How Sharp

Crosswind takeoffs and landings needn't be hairy for pilots

with right technique and an eye for pitfalls

It was a typical spring Sunday afternoon at the small airport just outside of town. Half a dozen pilots were trying to fly a decent pattern again after having hibernated through a long cold winter, while several others were swapping stories around the coffee pot in the operations office. Along the field fence, a number of family groups were enjoying the season's first warm sun and "watching the airplanes."

Along about the middle of the afternoon, the wind veered from the north to the northwest, just 45° across each of the field's two sod strips. Light at first, it gradually increased to between 15 and 20 m.p.h., and one by one several of the lightplanes in the pattern came in to the line as the pilots began having trouble with the crosswind.

The last *Cub* turned on final, began to drift to its right, and was crabbed by its pilot to maintain a straight-in approach. Coming over the fence, the plane began to drift again, and a second time was crabbed to hold its proper path. Leveling off, the pilot kicked out of the crab just before touching down, and rolled his wheels on the grass. The plane began to slow on its landing roll, but suddenly and rapidly groundlooped to the left, coming to a stop after making one and a half full turns.

Several of the pilots watching from operations and along the fence started running while the plane was still turning, but by the time they reached the scene the pilot had cut the engine, crawled out, and was ruefully inspecting a badly dented bow and ripped fabric on the plane's right wing tip. Questioned as to what had happened, he could only shake his head, smile sheepishly, and say, "Guess it just got away from me."

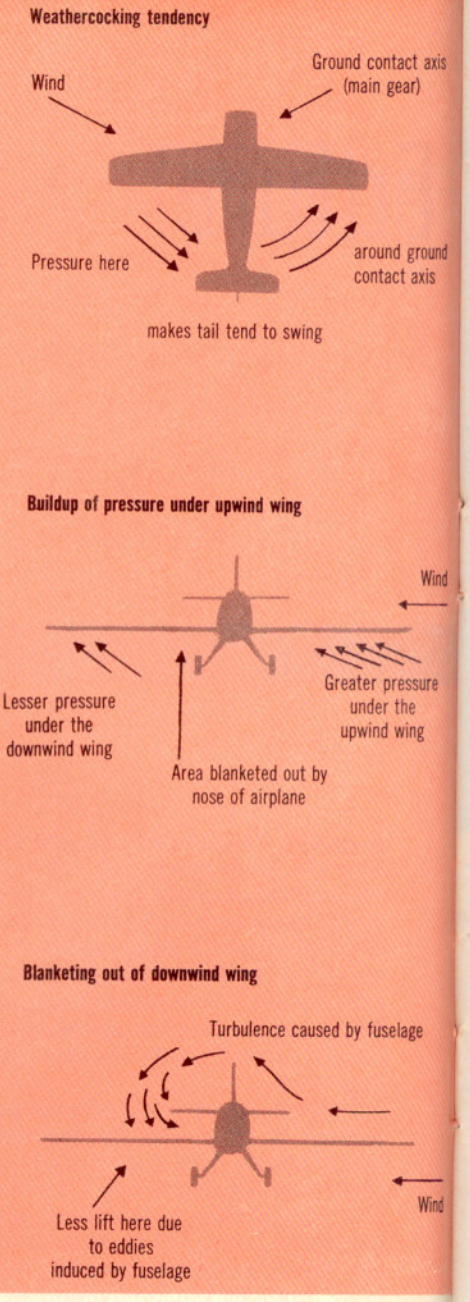
The foregoing incident has been a typical one on many airports, particularly on small ones which, with only one or two strips, cannot always offer a runway into the wind. While seldom resulting in any injury to pilot or passengers, the aircraft damage in dollars every year throughout the country amounts to a sizable sum, not to mention the damage to the pilot's pride caused by this "goof-up." The term is used advisedly, since all but a small fraction of these incidents are 100% avoidable. There are exceptions which will be discussed later.

Before discussing the execution of crosswind takeoffs and landings, it might be a good idea to take a look at the effect of a crosswind on an airplane, and why it can cause a pilot trouble. Three factors are the direct result of a crosswind: tendency to weathercock into the wind, building up of pressure under the upwind wing, and blanketing out of the downwind wing.

