

# Private Pilot Cross Country Flight Planning

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The process of planning a cross county flight at the Student Pilot level is one topic not usually covered well within the scope of references provided to students. The individual tasks, such as calculating the time to cover a certain distance at a given airspeed, or fuel consumption, are contained in numerous sources, but none cover the entire process from start to finish. This primer provides an outline that takes a student from start to finish and hopefully offers sufficient guidance to finish the task. Feedback from students is encouraged to make this document more thorough or better understood.

**Needed items.** You will need the following items.

- Current Sectional for the route of flight
- E6-B or other flight computer
- Plotter
- POH for the aircraft you are using
- Compass Deviations
- Blank navigation log forms (Jeppesen Form)
- Access to DUATS or a flight briefer
- Airport Facilities Directory
- Practical Test Standards

**Destination.** The first factor to consider is where you are going. It is assumed that this has been decided for you as part of your training program. For this case, let us assume you are going from Fredericksburg (KEZF) to Farmville (KFVX). Check the AFD for any pertinent information and tab the pages so you can find them later.

**Initial Risk Assessment.** (For a more detailed discussion of this topic, see the handout on Risk Assessment). The first step is to conduct an initial assessment. I usually do this using the PAVE construct. Consider this trip in N61954, a C172M. If there are no obvious "no-go" mandates, then proceed, noting any elements of risk. The assessment might look like this.

**P (Pilot).** Student pilot. Current in make in model with proper endorsements for cross country flight and solo flight in a C172. Limited instrument and night time.

**A (Aircraft).** A C172 (ceiling about 13,000 feet, 38 gallons of usable fuel), no known squawks, limited night cockpit lighting, 105 knots cruise, late model GPS with an out of date database.

**V (enVironment).** Lowland consisting of crops land and wooded areas, summertime (late EENT), lots of wooded terrain from Lake Anna south with few features on which to navigate.

**E (External Pressures).** VFR or IFR, day or night, local or cross country.

**Weather.** The next thing to do is get the weather report. This is actually an orderly process and is easy to do once you understand what you need and where to look for it. Use the back side of the Jeppesen Navigation Log Form to guide you. Start with the National Weather Service's Aviation Weather Center at <http://aviationweather.gov/adds/>. Note the light blue tabs in two rows across the top third of the screen. These are what you will be using. There are many other products you *can* use, but these provide the basic data. Access them in this order:

**Prog Chart.** Select the Prog Chart and you should see at five maps of the US with weather and precipitation symbols. As part of your training you should know what all the symbols are and what they mean. Use the "i" button to the right of the tabs to look up any you don't know. For example. The "H" symbol indicates a High Pressure Cell. Air around a HIGH flows clockwise, outward and downward. Winds move generally in the direction of the isobars and the distance between isobars gives you an idea of wind speed. Use the Prog Charts to get an overall weather picture. Briefly record this information on the right hand column within the weather portion of the Navigation Log.

**Current Weather.** The existing conditions at your point of departure, destination, alternate and en route can be obtained using the METAR tab. A cross country trip to Farmville via the Gordonsville VOR should include Shannon, Louisa, Farmville and perhaps Stafford. Use the pull down option to obtain the last 2 hours. This will give you an idea of any trends. Record the METAR verbatim in the current weather column.

**Forecast Weather.** The expected conditions for your flight are obtained using the TAF tab. Not all airports have TAFs, but the more you get weather the more you will know which ones have weather. For the above trip, the TAF for Reagan National (KDCA), Charlottesville (KCHO) and Richmond (KRIC) should provide you what you need. If the weather systems from moving in from the northwest, you should substitute Dulles (KIAD) for Reagan National. If the weather is moving from the southwest, substitute Lynchburg (KLYH) for Reagan National. The weather at Quantico (KNYG) is notoriously inaccurate and often not updated in a timely manner. You should be able to read the TAF report from the text. Record the results on the form.

