

# ***VFR Flight Planning Guide***

By

Jim Pitman

[FlywithJim.com](http://FlywithJim.com)

Rev 2018.3

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## ***Introduction***

NOTE: This document is **not** meant to be used as a self-study guide for new pilots. Instead, it is meant to be used as a guide for qualified flight instructors to teach pilots how to properly perform each step in the flight planning process. It is also an effective study tool for pilots to use **after** receiving the needed instruction.

For an excellent online course that covers the step-by-step procedures of flight planning, I recommend Rod Machado's course:  
[rodmachado.com/products/basic-cross-country-flight-planning-for-student-pilots-interactive-course?aff=291](http://rodmachado.com/products/basic-cross-country-flight-planning-for-student-pilots-interactive-course?aff=291)

Proper flight planning is a process that includes several elements. Each element is like a different piece of the overall puzzle. Some pieces of the puzzle will not be needed for certain flights, but each piece should be considered for every flight, regardless of the distance to be flown.

Unlike putting an actual puzzle together, flight planning is really never complete. We fly in a dynamic environment where things are always changing. We plan based on expected aircraft performance and forecasted weather, but it's important to continuously compare these expectations to reality in order to identify unexpected threats.

Remember... A forecast is just a guess of the future and a report is history from the past. Reality is what we see right now - either on the gauges or out the window.

This guide outlines the elements (puzzle pieces) that make up the overall flight planning process.

### **A note about EFBs (Electronic Flight Bags)**

EFB apps such as ForeFlight, Garmin Pilot, FLTPlan Go, and FlyQ are amazing and I encourage their use **after** a pilot has a working understanding of the fundamental principles that are involved with flight planning and navigation. This outline focuses on the use of paper charts and manual computations to teach pilots these fundamentals.

## ***Required Gear / Items***

The following items are needed to conduct this training:

1. Current paper sectional chart(s) for the route you will fly
2. Plotter
3. Current Chart Supplement (formerly known as the AF/D)
4. Current airport diagrams for each airport to be used
5. Navigation Log
6. E6B flight computer (wiz-wheel, non-electronic type)
7. Good pens (fine and medium felt-tip pens work best on charts)
8. #2 (soft tip) pencil and high-quality eraser
9. Airplane POH/AFM
10. Notepad / scratch paper

Links to the pilot gear I recommend can be found at: [FlywithJim.com/pilotgear](http://FlywithJim.com/pilotgear)

### **Pro tip:**

The current Chart Supplement (formerly known as the AF/D) and airport diagrams are available from the FAA as free digital downloads at:

[faa.gov/air\\_traffic/flight\\_info/aeronav/digital\\_products/dafd/](http://faa.gov/air_traffic/flight_info/aeronav/digital_products/dafd/) and  
[faa.gov/air\\_traffic/flight\\_info/aeronav/digital\\_products/dtpp/search/](http://faa.gov/air_traffic/flight_info/aeronav/digital_products/dtpp/search/)

## ***Aeronautical Decision Making***

Reference: PHAK chapter 2

Proper aeronautical decision making involves identifying and mitigating the threats associated with each unique flight. These threats are both anticipated and unanticipated. This should be the foundation of every flight. **Think of this as the table the puzzle is built on.**

Tools to help:

- IMSAFE checklist
- PAVE checklist
- DECIDE model (ADM)
- CRM
- SRM
- Hazardous attitudes
- Personal minimums

The "Go / No-go decision" and "Continue / Divert decision"

Remember... It's better to be on the ground wishing you were in the air, than to be in the air wishing you were on the ground.

## ***Working with Flight Service***

1. 1-800-WX-BRIEF
2. [1800wxbrief.com](http://1800wxbrief.com)
3. Weather briefings
4. Opening/closing flight plans
5. Radio communication procedures and how to find frequencies on the sectional chart

### **Action Item:**

Create a free account at [1800wxbrief.com](http://1800wxbrief.com) and set up your user profile.

## ***Navigation***

Types of Navigation:

- Pilotage
- Dead Reckoning
- Radio Navigation

Short flights can easily be accomplished with pilotage. Longer flights usually incorporate the use of all 3 types of navigation at the same time.

## ***Chart Reading and Route Selection***

VFR charts:

- WAC
- Sectional
- TAC

Reading LAT/LONG

Factors for route and altitude selection include:

- Terrain and obstacles
- Airspace
- Aircraft performance
- Cruising altitude rule

### **Pro Tip:**

Always carry current paper charts for the area you fly (the batteries never die). I suggest using the automatic subscription service at [www.mypilotstore.com](http://www.mypilotstore.com).

### **Pro Tip:**

Make your top of climb (TOC) and top of descent (TOD) actual check points on your chart and navigation log that can be identified with landmarks and/or radio navigation. Doing so will allow you to more easily calculate the appropriate ground speed for each line of your navigation log.

