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28 March 2024

MEMORANDUM FOR RECORD

FROM: CAWG/CC

SUBJECT: Nondirective Publication Disclaimer – CAWGP 70-1-6

1. Attached to this memorandum is California Wing Pamphlet 70-1-6. This pamphlet is a nondirective publication, as that term is defined on page 18 of CAPR 1-2.

2. Compliance with this pamphlet is not mandatory. Any requirements or procedures explained in this pamphlet are either directed by other, directive publications or are provided as suggested methods, techniques, and/or best practices.

3. To the extent that the requirements or procedures explained in this pamphlet exceed the requirements and procedures directed by Civil Air Patrol, Pacific Region, or California Wing directive publications or by applicable law, a failure to comply with the requirements or procedures explained in this pamphlet shall not constitute a discrepancy for purposes of a Compliance Inspection or Subordinate Unit Inspection, nor shall they be grounds for termination of membership under CAPR 35-3.

4. Any directive language used in this pamphlet to describe a requirement or procedure which exceeds the requirements and procedures directed by Civil Air Patrol, Pacific Region, or California Wing directive publications or by applicable law, shall be interpreted as nondirective.

CRAIG E. NEWTON, Col, CAP
Commander

Attachment:
CAWGP 70-1-6, 28 March 2024

California Wing Pamphlet 70-1-6

CAP Cessna 182T Introduction

28 March 2024

OPR: DOV

Table of Contents

1. Introduction

1.1. This pamphlet will focus on post-2004 model year Cessna 182Ts in Civil Air Patrol. The vast majority of Cessna 182Ts have G1000 but there are some non-G1000 182Ts. The non-G1000 are usually between the model years 2000-2003.

1.2. With G1000 182s being in production almost 20 years at this point, there are differences between many of them. A Form 5 Evaluation in any 182T G1000 will count for all 182s 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. The Cessna 182T is normally aspirated or non-turbocharged. The "T" at the end of 182T is just the series that the model is in, i.e. A to T. There are Turbocharged 182s and they will have the T in front of the model number, i.e., T182T. We'll be covering only the normally aspirated, non-Turbo version.

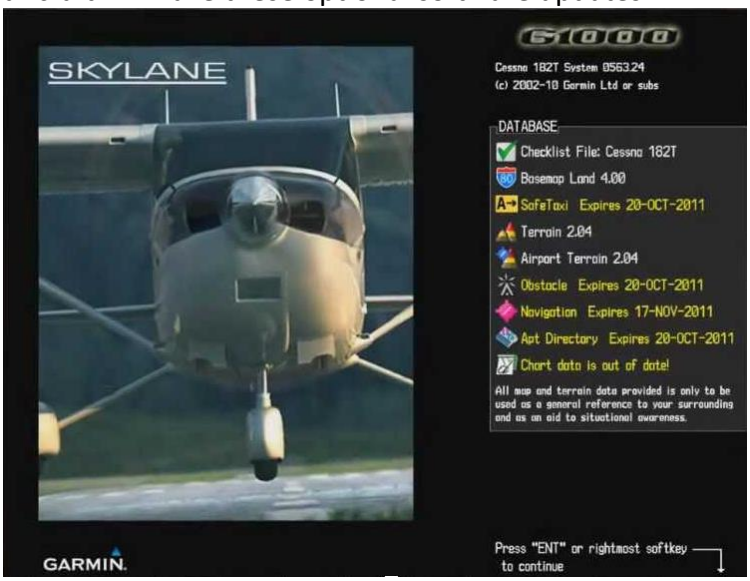
1.4. This guide will not cover mandatory G1000 topics or 182 specifics that your instructor needs to cover. That is for separate teachings, but this guide covers many of the missed items by many pilots transitioning.

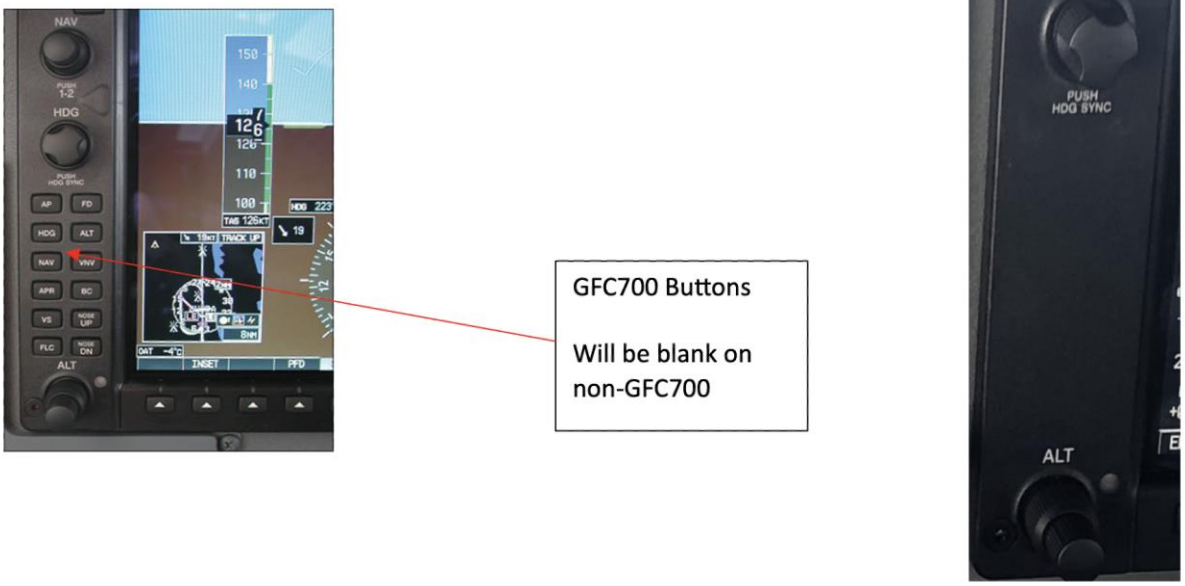
2. Generations

2.1. Because there are so many versions of G1000 182s 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. C182Ts from model years 2004-2007 will have the G1000 with KAP140 autopilot. There is no WAAS on these aircraft. For IFR, it will feature the older style software for Vectors to Final. More specific details on Vectors to Final on page 51.

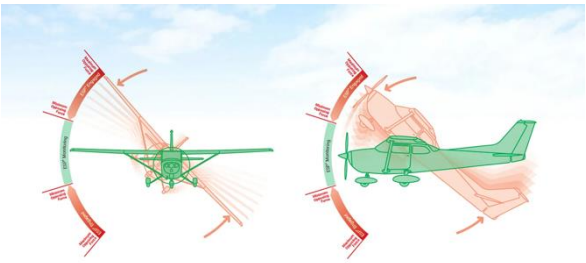
2.3. C182Ts from model years 2008-2016 will have the G1000 with GFC700 autopilot. These have some of the most subtle differences so you might want to watch out. Most have WAAS. Some will have ADSB-In, and some won't. There is a software update to allow new style Vectors to Final. There is also a software update available for the pilot to input Holding Patterns. Not all of these aircraft will have these optional software updates.





2.4. 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).

2.5. 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.



2.6. 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.

G1000 NXI

Without ESP With ESP

3. Weight and Balance

3.1. Probably the most consequential aspect to the weight and balance is that the takeoff weight and landing weight are not identical for the C182T. The maximum takeoff weight is 3100 pounds, but the landing weight is 2950 pounds. 3100-2950= 150 pounds

3.2. This 150-pound difference is going to almost always need to be in fuel burned. At 6 pounds per gallon, you need to burn 25 gallons if you took off right at maximum takeoff weight. With a typical cruise fuel burn of 12-15 gph, you might need to fly almost two hours before intending to land.

3.3. This does not mean you can't land in an emergency or as a safety of flight requirement. PIC emergency authority is still paramount. However, when planning a normal flight, you must take this math into consideration. As a tip, many pilots try to stay inside landing weight or just barely over so less math is required.

3.4. If an overweight landing occurs, please ground the aircraft for an Overweight Landing Check by an A&P. The Aircraft Maintenance Officer for the aircraft should be notified to arrange the process.

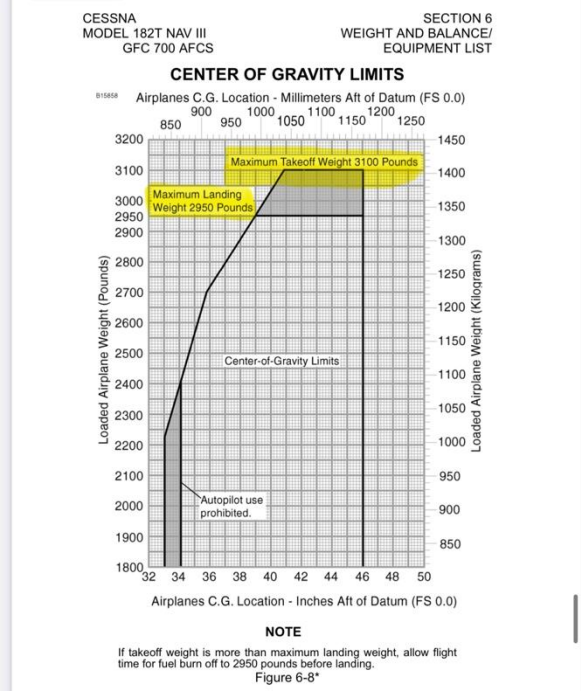


Figure 6-8*

Excerpt from Cessna Service Manual

2. Unscheduled Maintenance Checks Defined and Areas of Inspection

A. Hard/Overweight Landings.

(1) A hard landing is any landing made when the sink rate is more than the permitted sink rate limit. An overweight landing is any landing made when the gross weight is more than the maximum gross landing weight given in the approved Pilot's Operating Handbook.

NOTE: If the hard/overweight landing also has high drag/side loads, more checks are necessary.

(2) Hard or overweight landing check.

(a) Landing gear.

1 Main gear struts - Examine for correct attachment and permanent set.

2 Main gear attachments and supporting structure - Examine for loose or unserviceable fasteners and signs of structural damage.

3 Nose gear trunnion supports and attaching structure - Examine for loose or unserviceable fasteners and signs of structural damage.

4 Nose gear attachments and supporting structure - Examine for loose or unserviceable fasteners and signs of structural damage.

(b) Wings.

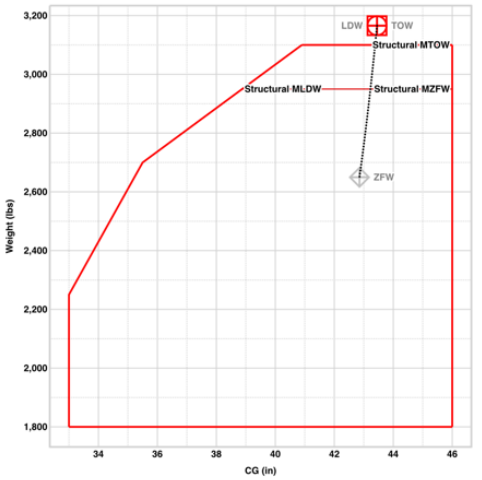
1 Wing surface and lift strut - Examine the skin for buckles, loose or unserviceable fasteners, and fuel leaks. Examine the attach fittings for security.

2 Trailing edge - Examine for any deformation that stops the normal flap operation.

4. Fuel vs Useful Load

4.1. It is rare to "top off" the fuel on the C182T. Fuel at maximum capacity of 87 gallons usable will severely limit the remaining useful load. Most aircraft are kept mission ready between 50-64 gallons. It may be local discretion or wing-level standardized. Never "top off" without fully understanding the implications.