**Winds Aloft.** Use the winds/temp tab to obtain the winds. After selecting the tab, you can look at the weather maps to get an idea of winds at different altitudes. Then select the "Official NWS Textual FB Winds/ Temp Aloft" text just below the tabs. You will get a map of the US. Run the cursor over the NE US. When that section is highlighted in gray, select it. Notice all the locations indicated on the map. There are the sites that collect weather data. Note that for this trip, Richmond has winds aloft and temperatures for altitudes in 3,000 foot increments. Record the information for your trip, including the temperature. Use this data to compute WCA and TAS.

**Radar.** During the summer the radar report is a constant companion. Use it to track the locations, intensity and direction of movement of precipitation and storms. You should also now be able to correlate the radar data with the Prog Chart and METAR/TAF. They should tell the same story. In the summer when thunderstorms are possible, be sure to check radar immediately before each flight.

**AIR/SIGMETs.** Next check the AIRMETS and SIGMETs. You should know what the three types are (S, T, Z) and what "triggers" each, and what each level means. For example, you should know that moderate turbulence triggers an AIRMET-T and that moderate turbulence indicated what the airplane, you and objects in the cockpit will do. Check the AIM for the full chart. Next, select the "Graphical AIRMET (G-AIRMET Interactive Display. Note the map of the US (with nothing on it) and the light blue tabs at the top. Click one each one to graphically depict the location of each AIRMET. Each AIRMET should be a "red flag" and force you to reconsider making the trip. Discuss each AIRMET that pertains to your flight with your flight instructor. Record the information on your Navigation Log.

**NOTAMs.** In this area of the country, NOTAMs are especially important. TFR's pop up with little warning. AOPA flight planner is especially good about graphically depicting NOTAMs. For you to find them, go to the left hand side of the weather page and locate "Standard Briefing." Select it. Notice that you will see links for different products in the same order that a weather briefer will give them to you. Scroll down until you come to Notices to Airmen. Select the FAA's PilotWeb NOTAM Page. Now go to Flight Plan Search. Enter KEZF, GVE KVVX, and also select the "Enroute Airport and Navigational Aids. The default 20 NM buffer will pick up a lot more information than what is just on the route. Now select "View NOTAM" and you will get quite a selection. The first section will give you the selections you entered. The second section will give you other points along the route. Every once in a while you will come across an unexpected NOTAM that impacts your flight. Be certain to check NOTAMs for each cross country.

If there are no weather considerations that dictate a "no-go" decision, proceed with your planning, noting any potential risk factors.

**Initial Route Selection.** The initial route selection should be based on “how” you intend to navigate. One method is to simply draw a line between the two points. This implies that pilotage and dead reckoning are the primary methods, perhaps augmented by GPS. The advantage is that this is usually the shortest route, though it does require more scrutiny of the route to be flown. A second method involves using VORs. The advantage here is that you are more likely to stay on course, and the course to be flown has been flown and mapped, and usually ensures navigational and communications coverage. The distance may be longer, but usually not more than about 10% of the distance to be flown. In this case, Shannon to the Gordonsville VOR, then to FVX would be such a route. It is usually best to choose a preferred method for each leg, and use the other method to confirm your location. Remember that the PTS requires the use of all methods. Now draw a pencil line on your sectional to show the route.

**Altitude Selection.** The aircraft ceiling gives you a top limit. The terrain gives you a bottom limit (ground level plus 1,500 feet). The hemisphere rule further limits your selection to a half dozen or so altitudes. For a FVX flight, you could select 2,500, 4,500, 6,500, 8,500, 10,500 and 12,500. Now use weather, winds, and operational considerations to further limit your selections. You might eliminate 2,500 because you want more options in case of an emergency, and anything above 6,500 because of the time it takes to climb and the fact that you may not be able to clearly see some terrain features at those altitudes. Selecting among two alternatives (4,500 and 6,500) based on winds aloft, clouds and flight visibility is now an easy selection. Do the same for the return flight.

