What's Different About Taildraggers?

What makes a taildragger different from an airplane with tricycle gear? There really is only one simple difference. The center of gravity is forward of the main gear on the tricycle gear airplane and behind the main gear of the taildragger. This one little difference accounts for some pretty significant differences in the way the airplanes behave while on the ground and during takeoff and landing.

Taxiing

The first difference you would notice comes during taxiing. Since the center of gravity is behind the taildragger's main landing gear, the airplane does not want to go straight. The tail wants to come around and go in front of you because the center of gravity is pushing from behind. When you push something, it's tricky to keep it going straight. Since the tricycle gear airplane's center of gravity is forward of the main landing gear, it acts to pull the airplane behind it. When you pull something, it comes along nice and straight behind you.

A good analogy can be made with one of those carry-on pieces of luggage everyone seems to have these days with two wheels on it and a pull out handle. If you pull it behind you it rolls straight along. This is the principle of the tricycle gear airplane at work. If you try to push it out in front of you, the principles of the taildragger are at hand and it's a different animal. You really have to pay attention and be quick to keep it out there in front of you. It constantly wants to go to either side and swing around behind you. The further off-center you let it get, the more difficult it is to get it straight again. If you let it get too far off center it's too late. It's sideways and you cannot get it back in front of you. If you have a piece of luggage like this, give it a try. You will get an excellent feel of the forces affecting the ground handling of a taildragger.

This is really the exact same physics at work as trying to balance a baseball bat standing straight up on the palm of your hand, with the grip end up in the air. It's not quite that quick in the airplane because most taildraggers have a much wider wheelbase to length ratio than a baseball bat. The taildragger's center of gravity is much closer to its main gear than the baseball bat's is to its tip, but this analogy really brings the point home. As long as you pay attention you can keep that bat balanced up there, but let your attention wonder just for a moment and the bat might start to fall. More than likely it will get too far over to save. You will soon run out of arm movement necessary to get back under the balance point, which would be like running out of brake power, rudder, and runway in the taildragger.

Takeoff

The next difference you will notice comes during takeoff. With a tricycle gear airplane, you accelerate down the runway, the airplane pretty much rolling straight on its own, until you reach a desired speed, at which time you simply pull back on the wheel and lift off. Takeoffs in a taildragger require a lot more work. Predominantly, right rudder will be required to keep the airplane rolling straight down the runway, but constant rudder corrections are necessary to keep it rolling absolutely straight. With the tailwheel on the ground, most taildraggers are rolling down the runway right at the stall angle of attack. This is by design for landing purposes. The normal takeoff procedure is to raise the tail just a little to the proper angle of attack for the airplane to fly itself off the ground. When the tail comes up, you lose the traction of the tailwheel, so a little more right rudder is required to keep it going straight. Also, there is a law of physics that says when the plane of a gyro is tilted, it reacts with an opposite force 90 degrees in the direction of rotation. Well, it turns out that the propeller is a pretty good gyro. When the tail comes up, you are tilting the plane of the propeller. The force you are applying is the equivalent of pushing at the top of the propeller arc from behind. Since the propeller is rotating clockwise when viewed from behind, the gyroscopic reaction comes as if it were pushing on the airplane's right side of the propeller arc. This tends to turn the airplane to its left while the tail is actually moving up. So, while the tail is moving up, an extra dose of right rudder is required. A good taildragger pilot leads with a little extra right rudder an instant before the tail starts up to keep the nose aligned perfectly straight, rather than waiting for it to start left and then apply the correction. Also know that the more horsepower the engine has, the stronger this gyroscopic reaction is, as well as torque, so more right rudder will be required. In some really powerful airplanes, you would not have enough rudder to counteract these forces, so power is carefully applied and increased thought the takeoff roll so you don't run out of rudder. Once you get the tail up and stopped at the desired pitch attitude, you're in pretty good shape. The airplane is picking up significant speed now, so the rudder is becoming very effective. The P-factor is also reduced with your now lower angle of attack. You still have to pay full attention straight ahead and use the rudders to keep the airplane going straight, especially in a crosswind. Soon, the airplane lifts itself gracefully off the ground. Many people get the tail too high on the takeoff roll and then pull back on the yoke to lift off. It's better to learn the right attitude for your airplane so it flies itself off under normal conditions. This allows you to look straight down the runway and ignore the airspeed indicator so you can keep the airplane straight.