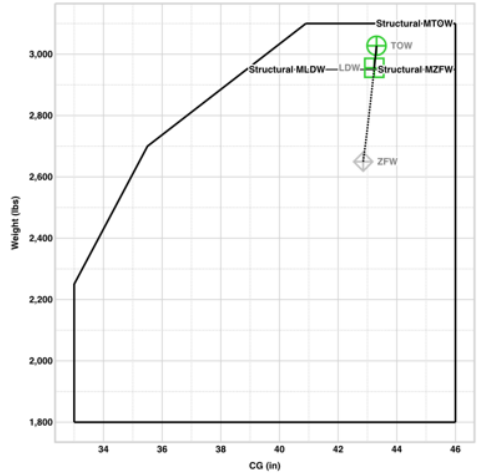
4.2. A habit that may lead to being over fueled is not being physically present during the fueling. If asking for a fueler to do the fueling from a truck, you should be there to remind them the exact gallons right there. Asking for fueling remotely has led to a fueler not understanding or hearing and just topping off like is common on some other types of aircraft. The picture to the right depicts three 180-pound persons and no cargo and full fuel.



	Weight (lbs)	Limit (lbs)	CG (in)	FWD / AFT Limits (in)
BEW	**2,050**	-	**39.5**	**33.0 / 46.0**
Payload	600	900	-	-
Zero Fuel Weight	**2,650**	**2,950**	**42.9**	**35.2 / 46.0**
Fuel Tanks	522	522	-	-
Ramp Weight	3,172	**3,110**	**43.5**	-
Taxi Fuel	6	-	-	-
Takeoff Weight	3,166	**3,100**	**43.4**	-
Fuel To Destination	0	-	-	-
Landing Weight	3,166	**2,950**	**43.4**	-

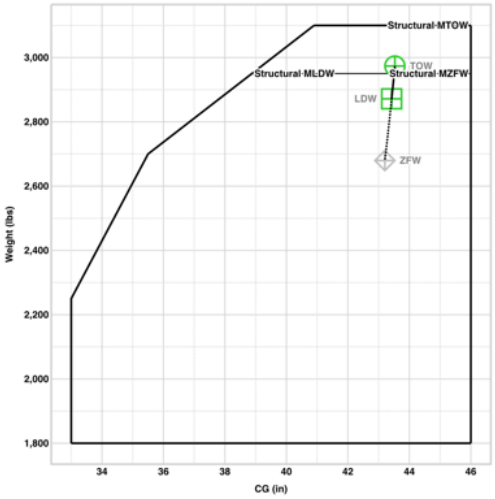
4.3. Even though there are four seats in the aircraft, it is uncommon to have more than three occupied. It is possible to have a fourth, but circumstances will make it unlikely. In this example with 64 gallons and very minimal cargo, three 180-pound persons can takeoff, but you must check your fuel burn math before landing.

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.



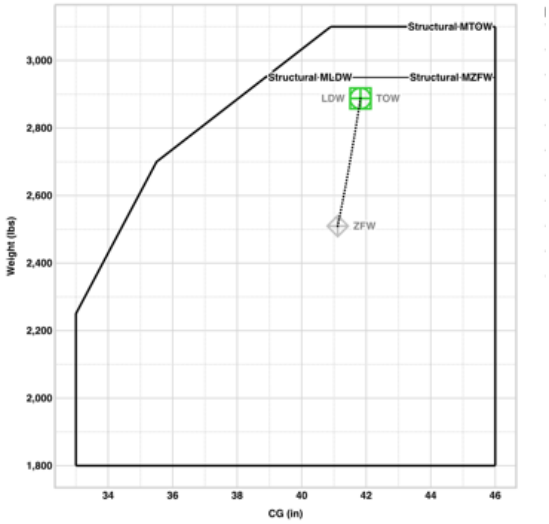
	Weight (lbs)	Limit (lbs)	CG (in)	FWD / AFT Limits (in)
BEW	**2,050**	-	**39.5**	**33.0 / 46.0**
Payload	600	900	-	-
Zero Fuel Weight	**2,650**	**2,950**	**42.9**	**35.2 / 46.0**
Fuel Tanks	384	522	-	-
Ramp Weight	**3,034**	**3,110**	**43.3**	**40.0 / 46.0**
Taxi Fuel	6	-	-	-
Takeoff Weight	**3,028**	**3,100**	**43.3**	**39.9 / 46.0**
Fuel To Destination	72	-	-	-
Landing Weight	**2,956**	**2,950**	**43.2**	**39.0 / 46.0**

4.5. In this example by reducing the fuel to 50 gallons, we're just barely over landing weight. Little to almost no extra math is required. This assumes three 180-pound persons with minimal cargo.



	Weight (lbs)	Limit (lbs)	CG (in)	FWD / AFT Limits (in)
BEW	**2,050**	-	**39.5**	**33.0 / 46.0**
Payload	630	900	-	-
Zero Fuel Weight	**2,680**	**2,950**	**43.2**	**35.4 / 46.0**
Fuel Tanks	300	522	-	-
Ramp Weight	**2,980**	**3,110**	**43.5**	**39.3 / 46.0**
Taxi Fuel	6	-	-	-
Takeoff Weight	**2,974**	**3,100**	**43.5**	**39.2 / 46.0**
Fuel To Destination	102	-	-	-
Landing Weight	**2,872**	**2,950**	**43.4**	**37.8 / 46.0**

4.6. This example with only two 180-pound persons with 64 gallons means we're way under landing weight already before starting the flight. With only two persons, it's less likely to be overweight.



	Weight (lbs)	Limit (lbs)	CG (in)	FWD / AFT Limits (in)
BEW	**2,050**	-	**39.5**	**33.0 / 46.0**
Payload	460	900	-	-
Zero Fuel Weight	**2,510**	**2,950**	**41.1**	**34.4 / 46.0**
Fuel Tanks	384	522	-	-
Ramp Weight	**2,894**	**3,110**	**41.8**	**38.1 / 46.0**
Taxi Fuel	6	-	-	-
Takeoff Weight	**2,888**	**3,100**	**41.8**	**38.0 / 46.0**
Fuel To Destination	0	-	-	-
Landing Weight	**2,888**	**2,950**	**41.8**	**38.0 / 46.0**

5. Fuel Totalizer

5.1. The pre-defined values for the fuel totalizer on the 182T are 87 or 64 gallons. We typically fly a little less than 64 so can set 64 and subtract as appropriate to the actual fuel quantity you manually measured.

5.2. 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. Because we rarely fly "topped off", you need to measure manually. The tabs marks are not effective for getting a precise number.

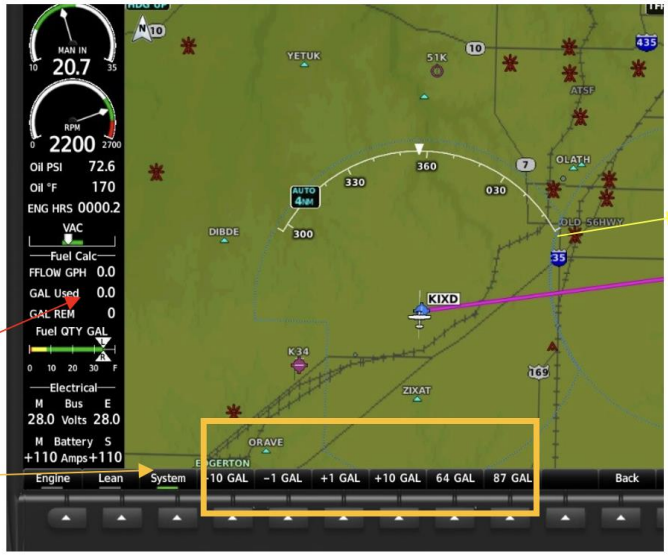
5.3. As a reminder, this totalizer is completely independent of the fuel quantity gauges. You must input an accurate GAL REM (gallons remaining) into the totalizer otherwise its indications are meaningless.

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.

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.

The number here and the color gauge are not linked in anyway.

This number will be “0” after being reset. 64 or 87 will make it 64 or 87. Adjust the plus or minus from 0 or 64/87 to get the real number you measured.



Example if you want 50 GAL: 64 – 10 – 1 – 1 -- 1 -- 1

6. Unleaded Fuel STC

6.1. Some of our C182Ts have Supplemental Type Certificates to use Swift UL94 unleaded aviation fuel. The STC involves extra sheets in the POH and new placards near the fuel cap openings. There is a requirement to use certain types of oil or an additive. The AIF binder should have this type of oil.

6.2. While nothing physical about the aircraft or engine has changed, this STC is aircraft serial number specific. You can't just use this fuel on an identical airplane without the official STC.

6.3. The fuel is clear in color, some will say it has a straw like color also. As far as confusing it with Jet A, there is almost no odor in UL94. Jet A will have a distinct strong odor vs UL94. You can mix UL94 and 100LL.

6.4. The figure to the right shows UL94 with a little 100LL mixed in. UL94 has an odor similar to 100LL. Jet fuel will have a distinct kerosene smell. If water is present at the bottom of UL94, it should still show a bubble between the fuel and water. UL94 is approximately 5.9 Pounds per Gallon.

7. Kinds of Operation Equipment List

7.1. 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.

7.2. 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 your purview.

SECTION 2
OPERATING LIMITATIONS

CESSNA
MODEL 182T NAV III
GFC 700 AFCS

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					
182T Nav III - GFC 700 AFCS POH/AFM	1	1	1	1	Accessible to pilot in flight.
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	

8. Regulatory Compliance for Beacon Light

8.1. The KOEL for the 182T 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

8.1.1. 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.

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

8.3. 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]

9. Essential Bus and Standby Battery

9.1. 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.

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

9.3. 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.

9.4. 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 accidently 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.

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

9.6. 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.

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

9.8. On just the essential bus, you lose quite a few things. There'll be no transponder, no ADSB, no Flap movement, no Stall Warning horn. 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.

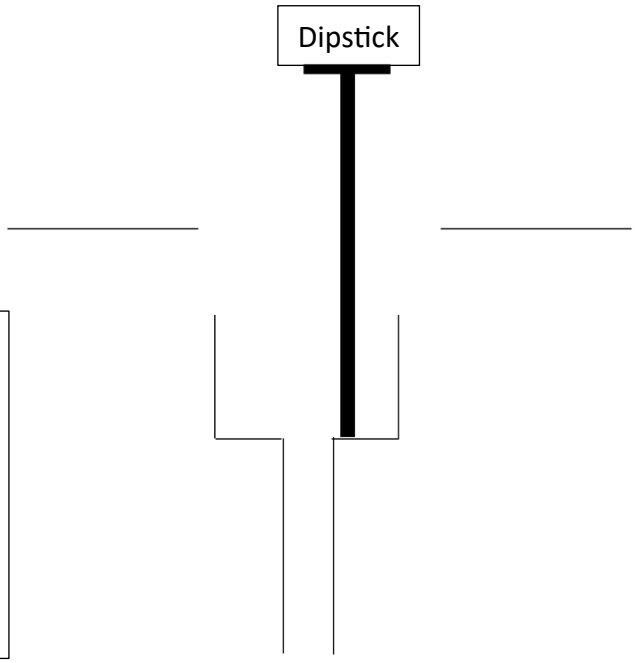
10. Oil Dipstick

10.1. The panel with access to the oil dipstick is in a less than ideal position. Many pilots will prefer to use a ladder to have simpler access. The position means you probably won't be able to see the actual opening for the dipstick so re-insertion can be a real challenge.

10.2. As a tip, when trying to re-insert, make sure the stick is almost completely vertical when dropping. Initially, you may want something to help you visually see the opening. After a while, you will have more muscle memory that makes access easier.

10.3. The AFM/POH minimum oil quantity for the C182T with the Lycoming IO-540 is **four quarts**. Many will try to keep it between six to eight quarts but the minimum is four. The opening for the dipstick is also the oil adding source.

10.4. An important note, CAP has many older Cessna C182R models with Continental engines. These have a minimum oil quantity of **nine quarts**. Don't takeoff with less than nine quarts on an C182R model.