**Route Study.** Now look at the route. Can you actually get there? In other words, are there restricted areas, MOAs, terrain problems (fly over water outside glide range?) or other considerations? What would you do in case you could not complete the flight as planned?

**Final Route Selection.** If you find conditions that would prevent you from making the flight as planned, go back and pick another route. If you are satisfied that you can complete the flight along the route selected, then proceed with your planning. Using a highlighter, draw your course line. If your course takes you through an area covered by a TCA chart, get one and use it. The larger scale and additional information will only help you out.

**Climb Point.** The first point I would pick would be slightly beyond the point at which my climb would be complete. Refer to the POH for climb data, and then compute the distance to the first point. Let's assume that we do this and reach our cruising altitude just over the lake about 10 miles west of EZF. Note this point and put it on your flight log. Keep in mind that during planning, you may not know which runway you will depart. This is why it is best to give yourself a little distance so that you can arrive at the climb point when departing either runway. Variations in the “time to climb” will also introduce a potential timing error in your flight log. This is expected.

**Descent Point.** The second point is the descent point. Assume we will be traveling at 105 knots, and that we need to descend to a pattern altitude 1,500 feet (rounded off) at FVX. That means we need to descend 3,000 feet (assume we selected 4,500 feet for the en route altitude). We know that we can descend at 500 fpm and that at that rate, it would take 6 minutes. This means our point needs to be about 8 miles from FVX. There is no specific corresponding point on the ground, but we can identify this spot by using a radial from the RIC VOR. Another consideration is the selection of a “no lower than...” altitude. This is a point along your descent beyond which you will not proceed lower unless you have the airport in sight. In this case, an altitude of 3,000 feet MSL (about 1,500 above TPA) puts you about 5 miles out. If you cannot identify the airport from here, you would still have enough altitude to see across the landscape. Note that the descent point should be marked on the sectional, but need not be a checkpoint.

**Check Points.** Next, identify several check points. Louisa Airport, a point at Lake Anna, and the tank farm near the James River all look good. Check points should be 15-20 miles apart. They should be easily visible and uniquely identifiable using multiple features. Use VOR radials to confirm locations. Here are some other point selection tips.

1. Make sure it is a point, not a large feature. A small dam is OK, Lake Anna is not. A runway is OK, but make sure you measure to one end or the other. CHO's runway is more than a mile long, which will throw off your calculations.
2. Number and mark your points on your map and on your flight log in the left margin. On longer flights this will make them easier to locate.
3. Not every good check point needs to be put on a log. The town of Orange is also an unmistakable point, but too close to the airport. It is appropriate to check your flight progress with interim points just to confirm your location.
4. Points too close create inaccuracies when computing distance, time and speed calculations.
5. Do not select too many points, as you will be constantly filling out your navigation log instead of flying and looking for traffic.

**Ancillary Information.** There are several other items that need to be addressed in your flight planning. Here are a few additional considerations.

1. Select several alternates. If something prevents you from crossing the mountains, Orange County or Charlottesville look good. If you cross the mountains and cannot land at SHD, perhaps New Market or Bridgewater would make good alternates. The best alternates could be the ones that you have flown over and have previously identified.
2. Identify the VORs or radio frequencies that you will use to contact FSS to open and close your flight plan, submit a PIREP or contact Flight Watch.
3. Locate "barrier" features to assist in your navigation. In this case, I-81 runs N-S and is west of the airport, and easy to see. You know if you cross it, you have gone too far, so don't do it.
4. Use the AFD. Look up the airport you intend to land at and read about it. Book mark the page so you know where to go once you land. This is especially helpful at larger airports.

