Flight Advisor Corner by Hobie Tomlinson

August 2005 **Tailwheel Transition, Part III**

Last month we left our tailwheel discussion with normal takeoffs. This month we will pick up where we left off and wrap up the series with the other types of takeoff/landing procedures.

First let's discuss the **Normal or 3 Point (full stall) Landing** for tailwheel aircraft. The approach in a tailwheel aircraft is the same as for its tricycle gear counterpart. It would typically be flown with partial power and a 3 degree descent path @ 1.3 Vso. The descent rate "rule of thumb" for a 3 degree descent path is 5 times your groundspeed, which gives a rate of descent of 400 fpm at 80 kts. **The power is then reduced to idle as the aircraft enters the "roundout" phase of the landing**. At smaller airports, many people prefer to fly a "tighter" pattern and make an idle descent to landing from pattern altitude. While there is nothing wrong with this, it is no longer the normal procedure at today's busy airports. Heavy tailwheel aircraft will carry some power all the way to touchdown and land with the tail slightly elevated. This is to prevent high sink rates from developing at the slower speeds.

The landing technique for tailwheel aircraft starts to diverge from its tricycle gear counterpart after the "roundout" phase. While tricycle gear aircraft are "tolerant" of low pitch attitude landings, tailwheel aircraft are not. This has to do with the gear geometry. Once the main gear contacts the runway in a tricycle gear aircraft, it tends to cause the nose to pitch down, thereby lowering the angle of attack (AOA) and reducing lift. Also if the aircraft was drifting slightly (or in a crab) at touchdown, the aircraft aligns itself, as the center of gravity (CG) is forward of the main gear "pivot point" and point of resistance (wheel brakes).

All theses items are reversed in tailwheel aircraft, as the center of gravity is aft of the main gear "pivot point" and point of resistance. Thus if the main landing gear is allowed to contact the runway much before the tailwheel, the tail will tend to drop, increasing the pitch attitude and lift. This causes the aircraft to "balloon" back into the air with decreasing airspeed. The nose then drops due to reducing airspeed and the aircraft contacts the runway nose low again, setting up a porpoise. Also, if the aircraft is allowed to drift and contacts the runway while drifting (or in a crab) a strong swerving tendency is created, rapidly leading to loss of directional control and a ground loop. Because the CG is aft of the main gear, the natural tendency of a tailwheel aircraft during landing is to want to "swap ends" (Similar to shooting an arrow backwards). This negative directional stability during landing roll must be carefully managed to retain control.

Once the roundout phase is completed the aircraft is kept just above the runway by increasing the pitch attitude as airspeed decreases. Backpressure on the elevator control will need to increase fairly rapidly as elevator control effectiveness is decreasing (due to dropping airspeed) even as we need to keep increasing the nose attitude. In the ideal landing, the elevator control will be nearly full aft as the aircraft settles onto the runway at stalling speed. This attitude has the main gear and tailwheel contacting the runway simultaneously, or slightly tailwheel first. The aircraft's energy & lift are spent prior to touchdown, thus preventing ballooning. After the aircraft has touched down, the elevator control is kept full aft during the landing roll. This will increase the tailwheel traction, improving directional control and preventing the tail from "lifting" as brakes are applied.

The landing roll requires vigilance and precise directional control to prevent a ground loop. **Remember a tailwheel aircraft has negative directional stability on landing!** Many tricycle gear pilots have developed the bad habit of neutralizing the controls upon touchdown, or *even letting go of the controls!* **This is a recipe for disaster in a tailwheel aircraft!** Maintain directional control by picking an object at the far end of the runway and keeping it at a constant place "in the windshield" or over the cowling. As airspeed drops, more and more rudder deflection will be required to obtain the same result, due to decreasing rudder effectiveness.

Crosswind Takeoffs involve a slightly different procedure in tailwheel aircraft. The aircraft is first aligned with the runway and the tailwheel centered (and locked if a locking type). The ailerons are positioned into the wind and the elevator control aft. Brakes are released and the throttle smoothly advanced to takeoff power, while maintaining enough aft elevator input to keep the tail solidly on the runway. In strong crosswinds, some downwind braking may be initially required to keep the aircraft straight until rudder effectiveness increases. The transition from tail down to tail up is delayed until a slightly higher airspeed to keep the tailwheel control function longer. Once the tail is raised it is positioned higher than in a normal takeoff, giving a slight negative angle of attack and keeping more weight on the main gear. Slightly higher takeoff airspeed is used to insure a "positive" liftoff. Aileron control input is reduced as aileron effectiveness improves with increasing airspeed.

The higher liftoff speed used precludes the aircraft settling back on the runway while drifting. Once liftoff speed is obtained lower the tail slightly and the aircraft will fly off the runway. In strong crosswinds, use enough aileron input not only to prevent the upwind wing from lifting, but to actually lift the downwind wing. This will allow the aircraft to fly off in a slip, thus preventing drift if a gust lull should cause it to momentarily settle back onto the runway. Once solidly airborne, eliminate the slip and return to the crab method of drift control.