Landing

The final difference you will notice comes during landing. This is probably where the difference seems most significant. First, there are the stability issues discussed above that begin during taxi. These issues have not gone away! When the airplane touches down, it must be going perfectly straight down the runway and its longitudinal axis perfectly aligned with the runway. In other words, no drift or crab (which really are the same thing). Second, at the moment of touchdown, since the center of gravity is behind the main landing gear, it's downward inertia pulls the tail down, thus increasing the angle of attack so the airplane becomes airborne again, or seems to bounce. There are two ways to deal with this. The first is to make sure the tailwheel touches at the same time, or a few inches before the main wheels. This is loosely called a full-stall or three-point landing (there is actually a difference between the full-stall and three-point landing which is discussed in more detail on the landing page). The second is to make a wheel landing, which is where you make your touchdown on the main wheels as smoothly as possible so the center of gravity has little downward inertia. You also anticipate the moment the main wheels touch and push forward a little on the yoke/stick to stick it on. You can really push the nose over and actually obtain a zero or slightly negative angle of attack with the wings so you're really stuck down to the ground. Both these landing techniques are discussed in much more detail on the landing page.

The merits of wheel landings verses full-stall/three-point landings in a crosswind are discussed in our great debate. Please visit that page and add your comments.

Landing a Taildragger

Overview

If there is really one word that sums up all you need to know about landing a taildragger, that would world be "**straight**". You must touchdown with the airplane absolutely straight with no drift or crab (which are really the same thing). Since the center of gravity (CG) is behind the main wheels of the taildragger, if you are not straight when you touch down, that CG will be offset and will try to swing the tail around. If the drift is slight, you can fight it back with the rudder. If the drift is significant, or if you have a crosswind, you may not have enough rudder or brake available to straighten things out, in which case you may find yourself upside down the the weeds along the side of the runway faster than you can say "groundloop". *The bottom line is you want your wreckage to go straight down the runway!*

The other big issue with landing a taildragger is that given the CG being rear of the main wheels, when the main wheels touchdown, the CG will want to continue its downward momentum, thus pulling the tail down, which increases the angle of attack, thereby increasing lift and causing the airplane to fly again, or appear to "bounce". This kind of bounce in a taildragger is different than that in a nose wheel airplane. Usually a bounce in a nose wheel airplane is caused by landing too hard and the spring in the gear pushes the airplane back into the air. There is no increase in lift so the airplane settles back down. In a taildragger, the airplane wants to stay up in the air a little longer after the bounce, yet it's slow, so a stall higher off the runway than you really want is possible. Sometimes you may have been carrying a little too much speed and the bounce leaves you 20' or more up in the air, and slow! This bounce may require some quick work to keep the airplane flying and get it setup for another touchdown attempt, or to make a go around.

To avoid this "bounce", you need to either make a proper stall or three-point landing, or a wheel landing. Basically, with a stall landing, you stall the airplane just a few inches off the runway. The taildragger is designed to sit on all three wheels at about the stall attitude, so when you actually stall it, the airplane will touchdown almost on all three wheels, probably a little tailwheel first. Since the tailwheel is down now, the CG cannot bring the tail down any more, so your angle of attack will not increase, and the airplane will not lift off the ground again. Even if the angle of attack could increase, it's already at or exceeding the stalled angle of attack because you did just stall it, so it would be impossible for it to gain any lift and fly off again.

The three-point landing is actually very similar to the stall landing. Most taildraggers will sit at their three-point attitude just slightly shy of the stall. When you really get familiar with a particular airplane, you can learn that exact attitude and touchdown so that all three wheels roll on at the same time. Usually it's just shy of a full stall. It requires a little finesse to do this nicely.

The wheel landing is actually pretty easy to make once you get the hang of it. This landing simply requires that you make easy contact with the runway on the main wheels first, with the shallowest rate of descent possible so the downward momentum of the CG is slight. At the moment of touchdown on the main wheels, almost with a slight anticipation, you apply forward stick/yoke to prevent the downward momentum of the CG from pulling the tail down. You actually want to raise the tail at that instance, decreasing the angle of attack, maybe even to zero or slightly negative, so you really stick the airplane down onto the runway. As the airplane slows down, the tail will come down and you end the landing rollout the same as if you had made a stall or three-point landing.

