VII.C.R7 Collision hazards.

PA.VII.C.R8 Distractions, task prioritization, loss of situational awareness, or disorientation.

Skills: The applicant exhibits the skill to:

PA.VII.C.S1 Clear the area.

PA.VII.C.S2 Select an entry altitude that allows the Task to be completed no lower than 1,500 feet above ground level (AGL) (ASEL, ASES) or 3,000 feet AGL (AMEL, AMES).

PA.VII.C.S3 Establish the takeoff, departure, or cruise configuration, as specified by the evaluator, and maintain coordinated flight throughout the maneuver.

PA.VII.C.S4 Set power (as assigned by the evaluator) to no less than 65 percent power.

PA.VII.C.S5 Transition smoothly from the takeoff or departure attitude to the pitch attitude that induces a stall.

PA.VII.C.S6 Maintain a specified heading, ±10° if in straight flight; maintain a specified angle of bank not to exceed 20°, ±10° if in turning flight, while inducing the stall.

PA.VII.C.S7 Acknowledge cues of the impending stall and then recover promptly after a full stall occurs.

Private Pilot for Airplane Category ACS (FAA-S-ACS-6C) 44

Airman Certification Standards (ACS)

21. Mixture Lean for Ground Ops

21.1. The order of the CAP Checklist will follow the POH Checklist with some minor changes. One item of note is the location of the item to Lean the Mixture while on the Ground after start. CAP has it on the Taxi Checklist.

21.2. Depending on the exact CAP Checklist, there are approximately 16 items between the movement of mixture to full rich from start to the mention of leaning on the ground. These 16 items can take quite a while, especially for newer transitioning pilots learning.

21.3. As just a suggestion, doing the leaning the mixture for ground operation right after the actual engine start will lead to less carbon buildup on spark plugs. Doing the 16 items between start and leaning could be over 5-10 minutes or longer.

21.4. The POH checklist does not have a specific item for Leaning the Mixture for Ground operations on the ground. The procedure is listed in the text but not in a specific order.

17. Mixture Control.....Advance to full rich when engine starts ← Start

Note: *If the engine floods, place the mixture control in the Idle Cut Off position, open the throttle control ½ to full, and engage the starter motor (Start). When the engine starts, advance the mixture control to the Full Rich position and retard the throttle control promptly*

18. Oil Pressure .....Check
19. Amps (M Batt & Batt S).....Check charge (positive)
20. Low Volts Annunciator ....Verify Off
21. Avionics Switch (Bus1&2).....On
22. Mission Master Switch.....On
23. Check MFD for correct A/C type and Navigation database expiration dates, then press ENT
24. Flight Data Logger-Status.....Check
25. ESP.....Enabled/Disabled
26. Fuel Totalizer.....Reset
27. ATIS / AWOS.....Copy
28. Altimeters: PFD & Standby.....Set
29. Clnc Del/Gnd Control.....Contact
30. Transponder.....Code/Flight ID/ALT
31. Wings Flaps.....Retract
32. Flight Plan.....Enter
33. Parking Brake.....Release

Taxi

1. Mixture.....Lean as desired for GND Ops ← Lean
2. Brakes .....Test

LEANING FOR GROUND OPERATIONS

For all ground operations, after starting the engine and when the engine is running smoothly:

1. Set the throttle control to 1200 RPM.
2. Lean the mixture for maximum RPM.
3. Set the throttle control to an RPM appropriate for ground operations (800 to 1000 RPM recommended).

NOTE

If ground operation will be required after the BEFORE TAKEOFF checklist is completed, lean the mixture again (as described above) until ready for the TAKEOFF checklist.

22. Audio Panel

22.1. On most non-CAP G1000 light GA aircraft, there is only one audio panel. But in CAP G1000, there are two audio panels. This allows the left and right seat aircrew members to operate on independent frequencies more seamlessly. There are some differences and challenges presented though.

22.2. In this example, the left seat is active on COM2. The right seat is active on COM1. If the left seat switches between 1 and 2, the right seat keeps whatever it is selected already.

22.3. Most general aviation pilots are not used to this set up. When you switch between COM1 and COM2 in most other GA aircraft, all the aircraft occupants are on the same COM. On the CAP G1000, if you switch from COM1 to COM2 on the left seat, the right seat will be still on COM1. If you want both to be on the same, you must either press both or utilize good crew resource management. Some learn to not flip flop between Coms as much as practical.

