There are three distinct errors common while learning to execute a lazy 8. The most common is to hurry the maneuver. As I mentioned previously, it is *not* called an accelerated 8; it should be done as slowly and as smoothly as possible for the best outcome.

The second most common error is for the longitudinal axis of the aircraft to pass through the horizon either too early or too late. It should fly through the horizon at exactly the 90-degree point. If the longitudinal axis passes through the horizon too early, you will usually complete the maneuver at an altitude much lower than the altitude at which you entered. This is because passing through the horizon early allows the aircraft more time to descend and it winds up using this time to descend more than it climbed, thus destroying the symmetry of the maneuver. Conversely, if the longitudinal axis passes through the horizon late, the maneuver will be completed at an altitude higher than the original. The reason for this is the exact opposite of passing through the horizon too early. The aircraft will not have as much time to descend, and this causes the maneuver to end up at an altitude higher than the one from which you started. You can cheat and force your aircraft to return to the original altitude, but the symmetry is destroyed and you make little gain in understanding the precision involved in mastering this maneuver.

The third most common error concerns power selection. The correct power setting is essential if the lazy 8 is to be performed with any degree of symmetry. For example, the power setting you choose on a day when you are the only person on board with half tanks of fuel and an outside air temperature of 35°F will be quite different than if you are loaded with full fuel on a very hot day. The reasoning behind this involves your power-to-weight ratio. If your aircraft is light and the day is cool, you require less power to lift the weight. So if you use too much power, you gain more altitude than you can lose without exceeding your entry airspeed, causing you to wind up higher at the end of the maneuver than you were at the entry. On the other hand, if you select too little power for a given day, you will not climb enough to make your lazy 8 symmetrical. So before you initiate your lazy 8, give some serious thought to what power setting should be right for the conditions you have on this particular day. Don't try to use the same power settings day in and day out; it won't work. Remember what I told you earlier. The lazy 8 is the only maneuver I know of that cannot be done by rote. The lazy 8 is either performed correctly or not at all.

Steep power turns

Figure 4-10 illustrates a steep power turn. The bank angle must be large enough that there is a tendency for "overbanking," or the bank actually steepens on its own and you must use opposite aileron to prevent the bank from becoming greater. For most general-aviation aircraft, the bank angle will be somewhere around 50 to 60 degrees. You do not want to exceed the recommended bank angle due to the load factors it may impose on the plane's structures. As the bank angle increases, the g-loads on the airplane increase. Once past 60 degrees of bank in level flight, the g-loads increase very rapidly, with the possibility of exceeding some plane's structural capability. At 60 degrees of bank, the load is 2 g's—twice normal weight. At 70 degrees it increases rapidly to about 3 g's. This is very near the limitation of most general-aviation aircraft in the normal category, so you must watch your bank angle when practicing steep power turns.

You are not using a reference point at the center of the turn and you do not need to be at pattern altitudes. In fact, until you become proficient at steep power turns you should maintain a higher altitude in case you stall the plane accidentally.

Enter the turn at or below maneuvering speed, V_a, to avoid overloading the airplane's structure. Roll smoothly into a 50- to 60-degree bank using coordinated rudder and aileron inputs. A noticeable