Is either the three-point/stall or wheel landing any better than the other? This is a good topic of debate among taildragger pilots, but the answer is simply *no*. Of course there are exceptions both ways for particular airplanes as specific airplanes have to be approached differently for all kinds of reasons, including how you might land it. Overall, either type of landing is fine if executed properly. What really matters either way is that you touchdown straight with no drift/crab. If you can't get it straight, you must go around and try again, or go find another runway. The bottom line is that for your typical taildragger you should remain proficient in both types of landings and make whichever one you feel most comfortable with in any given condition as that's going to be the safest type for you.

Keep the Stick Back!

With all landings, you must **keep that stick back** when the tailwheel is down on the runway! Keep it all the way back during landing rollout, without exception. If making a full-stall landing, you want to work the stick all the way back so that it hits the stop the moment the airplane stalls and touches down, then hold it there until you shut down and get out. With the three-point landing, you want to do the same if possible, or immediately get it back at the moment of touchdown (it will be almost there if not already). After making a wheel landing, as soon as you get the tail down, immediately get that stick back and keep it back.

We have an entire page devoted to keeping the stick back.

In the following sections, we will break out into more detail each type of landing.

Stall Landing

Stall Landing Outline

- Make normal approach to runway.
- By short final, eliminate any drift by lowering the upwind wing and keep the airplane straight with opposite rudder as necessary
- Make a normal flare to level flight just inches off the runway
- Keep working the stick/yoke back so as to not let the airplane land and keep it a few inches off the runway
- Strive to get the stick/yoke all the way back to its stop
- Allow the airplane to stall just inches off the runway
- Keep the stick back!!!
- Keep looking straight down the runway and steer the airplane with the rudders
- DO NOT let your attention drop one instant from maintaining directional control
- Keep the ailerons turned into the wind as necessary
- Keep the stick ALL THE WAY back!

Three-Point Landing

Three-Point Landing Outline

- Make normal approach to runway.
- By short final, eliminate any drift by lowering the upwind wing and keep the airplane straight with opposite rudder as necessary
- Make a normal flare to level flight just inches off the runway
- Keep working the stick/yoke back so as to not let the airplane land and keep it a few inches off the runway
- Strive to attain the exact attitude at which all three wheels will touch at the same time. This attitude will probably be a little shy of the full stall attitude.
- Try to hold that attitude with the wheels just inches off the runway until the airplane settles onto the runway.
- Once the airplane is solidly one the runway, get and keep the stick back!!!
- Keep looking straight down the runway and steer the airplane with the rudders
- DO NOT let your attention drop one instant from maintaining directional control
- Keep the ailerons turned into the wind as necessary
- Keep the stick ALL THE WAY back!

Wheel Landing

The wheel landing is very easy to make once you get the hang of it. You are basically just flying it onto the ground, touching on the main wheels as gently as possible. Once the main wheels touch, you apply a little forward pressure to the stick/yoke to stop the downward momentum of the CG so the tail does not come down, thus increasing your angle of attack and causing the airplane to fly again. You can even apply enough forward stick/yoke so as to reach a zero or even slightly negative angle of attack to really stick it on the runway. This technique might be useful in gusty conditions.

Don't worry too much about the touchdown attitude as it will vary depending upon your speed. Some folks like to approach a little faster for a wheel landing, but that's not necessary. You should be able to decide between a wheel landing and a stall landing during the flare!

Wheel Landing Outline

- Make normal approach to runway with normal final approach power
- By short final, eliminate any drift by lowering the upwind wing and keep the airplane straight with opposite rudder as necessary
- Make a slight flare to near-level flight just inches off the runway, but keep the nose down a little
- Let the main wheels settle onto the runway - be patient. Use the elevator control to achieve this
- Once the main wheels are one the runway, chop the power and stick it on with a little forward stick/yoke if necessary (often chopping power will be good enough)
- Keep looking straight down the runway and steer the airplane with the rudders
- Hold the tail up with more and more forward stick/yoke until it settles on its own
- DO NOT let your attention drop one instant from maintaining directional control
- Keep the ailerons turned into the wind as necessary
- Once the tail comes down, immediately bring the stick/yoke all the way back into your gut and keep it there
- Keep the stick ALL THE WAY back!

