Civil Air Patrol

Cadet Flight Academy Powered

Flying Handbook

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COCKPIT SETUP

Student Seating

One of the most fundamental keys to the success of students at flight academy has been how the students are seated at the controls of their airplane. The most successful instructors at flight academy have found that their students must sit high enough to have good visibility over the nose of the airplane and close enough to reach the controls comfortably.

Students who are sitting too high in their seats perform better than those students who are sitting too low. Students who are sitting too low in their seats have more difficulty in maintaining a pitch attitude.
Sitting too low also makes practicing the round-out and flare more difficult because the nose obscures the horizon and runway when it is raised. The student will lower the nose again to see the runway they are landing on which results in consistently poor landings.

Students must sit close enough to apply full rudder travel comfortably.

USE SEAT CUSHION(S) IF NECESSARY!

The Reference Mark (Grease Mark) on the Windshield

Another of the most fundamental keys to success of the students at flight academy has been the windshield reference mark. The mark on the windshield provides a much more exact reference than using the cowl or some other part on the nose of the airplane.

The grease spot reference should be about 8 inches above the bottom of the windshield plexiglas, or 3 inches above the eyebrow of the instrument panel.

If the grease spot is less than 3 inches above the instrument panel, the instructor must ensure the seat is articulated to its highest position and, if necessary, use a boat cushion under the student.
For proper training the student must sit high enough in their seat.

Instructor Action:

While holding the aircraft in a straight and level attitude, the instructor, sitting in an upright position, extends his arm and makes a reference mark on the windshield with the china marker.

Place the mark on the windshield to indicate the position of the horizon on the windshield when the instructor is sitting back in his seat in a normal position.

The most common error in creating the reference mark is to lean ahead while making the mark or to assume some other unusual seating position.

Student Action:

Now the instructor holds the aircraft in a straight and level attitude and keeps the windshield reference mark he made earlier on the horizon.
The student, sitting back in the seat in an upright manner, extends his arm and makes a reference mark on the windshield to indicate the position of the horizon.
To accurately create this mark, the instructor must insure the student is assuming his normal position at the controls.

The marks can be adjusted as needed if they are not found to be accurate as training progresses.

COLLISION AVOIDANCE

Scanning For Traffic

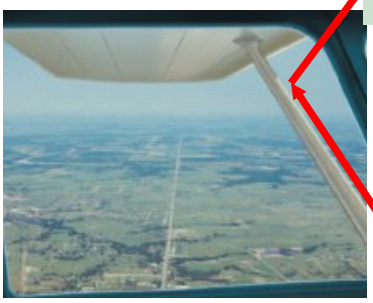
The primary responsibility for collision avoidance rests with the pilot. Learning collision avoidance procedures must begin with your first flight. Studies have shown that the majority of mid-air collisions occur within 5 miles of an airport, during daylight hours and in VFR conditions.

From the wing strut, scan into the windshield area.

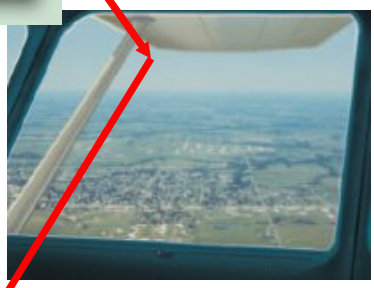
Use short regularly spaced eye movements of no more than 10 degrees making sure you focus at least one second on each segment of the sky.
Make sure you scan both vertically and horizontally.

Scan across the windshield and down the wing strut to the cockpit making sure to focus on each 10 degree segment of the sky.

Be especially alert for traffic showing no motion but is getting larger. This indicates it is likely on a collision course with your airplane.



SEEING & AVOIDING IS THE PILOT'S MAIN RESPONSIBILITY. DEVELOP YOUR SCANNING SKILLS!!



After finishing the cockpit scan of the flight and engine instruments, scan out the pilot side window using the wing strut as a guide.

An airplane coming from the side has little relative motion unless there is a large speed difference and will be harder to see.

