



From the Library at www.faa-ground-school.com

What The Heck Is He Doing? ---

A Layman's Guide to Aviation

To the non-pilot, the world of flight can seem detailed, confusing, intimidating, or boring, all depending on your perspective. The person you fly with – the pilot – may appear wrapped in a cloak of mystery, flipping innumerable buttons and switches while speaking in a language made of English words, yet one that is virtually indecipherable to you. Or maybe he (or she) seems caught up in a meaningless series of rituals, all designed to confound the uninitiated.

There certainly is a lot more to flying than cranking the engine, steering the airplane around, and landing. The secret is that there really isn't any secret. You *can* learn what the pilot is doing and why he or she is doing it. And in the process, you'll find that flight is simply a lot more fun for you.

From Your World

When you drive your car, you are operating in a two-dimensional world. You rotate the steering wheel and the car complies with a turn in the desired direction. To go faster, you press the gas pedal. To go slower you let off on the pedal, and in some situations, press down on the brake pedal.

While driving, you watch for markings in the road, color-coded lights above intersections, and read signs of different shapes and colors that contain short English phrases. You watch the other cars and anticipate their movements. You have probably done this for so many years that you don't give much thought to it. But you are processing your environment, following rules, avoiding unsafe situations, all while navigating to your destination.

A pilot flies an airplane with similar, but more complicated considerations. His world contains three dimensions and is consequently more dynamic, but the basic results are the same: travel from point A to point B in a safe manner, and hopefully enjoy the ride.

Getting Ready to Go

When you decide to drive to the mall, a minimal amount of planning is required. You've been there many times before and you're totally familiar with the route. You know where the turns are and don't need a map. If you live in a big city, you might plan to make your trip during a time period other than rush hour. Or a heavy rain might cause you to postpone your drive for an hour or so.

But once you've committed to go, you grab your wallet because it contains your driver's license and head to the car. Hopefully you take time to notice if the tires all have air in them before climbing in. Once in the driver's seat you turn the key and the engine cranks. Your eyes check the fuel gages and subconsciously scan the panel for warning lights. If everything looks good, you back out of the garage and depart the driveway to your destination.

The pilot, planning for a short trip to a familiar destination, follows a procedure. He must carry his version of a driver's license. It is called a *pilot certificate*. Additionally, he must carry a few other documents and items to be legal behind the wheel. So, instead of just carrying a wallet (or purse) the pilot probably takes a flight bag.

Even though the destination is familiar, the pilot will likely bring charts and books that describe all the airports in the area. Though the route is familiar, the pilot brings these extras just in case. Perhaps a sudden rain storm moves in or maybe the airport turns out to be closed. Surprises happen. The pilot has planned for these possibilities by making sure he has the needed paperwork to find his way to a different airport if necessary.

Prior to starting the airplane's engine, the pilot follows a carefully choreographed procedure called the *preflight inspection*. Using a checklist, items all around the airplane, inside and out, are inspected to ensure proper function. The checklist doesn't mean that the pilot doesn't know what to do - it is used because there are a large number of items to be checked. By following the checklist, the pilot is able to confirm that he or she has not overlooked anything during the inspection.

Unlike a car, the simple act of starting the engine involves multiple operations and checks. Thus, the pilot also uses a checklist to perform the start up. Some pilots may have flown the airplane so many times that they have memorized the checklists. But they still go through the same operations every time they get ready to fly.

Inside and Out

I'll assume that the wings, tail, and propeller are obvious to you. It isn't necessary to have a deep understanding of how they work as long as you know where they are.

The main portion of the airplane, analogous to the body of your car, is called the *fuselage*. The area inside of the fuselage where you and the pilot sit is called the *cabin* or the *cockpit*.

If the airplane has side-by-side seating, the pilot will sit in the left seat while you will likely sit in the right seat. In front of both seats is a control that looks like a modified steering wheel. This is called the *yoke* and is one of the main controls that the pilot uses to maneuver the airplane in the air. Instead of a yoke, some airplanes may have a vertical *stick* that performs the same function.