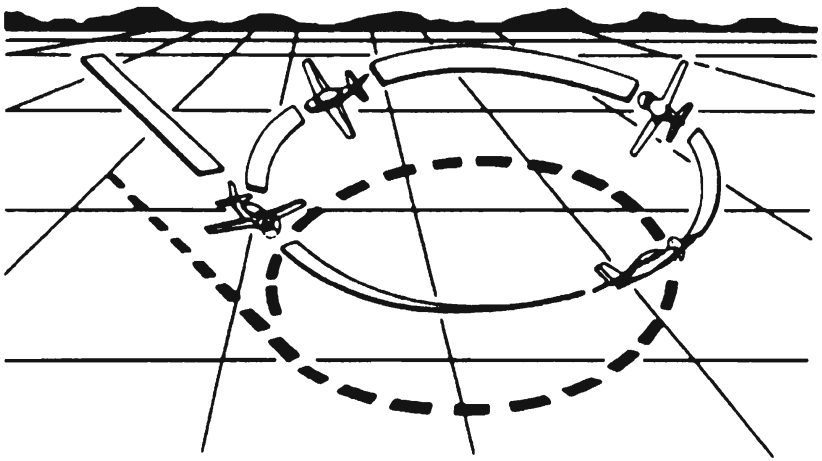

Fig. 4-10 *Steep power turn.*

amount of elevator backpressure will be needed to maintain a level altitude as the bank becomes steeper. This is where many pilots become uncomfortable with flying steep turns. As the bank becomes steeper and the elevator backpressure increases, so do the g-loads, as compared to normal turns. The elevator backpressure can become quite heavy, and many pilots hesitate pulling that hard. Many use rudder opposite the direction of the turn to hold the nose of the plane up and alleviate some elevator backpressure. The turn is then very uncoordinated, at a steep bank angle where the stall speed also increases, and in the perfect setup for a high-speed stall/spin situation. Use coordinated control inputs throughout the maneuver, and this potential problem can be reduced.

Once established in the turn, use slightly opposite aileron to compensate for the overbanking tendency steep turns cause. As you adjust the aileron, also adjust the rudder inputs. If the plane loses altitude and you are pulling hard on the elevator control, add more power. The maximum turning performance for a given aircraft will be reached when the radius of the turn is smallest and the rate of turn is highest. This will vary with the bank angle and airspeed of the plane. If power settings cannot be increased and the plane is descending, decrease the bank angle to hold altitude.

As the turn progresses, monitor the heading closely. Pilots have a tendency to fly past the desired rollout heading because the plane is turning so quickly. When rolling the plane back to level flight, remember to release elevator backpressure and, if necessary, reduce engine power. It is not uncommon for pilots to gain several hundred feet as they roll out of a steep power turn due to this mistake. The amount of lead necessary to roll out on heading will depend on the plane and the rate of turn, but be prepared to give a generous lead.

5

Takeoffs and landings

There are so many things that lead to good overall piloting ability. Taking off and landing happen to be two of the pieces that make up the overall picture. Granted, taking off and landing are important, but to do so with great skill and confidence, you must first master a host of other important and related tasks.

With today's tricycle-gear aircraft and miles of hard-surface runways, the normal takeoff is one of the easiest maneuvers to master. Almost all you have to do is point the aircraft straight down the runway, apply power, keep it straight until rotation speed is reached, and rotate. It's that simple. Or is it? If you are a robot, it is. If you are a pilot, there's a little more involved, such as knowing how to straighten it out if things suddenly go astray and remembering to keep one eye on the oil pressure and airspeed indicator while keeping the other eye on runway alignment of the aircraft, all at the same time. It goes on and on.

Ground operations

Before you can take off, you have to be able to get your aircraft safely started and out to the runway. While this may sound rather simplistic, it can be a source of problems to the careless or uninitiated.

The first and foremost considerations in ground operations are common sense and courtesy. For instance, when you are ready to fire up your engine, you always holler "Clear!" don't you? But do you wait a few seconds after you call out so some poor boob can actually move himself out of the propeller area? Applicants on a checkride are sometimes nervous and are especially susceptible to calling "Clear!" as they are turning the key to start the engine. I'll tell you this: Anyone in the way of the prop with one of these guys will be

looking for his parts over a wide area. This is one example where thoughtlessness can turn deadly. Here's another:

An acquaintance of mine was in the process of starting his aircraft on his ranch, far away from the potential problems we mere mortals face at the local airport where we have to share space with the rest of humanity. As he prepared to start up his aircraft, it became clear to me that he wasn't going to clear the area before turning the starter switch. I asked him if he shouldn't clear the area even though we were in the boonies. He told me that, "Nah" he never needed to verbally clear at the ranch. There were only so many people around and he had them all accounted for. This particular day he started his aircraft and threw his favorite dog about 50 feet, straight into doggy heaven. We'll never know if old Scruffy would have responded to a loud call, but I'll bet he would have come around just to see what his master wanted. And you can believe any person over five years old will move in a hurry if warned of an impending startup. The point is that people and animals certainly deserve the chance to get out of the way, so slow down and give safety a helping hand.

