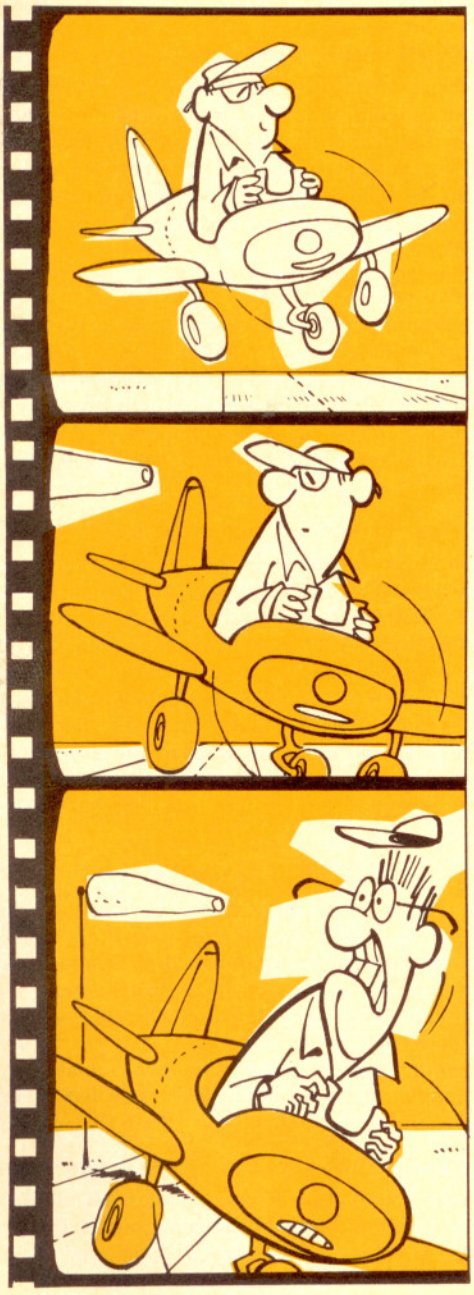
Understanding the factors involved and demanding precision from yourself as a pilot: both can help you avoid

Those Costly Crosswind Crossups

by DON DOWNIE / AOPA 188441



Illustrations by Frank H. Fletcher

■■ After World War II, engineers decided to move the little training wheel to the front end of popular new airplanes, thereby eliminating all groundloops. It didn't quite work out that way, and pilots of both "nosedraggers" and "taildraggers" are still having problems with directional control.

A recent FAA Accident Prevention Program bulletin on "Directional Control and the Nosewheel" pointed out: "You are taking a risk of aircraft damage or loss of directional control, or both, anytime you land in a crab, or while drifting and expecting centrifugal force to 'straighten things out.' The tri-gear airplane can be groundlooped *by any pilot.*"

"I teach all my students to believe that the runway is just 20 feet wide, with a moat full of hungry crocodiles on each side," says aerobatic instructor Michael Dewey (AOPA 255296), of Santa Paula, Calif. "You can nose-loop any of these tri-gear ships when you land on a big runway with full flaps and let go of the wheel after touchdown. The center of vertical force, from the airplane against the runway, shifts forward, and there's virtually no main-wheel braking because of the flaps. Always pretend you're flying a taildragger, and never go forward on the controls after touchdown with a tri-gear."

Veteran instructors point out that touchdown in a crosswind changes an airplane from an excellent air vehicle into a lousy ground vehicle, taildraggers being only slightly worse than tri-gear aircraft.

"The physics of a crosswind situation says that in order for the wheels to run straight with the runway, the airplane must be in a slip before touchdown," says research scientist Irv Culver (AOPA 117226). Culver began flying in a "Jenny" 48 years ago and now has a Cessna Turbo 210.

"Don't be timid about banking the airplane into the wind," he continues. "The idea is to keep the airplane from drifting to the downwind side of the runway, or off the edge of the downwind side. Banks of 30 degrees or more are permissible. Actually, little damage would result even if a wingtip were dragged, although to my knowledge no one has ever achieved this in a modern airplane. Personally, I have never heard of anyone tipping over an airplane on the upwind side, though it may be possible.

"The procedure I use," Culver says, "is to correct drift with opposite rudder considerably before flare—10 seconds or so,

depending on your quickness. Don't wait until the very last minute to kick out drift. The slip will create a sink speed that is higher than normal, and it is generally wise to carry some power to offset this greater sink speed.

"An excellent technique for the skilled pilot, but not recommended for amateurs," he adds, "is to fly the approach to landing along the downwind side of the runway and turn slightly upwind a short time before flare. The track of the airplane will then be upwind across the runway at a slight angle. This reduces touchdown speed and length of rollout. This technique can be carried to an extreme when crosswind speed is near the landing speed of the airplane, reducing the rollout dramatically. The reverse of this technique, however, is murder.

"There's a tendency in crosswind situations to attempt to land too fast," Culver points out. "The faster the airplane goes, the less bank is needed, and also the less rudder.