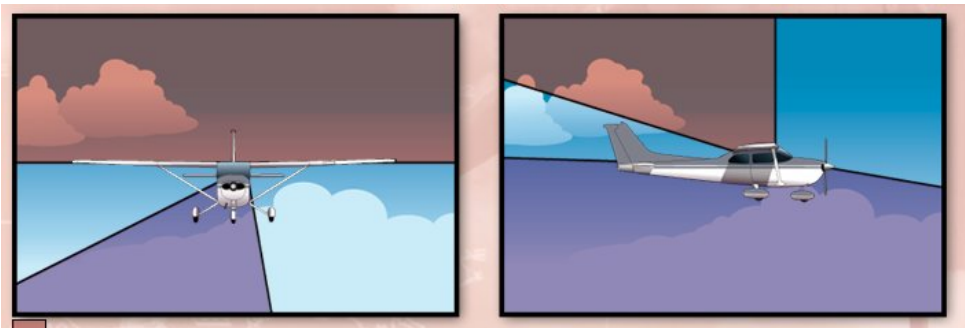
Scan into the cockpit and check radio frequencies.

Verify that the flight instruments are confirming that your visual references are correct and adjust the airplane as needed. Check that the engine instruments are indicating in the proper operating ranges.

Re-Start the scan up the strut.

Aircraft Blind Spots

In both high wing and low wing airplane designs portions of your view are blocked by the fuselage and wings making it difficult to see conflicting traffic. The blind spots for the Cessna 172 are indicated in the diagram below.



Magenta Areas:

The upper magenta parts of the diagram indicate the blind spots created by the wings of the C-172

Purple Areas:

The lower purple areas of the diagram indicate the blind spots created by the fuselage of the C-172.

Clearing Turns

Clearing Turns **two 90 degree turns, left then right,** before starting a practice maneuver. Theses **turns allow the pilot to see areas blocked by the wings and the fuselage of the airplane** and make it easier to maintain visual contact with other aircraft in neighboring practice areas.

Before starting any maneuvers in the practice area, you need to make clearing turns and carefully scan the practice area for other aircraft! The US Air Force teaches CHEF-Clear as a pre-maneuver checklist. Cockpit, Harness, Engine Instruments, Fuel and Clearing turns.

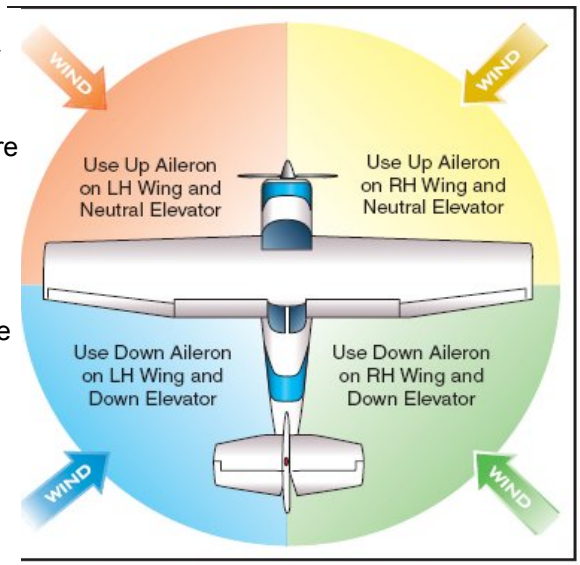
GROUND (TAXI) OPERATIONS

Taxiing is the controlled movement of the airplane under its own power while on the ground.

The pilot must be aware of the entire area around the aircraft to ensure that the airplane will clear all obstructions and other aircraft.

CAP regulations state that the pilot must bring the aircraft to a complete halt anytime you are within 10 ft of an object before proceeding on. Students will keep one hand on the throttle and one hand on the yoke during all ground operations.

Avoid gripping the controls too tightly. Stay Loose!



gure 2-10. Flight control positions during taxi.

Requirements for Safe Taxi:
1) Positive control
2) Ability to see potential hazards in time to avoid them.
3) Ability to stop or turn without relying on the brakes too heavily.

While it is difficult to set a single safe taxiing speed, you should be slow enough so when the throttle is closed the airplane can be stopped promptly.

When yellow taxiway center-line stripes are provided, they should be followed unless it becomes necessary to avoid other aircraft or obstructions.

Steering is done with rudder pedals and brakes, not the control yoke!