Just like the dashboard in your car, the airplane has an instrument panel. It probably looks a bit more intimidating than the one in the automobile, but the use is essentially the same. Among other things, the instruments tell the pilot the direction, the speed, and the altitude of the flying airplane.

On the Move

After the engine has been started, the pilot will generally listen to a special pre-recorded broadcast on the radio. Just as you might dial in your favorite station on your car's stereo, the pilot twists knobs on the airplane's radio to get to the correct frequency. Once there, he listens to a description of the winds (where they are coming from and at what speed), the visibility (in terms of miles), the cloud cover, and the barometric pressure.



If the airplane is located at an airport with a control tower, the pilot will next call a controller on a different radio frequency and ask for permission to *taxi* out to the takeoff runway. Look and you'll see him pressing a button on the yoke as he speaks. When the button is pressed, anything he says is transmitted over the radio. When it is released, the two of you may talk freely without transmitting your conversation. This button is called the *push-to-talk* button. There is probably one on your yoke, too. Ask the pilot to show you where it is.

Taxiing is the slow movement of the airplane on the ground. You could think of it as being analogous to slowly driving down your driveway or maneuvering through a parking lot. The pilot follows a *yellow line* on the pavement that leads to the runway.

One thing of interest you might notice – in small airplanes pilots don't steer with the yoke or stick. They steer with their feet. Two pedals (called *rudder pedals*) allow the pilot to swing the nose left or right. This works on the ground as well as in the air. So they swing the nose with their feet on the rudder pedals to steer the airplane on the ground. A push with the right foot turns the airplane to the right. Fascinating bit of trivia, huh?

After taxiing to the runway, a last set of pretakeoff checks still need to be made. The pilot may refer to this as the *runup*, but there is a bit more involved. He will check all the instruments for proper function and settings and will move the yoke and rudder pedals to ensure that they are operating correctly.

Next, the runup itself. The pilot will push a lever or plunger-looking control forward. This is the *throttle*. Like your foot on the gas pedal, the pilot pushes forward to increase the amount of fuel being fed to the engine. When he does, the propeller will turn significantly faster and make a lot more noise. Hang in there, though, it just takes a moment. The pilot is checking engine operation at this increased power setting. Once he has completed the checks, he reduces the power and the propeller idles back down.

And Into the Air

All right. The pilot has taxied to the runway and performed his final checks. At a towered airport, the pilot calls the controller on the radio to ask for permission to takeoff. When the controller replies “cleared for takeoff”, the two of you will taxi out onto the runway itself. If the airport does not have a tower, the pilot will call out his intentions to takeoff on a frequency assigned to that particular airport. Other pilots in the area will be listening on that frequency and will be alerted to your impending departure.

Once on the runway centerline, the pilot will push the throttle all the way forward, applying full power to the engine. He will use his feet to steer the airplane along the runway centerline. When sufficient speed is reached, he will gently pull back on the yoke or stick, causing the airplane's nose to slightly rise. And into the air you go.

As the airplane climbs, you will notice that you cannot see as well over the nose. It is pitched up relative to the horizon. You can expect this relatively high pitch *attitude* whenever the airplane is in a climb. Another thing to note – climbs are generally performed with full power. You will probably see that the pilot is keeping his hand on the throttle all during the climb just to make sure that it stays at the full power setting.

The Four Fundamentals of Flight

The pilot keeps the airplane in the climb attitude until a target altitude is reached. He can see the altitude displayed on a gage called an *altimeter*. It actually tells altitude above sea level so the pilot needs to have some rough idea of the ground elevation below.

When the desired altitude has been reached, the pilot gently lowers the nose to a level pitch attitude and pulls the throttle control slightly back, reducing power. Full power is generally reserved for climbs.

This level flight attitude is usually referred to as *cruise*. As the airplane transitions into cruise, the airspeed will increase – even though the power has been reduced. How can that be?

Think of a car climbing a hill. You need to push the gas pedal a little harder to keep your speed up as you motor up the incline. At the top of the hill, if you keep your foot where it is on the gas pedal, your speed will increase. So, at the top of the hill, you let off of the gas.