A mental note on the dipstick insertion is to first find the bigger opening. Once you're confident you are inside of that, you can feel around for the smaller opening. Then the dipstick should freely fall into place to then tighten.

11. Seatbelts

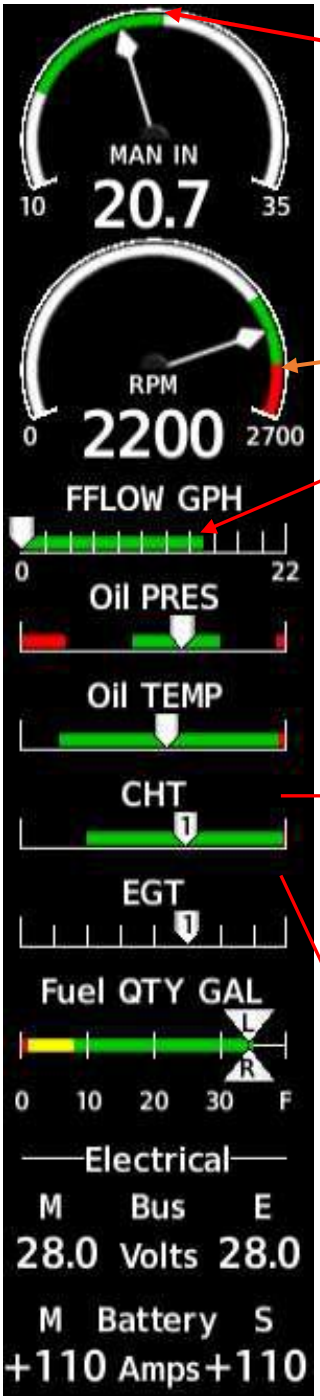
11.1. There are various versions of seatbelts on the C182Ts. Some are the more traditional seatbelts. Some will have Amsafe airbag type seatbelts. When buckling the seatbelts with airbags, make sure you position the airbag in the proper direction to ensure inflation the correct way. Some aircraft that 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.

11.2. 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.

11.3. 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.

12. Engine Instruments

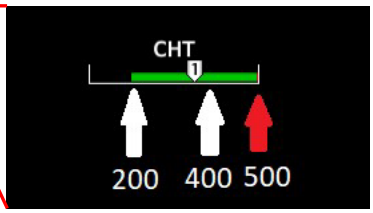
12.1. Reading the Engine Instrument Panel requires a little bit of pre studying. 23" MP will be referenced many times.



23" MP is the upper end of the green band.

2400 RPM is where the green and red meet.

15 GPH is the far-right end of the green band.



500 degrees F CHT is the far-right side of the green band
400 degrees F CHT is two-thirds of the green band

13. Tach Time and Vacuum

13.1. The normal first page of the G1000 Engine Indicating System (EIS) will not have tach time or the vacuum. You must press ENGINE then SYSTEM. Tach time will be called ENG HOURS. Vacuum is also on this page. If on newer aircraft with GI 275, there is no vacuum system and thus no gauge to display.

14. Climb Power

14.1. There are two AFM/POH stated methods for climb power. However, the CAP checklist only talks about one and is brief on the subject. Please make sure you understand both. There is no operating limitation to reduce throttle or RPM immediately.

14.2. For most 182Ts, the Prop Control (blue knob) will stay full forward from takeoff and all of the climb. If the throttle is in the governed range, the prop control in the full forward position should show 2400 RPM. When the checklist says Prop Control 2400, it's usually verifying it only.

14.3. There are some modified 182s, usually older, that have higher operating RPM ranges. This is why PIC familiarity with tail specific POH and any STCs is so important. Comply with the official documentation.

14.4. When climbing, pick "normal" or maximum. Either is acceptable. But they have two different mixture and airspeed procedures. You may want to default to "normal" but if you have any reason to need extra climb rate, go maximum. There is no limitation on maximum vs normal.

14.5. Under normal power, you can bring throttle back to 23" MP but should keep mixture Rich until 5,000 ft. This 5,000 ft statement is not on the CAP checklist. Then lean for 15 GPH. Maximum climb means keeping throttle full but leaning according to the placard below the PFD.

MODEL 182T NAV III
GFC 700 AFCS

NORMAL PROCEDURES

ENROUTE CLIMB

NORMAL CLIMB

1. Airspeed - 85 - 95 KIAS
2. Throttle Control - 23 in.hg. or FULL (if less than 23 in.hg.)
3. Propeller Control - 2400 RPM
4. Mixture Control - 15 GPH or FULL RICH (if less than 15 GPH)
5. FUEL SELECTOR Valve - BOTH
6. Cowl Flaps - OPEN (as required)

MAXIMUM PERFORMANCE CLIMB

1. Airspeed -80 KIAS at sea level
   74 KIAS at 10,000 feet
2. Throttle Control - FULL (push full in)
3. Propeller Control - 2400 RPM
4. Mixture Control - FULL RICH (or SET to Maximum Power Fuel Flow Placard value for altitude in Amplified Normal Procedures)
5. FUEL SELECTOR Valve - BOTH
6. Cowl Flaps - OPEN

ENROUTE CLIMB

Normal enroute climbs are performed with flaps up, at 23 in.hg. manifold pressure or full throttle, whichever is less, 2400 RPM, and 85 to 95 KIAS for the best combination of performance, visibility, engine cooling, economy and passenger comfort (due to lower noise level). The mixture should be full rich during climb at altitudes up to 5000 feet pressure altitude.

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 MCP. This speed is 80 KIAS at sea level, decreasing to 74 KIAS at 10,000 feet. For maximum power climb use full throttle and 2400 RPM with the mixture set in accordance with the Maximum Power Fuel Flow placard.

If an obstruction dictates the use of a steep climb angle, the best angle of climb speed should be used with flaps up and maximum power. This speed is 64 KIAS at sea level, increasing to 68 KIAS at 20,000 feet. This type of climb should be of the minimum duration and engine temperatures should be carefully monitored due to the low climb speed.

For maximum power, the mixture should be set in accordance with the Maximum Power Fuel Flow placard. The fuel flow values on the placard are minimum fuel flows.

For maximum power, the mixture should be set in accordance with the Maximum Power Fuel Flow placard. The fuel flow values on the placard are minimum fuel flows.

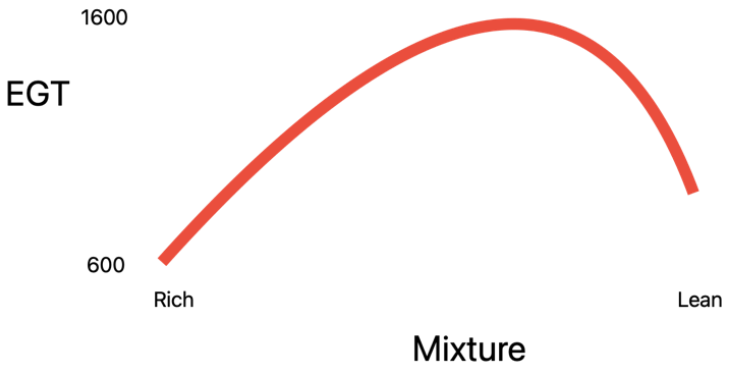
MAXIMUM POWER FUEL FLOW	
ALTITUDE	FUEL FLOW
S.L.	20.5 GPH
2000 Feet	19.0 GPH
4000 Feet	17.5 GPH
6000 Feet	16.5 GPH
8000 Feet	15.5 GPH
10,000 Feet	14.5 GPH
12,000 Feet	13.5 GPH

15. Leaning

15.1. 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.

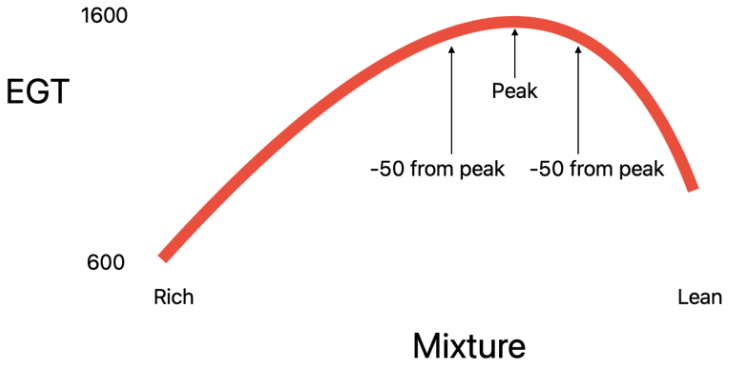
15.2. For those with significant experience leaning based on EGT on other systems, the Lean Assist may be intuitive. But without a solid understanding, it can be quite confusing if one does not understand the theory.

15.3. 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.



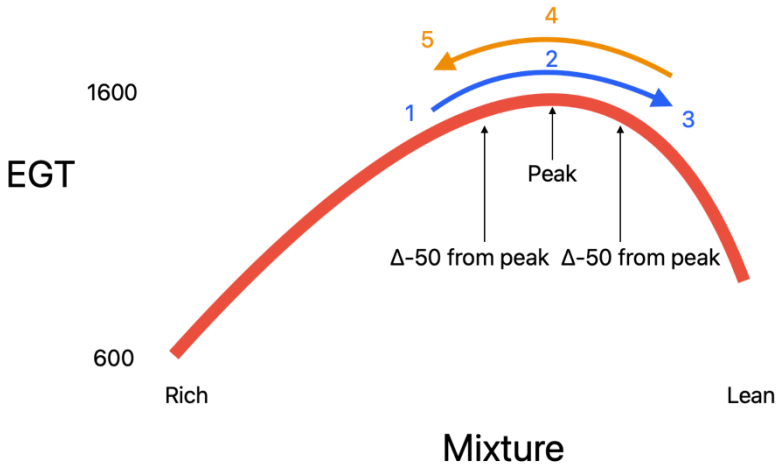
15.4. When we refer to rich or lean side of peak, we mean a position to the left or right side of that example curve.

15.5. 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.



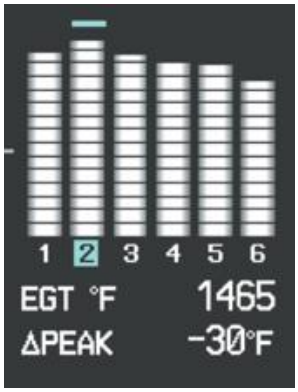
15.6. Once on the lean side, we need to move the mixture back to the rich side. Exactly how rich will depend on several factors.

15.7. The AFM/POH has three stated positions for leaning with reference to EGT. Recommended lean is 50° Rich of Peak EGT. Best Economy is EGT. Best Power is 125° Rich of Peak EGT. You are not absolutely required to be at these values but have a reasoning.



15.8. 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.

15.9. 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.



15.10. 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.

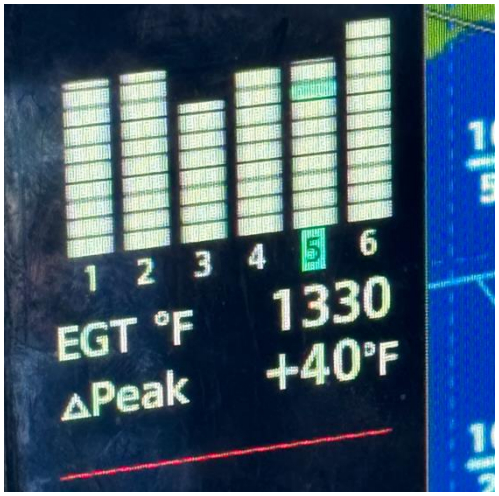
15.11. When you lean out, the fuel flow should be somewhat close to the AFM/POH Performance Section 5 numbers. Typical cruise fuel flows are 9-14 GPH for 55-80% power. If way below the GPH at normal power, you're probably on the lean side.

> The 182T 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 80% power.

15.12. 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 182Ts.

15.13. 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.

15.14. 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.