**Cruise Data.** A critical step in the planning process is to refer to the POH to select, and then record the cruise data appropriate for your flight. This data is based on altitude, temperature and desired power. The actual numbers will be RPM, true airspeed and fuel consumption. Again, record all this information in a blank spot on your navigation log. You will gain an understanding of the aircraft's expected performance as well as a planning number for fuel consumption. As a planning rule of thumb, you should select an RPM of that generates about 65% BHP. Engines seem to do well at this setting and here is typically where the best engine performance is obtained. For longer flights, a cruise altitude of 2/3rds the service ceiling also allows for the best performance. Here you won't take all day getting there, yet you will enjoy better cruise speeds. In this case we did not go to 8,500 for such a short flight. Be sure to consider density altitude when making this selection.

**Navigation Log.** Now you can begin filling in your navigation log. Use pencil. Using the winds aloft, you can compute ground speed and the wind correction angle. From ground speed you can determine the time between points as well as fuel burn en route. Use the rate of climb table for the departure leg, and use the 2100 RPM setting for the descent leg. Fill in only the ETE block on the ground. You will be filling in the remaining blocks in the air. Also be sure to put in frequencies and other information from the AFD on the form as necessary. It's nice to have that stuff available in large print.

**Fight Plan.** The next step is to complete your flight plan. Common mistakes include the following.

1. Be sure to put the equipment suffix in the aircraft type (ex. C172/U)
2. Do not put the destination and departure airports in the route box.
3. The time en route for your practical exam is the time from wheels up to wheels down. In real life, add 30 minutes to allow for time to contact flight service after you land.
4. Put you cell phone number in the pilot box so that when you forget to execute step 3 they will call you first.

5. Put "student pilot" in the remarks box. Everyone was one once, and others will look out for you if you do this.

**Call the Weather Briefer.** Since you already have most of the weather from DUATS, this should be a "listen" briefing instead of a "write as fast as you can" briefing. This means you should actually understand the briefer when he interprets the weather for you. At the completion of the briefing, submit your flight plan. This is the best way to ensure it will be on file when you contact flight service. Here are a few more tips.

1. Use the request sequence provided by your instructor. You should be able to dictate the elements of your request in the order that the briefer needs them. Practice on someone if you need to.
2. Dictate at a speed that allows the briefer to enter the information into the computer. If you write it as you say it, you will have an idea of the speed needed.
3. Again, tell the briefer you are a student pilot. He will go slower. Do this through your commercial license if you need to.

**Final Planning Considerations.** There are several more items that warrant completion.

1. Go back and relook your risk analysis. If you have too many risk elements, either don't go, or do something to mitigate the risks.
2. Do a weight and balance. This will enable you to modify important information such as  $V_A$ , takeoff and landing data and ensure that you are within weight and CG limits.
3. Decide what constitutes being lost before you depart. Here is a suggestion. If it has been 30 minutes since your last known position, or you have timed out past two consecutive check points, you are lost. Execute the 4C's immediately. There is no penalty for being lost, only for not doing anything about it.

**During the Flight.** All this flight planning is designed to provide you with a smooth departure and a direct route safely to your destination. Here are some points to remember.

1. After the preflight and once you get situated in the aircraft, organize the cockpit. Know where everything is and have it readily accessible.
2. After the run-up, be sure to preset any VOR or GPS equipment. This includes setting communications frequencies, VOR frequencies and OBS headings, GPS route or functions and ADF features. This should include setting the radios so that you can open your flight plan once you leave the traffic pattern. Everything you can do on the ground means less you need to do in the air. Also, review before taking the runway when and where your first turn will be, if any. In this case, if you are departing from Runway 6, make a 45 degree left turn on departure at 700 feet AGL, depart the pattern, then turn on course when clear of the pattern.
3. Before takeoff, be sure to do the 4-T's. This is a "before departure checklist" that is unwritten and the final few items you complete before departing. Time (start your timer), Talk (announce your departure), wind-T (last check for wind direction and speed) and Throttle. Remember that the runway is poor choice of location to hang around. You should spend no more than 15 seconds on the runway threshold prior to departing.
4. After clearing the pattern, steer on course and begin looking for landmarks. Establish your climb and scan for traffic. A good practice is to lift each wing every 1000 feet to clear left and right.
5. Take several pens. (a corollary to Murphy's Law: if you have only one pen, you will drop it and it will come to rest in the most geographically inaccessible point of the aircraft, and will do so immediately before you need to write something down)
6. During each flight, pick something new to attempt. If you have never requested flight following, do so. Write out a script if you need to. If you have never submitted a PIREP to Flight Watch, do that as well. Talk to ATC and get a transponder check.
7. Open your flight plan within the first 10 minutes of flight. When you do, let them know your actual departure time.
8. Be sure to lean properly. Your POH has some specific guidance regarding leaning in a full power climb as opposed to cruise.