### **Pro Tip:**

Use expired charts as unique wrapping paper for birthday and holiday gifts :-)



## ***Weather***

The basic tools:

- Surface Analysis Chart
- METARs
- TAFs
- Winds Aloft

Hazardous weather products:

- Composite radar
- AIRMETs
- SIGMETs
- Center Weather Advisories

Suggested weather resources:

- [weather.com/maps/planner](http://weather.com/maps/planner)
- [aviationweather.gov](http://aviationweather.gov)
- [1800wxbrief.com](http://1800wxbrief.com)
- Search your app store for “MyRadar”

## ***Aircraft Performance***

### **Preparation:**

Before working with this piece of the puzzle, the pilot will need to know:

1. The approximate temperature expected at the time of the flight (departure, cruise, and destination)
2. The altitudes of the airports to be used
3. The planned cruising altitude

There are 6 aircraft performance questions that need to be answered:

1. How long will it take to climb to my cruise altitude?
2. How many miles will I fly while climbing to my cruise altitude?
3. How much fuel will I burn while climbing to my cruise altitude?
4. What will my true airspeed be at my cruise altitude?
5. What will my cruise fuel burn be?
6. Is there sufficient runway length for takeoff and landing?

This information is usually found in section 5 of your airplane's POH/AFM. The format of the data varies greatly with each manufacturer.

## ***The E6B Flight Computer***

The E6B flight computer has two sides that we refer to as:

1. The front side - Used for distance, rate, and time calculations (with some additional calculators included depending on the brand)
2. The wind side - Used for calculating wind correction angles and ground speeds

Several good how-to videos are available on YouTube:

[youtube.com/results?search\\_query=how+to+use+an+e6b+flight+computer](https://www.youtube.com/results?search_query=how+to+use+an+e6b+flight+computer)

### **Pro Tip:**

Start with a manual E6B (not an electronic computer) to get a sense of the relationship between the numbers being calculated and to visualize the effect the wind has on your flight path and ground speed.

## ***Navigation Log***

The navigation log is a table of information needed to navigate with Dead Reckoning.

The information in the navigation log answers 3 basic questions:

1. What direction do I expect to fly?
2. How long do I expect to fly in that direction?
3. Will I have enough fuel?

### **Preparation:**

To work with this piece of the puzzle, the pilot will need to know:

1. The true course (TC) and distance of each leg
2. Magnetic variation (VAR) for the area
3. Compass deviation (DEV) for the airplane to be used
4. The expected TAS for each leg
5. The expected fuel burn for each leg

### **Define:**

1. NM vs SM
2. VAR (discuss true north vs magnetic north)
3. DEV
4. TC
5. TH
6. MC
7. MH
8. ETE
9. ETA
10. ATE
11. ATA

Distance, rate, and time formulas:

$$D=R*T$$

$$T=D/R$$

$$R=D/T$$

With any two variables, you can easily calculate the third.

The real purpose for completing the navigation log is to answer the question, "What has changed?" during the flight. This feeds back into the DECIDE model to adjust future plans as needed.

There are many different styles and formats of navigation logs available online at no charge. Here is a basic version I recommend: [firstflight.com/assets/pdf/FFnavlog.pdf](http://firstflight.com/assets/pdf/FFnavlog.pdf)

The information to be entered on the navigation log should be organized into 3 categories:

1. Items to enter before knowing the winds aloft
  - Waypoints (the location of the TOC and TOD may change slightly with wind, but it should be negligible)
  - VOR frequencies and morse code
  - Distance for each leg
  - TC for each leg
  - Magnetic variation (VAR)
  - Cruising altitude(s) (may change after getting winds aloft, but it's good to start with a preferred altitude based on other variables)
  - Departure and destination airport information
2. Items calculated/written after knowing the winds aloft
  - Wind and temperature for each leg
  - WCA for each leg
  - TH, MH, and CH for each leg
  - GS for each leg
  - ETE for each check point
  - Fuel for each leg
3. Items calculated/written in flight
  - Departure time
  - ETA for each leg (as you go)
  - ATA for each leg (as you go)
  - ATE for each leg (as you go)

**Pro Tip:**

Get in the habit of noting your departure time every time you takeoff, even on local training flights.

**Pro Tip:**

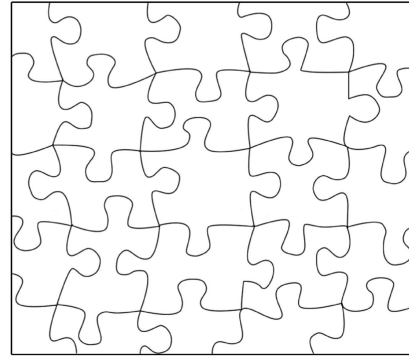
Use a #2 (soft tip) pencil and high-quality eraser on the navigation log.