22.4. Both panels have identical functions except for one button. The Right-seat red Reversionary Button is not connected to anything. If you push it, it won't do anything.

22.5. To add even more confusion, there are two generations of audio panel onboard. Around 2018, new G1000s have been delivered with the newer style audio panel.

OLD

NEW

23. Audio Select Panel

23.1. On CAP G1000 aircraft, an additional set of switches are installed either above the engine controls or below them. On the 172, there is just one switch. On 182/206, there are two.

23.2. There is an additional Push to Talk switch in the rear left seat. However, only one switch, either the front right seat or that rear left seat can be active at any one time.

23.3. The Seat Select Push Button will have a 2 or 3 on it. 2 is for front right seat. 3 is rear left seat.

23.4. A common error is someone will call maintenance and say the front right seat push to talk doesn't work. It usually is the Seat Select Push Button being left in Position 3 vs 2.

23.5. The hand mic may obscure the Seat Select switch.

Seat Select Switch

Seat Select Position 3
(Rear Left Passenger Seat)

The 172S does not have a COM3 Select Switch. You would see a COM3 Switch on the 182 or 206 aircraft.

24. Control Wheel Buttons

24.1. There are multiple buttons on the control wheel. The push to talk (PTT) switch feels the exact same as the Control Wheel Steering (CWS) button. It is inevitable you will push the CWS when you really mean to do PTT. Just try to avoid this as much as possible.

24.2. If you notice the Flight Director come on when you didn't command it, you probably pressed the CWS button instead of the PTT button. Press FD to get rid of it if you don't want it and consider if ATC or other party heard what you last transmitted or think you transmitted.

25. Electric/Manual Trim Check

25.1. A CAP checklist item always gets many pilots confused. There's a difference between 172 and the 182. On the 182T checklists for both KAP140 and GFC700 is an item in the Run Up portion called Electric/Manual Trim…Check.

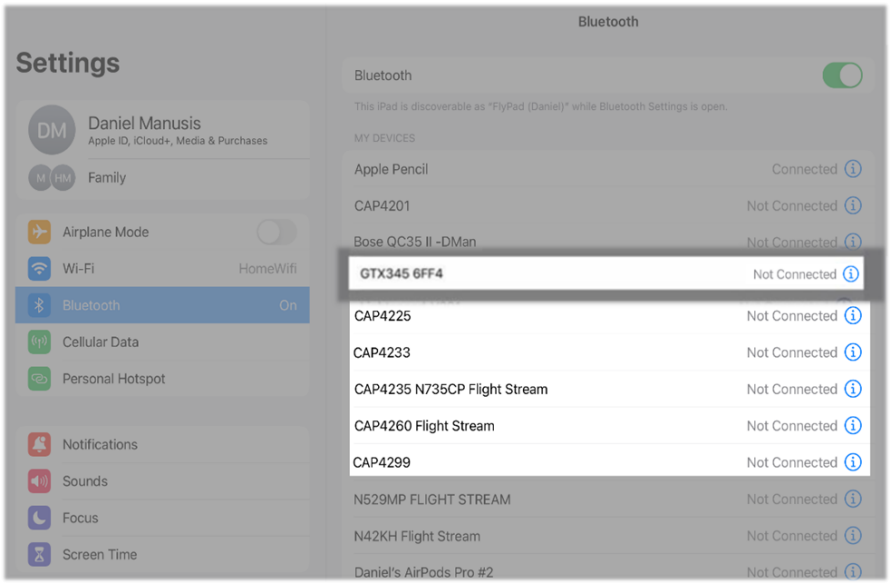
25.2. The vast majority of 172S CAP Checklists has no mention for the Electric/Manual Trim Check. Some pilots think this might be an error in the 172S Checklist. But there is no POH procedure for this Electrical/Manual Trim Check in the POH.

25.3. On the most recent edition of CAP Checklist for only the newest 172s with GI-275, there is an item for Manual Electric Trim…Check in the Before Takeoff checklist. This is not reflected on the other 172S with G1000 checklists.

26. Bluetooth Compatibility

26.1.

26.2. Being able to connect your mobile devices for ADSB-In is available on most of the G1000s. On non-NXi G1000s, you should see a device named GTX 345 XXXX available to pair. There is nothing to access or view via the G1000 screens for this.