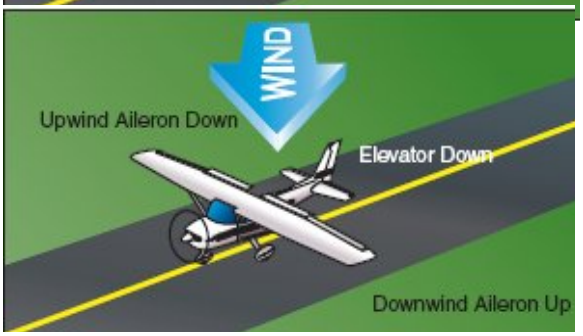
Because moderate to strong winds or jet blast can cause a loss of control or even overturn your aircraft, proper use of the ailerons and elevator will help you control the aircraft while taxiing.

Climb and Turn Toward (Into) a Headwind

When taxiing into a quartering headwind, the wing on the Upwind side will tend to rise unless you turn the control wheel in the direction the wind is blowing from (upwind aileron up). Moving the upwind aileron up reduces the impact of the wind striking underneath the wing. The control movement also causes the downwind aileron to go down, increasing lift on the wing and further reducing the tendency of the upwind wing to rise. Hold the elevator neutral or back slightly (in a climb position).

Dive and Turn Away from a Tailwind

When taxiing with a right quartering tailwind, keep the control wheel forward (in a dive) and turn the control wheel to left (turn away from the direction the wind is blowing from). Since the wind is striking from behind, the force of the wind is reduced under the upwind aileron and wing, and the elevator position keeps the tail down.



Use of the Brakes While Taxiing

It is a common student error to taxi with a power setting that requires controlling taxi speed with the use of the brakes. This is like driving your car with one foot on the brakes and the other foot on the gas pedal. Rather than continuously riding the brakes to control speed, it is better to apply brakes only occasionally and use the throttle to control your speed. Since the brakes are on the top of the rudder pedal, the best way to avoid the brakes is to keep your heels on the cockpit floor when you are taxiing.

Normally, all turns should be started using the rudder pedal to steer the nose-wheel. To tighten the turn after full pedal deflection is reached, the brake may be applied as needed. When stopping the aircraft, it is always advisable to stop with the nose-wheel straight ahead to relieve any side loads on the nose-wheel, making it easier to start moving ahead again.

Instructor Emphasis Items

INSIST THAT THE STUDENT KEEP ONE HAND ON THE THROTTLE DURING GROUND OPERATION (INCLUDING RUN-UP), DURING CLIMBS AND DURING LOW ALTITUDE SITUATIONS.

MONITOR A SAFE TAXI SPEED. INSIST ONE HAND ONLY BE ON THE YOKE. USE A LIGHT GRIP AVOID "CHOKING" THE YOKE.

THE FOUR FUNDAMENTALS OF FLIGHT

The Horizon as a Visual Reference

The airplane's attitude is established and maintained by positioning the airplane in relation to the natural horizon. The airplane's attitude is confirmed and re-checked by referring to the flight instruments in the cockpit. Continuous checks and immediate corrections will allow little chance for the airplane to deviate from its flightpath. The pilot must become familiar with the relationship between the outside references to the natural horizon and corresponding indications on the flight instruments inside the cockpit.

1. Straight & Level
2. Turns
3. Climbs
4. Descents

All flight maneuvers are made up of combinations of the four fundamentals of flight. Proficiency in these basic maneuvers will make the next more advanced steps of your training much easier to achieve. Each time you fly, your position in the aircraft should be the same. Your instructor will help you determine the position of the seat that is correct for you. Your instructor will also help you place a mark on the windscreen of the aircraft that will be a reference point to make learning and doing the maneuvers much faster and easier.

Straight and Level Flight

To maintain straight and level flight there are three main reference points that you will use; 1) equal distances between the bottom of the wings and the horizon; 2) the grease spot on the windscreen is on the horizon.