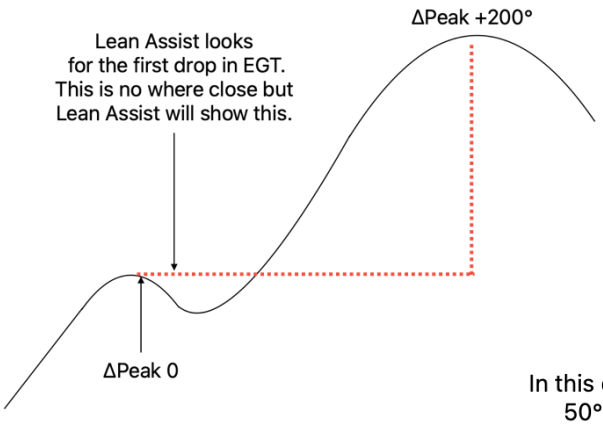


15.15. It has no context as to why the EGT number dropped. Again, in a perfect world, it drops with those curves shown earlier. But if the mixture is leaned too quickly, the EGT may never reach true highest peak before the EGT drops again. Then as you richen, you get the actual highest EGT which will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

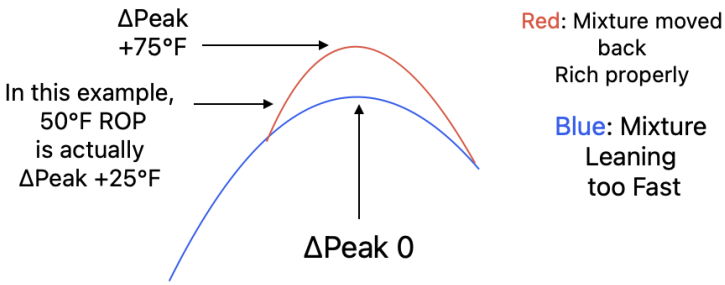
15.16. Also, if anything causes EGT drop while doing lean assist, it's going to show a peak because the EGT dropped. Remember, it has no context as to why the EGT dropped. It just assumes that's the peak. Some common reasons might be reducing throttle during this process, leaning then enrichening before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

15.17. 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.

15.18. 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.



16. CHT Management

16.1. The biggest factor Lycoming has identified for potential wear on the engine is higher sustained CHTs. There are some non-intuitive factors on the 182T 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

16.2. 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. The POH mentions opening the cowl flaps partially and to the extent necessary to provide cooler air.

While in cruise flight, cowl flaps should be closed unless hot day conditions require them to be adjusted to keep the CHTCHT at approximately two-thirds of the normal operating range (green band).

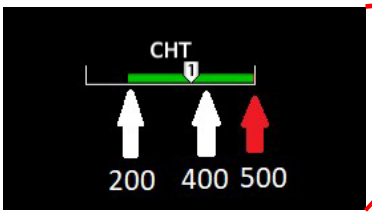
AFM/POH excerpt

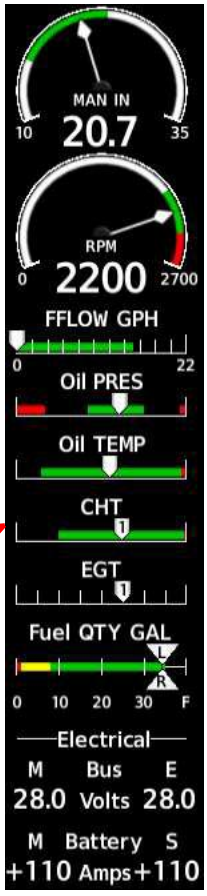
16.3. Figuring out the CHT is not intuitive. The front-end EIS screen has a green band. About 2/3 of the band is 400° F. The other option is go to the Engine – Lean page.

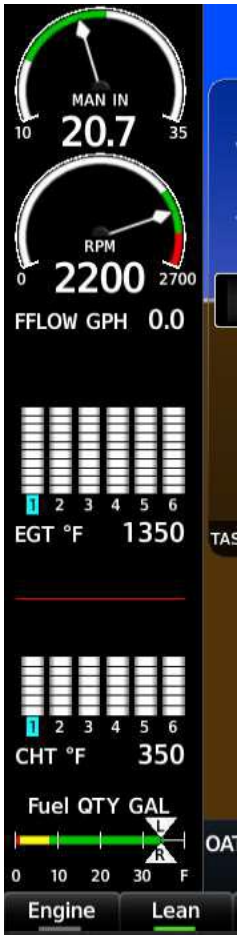
16.4. Officially, the POH says 500° F for the CHT is "normal". Almost every external source to include Lycoming will mention that 500° is far too hot for continuous normal.

POWERPLANT INSTRUMENT MARKINGS

INSTRUMENT	RED LINE (MIN)	RED ARC (LWR)	YELLOW ARC	GREEN ARC (NORMAL OPERATING RANGE)	RED ARC (UPR)	RED LINE (MAX)
Tachometer	----	----	----	2000 to 2400 RPM	2400* to 2700 RPM	---
Manifold Pressure	---	---	---	15 to 23 in.hg.	---	---
Cylinder Head Temperature	----	----	----	200 to 500°F	----	500°F
Oil	----	----	----	100 to 245°F	245° to	---







Flight Characteristics to CHT Relationship

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

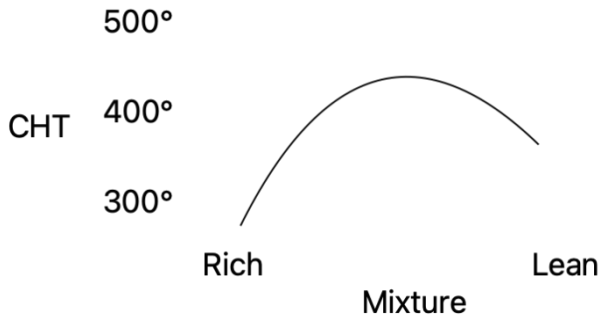
16.6. For example, for climb you decide to reduce throttle to 23" MP to reduce overall power. This by itself does reduce CHT. However, as you reduce power you notice the climb rate is significantly reduced. You want to keep climbing at a certain rate so you raise the nose and lower the airspeed to get a better climb rate. But by raising reducing the airspeed, you now don't have as much cool air entering the inlets.

16.7. In this above example, you may be better served by keeping throttle full and keeping that climb rate going at a faster speed. No one size fits every situation.

16.8. Another is 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.

16.9. Or you can open the cowl flaps partially. Opening the cowl flaps has a drag penalty, although relatively minor.

16.10. Sometimes more than one option works. Almost every decision has a positive and negative. 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.

17. Cowl Flaps Misc.

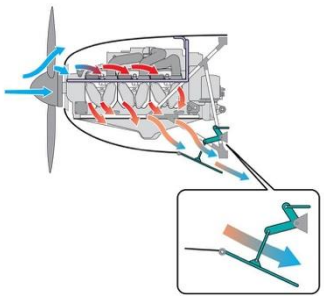
17.1. There are some phases of routine flight that have no guidance on the Cowl Flaps in the AFM/POH. Ultimately it is your discretion as PIC. But this will give you some tips and thoughts for consideration.

17.2. During maneuvers such as slow flight, if cowl flaps are closed, you will easily exceed 400° CHT. Strong recommendation is to keep them open. An advanced pilot could close them for the initial power reduction then open them when adding power. But not a common procedure.

17.3. Touch and gos don't have a published procedure. If the runway is long and wide enough, you could close them on downwind and then after landing touch down, open them while on the runway before power addition. This is the ideal method for engine management but will add a distraction during a critical phase of flight. If the runway is long and wide enough, maybe an acceptable option. If you don't want to do this for whatever reason, one option is to open them after becoming airborne again on the upwind/departure leg after. Another option is to open them on short final. Just leaving them open entirely is a less than ideal option. A balance needs to be struck balancing practical aircraft control safety with engine management. PIC discretion is needed.

17.4. Planned low approach or go around is another area to use discretion on. From the context of developing good habits, keeping them closed and then going through the motion of opening them after the go-around is a positive habit. If you encounter an unplanned go around, it's a good habit to develop.

17.5. Simulated engine failures from up high to low with extended throttle at idle should probably be kept closed. Remember to reopen when adding power.



18. Rotation and Approach Speeds

18.1. Unlike a 172 that has specific speeds for takeoff rotation and approach, the 182 only provides a range. It is up to you as PIC to give context and pick an appropriate speed to use.

SECTION 4
NORMAL PROCEDURES

CESSNA
MODEL 182T NAV III
GFC 700 AFCS

TAKEOFF

NORMAL TAKEOFF

1. Wing Flaps - UP - 20° (10° preferred)
2. Throttle Control - FULL (push full in)
3. Propeller Control - 2400 RPM
4. Mixture Control - RICH (above 5000 feet pressure altitude, lean for maximum RPM)
5. Elevator Control - LIFT NOSEWHEEL (at 50 - 60 KIAS)
6. Climb Airspeed -70 KIAS (FLAPS 20°)
   80 KIAS (FLAPS UP)
7. Wing Flaps - RETRACT (at safe altitude)

18.2. The normal takeoff rotation speed is 50-60 knots. As a technique, the heavier the aircraft, the higher the rotation speed. But also, as a technique, the more flaps, the lower the rotation speed. If heavier than normal using partial or no flaps for takeoff, maybe consider being closer to the 60 knots. If lighter and using flaps 20, it'll probably be closer to 50 knots. Gusty conditions may require higher speeds, but PIC discretion is required.

18.3. The G1000 has an "R" symbol on the speed tape which is for rotation. It is defaulted to 59 knots IAS. This is not a mandatory speed. PIC familiarity is paramount.

18.4. The worst situation is when the aircraft wants to fly but the pilot mistakenly thinks rotation must be delayed to 59 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.

18.4. Approach speeds for a normal landing are also in a range. With Flaps Full, 60-70 Knots. Again, weight and flap setting are the biggest contributor to that determination. Flaps Up, is 70-80 knots. With partial flaps, you'll have to interpolate.

NORMAL LANDING

1. Airspeed - 70 - 80 KIAS (Flaps UP)
2. Wing Flaps - AS DESIRED (UP - 10° below 140 KIAS)
   (10° - 20° below 120 KIAS)
   (20° - FULL below 100 KIAS)
3. Airspeed - 60 - 70 KIAS (Flaps FULL)
4. Elevator and Rudder Trim Controls - ADJUST
5. Touchdown - MAIN WHEELS FIRST
6. Landing Roll - LOWER NOSEWHEEL GENTLY
7. Braking - MINIMUM REQUIRED

18.5. 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. Short field techniques are different and covered later.

18.6. A note about the Flap Settings. The actual degree measurement for Flaps FULL in the 182T is 38°. There is no notch in the Flap handle for 30°. If you're transitioning from newer 172s with only 30° of Flaps for FULL, the FULL setting on the 182T vs 172 is not the same. Many newly transitioning pilots find FULL (38°) to have a lot of drag compared to other aircraft they have previously flown.

18.7. There are older 172s or 182s with Flaps 40 or a notch for Flaps 30. This advice is primarily for 172N-S model series moving direct to the 182T.

Control Surface Movements	Wing flaps			Down	38° +0°, -1°
	Elevator tab	Up	24° ± 2°	Down	15° ± 1°
	Ailerons	Up	20° ± 2°	Down	15° ± 2°
	Elevator (Relative to stabilizer)	Up	28° ± 1°	Down	21° ± 1°
	Rudder: Right: (Parallel to 0.00 W.L.)		24° +0°, -1°	Left: 24° +0°,-1°	
	Right: (Perpendicular to hinge line)		27°13' +0°, -1°	Left: 27°13' +0°,-1°	
Serial Numbers Eligible	182S: 18280001 through 18280944 182T: 18280945 and On				

19. Short Field Speeds

19.1. The normal and CAP checklist leave out some crucial items to consider for short-field takeoff. The checklist has an obstacle clearance speed of 58 KIAS at full gross weight. But it offers nothing about a rotation or liftoff speed. Assuming you've done the proper 20 degrees of Flaps, DO NOT try to rotate at 58 knots. You'll probably have to push the yoke forward and run into the wheelbarrow issue mentioned earlier.