26.3. The four-digit code after the GTX345 is random and not obvious by tail number or callsign. If you fly multiple aircraft with this GTX345 link, you may want to rename the device on your phone or tablet's settings. Just remember, some G1000s do not have it.

26.4. On NXi aircraft, the Bluetooth pairing must be initiated on the MFD screen. You must go to AUX-Connext Setup. While on that page, you should see the device available to pair on your tablet or phone.

26.5. If you don't see the airplane on your personal device's Bluetooth page to pair, there is a maximum saved paired number of devices. You'll likely have to delete someone else's pairing and then you'll see yours available. You must acknowledge the pairing on the screen.

26.6. On these aircraft with Flight Stream 510, you can send flight plan info back and forth between the panel and mobile device.

26.7. As a note, the NXi has separate Bluetooth connections for voice and data. Don't confuse the Bluetooth symbol on the audio panel for the ADSB-In data.

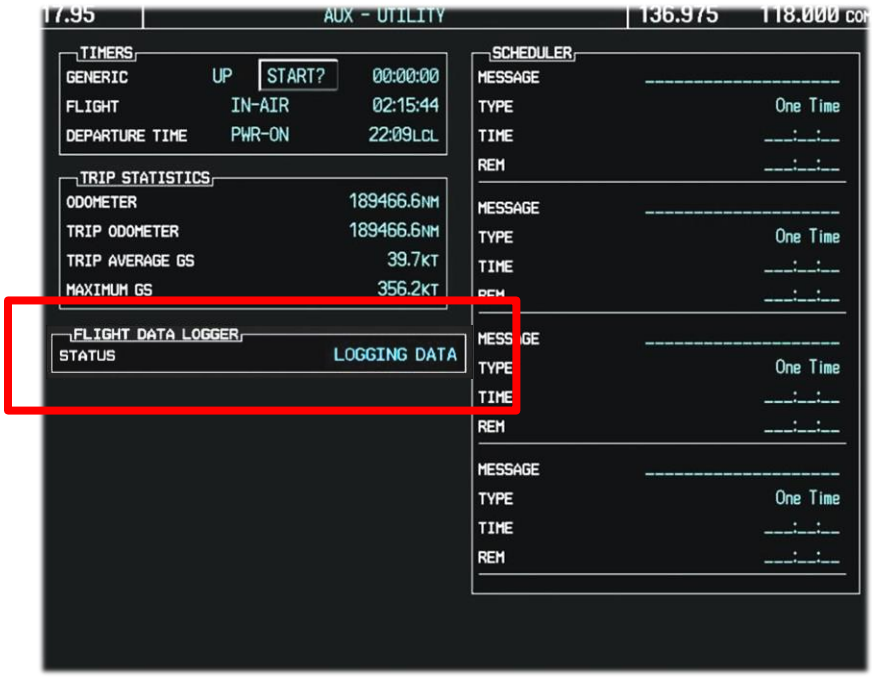
27. Flight Data Logger Status

27.1. In the CAP Checklist, you will see an item for the Flight Data Logger Status. One of the SD card slots in the G1000 can record flight data parameters. In the event of a mishap, the SD card can be used in the investigation. The Checklist is directing you to make sure it is properly logging data.

24. Check MFD for correct A/C type and Navigation database expiration dates, then press ENT
25. Flight Data Logger-Status.....Check
26. Fuel Totalizer.....Reset
27. ATIS / AWOS.....Copy
28. Altimeters: PFD & Standby.....Set

27.2. You can do this on the MFD. AUX – UTILITY. Under the Flight Data Logger, you should see "Logging Data" displayed. It may say something else such as "No Card, Card Full, or Card Error, etc." If it shows anything but "Logging Data" it is not required for flight, and you may continue. However, you are supposed to create a maintenance discrepancy when the flight is finished. The intent is to get it fixed ASAP but not cancel any flights. But the issue should not be left open.

27.3. There are strict protocols in place with accessing the data on that card. Do not remove the card unless you're following the direction spelled out in CAPR 70-1.



28. ESP: Electronic Stability Protection

28.1. As mentioned earlier, new G1000s from 2020 and later are coming equipped with ESP. This uses software to manipulate the autopilot servos to try and maintain flight inside certain parameters. As an example, it'll apply roll authority the opposite direction if the bank angle exceeds a value while hand flying.