If there's anyone standing behind you, they might also wish to move rather than be showered with a propeller blast, rock chips, dirty water, oil, or who knows what. A small amount of courtesy goes a long way towards a safe flight. And a safe flight literally begins when you strap into the aircraft.

Taxi procedures

As you begin to taxi, move away with only enough power to initiate forward movement, and then retard the throttle to a point that lets you taxi at about a fast walk. I said a fast walk. I have ridden with some pilots who taxi faster than a cheetah can run. And it gets pretty interesting when they come to a corner. Taxi only as fast as you are comfortable with, and never attempt to turn a corner too fast in an aircraft—they can, and will, tip over. Wouldn't you love to try to explain that at the next company party?

As you taxi, it is of vital importance that you position the controls to minimize the effects of wind as it relates to lift, directional control, and yaw tendency. (See Fig. 5-1.) The idea is to position the ailerons and elevator to generate the least amount of lift under the wings and tail during taxi, especially when the wind is from the rear. You want the wind to hold the wings and tail down rather than create any lift-

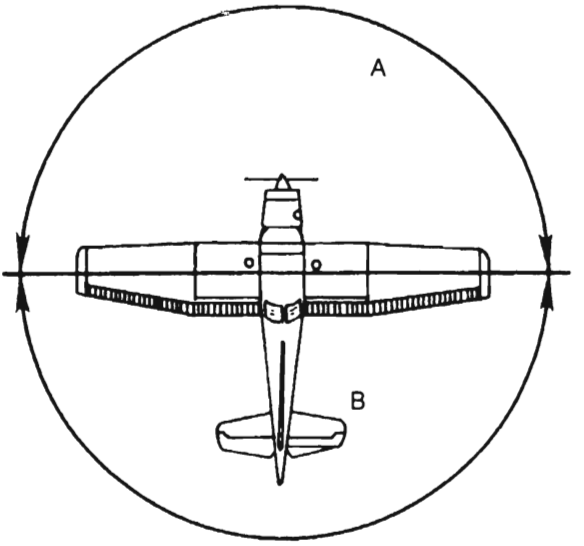

Fig. 5-1 *Selecting control positions during taxi. Imagine a line running through your aircraft from wingtip to wingtip, (the lateral axis): A) If the wind is coming from in front of the imaginary line, turn your control wheel towards the wind direction and hold neutral or up elevator; B) If the wind is coming from behind the imaginary line, turn your control wheel away from the wind direction and hold forward elevator.*

ing action that could overturn you during this critical phase. Remember that aircraft are not at home until they become airborne. In fact, most aircraft are rather awkward on the ground.

During the run-up prior to takeoff, you turn your aircraft directly into the wind. This will do two things for you:

1. It will provide maximum cooling for your engine;
2. It will maximize the aerodynamic flow of air over your control surfaces. In fact, if you have a bit of a breeze, when you test your controls for freedom of movement, the aircraft will react just as it would if airborne. Pull back on the yoke and the nose should rise slightly, etc.

Lastly, any run-up should be completed with the nosewheel pointed straight. If you stop during a turn, leaving the nosewheel crooked, the thrust from running up the engine can cause the bearings to get out of round. Then, when you take off or land, the nosewheel can shimmy very badly. If you have flown a plane in which

the nosewheel vibrates violently at some point, you can usually attribute the cause to the plane having been run up with the nosewheel in a cocked position.

Normal takeoff

If you have learned your lessons well out in the practice area and can put to use the principles of slow flight, stalls, straight and level, and all the rest, the normal takeoff will hold few surprises for you. As I taxi onto the active runway, I always do a little mental jog I call my FFT check. It's a last check of the three most often overlooked items on your pretakeoff checklist. I call them the "killers" since a takeoff with one of these items set incorrectly can lead to dire consequences. FFT stands for fuel, flaps, and trim. As I think "fuel, flaps, and trim," I carefully check each one to be sure it is indeed in the takeoff setting. Some pilots have come to a sorry realization at a very inopportune time that one of these wasn't set correctly. One memorable event that cost many lives occurred to the crew of an MD-80 at Detroit, who attempted a takeoff with the flaps in the wrong position. This very preventable human mistake could have been avoided with a simple last-minute check that the fuel was on and that the flaps and the trim were set correctly.