19.2. The lift-off or rotation speeds are in the AFM/POH Performance Section 5. At 3100 pounds, the lift off speed is 49 KIAS.

19.3. For landing, the only approach speed is 60 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

Short Field Takeoff

1. Wing Flaps..... 20°
2. Brakes..... Apply
3. Throttle Control .....Full
4. Propeller Control..... 2400 RPM
5. Mixture Control Rich (above 5000 ft pressure alt. lean for max RPM
6. Brakes..... Release
7. Elevator Control .... Slightly Tail Low Climb Airspeed .....58 KIAS (until all obstacles are cleared)
8. Wing Flaps ... Retract Slowly (when airspeed more that 70 KIAS)

No Rotation or Lift Off speed mentioned

POH

SHORT FIELD TAKEOFF

1. Wing Flaps - 20°
2. Brakes - APPLY
3. Throttle Control - FULL (push full in)
4. Propeller Control - 2400 RPM
5. Mixture Control - RICH (above 5000 feet pressure altitude, lean for maximum RPM)
6. Brakes - RELEASE
7. Elevator Control - SLIGHTLY TAIL LOW
8. Climb Airspeed - 58 KIAS (until all obstacles are cleared)
9. Wing Flaps - RETRACT SLOWLY (when airspeed is more than 70 KIAS)

SECTION 5 PERFORMANCE — CESSNA MODEL 182T NAV III GFC 700 AFCS

SHORT FIELD TAKEOFF DISTANCE AT 3100 POUNDS

CONDITIONS:
Flaps 20°
2400 RPM, Full Throttle and mixture set prior to brake release.
Cowl Flaps OPEN
Paved, Level, Dry Runway — Lift Off: 49 KIAS
Zero Wind — Speed at 50 Feet: 58 KIAS

CESSNA MODEL 182T NAV III GFC 700 AFCS — SECTION 5 PERFORMANCE

SHORT FIELD TAKEOFF DISTANCE AT 2700 POUNDS

CONDITIONS:
Flaps 20°
2400 RPM, Full Throttle and mixture set prior to brake release.
Cowl Flaps OPEN
Paved, Level, Dry Runway — Lift Off: 45 KIAS
Zero Wind — Speed at 50 Feet: 54 KIAS

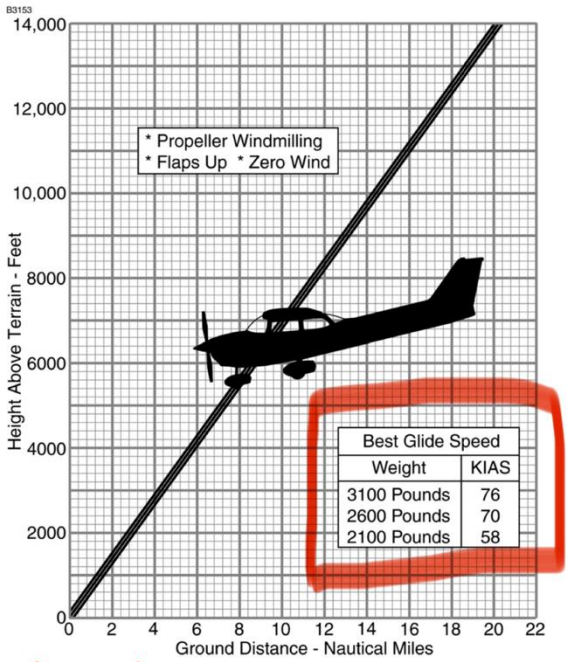
20. Best Glide Speed

20.1. Given the large variance on weight, the best glide speed will vary significantly. Of note is that published best glide speed of 76 KIAS is for maximum weight.

20.2. As mentioned earlier, we rarely actually fly at that weight. The G1000 speed tape has a "G" symbol at 76 knots. But again, we rarely fly at the weight that 76 is for.

20.3. The checklist will only say 76 KIAS. What you might want to consider is "what is today's (not published) best glide speed?". Also remember, the recommended Approach speeds without Engine Power are different than best glide speed.

MAXIMUM GLIDE



checklist assumes max weight

Figure 3-1

ENGINE FAILURES (Continued)

ENGINE FAILURE DURING FLIGHT (Restart Procedures)

1. **Airspeed - 76 KIAS (best glide speed)**
2. **FUEL SELECTOR Valve - BOTH**
3. **FUEL PUMP Switch - ON**
4. **Mixture Control - RICH (if restart has not occurred)**
5. MAGNETOS Switch - BOTH (or START if propeller is stopped)

EMERGENCY LANDING WITHOUT ENGINE POWER

1. Pilot and Passenger Seat Backs - MOST UPRIGHT POSITION
2. Seats and Seat Belts - SECURE
3. Airspeed - 75 KIAS - Flaps UP
   70 KIAS - Flaps 10° - FULL

21. Seat Position and Sight Picture

21.1. Forward visibility on the 182Ts is significantly reduced compared to many other tricycle gear aircraft. If you've flown older 182s, the sight picture is quite different.

21.2. Even with the seatback all the way forward, if you rest your back and head fully on it, you won't see the cowling. This means during the landing flare, you may not be able to see any runway over the nose and have difficulty with the control inputs.

21.3. There are a few options to overcome this. One is to get your back off the default backrest. A cushion on your back can work. Or use your own body's lumbar muscles to move your back forward and thus your sight picture; some find this method easier than others though. This method is helpful for those who are used to lots of over the nose visibility on other aircraft and the easiest way to transition.

21.4. This camera is mounted above the pilot's head. If this is the type of sight picture you're used to seeing on other aircraft, you want to consider how you'll sit and use your body's lumbar position to achieve this view. A cushion can be helpful.

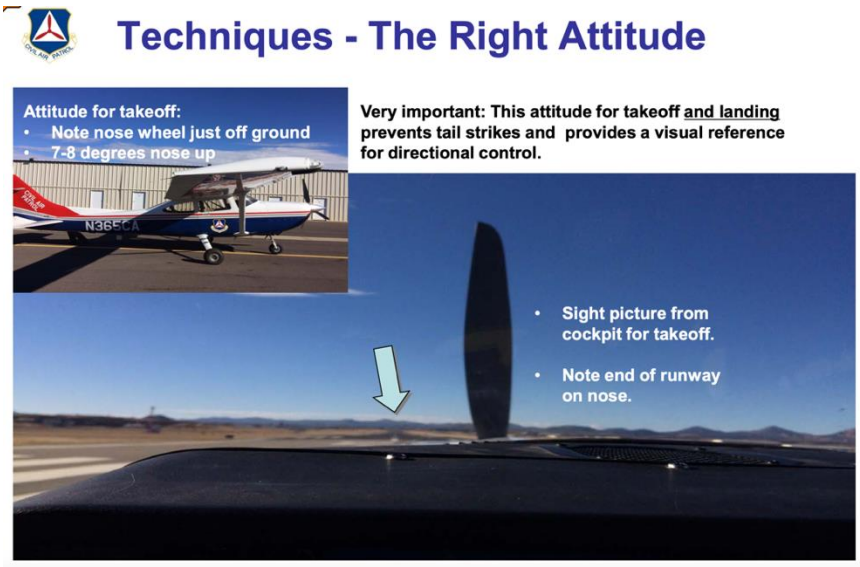
21.5. The other option is to leave your back resting against the back rest and learn to not have that sight picture. The view to the side of the windows provides great visual cues. Most tailwheel pilots learn how to fully take advantage of this. But unlike a tailwheel aircraft, you must be super cautious of a tail strike if keeping this style of sight picture.

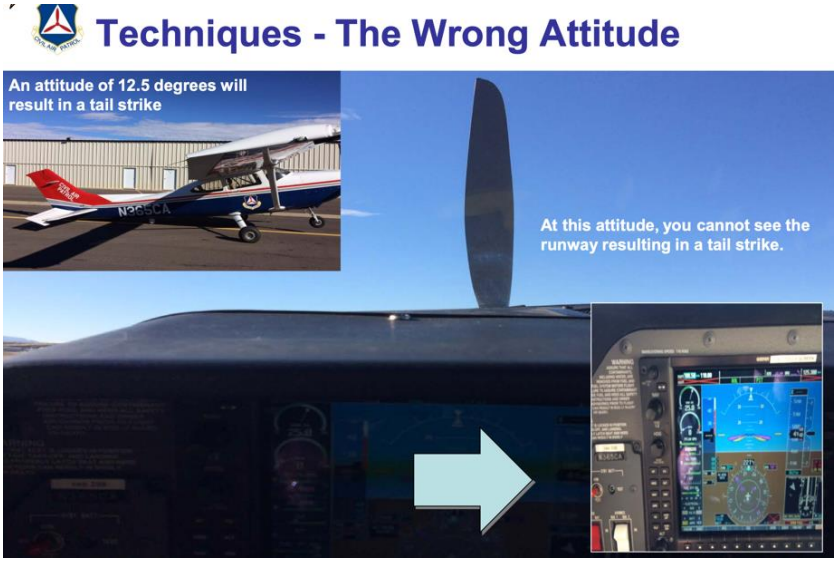
22. Tail Strike Awareness

22.1. One of the leading cause of mishaps in CAP are simulated Soft Field Takeoffs in 182Ts. During the Takeoff, if adequate back pressure is not released the tail ends up impacting the runway surface.

22.2. Compared to a 172, the 182T does have more horsepower and also uses a default Flaps 20° setting for Soft Field Takeoff. If you add power quickly and don't release any back pressure from full aft, you only have maybe one to two seconds before the tail will hit the runway. Instead, as you're adding power release some back pressure in anticipation of the nose rising.

22.3. Sight picture is also important. You won't have a lot of forward visibility to have reference to. The nose doesn't need to be very high up. This is why proper seat position and body position are so important.





23. Power-On Stall

23.1. Compared to a 172, the 182 at full throttle will make the power-on stall maneuver potentially harder to accomplish. The extra horsepower with favorable low speed characteristics means the plane will need to be at an ultra-aggressive nose up pitch attitude to reach the critical angle of attack.

23.2. 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 182 performance tables, you will note that 21" MP will generally achieve 65 percent power or more at typical altitudes and temperatures we would do this maneuver. It may require more than 21" MP to achieve 65% power but it should cover over 95% of circumstances at typical density altitudes for air work.

23.3. As a tip, reducing the airspeed to approximately 60 KIAS before adding power and pitching up will make the maneuver far easier to accomplish.