In the bigger Cessna's (180/185/190/195) and probably others, you can actually get on the brakes the moment both mains are planted. They won't nose over like you might think, and the brakes are very effective. You can get on them pretty strongly and pull back on the yoke and really stop quickly once you get the hang of this technique, and just let up on the brakes a little at the end and really put the tail down softly. If you've never done this, ease into it, or get instruction from someone who knows the technique.

Keep the Stick Back!

The stick/yoke should be kept all the way back in your gut most all times the taildragger is on the ground except during takeoff, rollout from a wheel landing until the tail comes down, or when taxiing with a significant wind on your tail. If you see a taildragger taxing by on a relatively calm day or rolling out of a landing and the elevator is neutral or down, or flopping around, that's the sign of a poor taildragger pilot and an accident waiting to happen.

The idea is that you want to keep the tail planted firmly on the ground. This improves directional control if you have a steerable tailwheel, and most taildraggers do, and you don't want an application of power to raise the tail unexpectedly and possibly drive the nose into the ground.

With all landings, you should **keep that stick back** when the tailwheel is down on the runway, and you want to keep it all the way back, without exception. If making a full-stall landing, you want to work the stick all the way back so it hits the stop when the airplane stalls, and then hold it there during the entire rollout. With the three-point landing, you want to do the same if possible, or get it back the moment of touchdown. After making a wheel landing, as soon as the tail is down, immediately come back with the stick and keep it back.

Many folks just don't keep the stick back out of bad habits, lack of technique, or just plain not paying attention. Some folks have made a conscious decision that it doesn't matter, and say it's not necessary, but this is not true. You want keep that tail firmly down on the ground for stability and so the tailwheel gets maximum traction. For the folks that just refuse to believe it's necessary, try to think of one good reason for not keeping the stick back. What could possibly be a good reason for keeping it forward or letting it do what it wants to do? Why take the chance?

Tailwind Taxiing

When taxiing with the wind on your tail, that wind has to be awfully strong to exceed any taxi speed plus propwash speed, so don't blindly use forward stick/yoke just because you have a tailwind. You need to learn to detect when the use of forward stick is applicable. Some can feel it, others can hear it. Sometimes you have to make a judgment call when conditions dictate, and just be extra careful anytime you're taxiing with a tailwind.

Even with a 65 HP Champ or Cub, the propwash over the tail is equivalent to a respectable breeze. Stand back there sometime and feel it for yourself and get a feel for what you're up against. If the wind is on your tail, your propwash may cancel it out unless it's a pretty strong or gusty wind. You should have some understanding of where this threshold is for your airplane. If you are moving at all, then you also have to take that into account. If you have a 10 MPH wind on your tail, but are taxing at 10 MPH, they absolutely cancel one another out. Just keep all this in mind and apply forward stick only when you think it is really warranted, and again, either way, always be very alert and careful when holding or taxing with a tailwind.

Aileron Application

It is very important to always apply proper aileron inputs when holding and taxiing. It's easy to do: turn into headwind components and turn away from tailwind components. So, if the wind is from your front and right side, turn into it by applying right aileron. If the wind is from your front and left side, turn into it by applying left aileron. If the wind is from behind you and from your right, turn away from it by applying left aileron (this puts the aileron on the right wing down), and if the wind is from behind you and from your left, turn away from it by applying right aileron. Be aware of wind direction at all times and smoothly change aileron application as appropriate while turning.

Summary

Many folks are seen rolling out of a landing with that elevator neutral, down, or even flopping around. No wonder they think these airplanes are squirrelly during a stall or three-point landing rollout. They aren't properly following through with those landings, so they really aren't making an accurate or fair observation. It's amazing how much more directionally stable the average taildragger becomes when you pull that stick/yoke back into your gut. If you're a new taildragger pilot and you find the airplane getting loose during landing rollout, or other things are happening after touchdown, such as purposing, just hold the stick back and everything should settle down.

Old habits are just hard to break, but if you have a habit of relaxing the stick/yoke, this is one bad habit you need to break in a hurry!

Takeoff in a Taildragger

Your first takeoff in a taildragger might seem like some kind of exercise is s-turns on the runway, but with a little understanding of what is happening, getting a few techniques down, and a little practice, you'll soon be able to make nice, straight, and clean takeoffs in the taildragger.