The first of these, weathercocking, is well known to all pilots from their first dual periods, and is caused by the wind's attempt to swing the tail of the plane on a long pivot around the principal point of ground contact, the main landing-gear wheels. On the average lightplane, this moment arm is definitely noticeable; on large aircraft such as the Douglas DC-3, it is tremendous. If this tendency is not immediately and positively corrected, the wind will swing the tail rapidly around the gear axis, resulting in a groundloop.

The second factor, the build-up of pressure under the upwind wing, is caused by the wind striking the upwind wing with greater force than the downwind, thereby tending to force it up and around the longitu-

FIGURE 1



dinal axis of the airplane. This tendency, if not halted, can tip the upwind wing up enough so that the lower, downwind wing can strike the ground. At the least, it can, if not corrected, force the plane from its intended landing path, usually requiring a go-around.

Working with this pressure build-up is the third factor, the blanketing of the downwind wing. This is caused by the fuselage setting up severe turbulence in the crosswind as it passes across the top of the fuselage, resulting in reduced lift on the downwind wing, thereby dropping that wing and causing the plane to tip away from the wind. This combination of forces—pressure build-up and blanketing—is especially noticeable on large, low-wing aircraft.

When taking off in a crosswind, the weathercocking tendency will become noticeable as soon as the roll is begun, decreasing as the speed increases and the controls become more effective. This can usually be overcome by normal use of opposite rudder. In some cases it may be necessary to use a little downwind brake pressure until the heading can be held with rudder alone. In any case, use only enough brake to start the takeoff roll on the correct heading, and then use rudder alone.

The tail is raised as quickly as possible, and held a little higher than normal in order to hold the plane on the ground until it has gained enough speed so that it may be pulled off the ground without any danger of settling back in a crab and damaging the landing gear. This tail-high attitude also minimizes pre-takeoff bouncing, with its resultant sideways drifting and strain on the gear.

Takeoff roll should be started with full stick into the wind and decreased as flying speed is approached. A slight wing-down position will counteract drift as the plane leaves the ground. When definitely airborne, level off—being careful not to settle back on again—until climbing speed is reached, then make a normal climb-out, crabbing into the wind in order to maintain the desired track over the ground.

Landing in a crosswind consists of solving two problems: correcting for drift in order that no severe side loads are imposed on the landing gear while touching down, and preventing groundlooping during the landing roll.

To solve the first of these, three methods of approach are possible: crabbing, slipping, or a combination of the two.

In the crabbing method, the airplane is turned into the wind to maintain a constant track in line with the runway and to keep it from drifting downwind. Just before touching the ground, the plane is turned into the drift and lined up with the runway for the actual touchdown, with just enough aileron used to keep the wings level.

The second method, slipping, depends on lowering the upwind wing and side-slipping the airplane into the wind in order to maintain the desired landing track. The upwind wing is held to the desired angle with the ailerons, while the airplane's path is kept constant with the rudder. Just before ground contact, the wings are leveled, still maintaining directional control with the rudder. If the wind is strong at ground level, land on the upwind wheel first, then slowly and carefully, in order to prevent gusts from raising the upwind wing, lower the downwind wheel to the ground.

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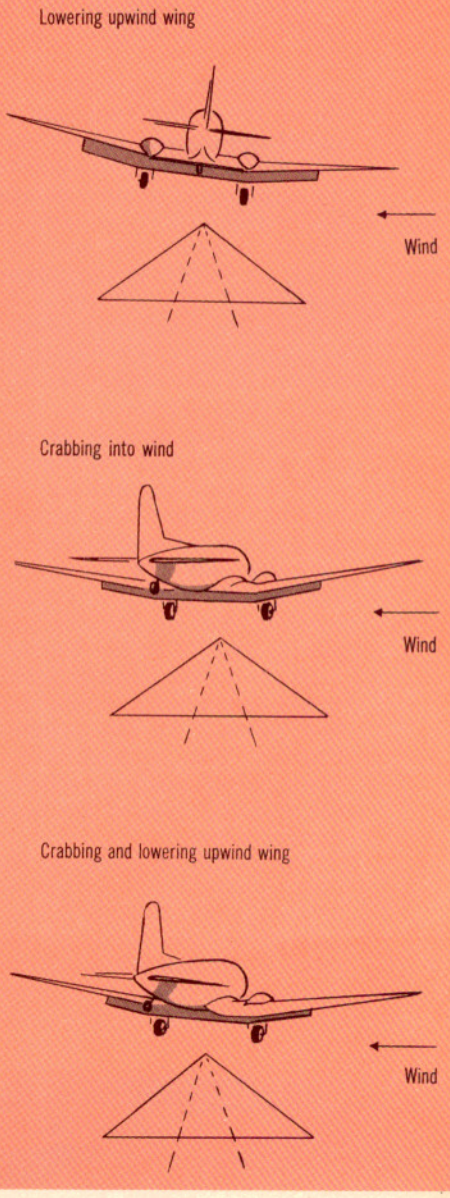
FIGURE 2