SECTION 5
PERFORMANCE

CESSNA
MODEL 182T NAV III
GFC 700 AFCS

CRUISE PERFORMANCE
PRESSURE ALTITUDE 4000 FEET

CONDITIONS:
3100 Pounds
Recommended Lean Mixture
Cowl Flaps CLOSED

RPM	MP	20°C BELOW STANDARD TEMP -13°C			STANDARD TEMPERATURE 7°C			20°C ABOVE STANDARD TEMP 27°C		
		% MCP	KTAS	GPH	% MCP	KTAS	GPH	% MCP	KTAS	GPH
2400	25	---	---	---	---	---	---	83	146	14.4
	24	84	140	14.6	81	142	14.0	78	143	13.6
	23	79	138	13.7	76	139	13.2	74	139	12.8
	22	74	134	12.9	72	135	12.5	69	135	12.1
	21	70	130	12.1	67	131	11.7	65	131	11.4
	20	65	126	11.4	62	126	11.1	60	126	10.8

Task	*C. Power-On Stalls*
References	FAA-H-8083-2, FAA-H-8083-3; AC 61-67; POH/AFM
Objective	To determine that the applicant exhibits satisfactory knowledge, risk management, and skills associated with power-on stalls. ***Note:*** *See Appendix 6: Safety of Flight and Appendix 7: Aircraft, Equipment, and Operational Requirements & Limitations.*
Knowledge	The applicant demonstrates understanding of:
PA.VII.C.K1	Aerodynamics associated with stalls in various airplane configurations, to include 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 (i.e., airplane design) and impending stall and full stall indications (i.e., how to recognize by 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 demonstrates the ability to identify, assess and mitigate risks, encompassing:
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., airplane buffet, stall horn, etc.).
PA.VII.C.R3	Failure to recognize and recover at the stall warning during normal operations.
PA.VII.C.R4	Improper stall recovery procedure.
PA.VII.C.R5	Secondary stalls, accelerated stalls, elevator trim stalls, and cross-control stalls.
PA.VII.C.R6	Effect of environmental elements on airplane performance related to power-on stalls (e.g., turbulence, microbursts, and high-density altitude).
PA.VII.C.R7	Collision hazards, to include aircraft, terrain, obstacles, and wires.
PA.VII.C.R8	Distractions, improper task management, loss of situational awareness, or disorientation.
Skills	The applicant demonstrates the ability to:
PA.VII.C.S1	Clear the area.
PA.VII.C.S2	Select an entry altitude that will allow the Task to be completed no lower than 1,500 feet 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
PA.VII.C.S4	Set power (as assigned by the evaluator) to no less than 65 percent power.

24. Mixture Lean for Ground Ops

24.1. 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.

24.2. 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.

24.3. 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.

24.4. 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

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
2. Brakes .....Test

Start

Lean

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.

25. Audio Panel

25.1. 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.

25.2. 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.

25.3. 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.

25.4. 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.

25.5. 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

CAP Radio

DF Unit

For everyone to hear everybody, these two lights <u>SHOULD NOT</u> be lighted

Adjust Pilot or Passenger Volume or Squelch <u>Only</u>

NEW

CAP Radio

DF Unit

For everyone to hear everybody, these two lights **should** be lighted up

Visual Volume

Adjust volume <u>every function</u>. Outer knob is a Cursor

26. Audio Select Panel

26.1. On CAP G1000 aircraft, an additional set of switches are installed either above the engine controls or below them.

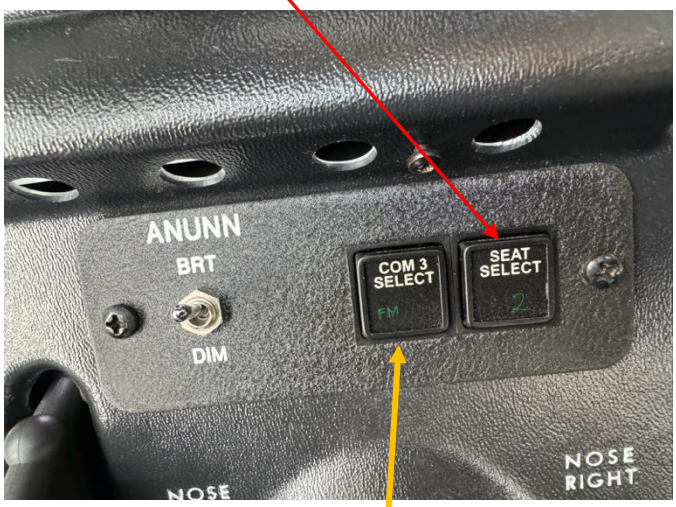
26.2. There is an additional Push to Talk switch in the rear left seat. However, only one switch, either the front right seat or that rear left seat can be active at any one time.

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

26.4. 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.

Seat Select Switch

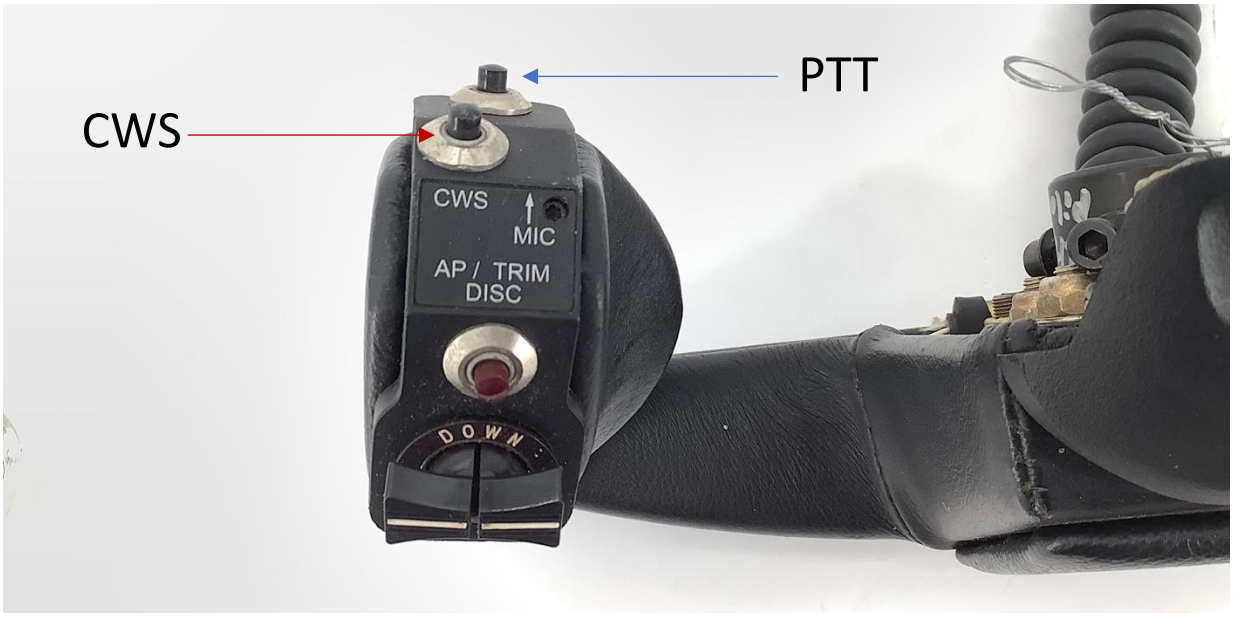
Seat Select Position 3
(Rear Left Passenger Seat)



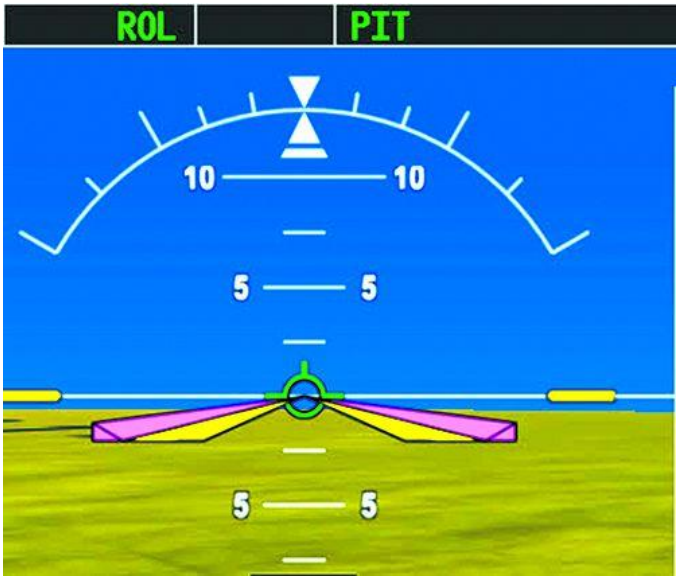
COM 3 SELECT can switch between FM and UHF. Very few aircraft have the UHF radio installed but connection ports are available to plug into. Over 99% of the time, keep it in FM mode.

27. Control Wheel Buttons

27.1. 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.



27.2. 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.

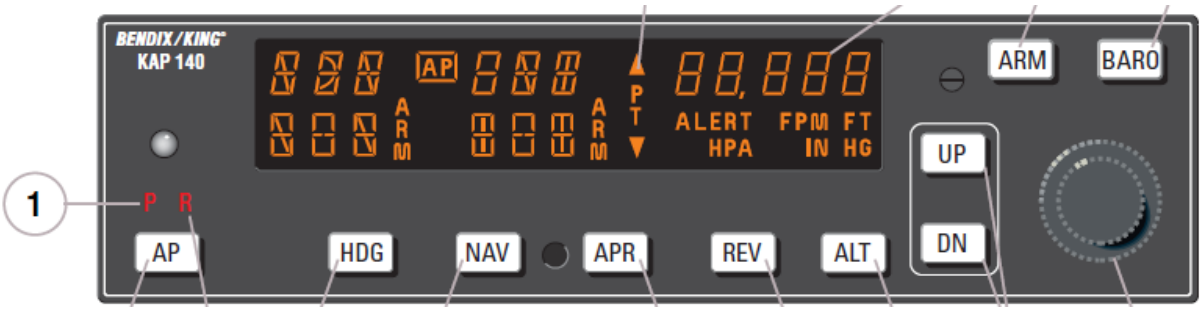


28. Electric/Manual Trim Check

28.1. A CAP checklist item always gets many pilots confused. On the 182T checklists for both KAP140 and GFC700 is an item in the Run Up portion called Electric/Manual Trim…Check.

28.2. In the POH for KAP140 specific 182Ts, you will find a quite thorough multi step process. In the POH for the GFC700, you will find nothing about this.

28.3. There is a 5-page procedure for this check in the 182T KAP140 POH Supplement 3. Part of that procedure involves looking for the Red P on the KAP140 box.



28.4. What do you do on the GFC700? There is no right answer. It may be best to simulate the motions of the KAP140 procedure. What is not acceptable is developing a bad or incorrect habit that is OK on the GFC700 and then using it when flying a KAP140. Look up the KAP140 procedure before flight if in a KAP140.

KAP140 POH GFC700 POH (no mention) CAP Checklist (both)

CESSNA
MODEL 182T NAV III

SECTION 4
NORMAL PROCEDURES

BEFORE TAKEOFF (Continued)

12. Mixture Control - RICH
13. FUEL SELECTOR Valve - SET BOTH
14. Elevator and Rudder Trim Controls - SET FOR TAKEOFF
15. Manual Electric Trim (MET) System - CHECK
(Refer to the POH/AFM, Supplement 3, for Manual Electric Trim check procedures)
16. Throttle Control - 1800 RPM
    a. MAGNETOS Switch - CHECK (RPM drop should not exceed 175 RPM on either magneto or 50 RPM differential between magnetos)
    b. Propeller Control - CYCLE from high to low RPM; return to high RPM (full in).
    c. VAC Indicator - CHECK
    d. Engine Indicators - CHECK
    e. Ammeters and Voltmeters - CHECK
17. Annunciators - CHECK (Verify no annunciators are shown)
18. Throttle Control - CHECK IDLE
19. Throttle Control - 1000 RPM or LESS
20. Throttle Control Friction Lock - ADJUST
21. COM Frequency(s) - SET
22. NAV Frequency(s) - SET
23. FMS/GPS Flight Plan - AS DESIRED

11. Mixture Control - RICH
12. FUEL SELECTOR Valve - SET BOTH

(Continued Next Page)

182TPHBUS-03 U.S. 4-15

SECTION 4
NORMAL PROCEDURES

CESSNA
MODEL 182T NAV III
GFC 700 AFCS

BEFORE TAKEOFF (Continued)

13. Autopilot - ENGAGE (push AP button on either PFD or MFD bezel)
14. Flight Controls - CHECK (verify autopilot can be overpowered in both pitch and roll axes)
15. A/P TRIM DISC Button - PRESS (verify autopilot disengages and aural alert is heard)
16. Flight Director - OFF (push FD button on either PFD or MFD bezel)
17. Elevator and Rudder Trim Controls - SET FOR TAKEOFF
18. Throttle Control - 1800 RPM
    a. MAGNETOS Switch - CHECK (RPM drop should not exceed 175 RPM on either magneto or 50 RPM differential between magnetos)