Overview

In this overview section, we will explain the basic takeoff procedure in a taildragger. The next section will break down the forces acting on the taildragger in more detail.

Takeoff in a taildragger starts about like a takeoff in any airplane. You taxi out onto the runway, get the airplane lined up with the center line, get the tailwheel straightened out, and begin applying power. You will see that right rudder is immediately required to keep the airplane rolling straight down the runway. You must look straight down the runway throughout the entire takeoff roll with full attention and use the rudder to keep the airplane going straight. Don't let anything distract you from paying full attention to maintaining directional control. Do not underestimate the taildragger's ability to quickly get you in trouble if you fail to heed this advice.

Taildraggers are essentially designed to sit at their stall angle of attack on the ground for landing purposes. This is not the ideal situation for takeoff. You need to raise the tail a little during the takeoff roll to achieve something closer to the airplane's normal climb angle of attack. You accomplish this by applying forward stick/yoke fairly early in the takeoff roll. Be prepared for an extra dose of right rudder when the tail comes up. Hold this attitude and allow the airplane to fly off the runway.

You don't worry about the airspeed indicator during takeoff in a taildragger. You're not waiting to achieve "V1" at which point you pull back on the stick/yoke to rotate and lift off as you do in a nose wheel airplane. Just the opposite is true in a taildragger. As discussed above, you actually push *forward* on the stick/yoke to lower the nose as it's too high when sitting on the tailwheel. Some folks raise the tail too high, then do pull back on the stick/yoke to "rotate" and lift off. This is not the correct way to make a takeoff in a taildragger. You want to raise the tail just a little to a normal climb attitude and let the airplane fly itself off. Airspeed is irrelevant during the takeoff roll in a taildragger. You're flying the airplane by pitch attitude, not airspeed numbers. In climb, the airspeed indicator is just used as a reference to make sure you have the correct pitch attitude. You tweak the pitch attitude to maintain the desired airspeed. Once the taildragger lifts off, you certainly use the airspeed indicator in this manner, but when rolling down the runway, you are highly concerned with marinating directional control, not waiting for any desired airspeed. The airplane will fly off when it's ready. Then you can start using the airspeed indicator as you normally would in climb.

It cannot be emphasized enough that you need to have all eyes looking straight down the runway on takeoff. You're actually flying a taildragger off the runway from the moment you started your takeoff roll. You need to pay full attention to controlling the airplane, especially keeping it going straight down the runway. You should have a feel for a good pitch attitude that allows the airplane to just fly itself off the runway. The ideal situation is to raise the tail to attain a normal climb attitude, the airplane flies itself off the ground in that attitude, and you continue to hold that exact attitude for climb as it is the normal climb attitude. That makes a pretty takeoff and climb out in a taildragger.

Next we'll look at the forces at work acting on the taildragger during takeoff that require you to use all that right rudder to keep the airplane going straight down the runway.

Forces at Work

Torque

Torque is a major factor acting on the airplane at all times when the engine is running. It's there when you're sitting on the ramp with the engine idling. It's there when you're doing your run-up. It's there when you're in cruise. It's there during takeoff too, and in a taildragger, this is one of the times it's most noticeable. In the average taildragger most of us fly, it is most noticeable early in the takeoff roll. Essentially, torque is the tendency for the propeller to stop and the airplane to turn. The more horsepower an airplane has, the stronger the effect of torque on that airplane. A 65 HP J-3 Cub does not have a lot of torque, but it is (barely) noticeable and cannot be ignored. A 300 HP Cessna 195 has very noticeable torque and must be countered properly during takeoff or you'll end up in the weeds for sure. Imagine what torque must be like in a P-51 Mustang! In these really powerful airplanes, you have to bring in the power incrementally as you pick up speed so you don't

introduce more torque than you have available rudder with which to counteract the torque.
The bottom line is that when you add power for takeoff, you must get on the right rudder to counteract torque. Torque is trying to turn the airplane to the left.