Bank (Roll) for Turns

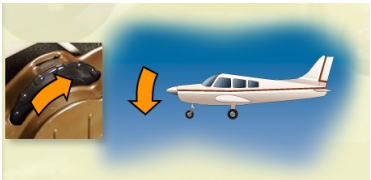
To maintain equal distances between the bottom of the wings and the earth's horizon, the control wheel is rotated to the right or left. Rotating the control wheel toward a wing raises that aileron,causing the wing to go down. At the same time, the other wing's aileron goes down causing the wing to go up. This movement, called roll, describes movement around the aircraft's longitudinal axis which runs from prop spinner to tail.

Pitch for Climbs and Descents

When forward pressure is placed on the control wheel, the grease spot on the windscreen moves below the horizon; when back pressure is applied to the control wheel, the grease spot on the windscreen moves above the horizon. The rotation is around the lateral axis, an imaginary line which runs from wingtip to wingtip through the center of gravity. Rotation around the lateral axis is called pitch attitude and is controlled by the elevator surfaces on the aircraft. Control of the aircraft pitch attitude around the lateral axis to achieve level, climbing or descending flight can easily be maintained by keeping the grease spot on the windscreen in a fixed position relative to the earth's horizon.

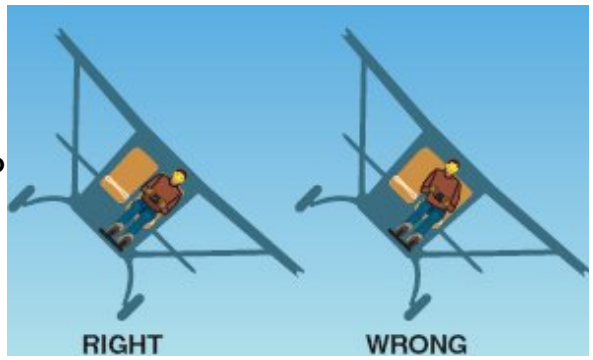
Trim Control

An improperly trimmed airplane requires constant control inputs, produces pilot tension and fatigue, distracts the pilot from scanning and contributes to abrupt and erratic attitude control. Once a constant airspeed /pitch attitude has been established, the pilot should hold the grease spot on the horizon with the control yoke and roll the trim wheel to remove the pressure the pilot feels on his hand from the control yoke. The aircraft will then maintain the desired pitch attitude and fly "hands off". A properly trimmed airplane is an indication of good piloting skills.



THE FOUR FUNDAMENTALS OF FLIGHT
Turns

A turn is a basic maneuver used to change the direction of the aircraft. Turns involve the close coordination of all three flight controls – ailerons, rudder and elevator. The ailerons bank the wings and determine the rate of turn. The elevators move the nose of the airplane up or down in relation to the pilot and perpendicular to the wings which sets both the pitch attitude in the turn and pulls the nose of the airplane around the turn. The rudder offsets any yaw effects developed by the other controls. **The rudder does not turn the airplane!**



Posture

Your posture while seated in the aircraft is very Important during all of the maneuvers you will perform. **Sit erect and don't lean from side to side during the turns.** If you don't maintain a constant position in the cockpit, your outside references will continually change and the maneuvers will be much harder to learn.

Shallow, Medium and Steep Turns

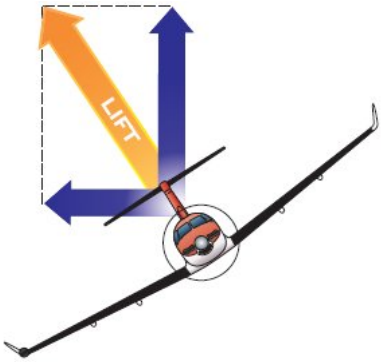
Turns are usually divided into three classes depending on the amount of bank used: 1) Shallow – less than 20 degrees of bank, 2) Medium – 20-45 degrees of bank, 3) Steep – 45 degrees or more of bank.