Crosswind landing techniques



Are You In Crosswind?

by JERRY MARLETTE • AOPA 25803

Crosswind

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The third method is simply a combination of the first two, using part crab and part slip to achieve the desired flight path, then removing both just prior to ground contact.

Which method is the best? It's largely a matter of individual pilot preference. The first is generally used by single-engine and light-twin pilots for three reasons: it gives the best view of the runway ahead, allows the plane to maintain a normal glide angle, and allows quick use of rudder at any time, while aileron correction is slower and may allow a drift to occur while coming out of the slip, thereby requiring rudder action at the last moment anyway.

Pilots of larger aircraft, Twin Beech and up, usually prefer the third method, part crab and part slip, because less deflection of the aircraft attitude and flight path are required. This requires fewer and smaller corrective measures just before touching down.

Whichever method is used, the landing is not completed until the plane stops rolling, a fact many pilots have learned to their sorrow and chagrin. When the plane first touches down, it will have sufficient speed for full rudder control, so use the rudder sparingly, increasing downwind rudder slowly as the roll speed decreases, being careful not to overcontrol. If absolutely necessary, brake lightly, just enough to aid the rudder in maintaining direction. Do not brake excessively, as a groundloop in the opposite direction may result.

In lightplanes, when the airplane is definitely on the ground, hold the stick all the way back. This presses the tail wheel to the ground and helps the plane roll straight ahead. In larger aircraft with longer axis, land on the main wheels and hold forward pressure on the controls, keeping directional control with the rudder, power on the upwind engine, and cautious use of brakes.

For tricycle geared planes, a slightly different method is recommended: the airplane is crabbed on the final approach, then headed straight along the runway path when near the ground, with the upwind wing being lowered to correct for drift. Touchdown is made on the upwind wheel, then the downwind wheel and nosewheel are lowered, directional control being maintained by the steerable nosewheel and, if necessary, slight braking action.

Flaps, useful in normal landings, should be used with caution when landing in a crosswind. Generally speaking, as the wind angle and velocity increase, the amount of flaps should decrease, as unpredictable conditions of lift and drag induced by the flaps may make the aircraft difficult to handle during the touchdown and ground roll.

The question might well be asked, "What if the crosswind angle or velocity is too great to make a safe landing?" Although seldom the case, the only practical solution is to go to another airport, one with a runway close enough into the wind that a safe landing may be made. In an emergency, when you have no choice but to land, pick the widest area on the field where you can land into the wind, make a power approach, wheel landing, and short roll. Use caution, however, that you are not approaching an area where the wind can be blanketed out, leaving you at flying speed and facing a hangar, wooded area, or other large obstruction.

This last point brings up another: often, a crabbed approach will necessarily be made close to a building area, woods, or hills. Remember that once the airplane enters the lee of these obstructions the wind may decrease or change direction abruptly, so be prepared to apply corrective action. Many pilots have gotten into serious trouble through not expecting this sudden change, and reacting too late. Also, the crosswind is usually weaker at ground level, even on an open field, so be ready to decrease the crab or slip before reaching the runway.

Taken apart piece by piece and thoroughly examined, the crosswind bogey is not nearly as formidable as it appears at first glance. Just remember what you are trying to do—land the airplane without imposing side loads on the gear and complete the ground roll without groundlooping—and it will be a rare crosswind that will ever trouble you again. END