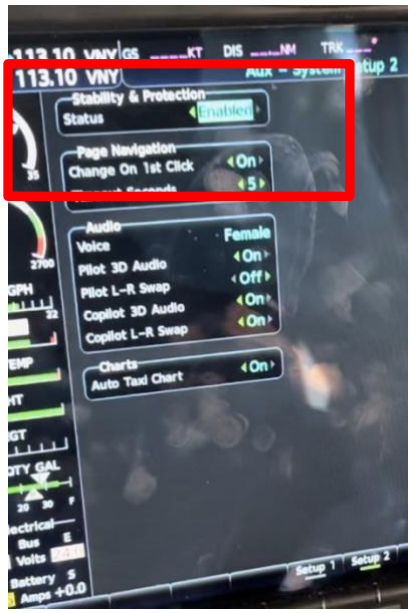
28.2. Because of how new this is, all the aircraft with ESP will be G1000NXi. However, there are G1000NXi that do not have ESP. Do not use the term NXi and ESP interchangeably.

28.3. If you are qualified to fly a CAP G1000, you may fly ESP equipped aircraft with no extra training, but you are then required to turn off ESP prior to departure. ESP is by default on every time the avionics are powered on. As a strong recommendation, you should attempt to get the ESP specific flight training before flying one.

28.4. There is a G1000 Refresher Course required every three years by CAP for G1000 qualified pilots. The ground topics do include ESP on it. The flight topics are not required to maintain G1000 currency, but they are one-time required to fly with ESP on.

28.5. Turning off ESP is not at all intuitive. You must navigate via the MFD to AUX then System Setup. Using the buttons at the bottom, select Setup 2. A box with Stability & Protection will then be displayed with the selectable box saying Enabled. You can select the box and change it to Disabled.

28.6. On the 172, the low airspeed protection will activate when below 55 KIAS. There is no audible cue that nose down force is being applied since this is usually still above actual stall AOA initially. This is unlike the 182 and 206 which activate when the audible stall warning cue is on. Instructors or those not active on the controls may not even realize the ESP is activated. Student pilots or those new to the aircraft on the controls may not recognize the subtle difference.



29. Flight ID

29.1. The ADSB-Out Flight ID should be your callsign that you use with ATC. In over 99% of the flying we do, it'll be the CAPXXXX callsign. Occasionally, it'll need to be changed. Or someone else changed it and didn't put it back to the usual.

29.2. The place to change the Flight ID is on the PFD. Press TMR/REF for the usual Timer and Speed References and Minimums. At the very bottom it may or may not show Flight ID and then a callsign. You should verify it matches your callsign and/or change it if not.

29.3. It may just show a blank spot there. The programmable Flight ID option box is a maintenance only function to turn it on or off. You probably still have ADSB-Out but the callsign is fixed. Hopefully, it is fixed to the callsign you are using. Please let your aircraft maintenance officer know this needs to be fixed to always be changeable.

The Checklist does have a line for the Flight ID check but it is very subtle. Most are looking at just the code and mode selected, but Flight ID is a part of the checklist.

30. Transponder.....Code/Flight ID/ALT
31. Wings Flaps.....Retract
32. Flight Plan.....Enter
33. Parking Brake.....Release

30. Transponder VFR Button

30.1. The VFR button on the Transponder for the G1000 has multiple functions. If on a pilot input code (example, 5555), pressing VFR will make the code 1200. If already on 1200, pushing VFR will change the code to the previous pilot input code (example, 5555).