When cleared, taxi onto the runway at the end. Don't waste 200 yards of that precious runway weaving back and forth to line up with the centerline. Go right to it. Line the longitudinal axis (nose-to-tail axis) with the centerline of the runway, and smoothly apply full power. You might need a little right rudder as the power is applied to overcome torque. Feel the controls begin to become effective as your speed increases. Glance quickly at the oil pressure and airspeed indicator, then get your eyes back outside where the action is. If you keep your eyes in the cockpit too long, there might be more action waiting for you out there than you want.

As the aircraft gains speed and the controls become more effective, use small control inputs to maintain your line straight down the runway. One of the most common errors in primary flight is the tendency to overcontrol, especially the rudder. However, be sure to use whatever it takes. Don't go the other way and be too timid with the controls either.

When you reach the rotation speed for your particular aircraft, smoothly apply a little backpressure and lift off (Fig. 5-2). The aircraft should be rotated so that you will be at an angle that produces

a climb at about V_y (best rate-of-climb speed). If you find this a little difficult at first, don't feel alone. The proper amount of rotation will come with a little time and practice.

Okay, now you're airborne and climbing out at V_y. Trim the aircraft to help maintain airspeed while you glance around to verify that you are climbing straight out from the runway centerline. Any drift should be corrected for by the use of the crab technique. Remember that you learned to correct for wind when you learned ground track procedures. Now is the time to put that knowledge to practical use.

The FAA recommends climbing to at least 500 feet above the ground before turning out of the pattern. Another suggestion is to climb straight ahead until you reach the end of the runway. Unless otherwise directed by the tower, do whichever comes last.

The traffic pattern

The traffic pattern can be a busy environment, and maintaining an awareness of other aircraft and their relation to your plane can demand a great deal from the pilot. Airplanes fly at different airspeeds, and even different altitudes while in the pattern. Whenever you fly, you should be looking for traffic, but this becomes extremely important when you fly in the traffic pattern. The maneuvers covered

Fig. 5-2 *Everything checked, lined up, and ready to go.*

so far in the book become of fundamental importance due to the need for dividing your attention between looking outside the plane, monitoring your ground track, looking for other airplanes, and flying the approach. Knowing how to enter and exit the pattern can help you be more efficient as you fly near the airport.

Preparation for pattern entry

You should begin planning for your landing while you are still well away from the airport. In a controlled airport, you will need to listen to the approach and tower frequencies, normally at distances of 20 miles or greater, depending on the airspace around the airport. At uncontrolled fields you should begin listening to the Unicom frequency while you are at least 10 to 20 miles from the airport. However, in either case, you should develop a mental picture of the traffic, the runways in use, the flow of traffic pattern, and any other factors that can affect how you will fly in the pattern.

By planning ahead, you can increase the level of safety as you fly into the pattern. As you approach the airport, you should clearly state your intentions, altitude, and position from the airport. This is true whether you are flying into a controlled or uncontrolled field.

At controlled fields, the tower staff will direct you through the airspace, giving you headings and altitudes. You are not relieved of the need to look for other aircraft, though, so don't become complacent and assume you do not need to keep looking outside the plane. At uncontrolled fields you may want to overfly the airport before you actually enter the pattern to get an idea of the runway layout, look at the windsock to determine wind direction, or observe for other aircraft in the pattern. There are times when pilots do not use their radio, or the plane they are flying is not equipped with a radio, so even though you may not hear any other traffic over the radio, make sure you are looking for other aircraft as you fly over the airport or prepare to enter the pattern.

Whether you are being directed by the tower at a controlled field or are flying the pattern at an uncontrolled airport, make sure you check the wind sock and compare the information you are getting from it with what the tower or Unicom staff is telling you. No one will purposely give you wrong information when you ask for weather information, but you want to use the wind sock to confirm the wind direction as you fly through the pattern. On some airports the wind sock may be difficult to find, but do your best to locate it prior to landing. Figure 5-3 shows the typical wind direction indica-