In shallow and medium banked turns, the pi

As the airplane is banked into a turn, lift becomes the result of two components; Vertical lift which opposes gravity and horizontal lift
which opposes centrifugal force (inertia).
It is the horizontal lift

the amount of pressure that is applied. You
which turns the airplane - not the

will hold the control pressures until the desired

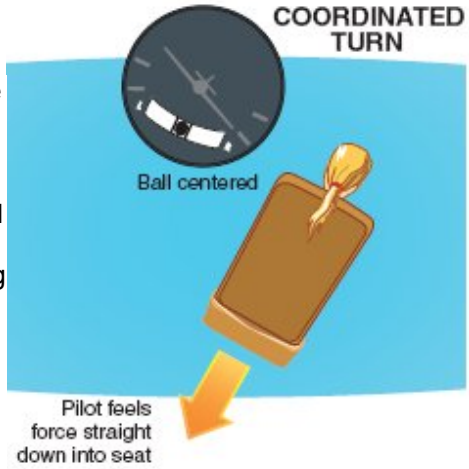


In shallow turns the pitch attitude is slight but as the bank angle increases, pitch attitude is much more pronounced.

To turn the airplane; Apply pressure to the rudder and the ailerons at the same time. The rate at which the airplane rolls depends upon how much pressure is applied to the controls. Hold a constant pressure on the controls until you get the desired angle of bank needed then neutralize the controls. Since the aircraft will turn as long as there is any bank, start the rollout before reaching the desired heading.

Coordinated Turns

When you apply aileron pressure to bank the airplane, the aileron on the rising wing produces a greater drag than the aileron on the lowered wing. The increased lift from the rising wing also produces increased induced drag (drag created by lift) which yaws (turns) the airplane towards the rising wing which is opposite to the direction of the turn.



To overcome this adverse yawing motion, rudder pressure must be applied together with the aileron in the desired direction of the turn. Use the rudder as long as the ailerons are deflected. The correct amount of pressure depends on aircraft speed and the amount of aileron used. By keeping the ball centered in the turn coordinator you will know you are using the correct amount of rudder.

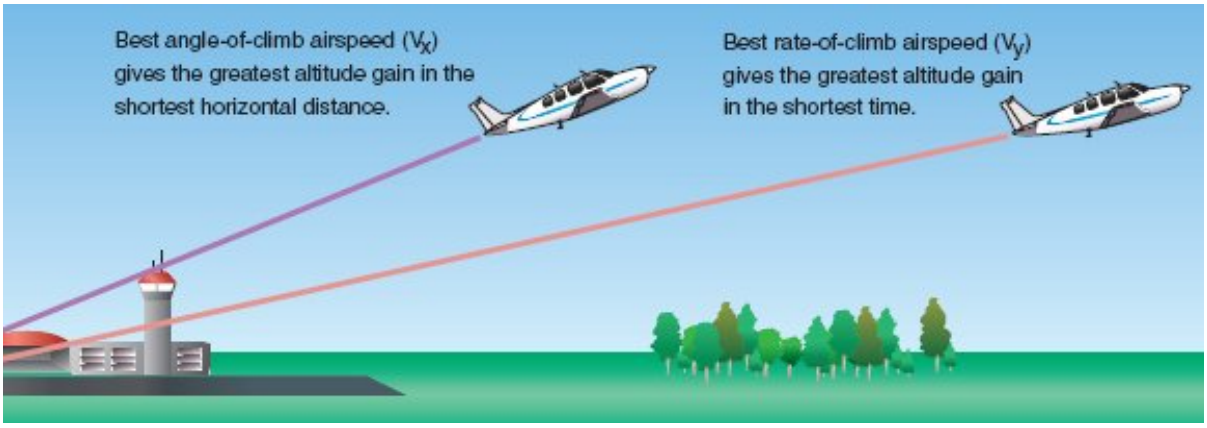
Instructor's Emphasis Items

MONITOR COORDINATION CONSTANTLY; INSIST ON RUDDER & AILERON TOGETHER ROLLING IN & OUT OF TURNS !!! BACK PRESSURE MUST BE ADDED IN ALL TURNS WHETHER LEVEL, DESCENDING OR CLIMBING. ERRORS WILL SHOW UP IN THE TRAFFIC PATTERN AS TOO HIGH AIRSPEED CLIMBS AND DESCENTS.

THE FOUR FUNDAMENTALS OF FLIGHT

Climbs

A climb is a maneuver executed to gain altitude in a safe, orderly manner. Like other maneuvers, climbs should be performed using outside visual references with the flight instruments as a back up. In a climb, weight acts in a rearward direction causing an increase in total drag. The increased drag requires an increased thrust to offset the drag so the forces will be balanced again. An airplane's ability to climb is limited by the available thrust.