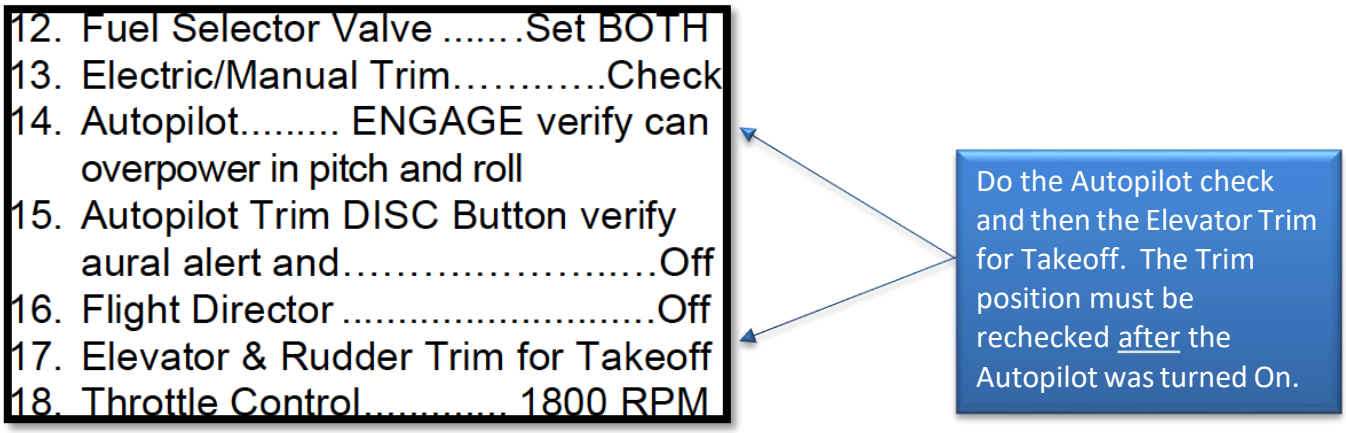
30.2. The takeaway is, if it's already 1200 and you want 1200, leave it alone.

31. Elevator Trim Position Check Sequence

31.1. On the run-up checklist is an item for the Elevator/Rudder Trim Check. The sequence and timing of checking that elevator trim is very deliberate.

31.2. As a reminder, the autopilot moves the yoke and the elevator trim as normal function.

31.3. During the autopilot check when the autopilot is engaged and physical force is applied to the flight controls, the elevator trim may move. That movement has a decent chance of moving it off the neutral position. This is a normal function that can occur. You need to recheck the trim position after the autopilot check. Don't assume the trim is good because you checked it at some point earlier.



32. Mission Master Switch

32.1. On the CAP Checklist, you'll see constant reference to the Mission Master Switch to be On or Off. This is a CAP unique item. This is essentially another avionics bus switch for the unique CAP items.

32.2. The Checklists wants you to protect this bus from electrical surges during start up and shut down.

32.3. As a side note, the 172S does not come equipped with a Rhotheta/Becker Direction Finding Unit installed. Some may have been modified but it is not default equipment on the newer 172S.

32.4. As another side note, the 172S does not come equipped with an openable side window in the back left seat that is common on the 182. This is the primary Airborne Photography port. Some have been modified with a new window that opens but it is not standard.

5. Brakes.....Test & Set
6. Circuit Breakers.....Check In
7. Electrical Equipment.....Off
8. Mission Master Switch.....Off
9. Avionics Switch (Bus 1&2).....Off

33. Flight Plan Layout

33.1. The original G1000 and G1000NXi have a few differences for flight plan construction. The original G1000 will have what we can call a blank canvas. It may default to the closest airport upon start up but then just empty space to fill in. You might just start typing waypoints then the final destination at the end.

33.2. On the G1000 NXi, there are specific data fields for origin airport, enroute waypoints, and destination airport. The departure airport will still default to the nearest upon start. But when you go to enter new waypoints, the destination airport will be the first data field to populate by default. It's your choice on how you want to do the entries. You can scroll back and do it the way the original does it or do destination and scroll back.

33.3. The NXi will also ask for a runway when you select departure or destination. You can usually leave it blank for most flying initially. If an instrument procedure requires one, you can usually select it upon selecting the details of that procedure. There is an optional NXi feature that gives an alert that you are using the runway that is different than the one selected. CAP typically does not purchase this feature on aircraft so not usually a concern.

34. Turn Anticipation

34.1. A helpful feature on the G1000 can sometimes not be helpful in unique situations. One of those is turn anticipation. It'll create an arc when passing close to waypoint to be on course for the next waypoint.

34.2. If the direction from one waypoint to another is extreme, it'll begin the arc much further out. A common scenario this comes up is when a pilot wants to head back to the departure airport.

34.3. If the flight plan was previously used to get to the practice area, it may include waypoints that are now behind you geographically. You input direct the departure airport. You also decide to engage the autopilot to follow the GPS course line.

34.4. The flight plan then creates a turn anticipation arc from the airport to the next waypoint, which happens to be behind you. The angle is quite extreme, so it has to start the turn a quite a ways away from the airport. Now all of a sudden, the plane is turning around.