9. Check your TAS as calculated against the book value. You should find them very close in value. Also compare your estimated ground speed against your actual ground speed. Attempt to resolve large differences.
10. Observe the weather along the route of flight for anything you did not expect.
11. Close your flight plan upon landing or prior to entering the traffic pattern. One technique is to put your watch on your other hand as a reminder. You can also text message yourself so that when you turn your cell phone on, you get a reminder.
12. When you fill up, compare your estimated fuel burn with your actual fuel burn.

**Diversion to Alternate Airport.** During the course of flying, it may become necessary to divert. Unexpected weather along the route of flight may make continuing impossible or unwise. Also, precautionary landings for equipment malfunctions or airport closures (accidents on the runway, for example) mandate finding another airport. In this case, you should apply the 4-F's for diversion.

- **Find** a suitable alternate. A good flight plan identifies several alternate candidates based on how far along the flight you have progressed. The departure airport certainly can be used, along with others.
- **Fix** the heading. Do this by using the sliding plotter method. Place your plotter across the sectional from your present position to your proposed alternate. Now without changing the orientation (angle) of the plotter, slide it so that the plotter crosses a VOR. Read the radial for the TO side of the VOR. This will indicate a good estimate for your magnetic course and be easier to read than Lat/Long lines on the sectional.
- **Figure** the time of arrival. Remember, the PTS says estimate. If you are flying at 105 knots, that's about 120 MPH, or 2 Statue Miles per minute. Divide the statute mile distance to the airport by 2 and that is a good estimate of the time it will take to arrive. Remember to start a timer or note the time.
- **Fly** to the airport using pilotage, deductive reckoning (just computed above) and use nav aids, if possible. As you near your alternate airport, be sure to obtain the local weather, if available, tune into the local frequency and monitor, and review the airport information in the AF/D. This information is essential so that you don't get caught with unique situations, such as airport restrictions, non-standard traffic patterns or other important items.

Note that the use of a GPS is encouraged, since it is legally installed equipment as part of the aircraft. If you use the DIRECT TO function, the GPS will determine the above calculations for you to a much greater accuracy. It is important to know how to do both, but if you know how to use the GPS, it is the preferred method.

**Lost Procedures.** Most pilots can recite the 4-C's of being lost; **Climb** (to increase line-of-site range), **Communicate** (with ATC, usually on the emergency frequency of 121.5 MHz), **Confess** (your situation, declare an emergency and ask for assistance), and **Comply** (with instructions). A more important question is "when are you lost?" The single greatest impediment to resolving the absence of positional awareness is the delay in acknowledging the situation and requesting appropriate assistance. It is important to identify prior to flight the conditions under which you WILL implement lost procedures. A good starting position for a student pilot would be to admit you are lost if it has been more than 30 minutes from your last known (absolutely confirmed) position or you have passed your second check point (in terms of time) and cannot identify the point.

It is my hope that using his guide will allow you a starting point from which to proceed with flight planning. As you become more experienced at cross country flying, you will become more comfortable and increase distances between points. I would advise you not to skip these steps. Each has a purpose and an incomplete plan can have adverse consequences.

Students often wonder how long it should take to flight plan. The answer is that it varies, but for a flight like this, hour should be sufficient. As you get better, you can reduce the time to about half. Much less that that means you may have sacrificed some thoroughness.

Remember, Have FUN! A well planed flight should be easy to execute.