Before Takeoff - Run-Up

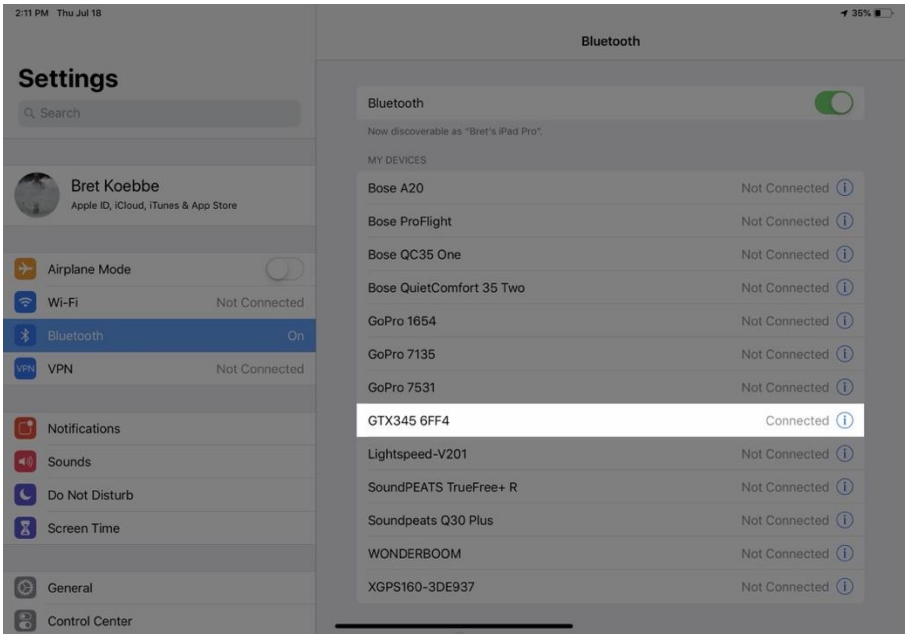
1. Parking Brake ..... Set
2. Pilot & Pax Seat Backs ..... Upright pos
3. Seats and Seat Belts ..... Secure
4. Cabin Doors ..... Closed and Locked
5. Flight Controls ..... Free & Correct
6. Flight Instruments . Check no red Xs
7. Altimeters Recheck:
   - PFD (Baro) ..... Set
   - Standby Altimeter ..... Set
8. G1000 Altitude Select (ALT SEL) .... Set
9. Standby Flight Instruments ... Check
10. Fuel Quantity ..... Check

Note: *Flight is not recommended when both fuel quantity indicators are in the yellow arc range.*

11. Mixture ..... Rich
12. Fuel Selector Valve ..... Set BOTH
13. Electric/Manual Trim..... Check
14. Autopilot..... ENGAGE verify can overpower in pitch and roll
15. Autopilot Trim DISC Button verify aural alert and.....Off

29. Bluetooth Compatibility

29.1. 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.



29.2. 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.

29.3. 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.

29.4. If you don't, 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.

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

29.6. 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.

30. Flight Data Logger Status

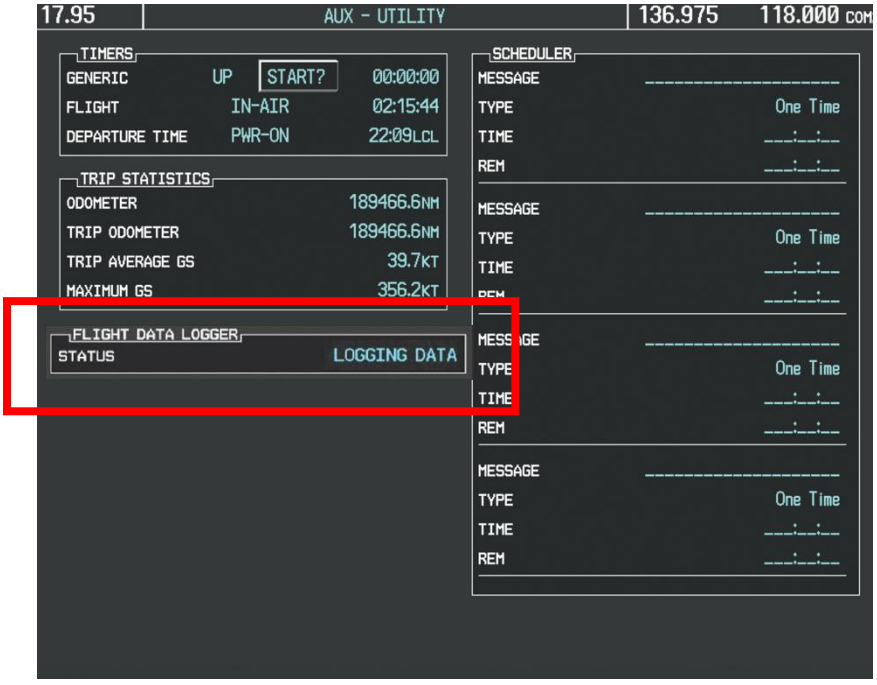
30.1. In the CAP Checklist, you will see an item for the Flight Data Logger Status. One of the SD card slots in the G1000 can record flight data parameters. In the event of a mishap, the SD card can be used in the investigation. The Checklist is directing you to make sure it is properly logging data.

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

30.2. 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 forever.

30.3. The checklist won't say how to find this message. Write it down on a cheat sheet until you memorize it.

30.4. 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.



31. ESP: Electronic Stability Protection

31.1. 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.

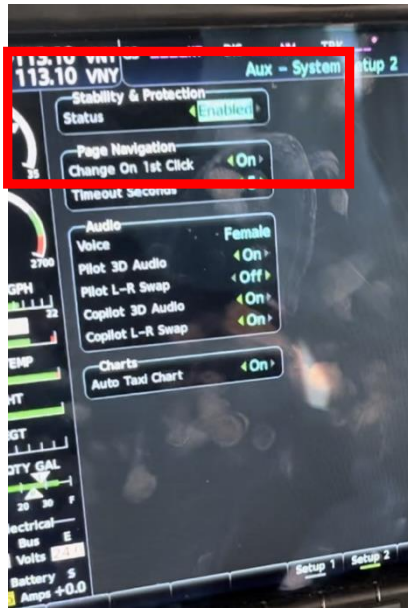
31.2. Because of how new this is, all the aircraft with ESP will be G1000NXi. However, there are G1000NXi that do not have ESP. Do not use the term NXi and ESP interchangeably.

31.3. 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.

31.4. 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.

31.5. 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.

31.6. The Checklist won't say how to find this page. Use a cheat sheet until you can memorize it.



32. Flight ID

32.1. 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.

32.2. 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.

32.3. 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.

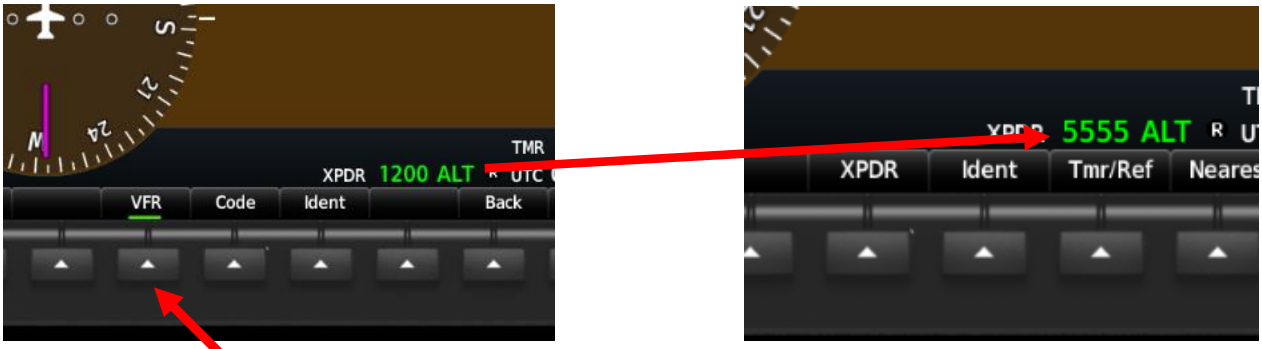
The Checklist does have a line for the Flight ID check but it is very subtle. Most are looking at just the code and mode selected, but Flight ID is a part of the checklist.

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

33. Transponder VFR Button

33.1. 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).

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



Pressing VFR while already 1200 will lead to it going to previously input code.

If already 1200 and you want 1200, leave it alone.

34. Elevator Trim Position Check Sequence

34.1. 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.

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

34.3. 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 <u>after</u> the autopilot check. Don't assume the trim is good because you checked it at some point earlier.

12. Fuel Selector Valve .....Set BOTH
13. Electric/Manual Trim.....Check
14. Autopilot..... ENGAGE verify can overpower in pitch and roll
15. Autopilot Trim DISC Button verify aural alert and.....Off
16. Flight Director .....Off
17. Elevator & Rudder Trim for Takeoff
18. Throttle Control..... 1800 RPM

Do the Autopilot check and then the Elevator Trim for Takeoff. The Trim position must be rechecked <u>after</u> the Autopilot was turned On.

35. Mission Master Switch

35.1. 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.

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

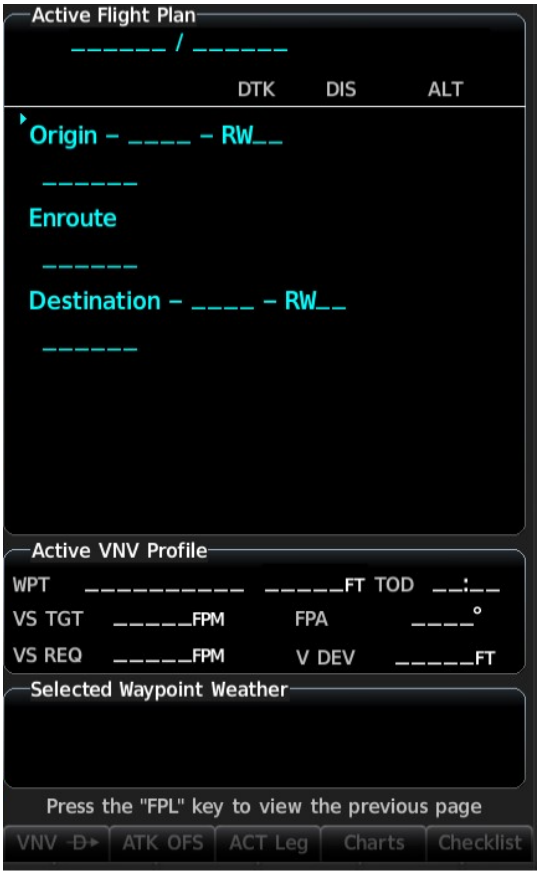
5. Brakes.....Test & Set
6. Circuit Breakers.....Check In
7. Electrical Equipment.....Off
8. Mission Master Switch.....Off
9. Avionics Switch (Bus 1&2).....Off

36. Flight Plan Layout

36.1. 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.

36.2. 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.

36.3. 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.