P-Factor

P-Factor is caused when the plane of the propeller is moving through the air at an angle. With the airplane in a nose-high attitude in relation to the path of the airplane, as is the case in a taildragger starting its takeoff roll, the plane of the propeller is not moving perpendicular through the air. The air is coming at the propeller at an angle from below. This means that the propeller blade moving downward has a higher angle of attack than the blade moving upward. Since the blade on the airplane's right hand side is moving downward it is realizing a higher angle of attack, therefore producing a little more "lift". Since the blade on the airplane's left hand side is moving up, it realizes the slightly lower angle of attack and produces a little less "lift". So, the right hand side of the propeller is pulling a little harder than the left hand side. This tends to turn the airplane to the left. If the airplane is not moving, there is no P-Factor at all. As the airplane begins to roll down the runway, P-Factor increases.

The bottom line is that this force also requires right rudder to counteract. This force gets stronger as the airplane picks up speed, but the rudder also becomes more effective as you pick up speed. This force is reduced once you have the tail raised, but is still there because you do not raise the tail high enough to completely eliminate this force.

Gyroscope Effect

This force only acts on the airplane during the moment the tail is moving up. The propeller is a pretty good gyro. When you apply a force to a gyro, it reacts 90 degrees in the direction of rotation. When you are raising the tail, you are essentially changing the plane of the propeller "gyro" as if you were pushing on the top of the propeller arc from behind. Since the propeller is turning clockwise when viewed from behind, and since a "gyro" reacts with a force 90 degrees in the direction of rotation, the reaction comes as if you were pushing from behind on the right side of the propeller arc. This tends to turn the airplane to the left. The more horsepower the engine has, the stronger this gyroscope reaction will be. In airplanes with a lot of power, you will need to be careful not to bring the tail up too soon, before you have enough speed and therefore rudder effectiveness to counteract this force.

The bottom line is that while the tail is coming up, an extra dose of right rudder is required to keep the airplane straight. A good taildragger pilot will anticipate the tail coming up and be there an instant before with the right rudder so the nose never moves, rather than waiting to see the nose to start to the left and then kicking it back with the right rudder. Once the tail stops coming up, you let off the right rudder a little because the gyroscope effect stops, and at this time, you have reduced the angle at which the plane of the propeller is moving through the air, so P-Factor has also been reduced. Also, when the tail comes up, you lose the traction provided by the tailwheel, so this too causes a little more rudder to be required.

Once the tail is up, the airplane is picking up speed, so the rudder is becoming more effective. As the rudder becomes more effective, less rudder is required to do the same job. The typical taildragger takeoff may require a lot of right rudder during the initial moments of takeoff, maybe even sustained doses of full right rudder. During the end of the takeoff, you have pretty much reduced right rudder usage to that normal during a climb. When the airplane flies off the runway, you are essentially in a normal climb, and we all know that a little right rudder is required in the climb, whether in a taildragger or a nose wheel airplane, to counteract torque and P-Factor.

<u>Techniques to Learn and Use</u>

Look straight down the runway

During a taildragger takeoff, you should look straight down the runway at all times and keep on the rudders to keep the airplane going straight. Don't concern yourself with the airspeed, waiting for V1 so you can rotate. That's not how it works in a taildragger. There is no rotation in a normal taildragger takeoff. Your first and foremost attention should be paid to keeping the airplane straight and getting the tail up to attain the proper angle of attack so the airplane flies itself off. You're flying the airplane off the runway like they did in the old days, not like they do in today's modern aircraft. Hopefully you're flying a taildragger in the first place because you like to fly, not watch gauges and push buttons on fancy radios and other equipment. <u>You're a pilot when you fly a taildragger, not a cockpit resource manager</u>!

Anticipate

Learn to anticipate right rudder when needed. When you start applying takeoff power, apply right rudder at the same time. Don't wait for the nose to move to the left, then come in with rudder and move it back. Keep ahead of the airplane. The same holds true when the tail comes up, as mentioned above in the gyroscope discussion. Anticipate that tail coming up. Be ready to lead that with right rudder so that when the tail comes up the nose doesn't move, rather than waiting for the nose to move to the left, then pushing in right rudder to bring it back straight. You may be a moment too late and full right rudder won't be enough to get the nose back straight.

Use your feet

Use you feet aggressively at first. The taildragger wants to do everything but go straight down the runway. Work your feet like crazy and stay ahead of the airplane. You're better off to use a little too much rudder a little too quickly than to let the airplane get ahead of you and heading off towards the weeds on either side of the runway because you can definitely get too far behind in a hurry and not be able to get the airplane straight again. You will probably pull the power off at that point, but you're probably going to end up in the weeds or the ditch along side the runway, and that's if you're lucky. If you're not lucky, you may end up plowing through other airplanes on a taxiway or parked on the ramp.