Very similar in an airplane. The pilot is using all the power available to climb. Once the climb is completed, this excess power must be slightly reduced. Now, it could be reduced to a really low setting and the speed in cruise might be the same as it was in the climb. However, your goal is to go somewhere and get there in a timely fashion. So, the pilot reduces the power just a little – the fact that the airplane is no longer laboring in a climb means that it can accelerate in speed.

In level flight, notice that the horizon remains a constant relative distance above the nose of the airplane. Hold your arm out and line up your thumb with the nose of the airplane, and your forefinger with the horizon. This is what level flight looks like from your vantage point.

There are instruments on the panel that the pilot can use to confirm level flight, but on a clear day with a good sharp horizon, a view through the windscreen is really all that is needed.

So there we are – two of the fundamental flight conditions – climbs and level flight.

Our next fundamental is the turn. When you're touring around the neighborhood in your car, you rotate the steering wheel and the car turns in the desired direction. But think what happens to a fast moving car. If it quickly turns at a high rate of speed, it will have a tendency to skid to the outside of the turn. That is why racetracks have those high banked corners.

An airplane will also skid in a turn if all we try to do is to point the nose off to the side. So, the pilot banks the airplane to initiate a turn. When the yoke is rotated, it causes the airplane to roll into a bank. It is this bank that allows the airplane to carve a nice curving turn and change direction.

The turn rate is proportional to the bank angle in an airplane. A shallow bank results in a slow, lazy turn. A steeper bank causes a tighter, faster turn. If you aren't comfortable

with steep banks, tell the pilot. He or she will be happy to flatten them out for you until you get more used to them.

The final basic fundamental flight condition is the descent. Let's go back to our automobile example. Imagine that you're cruising along and the road slopes down into an incline. What happens? Well, if you keep the gas pedal where it is, the car speeds up. In fact, it might easily get going too fast. Our remedy is to reduce the pressure on the gas pedal. Same deal in an airplane.

To descend, the pilot simply reduces power. The reduction in power causes the nose to drop slightly resulting in a gentle descent with a virtually constant airspeed. Over the nose, you see more Earth – the horizon appears higher in the windscreen. The airplane descends, but its speed remains essentially the same.

To See and Be Seen

When you fly, you operate under one of two sets of rules. They are called *VFR* and *IFR*. Most sight-seeing flights are conducted under VFR – visual flight rules. This means that the pilot must keep the airplane in conditions of good visibility. And that means out of the clouds. In fact, under VFR, the pilot will maintain a good distance away from the clouds. This isn't because being close to a cloud has some inherent danger. It is because there may be pilots inside the clouds flying under IFR – instrument flight rules. If they suddenly emerge, none of you want to look up and see a chance meeting in progress!

When you're flying VFR, if you see another airplane, point it out to the pilot. He has probably already seen it, but you both want to ensure that no other airplane goes unnoticed.

Home Again

When a pilot arrives at his destination airport, he enters what is called the *traffic pattern*. This is a rectangular course that surrounds the airport, culminating in a straight in approach to the landing runway. Before getting too close to the airport, your pilot will first listen to the pre-recorded weather broadcast. Then he'll talk on a different radio frequency, either to the tower controller or, if the airport has no tower, blindly to any other pilots in the area. The goal in approaching the airport and entering into the traffic pattern is to avoid bumping into anyone. Help the pilot watch for traffic – everyone else in the air is doing the same thing and following the same traffic pattern procedures.

Unless you really need to say something, it is best to keep quiet during flight in the traffic pattern and the landing itself. The pilot needs to listen to instructions from the tower, or calls from other airplanes, all while maneuvering his own airplane very precisely.

As the airplane descends to land, you'll notice that the pilot is slowly pulling the throttle back to reduce power. The goal is to touch down on the runway at the slowest speed possible, right on the centerline.

Summary

Flying is fun, but it can get busy at times. All the details have probably become easy for your pilot – he has probably performed them hundreds, even thousands, of times. Don't be afraid to ask him what he is doing. Your understanding will make the flight more enjoyable for you both.