"On a very long, wide runway, a fast approach can result in 'wheelbarrowing' or 'galloping.' The fast crosswind landing is very likely to force the nose of a tri-gear into the ground before the main gear touches. The pilot who wishes to commit himself to the problems of a fast landing should use very little flap so the nosewheel will not tend to hit first.

"A nose-first landing will result in wheelbarrowing or galloping, as the nose tends to bounce back into the air. The next time the pilot forces the nose down, it usually hits harder, and there's a pilot-induced oscillation that frequently winds up with a buckled nose gear.

"Landing on the nosewheel first," Culver adds, "usually causes a swerve toward the downwind side of the runway because the interconnected rudders and nosewheel are not centered with the runway on touchdown. If you're extremely lucky, this situation can balance out the tendency of the airplane to weathervane into the wind—but don't count on it."

Under strong crosswind conditions, it's usually prudent to program your mind to "take a look" on your first approach. If things begin to get out of hand, pour on the power and go around; find a runway that's nearer into the wind; or head for another airport with a runway into the wind. Just because someone else has landed safely, or because there's an aircraft of the same make and model as yours tied down in the parking area, is no reason you have to try it yourself.

Even if it's getting dark and your fuel gauges are edging toward empty, take the time to analyze the problem and consider the alternatives. Don't build up "target fascination"; in most cases you're not really committed to land on that particular runway at that particular time.

In conditions of extremely high wind, touchdown speeds may be only 20 to 30 mph when landings are made directly into the wind, so taxiways or smooth dirt parking areas can be acceptable substitutes for a runway in emergency situations.

No crosswind landing is really complete until after rollout; in fact, it usually doesn't get really interesting until the main gear is on the ground. Don't consider the landing finished until the aircraft is safely off the runway, chocked and tied down.

Situations may arise in which strong winds will make it impossible to taxi an aircraft safely without having at least one person "walk the wing" to keep the plane from being blown over. In addition, braking may be inadequate to turn the airplane crosswind to get it into the parking area. Then it's time for outside help in pulling and pushing.

If you're alone on an isolated airport in a strong wind, you really have a problem. In that case, your best bet to save your plane is to park headed into the wind and stay in the aircraft with your belt on tight, since your weight in the cockpit—plus use of the controls—may keep the plane from blowing over.

Crosswinds are frequently accompanied by gusts that will tweak your stall warner—and your composure—at the most unexpected times. Add the variables of tall trees, billboards, hangars, or whatever, near the upwind edge of the runway, and what seemed a controllable situation can well be something else again.

Many instructors compare being a pilot with being the captain of a ship. Many ship captains won't tackle particular harbors that can be hazardous in some wind and tide conditions, and the same principle should apply for pilots.

In crosswind situations, pilots have an additional factor working for them that is sometimes ignored. Most aircraft have aileron differential, with the result that the aileron forcing the wing down has about twice the deflection of the surface forcing the wing up. Thus this wing-down aileron creates twice the drag of the wing-up aileron, helping turn the aircraft into the wind on a crosswind landing. Engineers point out that the effective aileron differential under nose-high conditions can go as high as 4 to 1; so when you're holding that wing down into the wind, you're going to need a great deal of "downwind" rudder to keep the runway centerline under the middle wheel.

Anytime you run out of rudder, the wind is too strong to land that airplane on that runway at that particular time. This is one of the reasons instructors can be a bit "chewy" about demanding precision on touchdown and rollout, no matter the width and length of the runway.

Actually, holding a wing down into a crosswind creates a side slip that never really happens, because you're slipping upwind at the same rate the wind is blowing. As you near the ground, there's almost always a lessening of crosswind because of ground friction—but while you can anticipate this meteorological pattern, don't count on it 100 percent.

On all aircraft certificated since May 1962, safe handling with a 90-degree crosswind component of two-tenths the stalling speed (power off, gear and flaps down) must have been demonstrated. Thus a plane that stalls at 60 mph will safely handle a 90-degree crosswind of 12 mph, assuming average piloting skills—and 12 mph really isn't very much of a crosswind. Information on this crosswind component is included in the owner's manual.

In the final analysis, the owner's manual is the bible on crosswind landing technique for a specific aircraft. However, here are some helpful pointers used by many instructors:

1. Establish correct crosswind procedure very early in the final approach.
2. Use wing low into the wind.
3. Use "two brains." One half of your brain controls the ailerons, which position the airplane laterally with respect to the runway. The other half controls the rudder to line up the tires parallel with the runway.
4. If you can't keep the tires parallel with the runway, even with full rudder deflection, there's too much crosswind for a safe landing.
5. With interlocking nose-gear steering, the nose gear will not be lined up with the runway as the main gear touches down, so corrective rudder should be relaxed just as the nosewheel comes down.
6. Flaps up at touchdown will increase braking effectiveness.
7. Practice even when you don't need it. Put the center wheel on the centerline of the runway on every landing. You may need this proficiency someday. □