Takeoff Summary Outline

- Line the airplane up with the runway center line
- Get the tailwheel straight
- Look straight down the runway
- Apply power gently
- Keep looking straight down the runway and keep the airplane straight with the rudder
- Apply a little forward stick to raise the tail as necessary
- Anticipate the tail coming up and be ready with more right rudder at that time
- Keep looking straight down the runway and keep the airplane straight with the rudder
- Hold your climb angle of attack until the airplane flies off the runway
- Begin your climb out holding that same angle of attack
- Now check your airspeed and make minor pitch adjustments as necessary

Tailwheels and the Student

Pros and Cons

It's interesting to see what's been happening to the tailwheel of late. For one thing, what had been an anachronistic contrivance designed primarily to prevent an airplane from grinding a bare spot on its posterior, is now being re-valuated in terms of its teaching value. What can the tailwheel teach a student that a nosewheel can't, if anything?

As someone who has been instructing in tailwheels almost exclusively for 35 years, you'd expect that anything I'd say from this point on would be anything but unbiased. But you're wrong. I'm not going to say that everyone should learn on a tailwheel or that you can't learn to fly as well in a nosedragger. I'm not going to say that because I don't believe that. If a person is taught correctly in a C-152, he or she is going to be nearly as good as someone taught in a Cub. Yes, there will be certain differences in that the 152 driver won't be accustom to being blind on landing, but in today's world, is that really necessary?

Now go back to where I said, "...if a person is taught correctly in a C-152..." Now, underline the word "correctly and let's define the term.

"Correctly" when interjected into the tailwheel Vs nosewheel controversy means that the student will be taught to coordinate with the rudder at all times and he or she totally understands adverse yaw. It means that when landing, the airplane is put gently on the main gear, nosewheel clear of the runway and it rolls out that way. A crosswind landing will be with zero drift, on one main gear. The takeoffs will include gently lifting the nose wheel clear, then letting the airplane run on the mains until it flies itself off. If that's the way you were taught and that's the way you still fly, then the only thing the tailwheel is going to give you is quick feet and an appreciation for being able to see over the nose.

Do all students and/or pilots fly that way? Not by a long shot. Not by a very long shot. Why don't they? Because an airplane like a C-152 doesn't require that kind of aviating to be a satisfied, if not truly happy, camper. Its adverse yaw is minimal so the instructor has to work hard to get the student to use their feet in the air because the need for coordination is so subtle. On landing, it's not critical the airplane be straight on touch down so crosswinds are no sweat. Just get it down and the geometry of the gear will sort it out. Takeoffs can be anything you want them to be as long as you have the speed. Just drop the hammer and go.

Finesse, coordination and accuracy have to be forced upon the nosewheel student by a dedicated instructor because most nosewheel airplanes just don't require those qualities to be flown safely. In a nosewheel airplane, the instructor is the single most important ingredient in teaching the student to fly properly because the airplane has made it easy to simply get up and down.

And then there's the tailwheel airplane, the lowly Cub/Champ/Citabria/etc.. Here the instructor is also important, but in the tailwheel airplane he doesn't have to work as hard to teach the basics because the student quickly learns the airplane simply won't go where he wants it to unless he or she masters things like coordination and attitude control. The very basic skills on which all of aviation is built, coordination, speed control, attitude and directional control are absolutely necessary to keep the airplane from becoming a crumpled ball of fabric and tubing on the side of the runway. Getting it up and getting it down isn't really as hard as the horror stories about tailwheels make it sound, but to do it consistently means you've mastered the basic skills of aviation. How many pilots can actually say that? Not very many.

There is the mistaken idea that learning to keep a taildragger straight on landing is the primary benefit in learning to fly a tailwheel airplane. That's not only wrong, but is miles from the truth. Improved directional control is only a tiny, tiny portion of what a taildragger will teach you.

Here's an interesting fact: back when we were working Champs right along side Cherokees, it took about eight hours to safely solo most students in either airplane. Today, to transition a medium-time pilot from nosewheel to tailwheel often takes almost the same number of hours because he has to learn the basics all over again.