**Pro Tip:**

In the top-corner of your navigation log, draw a basic diagram of the airport runway(s) oriented for the way you plan to approach. Include runway numbers, arrows indicating traffic direction, and traffic pattern altitude(s).

## ***Putting it All Together***

Always keep proper risk management as the foundation that supports your flight. Remember that we fly in a dynamic environment. Keep an open mind and be constantly vigilant of changes. Taking the time to properly perform this planning will give you the confidence to deal with the changes, safely arrive at your planned destination, or divert as needed.



Now that you have worked with each individual piece of the puzzle, it's time to put it all together. Here is a step-by-step checklist to help:

### **0 to 5 days before your flight**

- A few days before your flight, start watching the general weather forecast at: [weather.com/maps/planner](http://weather.com/maps/planner)
- Draw your planned flight path on your chart(s) in pen, accounting for terrain, known TFRs, and airspace considerations
- Measure the TC for each leg
- Select an appropriate cruising altitude based on terrain and your direction of flight (remember that the cruising altitude rule is based on MC, which is TC +/- Magnetic Variation)
- Use your airplane's Time/Speed/Distance to Climb chart (POH section 5) to estimate the approximate location of your top of climb (TOC) - Mark it as a check point on your chart and write the information on your nav log
- Based on the amount of altitude to descend from cruise to traffic pattern altitude at your destination, determine the approximate location of your top of descent (TOD) - Mark it as a check point on your chart and write the information on your nav log (Note: With 120 kt GS and 500 FPM descent, you will travel 4 NM for every 1,000 feet you descend)
- Select other appropriate check points 20 to 30 NM apart - Mark them on your chart and write the information on your nav log
- Write the distance of each leg (be sure to use the correct plotter scale)
- Use your airplane's Cruise Performance chart to determine estimated TAS and GPH fuel burn for each leg
- Write applicable VOR information (include frequencies, radials, and DME information to help identify each check point)
- Write all other applicable airport information on your nav log
- Make note of any Compass Deviation for the airplane you plan to fly

### **Within 12 hours of your flight**

- Obtain the current winds aloft forecast
- Check the METARs and TAFs for your route of flight
- Check for any adverse weather advisories
- Use the wind side of your flight computer to calculate the WCA and GS for each leg
- Calculate TH, MH, and CH for each leg
- Use the front side of your flight computer to calculate ETE and fuel burn for each leg
- Total the leg ETEs to calculate the total estimated time enroute for the flight
- Check the total estimated fuel burn for the flight

### **Within 3 hours of your flight**

- Obtain a Standard Weather Briefing from Flight Service (1-800-WX-BRIEF), write the applicable information on the weather log (back of your nav log)
- Check that the winds aloft and other weather information are close to previous estimates, make changes to your nav log as needed (a few knots difference is not significant for most flights)
- Complete the Flight Plan Form on the back of your nav log
- Determine your estimated time of departure in Zulu time
- File your flight plan online at [1800wxbrief.com](http://1800wxbrief.com) or by phone (1-800-WX-BRIEF)

### **During your flight**

- If able, activate your flight plan on the ground immediately before departure - Be sure to note your departure time (write it on your nav log when at a safe altitude)
- Fly your planned indicated airspeed
- Fly your planned heading, but make appropriate adjustments for course deviations that may have occurred during departure, such as tower/traffic requiring you to extend the departure leg before turning on course
- Contact Flight Service to active your flight plan if that was not accomplished on the ground
- Use pilotage and radio navigation to track your position compared to what you planned
- At each check point, write the ATA, then calculate and write the ATE, and ETA for your next check point (when writing times for ETA and ATA, just write a colon and the last two digits, i.e. just :36 instead of 19:36Z)
- Make note of any significant changes to the enroute times and ask, "Why might that have changed?"
- Make adjustments to your plan as necessary
- Enjoy the flight! All of your hard work is paying off :-)

**Pro Tip:**

Set up EasyActivate™ and EasyClose™ in your personal account at [1800wxbrief.com](https://1800wxbrief.com) to easily open and close your VFR flight plans via text and/or email.

**Pro Tip:**

To prevent forgetting to close your VFR flight plan, use a simple memory aid, like moving a ring to a different finger or putting a rubberband on your wrist, to remind you that you are on an active flight plan.



## **Conclusion**

Thank you for using this guide!

**To the flight instructor:** I hope this guide has been useful in helping you organize the training you provide your clients.

**To the pilot:** After receiving the proper ground training from you instructor, I encourage you to study the information in this guide, explore the links and resources, and practice planning several flights on your own. As you learn to use flight planning/navigation apps and electronic flight computers in the future, the foundation of knowing how to manually perform flight planning calculations will increase your confidence and help you identify computer-induced errors before they become problems.

You are welcome to contact me through my website, [FlywithJim.com](http://FlywithJim.com), with any comments or suggestions.

Sincerely,

Jim Pitman