NORMAL (CRUISE) CLIMB

Cruise climb airspeed is generally higher than the airplane's best rate of climb.
Cruise climb airspeeds provide:

1) Better engine cooling
2) Better visibility over the nose
3) Easier aircraft control

The reference spot on the windshield is held 2-3 inches above the horizon.

BEST RATE OF CLIMB (Vy)

The best rate of climb airspeed is where the most excess power is available over what is needed for level flight. This condition of flight produces the most altitude gain in the least amount of time **(max. rate of climb in feet per minute).**

The reference spot on the windshield is held 3-5 inches above the horizon.

BEST ANGLE OF CLIMB (Vx)

The best angle of climb produces the most altitude gain in a given distance.
The best angle of climb airspeed:

1) Used to clear obstacles after take-off.
2) Results in a steeper climb path
3) Is a considerably lower airspeed than Vy

The reference spot on the windshield is held 8-12 inches above the horizon.

CLIMB & LEVEL OFF PROCEDURES

TO ENTER A CLIMB:

1) Gently raise the spot on the windshield to approx. 3 in. above the horizon (an attitude that should produce Vy at full power).
2) As the airspeed slows to 5 kts above Vy, add full engine power.
3) When the power is increased, the aircraft nose will tend to rise and turn to the left, so **right rudder must be added to keep the ball centered** in the turn coordinator and keep the same heading.
4) Re-Trim the airplane to relieve control pressures

TO LEVEL OFF FROM A CLIMB:

1) Start the level-off at 10% of the rate of climb. (A 500 ft/min climb should start the level-off 50 ft below the desired altitude).
2) Gradually lower the nose of the airplane until the spot on the windshield is on the horizon.
3) When the airplane gets almost to cruise airspeed, start reducing the power to cruise setting from full power.
4) Re-trim the airplane to hands-off level flight.

Instructor Emphasis Items

DURING CLIMBS & LEVEL OFFS:

Use Vy and full power for all normal climbs.
The spot on the windshield will be approx. 3 inches above the horizon.
Constantly monitor climbs for proper right rudder use!!!
Insist that students keep one hand on the throttle during climbs.
Students should put the spot on the horizon and leave full power on during level off until cruise speed is reached.
Trim <u>must</u> be used to relieve yoke pressure as the aircraft speeds up.

THE FOUR FUNDAMENTALS OF FLIGHT

Descents

Cruise (Enroute) Descent

- Descent using partial power.
- Target descent rate should be 400- 500 feet per minute.
- Airspeed may vary from cruise airspeed to the airspeed used on the downwind leg of the landing pattern.
- Airspeed, pitch and power should be pre-selected and kept constant

Descent at Minimum Safe Airspeed

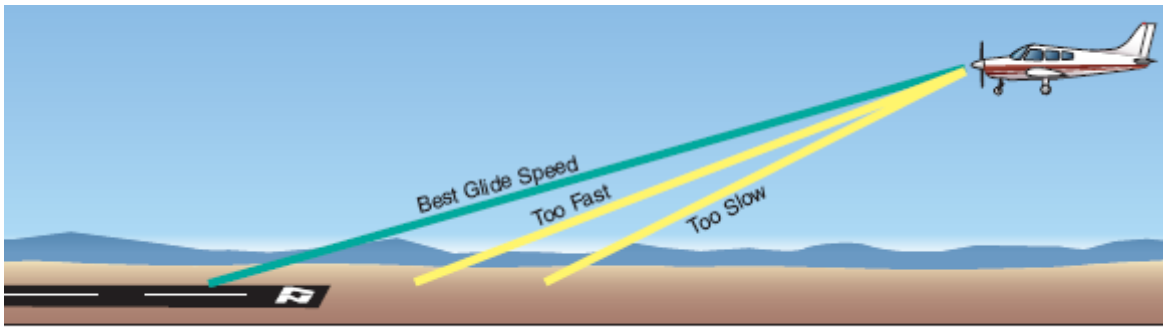
- Principally used for clearing obstacles while landing on a short runway.
- Airspeed used is recommended by the airplane maker – no greater than 1.3 Vso.
- A steeper than normal descent rate.