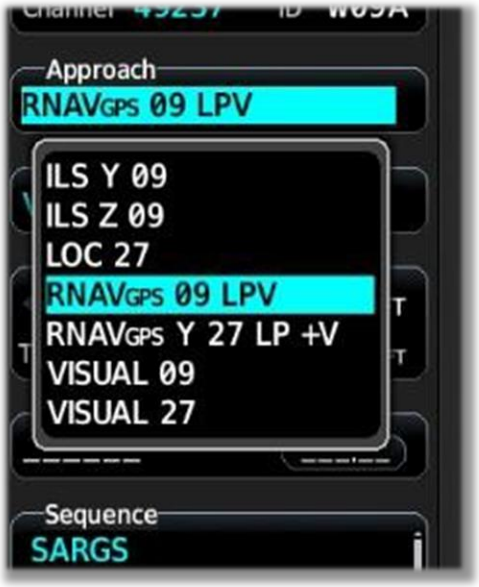
34.5. A few ways to fix this. One is delete the flight plan and then input an airport to head to from scratch. The other is to invert the flight and proceed direct to your new destination. There are then no waypoints after.

35. Naming Conventions of RNAV Approach Types
For IFR Only. Skip Ahead.

35.1. The G1000 will display naming that doesn't exactly follow the Approach chart.

LNAV is LNAV
LNAV+V is LNAV with an **advisory vertical component** but not an official part of the approach
L/VNAV is LNAV/VNAV
LPV is LPV
LP is LP
LP+V is LP with an **advisory vertical component** but not an official part of the approach

35.2. LNAV+V is completely different from LNAV/VNAV. LPV is completely different from LP+V



36. Vectors to Final

This is primarily an IFR item. Skip ahead if it doesn't apply.

36.1. Garmin has changed their Vectors to Final programming over the years. Because the G1000 in CAP's fleet range that span, you'll come across both styles.

36.2. Original G1000 from 2004 Vectors to Final (VTF) involved just the FAF being the waypoint shown. This means no intermediate or IAF waypoints displayed on the G1000. New style VTF also has the FAF as the active waypoint. But waypoints on the straight-in segment are shown as previous waypoints.

36.3. Some of you may have been taught to never do VTF because of some risk factors. Many of those risks are negated with new style VTF. One of the greatest issues with old style VTF was if ATC said proceed direct to a waypoint on the straight-segment. The other was not having step down sequencing awareness. Both of these are no big deal with new style VTF. For a direct to, just select the previous waypoint and proceed direct. For step downs, activate leg is still an option.

36.4. The dilemma becomes how do you know if it'll be new or old style VTF on your G1000. There are few ways to tell. The easiest is to hop in the one you're about to fly and try it out if you haven't already. But a few known ideas ahead of time. If it's a G1000 NXi, they should all be relatively new so they'll all have new VTF. If it's a GFC700 non-NXi, then it depends. The software update was available in approximately 2014. Not all G1000s have been upgraded to this feature.

OLD VTF (no waypoints before FAF)

NEW VTF (some waypoints before FAF)

37. Holding

This is primarily an IFR item. Skip ahead if it doesn't apply to you.

37.1. The original G1000 software has no method to input a holding pattern manually. Only published holding patterns programmed in the database as part of an approach can be utilized. And that just draws a racetrack. It will not fly the actual holding entry or track.

37.2. If the new software is not available or you want to practice a manual hold, there is a method that is too long for this guide. Seek out the training.

37.3. A software update available in approximately 2014 allows for unpublished holding pattern input in the flight plan. Not all G1000s have been or can be upgraded.

37.4. All the NXi are configured with the new software. The GFC700 may or may not have it.

37.5. Be comfortable using both software programable vs manual holds. You should cover this during G1000 IFR more in depth but understand the differences and limitations between our aircraft.

38. Missed Approach and Go-Around Button
This is primarily an IFR item. Skip ahead if it doesn't apply.

38.1. There are many differences in the process of the missed approach between generations. This topic has enough material to be its own guide. This small page is not adequate enough to become safe or proficient. Seek out comprehensive training on this topic. This presents probably the greatest threat by the differences in all the generations. Being low to the ground, in IMC, and confused is not a great spot to be in.

38.2. GFC700 equipped G1000s (2007-Present) all have a Go-Around (GA) Button just next to the Throttle.

38.3. On the GFC700, pressing the Go-Around Button will switch the nav source (if not already on it) to the GPS and sequence the flight plan legs to the Missed Approach waypoints. On the KAP140, you must always switch the nav source (if not already on it) to the GPS and press the SUSP to unsuspend waypoint sequencing to the Missed Approach waypoints.