Crosswind Landings may be made the same as normal landings in light crosswinds. The crab method of drift control must be changed to the slip method (wing low) prior to touchdown. It is my personal technique to transition from crab to wing low flight just prior to initiating the roundout in all aircraft. That way the aircraft track and drag configuration are stable thought the landing maneuver and critical timing judgments are minimized. (Initiating the slip method of drift control increases aircraft drag, so power needs to be maintained further into the landing maneuver than normal). The rudder is now used to keep the longitudinal axis of the aircraft aligned with the runway centerline, while aileron is used to bank against the drift until it stops. The aircraft will touchdown in a slip, upwind wheel first. As the aircraft slows, increase rudder and aileron control inputs (to retain effectiveness with slowing airspeed) up to full control travel, if needed.

Hobietw@att.net (802) 363-3411

In strong crosswinds, **Wheel Landings** are used to retain better aircraft control response all the way to touchdown. The low control effectiveness just prior to touchdown in normal landings is inadequate to deal with strong, gusty or turbulent winds.

A wheel landing is normally made from a power approach, as described above. The correct touchdown speed is one that will produce a level attitude upon touchdown and is usually about approach speed, or 1.3Vso. Upon completing the roundout, power may need to be increased slightly to prevent the speed from dropping off. Once the aircraft is flying just above the runway in a level pitch attitude, the power is reduced (without changing the pitch attitude) just enough to allow the aircraft to begin to settle onto the runway. During this phase of the landing, a constant, level pitch attitude is maintained with the elevator while the descent rate is controlled with power.
The common mistake at this point is allowing the airspeed to decay and the pitch attitude to increase. If that happens, a bounce and possible porpoise is guaranteed!

Once main gear contact with the runway is made, the tail is raised to “weight” the gear and maintain firm ground contact. Power is now reduced to idle. In strong crosswinds it is better to keep the tail up a little longer than normal, then rapidly transition the tail down. This is because the most marginal directional control occurs with the tail in an intermediate position during transition from tail up to tail down and vice versa. Of course while all this is going on we are maintaining very precise drift and runway alignment control using the “wing down” method. This will cause us to touch down on the upwind gear first, which is normal.

Oleo gear aircraft are the easiest to wheel land, while the Cessna “light type” gear legs are the toughest. This is because they act like a bow, if they are placed “in tension” by the landing load they will snap back and return the airplane to the air. Wheel landings are good to teach on long (or sod) runways initially. Sod runways have more give than pavement, while long runways provide more time to set up the landing. A technique that works well for me is to carry extra “nose down” trim for wheel landings. This makes it harder to “raise the nose” unintentionally, as more backpressure is required. Conversely, it is quite easy to raise the tail when the mains “touch on”. Wheel landings can be made power off, especially in calm winds, but extra approach airspeed is required and the timing has to be impeccable!

Short Field takeoffs are started by “swinging the tail around” at the very beginning of the takeoff area and stopping. Wing flaps, if available, are positioned to manufacturer’s recommended setting. Full power is then applied, correct static rpm verified and the brakes released. The tail is allowed to rise off the ground and then positioned for maximum acceleration. Once airborne, adjust pitch attitude to maintain best angle climb until looking over the obstacles immediately ahead, then accelerate to best rate.

Short Field landings are almost identical to normal landings, except that a power approach is made on a slightly steeper descent path at 1.2Vso. Because of the slower speed and higher sink rate, power is carried through the roundout until the sink rate "zeros" and then brought to idle. Once the aircraft has touched down (in a 3 point attitude) the elevator control is moved to full art and the brakes applied.

Soft Field takeoffs vary slightly from short field ones. Wing flaps, if available, are set to the manufacturer's recommended setting before leaving the parking area. Because the main concern is keeping the aircraft moving so it doesn't get "bogged down", a rolling takeoff is used. This usually precludes using the very end of the takeoff area. Full power is applied as the aircraft aligns with the runway and the tail allowed to rise off the ground. During this takeoff the tail is kept as low as possible. The tailwheel should be just barely clear of the ground during the takeoff roll. Excessive back pressured will keep the tailwheel on the ground, causing it to "rut-in" and slow the aircraft's acceleration. Once airborne, accelerate to best angle climb in ground effect and establish departure climb.

Soft Field landings are identical to normal landings, except that power is carried at touchdown. At the completion of the roundout, add enough power to transition to level flight just above the runway in the 3 point landing attitude. Then slightly reduce power until the aircraft settles onto the runway. Upon touchdown, additional power may be required to keep the aircraft moving and full aft elevator control held to keep the tail down.

So there you have it, tailwheel flying in a nutshell! People who correctly fly tricycle gear aircraft will not have significant problems with a tailwheel check out. Those pilots who have developed "bad habits' will take longer. Try it, you'll like it! It will improve your flying of all aircraft.

Our thought for this month is: *"The wise shall inherit glory, but shame shall be the promotion* of *fools!"* So until next month, **Think Right to FliRite!**

The "Glory Days" – FAR Pt 135 Instructor Pilot in Beechcraft D18S

Hobietw@att.net (802) 363-3411