Let's look first at the tailwheel airplane in the air, where it doesn't make any difference which end the little wheel is on. If the airplane has a tailwheel, regardless of when it was built (excluding birds like C-180s, 185s, etc.), will have vintage handling. It will have much more adverse yaw than a modern airplane because adverse yaw has been engineered out of modern designs. Push the stick sideways on any tailwheel bird and the nose very neatly moves the other direction unless the rudder is being used. It doesn't move a little. It moves a lot and the student quickly tires of sliding around in his seat and gets his feet into the game for self survival. Therefore, long before the tailwheel comes into play on the ground, the pilot is learning to coordinate simply because he has to.

Hopefully, while in the air, the instructor will point out the way the pilot's butt is telling him exactly what the airplane is doing. The adverse yaw is strong enough that side pressures on the pilot's rear end are noticeable and provide valuable input for proper coordination.

Then there's the landing. Actually, the basics of a proper landing are the same for any airplane, tailwheel or otherwise: a). It should be landed as slowly as practical, b) the nose and the tail should be in line with the direction of travel and c) it shouldn't be drifting sideways. That's all there is to it. The big difference between nosewheel and tailwheel, however, is that on a nosewheel airplane any, or all, of those factors can be screwed up and the airplane will eventually wind up going straight. The landing will be successful, if not pretty. On a tailwheel machine, however, let any one of these factors get out of whack and the landing is going to be an adventure. Count on it!

The geometry of a tailwheel airplane is such that the center of gravity is behind the pivot point of the two main wheels. On a nose gear machine it is in front of the mains, like on a child's tricycle. If the CG is kept right on the line of travel, either airplane will roll straight (more or less). However, if the tail is sideways or the airplane is drifting, the CG is no longer in line with the line of travel and inertia makes the CG want to continue going in a straight line. On a nosedragger, that swings the nose back in line. On a taildragger, the inertial of the CG tries to bring the tail around so that the CG will assume the most stable position which would be in front of the main gear. In other words, a taildragger's most stable position is going straight backwards. This is not necessarily the proper way to end a landing.

It only takes a few trips around the pattern before any student or pilot figures out that his life is a trillion percent easier if he or she plants it on the runway at minimum speed, with all three gear touching (wheel landings are another story), with the tail directly behind the nose and with no drift. If that's done, practically all tailwheel airplanes will roll straight except for gently trying to weathervane into the wind. If it's put on crooked or drifting, it'll start swerving the instant it touches. Like we said, the airplane, not the instructor, tells you it's a good idea to do it right.

What happens almost immediately is that the student/pilot starts to notice little things he never noticed before. For one thing, he'll start seeing what the nose is actually doing just prior to touch down. Tiny little drift angles he never saw in his Cessna/Piper/Beech now assume gargantuan proportions. After touchdown, for the first few hours of practice, the nose will have to move a fair amount sideways before he sees it and corrects. After just a little practice, he'll catch the nose movement the instant it starts and, in so doing, again make his life much easier. In other words, his visual acuity gets much better. He's seeing more of what's happening in the windshield.

Since the severity of turns and swerves on the runway are a function of the speed of the aircraft squared, just a little extra speed on touchdown results in greatly aggravated ground handling. So, the student learns quickly, if he holds it off until it's done flying, he doesn't have to work so hard to keep it straight. He also learns to appreciate a good wind down the runway.

Most, but not all, taildraggers cover the runway with the nose at the moment of touchdown so the pilot has to get his visual cues from the side of the runway. This makes him more aware not only of what's happening somewhere other than on the centerline, but makes it easier to see the drifting, assuming he isn't staring at just one side.

Does the taildragger produce a better pilot than a nosewheel airplane, all other things being equal? No, not really, but it is seldom that all other things are equal. It takes enormous effort for a nosewheel instructor to produce a student as good as any which come out of tailwheels. It can be done, but usually isn't.

If a pilot gets comfortable with the tailwheel, he will have raised virtually every part of his flying skills several notches without even realizing it. Then, when he gets into a nosewheel airplane, he'll be surprised at how much better he is because he is aware of so much more of what is going on around him.

Oh, yeah, there is one other advantage to being able to fly taildraggers: many of the most interesting airplanes have a tailwheel and who wants to be automatically excluded from flying so many neat airplanes just because the little wheel is on the other end.

Flying a taildragger isn't hard. It's just different. And it'll make you a better pilot in spite of yourself.