38.4. On the GFC700, the flight director or autopilot will capture the ALT SEL in GA (pitch) mode.

38.5. On the GFC700 without ESP, if the autopilot is on, pressing the Go-Around Button will turn off the autopilot. On GFC700 with ESP, if the autopilot is on, pressing the Go-Around Button will keep the autopilot on. ESP is the critical component difference. NOT NXi. There are some airplanes with NXi without ESP. On the GFC700, GA (roll) mode will not capture a course or heading. Just wings level.

38.6. While there are no 172Ss with G1000 with KAP140 in CAP, the reality is most pilots fly multiple types to include the 182s and 206s. This is to highlight those important differences.

39. Bearing Pointers

39.1. The bearing pointers in the G1000 can provide excellent situation awareness when flying. This is true when VFR but even more so during IFR. Unfortunately, bearing pointers end up being rushed over during most G1000 training.

39.2. A few items to note, the CAP Cessna 172Ss do not come equipped with DME receivers. The distance being shown with the bearing pointer box is derived from the GPS database and position. But the bearing to with traditional navigation (probably VOR) is real conventional navigation bearing.

39.3. But even the GPS bearing pointer can be helpful in situations. On the older G1000, only Bearing 1 could be on the left side and Bearing 2 could be on the right side. On the NXi, either Bearing 1 or 2 can be left or right. On the older G1000, the button to pull these up is "PFD". On the NXi, it is labeled "PFD Opt". On the older G1000, BRG1 and BRG2 was the naming convention. On the NXi, the naming is Bearing 1 and Bearing 2.

Author's Perspective

Having given many Form 5s to many pilots, there are some habits that can give hints on how well a Form 5 checkride will go. A common theme has been those pilots who pull up the bearing pointers right after engine start and configure them in a way to be useful, tend to always do well on the Form 5. It is probably that they are using all the tools at their disposal and have an above average understanding of the G1000.

40. Exterior Light Panel

OLD

NEW

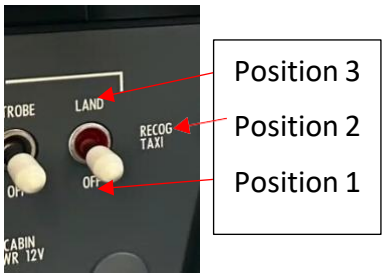
40.1. In 2011, newer Cessna aircraft started coming from the factory with the new switch and new dual wing LED lighting. Because all the G1000 172Ss in CAP came after 2015, you will only have the new style. The older one is shown to highlight the differences you might see in 182s and 206s.

40.2. On the older panel, there is a CAP unique item, the Pulse Light switch.

40.3. On the newer panel, there is no longer a pulse light switch. There is now a three-position switch for the Landing, Recognition, Taxi, and off. The top position for Landing will be full brightness continuously on always.

40.4. The middle position's function depends on if the plane is on the ground or inflight. On the ground, reduced light output for Taxi is shining continuously. In flight, the Landing lights will flash on and off in Recognition mode.

40.5. There is no firm rule on what function to use the lights beyond the usual FARs. For night takeoffs and landings, you probably want the Landing light in the full brightness position possible. Recognition (RECOG) position on a newer panel means the light will be on and off, far from an ideal situation when landing at night. On the older panel, the Landing or Taxi light on means the Pulse light function is inhibited.



OLD Style Lights

The Taxi and Landing lights must be in the OFF position for the Pulse Light function to work

One bulb for Taxi
One bulb for Landing
Pulse Light turns on and off Taxi and Landing bulbs in pattern