37. Turn Anticipation

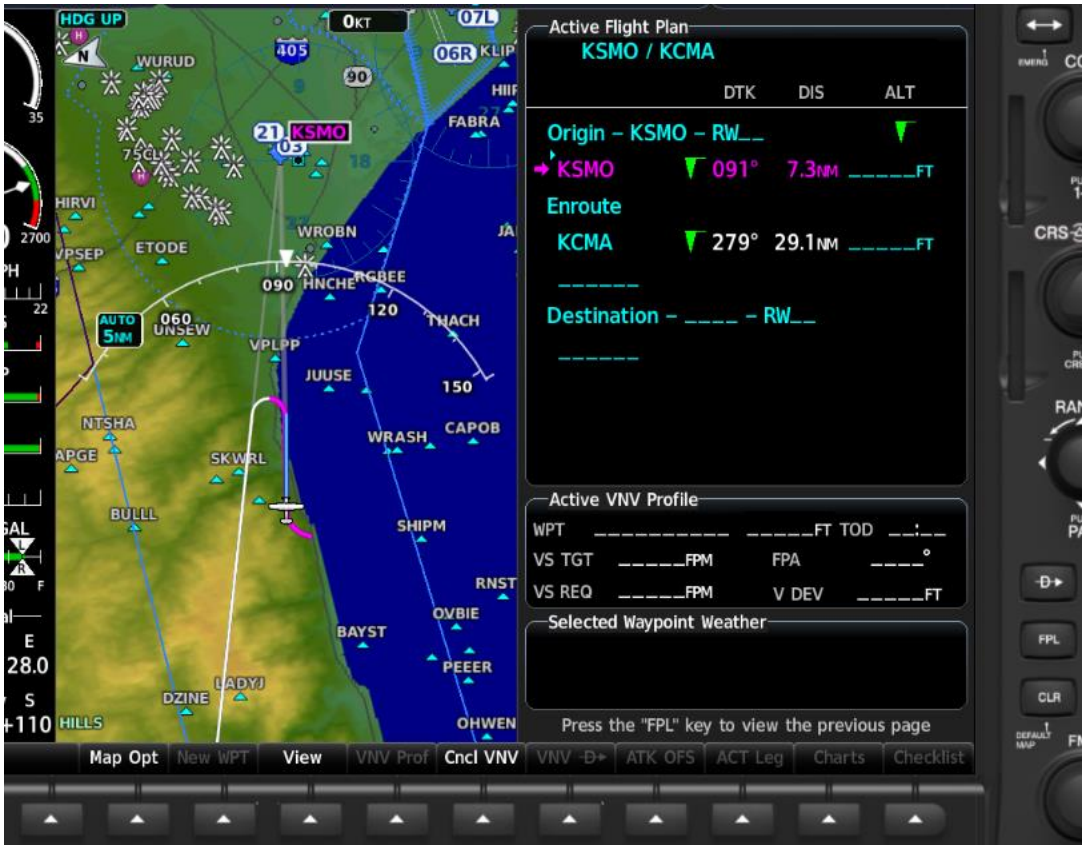
37.1. A helpful feature on the G1000 can sometimes not be helpful in unique situations. One of those is turn anticipation. It'll create an arc when passing close to waypoint to be on course for the next waypoint.

37.2. 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.

37.3. 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.

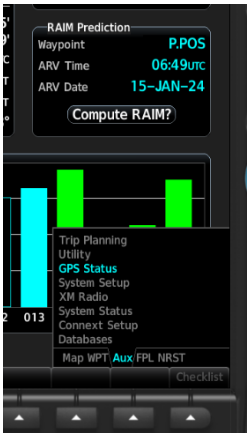
37.4. The flight plan then creates a turn anticipation arc from the airport to the next waypoint, which happens to be behind you. The angle is quite extreme, so it has to start the turn a quite a ways away from the airport. Now all of a sudden, the plane is turning around.

37.5. 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.



38. RNAV Approaches without WAAS

For IFR Only. Skip Ahead.



38.1. Many of the early G1000 do not have WAAS. This means you'll have to do a RAIM check and other alternate planning considerations per the FARs. This is primarily the KAP140 aircraft.

38.2. You may also run into the old software configuration in that the GPS sensitivity will display "APR". This is the equivalent of "LNAV" for sensitivity. There won't be any LNAV+V, LNAV/VNAV, LPV on these older aircraft. At the time the original G1000 was being programmed, there was only one type of RNAV approach.

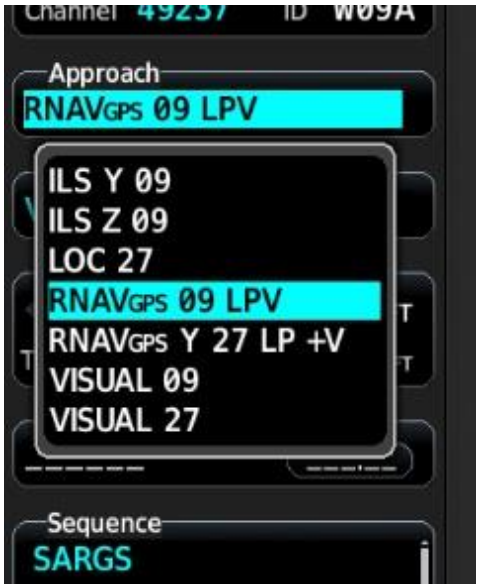
39. Naming Conventions of RNAV Approach Types

For IFR Only. Skip Ahead.

39.1. 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

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



40. Vectors to Final

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

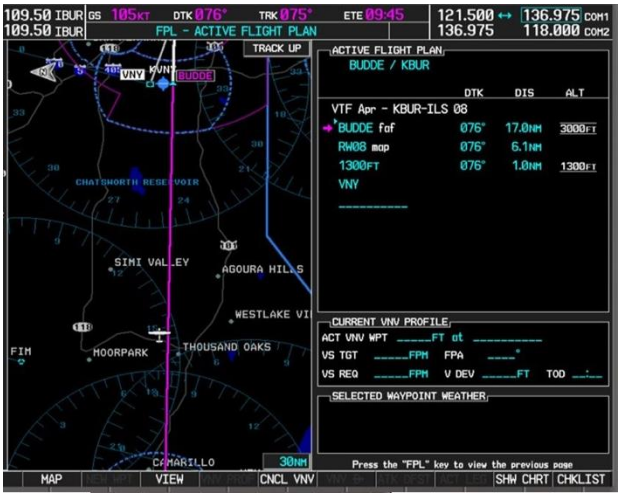
40.1. Garmin has changed their Vectors to Final programming over the years. Because the G1000 in CAP's fleet range that span, you'll come across both styles.

40.2. 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.

40.3. 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.

40.4. 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 original G1000 with KAP140, it will have old style 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)

41. Holding

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

41.1. 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.

41.2. 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.

41.3. 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.

41.4. All the NXi are configured with the new software. The KAP140 will generally not have the software update. The GFC700 may or may not have it.

41.5. 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.

42. Missed Approach and Go-Around Button

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

42.1. 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.

42.2. GFC700 equipped G1000s (2007-Present) all have a Go-Around (GA) Button just next to the Throttle. The KAP140 (2004-2006) has just a blank spot there.

42.3. 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.

42.3. On the GFC700, the flight director or autopilot will capture the ALT SEL in GA (pitch) mode. On the KAP140, the ALT SEL in the G1000 has nothing to do with the autopilot.

42.4. 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.

43. Bearing Pointers

43.1. 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.

43.2. A few items to note, the CAP Cessna 182Ts 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.

43.3. 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.

44. Exterior Light Panel

OLD

NEW

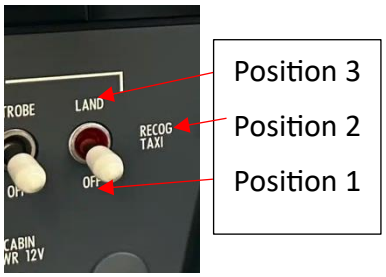
44.1. The panel for the exterior lighting will depend on the model year. In 2011, newer aircraft started coming from the factory with the new switch and new dual wing LED lighting.
On the older panel, there is a CAP unique item, the Pulse Light switch.

44.2. The Pulse light switch in the on position will automatically turn on and off the Landing and Taxi lights in a pulsing pattern. The Landing and Taxi light switches must be off for the Pulse light function to work. With the Landing or Taxi light on and the Pulse light position on, the normal continuous on function of the Landing or Taxi light takes over. There are no separate light bulbs for Pulse Lights.

44.3. 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.

44.4. 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.

44.5. 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

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

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

NEW Style Lights

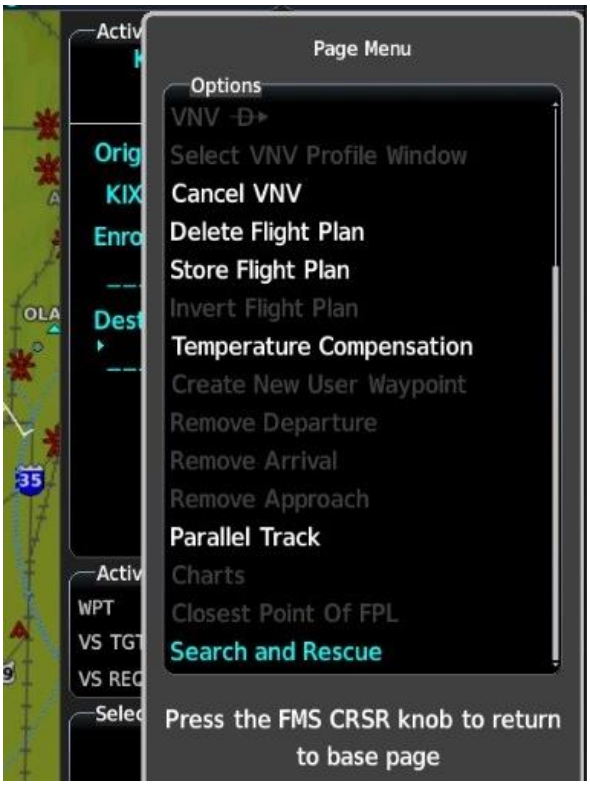
Lights on Each Wing
Taxi/Recog on the ground does one bulb in each wing on continuously
Taxi/Recog in the air does all bulbs on and off in a pattern
Landing does all bulbs on continuously

45. Search and Rescue SAR Package

45.1. 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.

45.2. All of the newer NXi aircraft should have it installed from the factory so you can count on those usually. The KAP140 autopilot G1000s cannot be upgraded to include the SAR package. 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.

45.3. 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).



46. Magnetic vs True

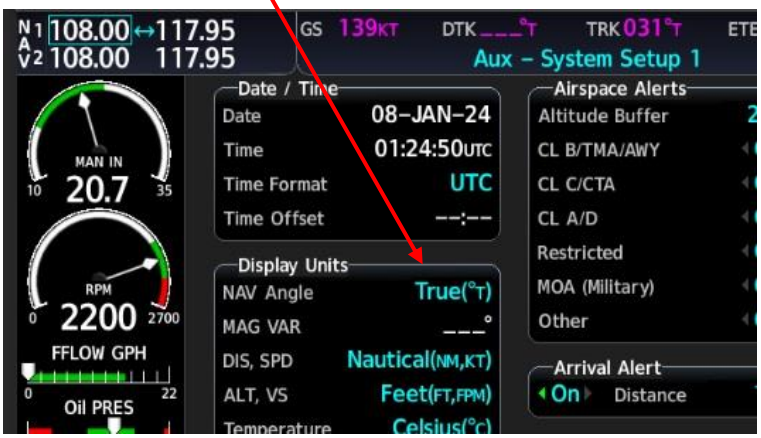
46.1. There is a possibility you will start up the airplane and find the G1000 is configured to True degrees instead of the usual Magnetic degrees. It is super not obvious you are in True. The "T" is there but not distinctive. This'll make flying radar vectors or certain courses offset by the local magnetic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

46.2. 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.

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

True

True/Magnetic Change



47. Closing Thoughts

47.1. 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. It is not enough for a FAA High Performance Endorsement. You must still seek out real training. This is just a supplement to aid.

47.2. Topics to still review:

47.2.1. Pilots Operating Handbook

47.2.2. Constant Speed Prop operation

47.2.3. High Performance Aircraft requirements

47.2.4. Garmin G1000 Pilot's User Guide

47.2.5. Garmin G1000 VFR or IFR CAP Courses

47.2.6. GFC700 or KAP140 Autopilot Procedures

47.2.8. Engine Temperature Management

47.2.9. Electronic Stability and Protection (ESP)

47.2.10. 182T Maneuvers Guide