NEW Style Lights

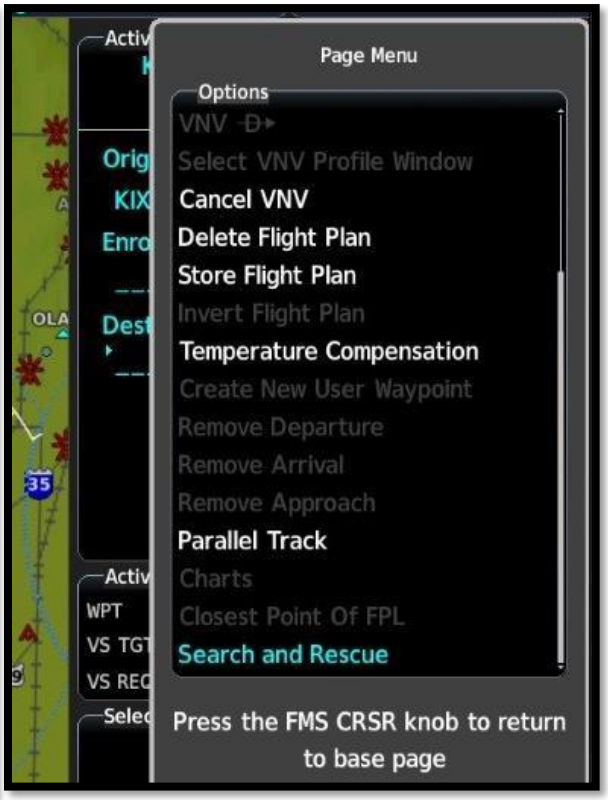
Lights on Each Wing
Taxi/Recog on the ground does one bulb in each wing on continuously
Taxi/Recog in the air does all bulbs on and off in a pattern
Landing does all bulbs on continuously

41. Search and Rescue SAR Package

41.1. While not critical for learning to fly the plane, the topic on the SAR Package comes up a lot. Not all of the G1000s have the SAR Package. Some are not hardware compatible to accept the software.

41.2. All of the newer NXi aircraft should have it installed from the factory so you can count on those usually. Some of the earliest GFC700 G1000 aircraft came without the software. They can and hopefully are upgraded but no guarantee. Some of the later model GFC700s came with the SAR package from the factory.

41.3. The NXi and non-NXi have the SAR functionality in different spots. They're both in Flight Plan then Menu. The Search and Rescue button is the first line in the older G1000s. On NXi, Search and Rescue is the last line (bottom).

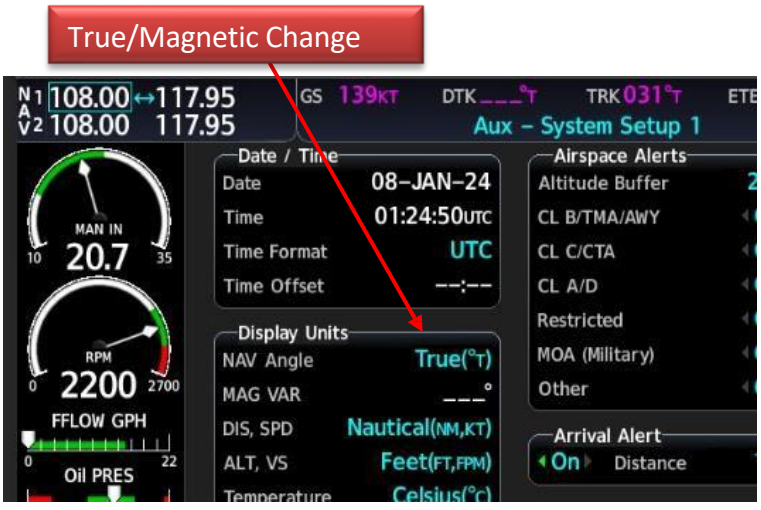


42. Magnetic vs True

42.1. There is a possibility you will start up the airplane and find the G1000 is configured to True degrees instead of the usual Magnetic degrees. It is super not obvious you are in True. The "T" is there but not distinctive. This'll make flying radar vectors or certain courses offset by the local magnetic variation the opposite way.

42.2. The reason for this is some of the CAP search patterns are simpler to do because they are based off of true north. Some crews will change the G1000 setting to be in True on purpose. If you do this, please change it back before the next person takes it. It will not reset to Magnetic for the next person automatically.

42.3. On the NXi only, you may get a message saying SLCT MAG. This is letting you know you are in True.



43. Closing Thoughts

43.1. This guide is in no way to replace any official POH or FAA documents. This is not a replacement for G1000 training required by CAP. You must still seek out real training. This is just a supplement to aid.

43.2. Topics to still review:

43.2.1. Pilots Operating Handbook

43.2.2. Garmin G1000 Pilot's User Guide

43.2.3. Garmin G1000 VFR or IFR CAP Courses

43.2.4. GFC700 or KAP140 Autopilot Procedures

43.2.5. Engine Temperature Management

43.2.6. Electronic Stability and Protection (ESP)