Glides

- The airplane loses altitude in a controlled descent with little or no engine power.
- Used in normal landing Approaches and in forced landings after engine failure.
- Forward motion maintained by gravity.
- Pilot adjusted pitch attitude controls airspeed.

GLIDES

Since portions of the normal landing approach make use of glides and the student needs to develop an ability to judge gliding distance, you must practice glides and gliding turns. The application of controls is somewhat different in glides than in power-on descents. The difference is caused by two factors: 1) The absence of a propeller slipstream over the horizontal stabilizer and, 2) The difference in effectiveness of the control surfaces at slower airspeeds. Since power is not used during a glide or power-off approach, the spot on the windscreen (pitch attitude) must be adjusted to maintain a constant airspeed.



Best glide speed provides the greatest forward distance for a given loss of altitude.

Best Glide Speed

- Speed at which the airplane will travel the greatest forward distance for a given loss of altitude in still air.
- Lets the pilot judge landing areas accurately

Gliding Too Fast

- Increased parasite drag degrades distance.
- Results in floating over the runway for varying distances before landing, overshooting the runway.

Gliding Too Slow

- Increased induced drag degrades distance.
- Results in landing short of runway, a flatter approach to landing and hard touchdowns.

Glide Procedures

Glide Entry:

- Reduce throttle to idle
- Keep the windshield spot on the horizon (maintain level flight attitude) until glidespeed is reached.
- Lower the windshield spot below the horizon (adjust the pitch attitude) to establish the desired glide speed and check the airspeed indicator to confirm airspeed.
- Trim the aircraft to maintain airspeed.

Notes:

- A glide with flaps allows you to descend at a faster rate and at a steeper angle without increasing air-speed.
- Remember to maintain proper rudder inputs for coordinated flight when airspeed and power changes are made.

changes are made

Level-Off From a Glide:

- When the aircraft is approx. 10% of the descent rate (10% of a 500 ft/min descent rate is 50 ft) above the target altitude, raise the windshield spot to the horizon (to level flight attitude).
- At the same time, add full power to return to cruise flight (keep spot on the horizon).
- Reduce the power to cruise setting and trim to maintain level cruise flight.

Instructor Emphasis Items

THE STUDENT MUST USE THE WINDSHIELDSPOT BY RELATING ITS DISTANCE ABOVE OR BELOW THE HORIZON TO DETERMINE THE AIRSPEED IN VARIOUS CONFIGURATIONS. THE WINDSHIELDSPOT WILL ELIMINATE THE NEED TO WATCH THE AIRSPEED INDICATOR CONSTANTLY.

STEEP TURNS

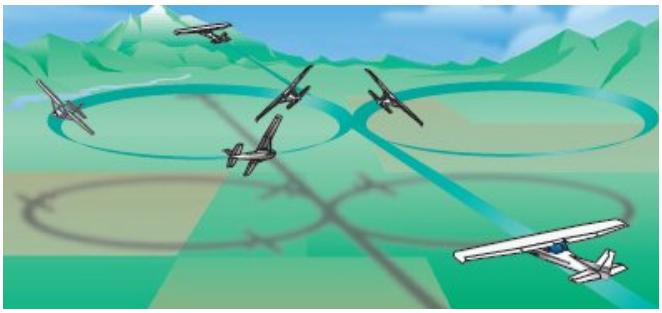
What is a Steep Turn

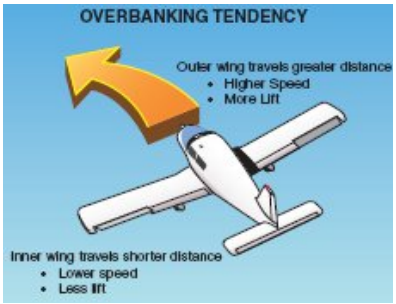
A steep turn consists of a turn in either direction, using a bank angle between 45 to 60 degrees . This will cause an overbanking tendency during which maximum turning performance is gotten and high load factors are imposed. Because of the load factors, these turns should not be performed at an airspeed that does not exceed the design maneuvering speed (Va).

Objectives of Steep Turns

Students who practice steep turns will develop the smoothness, coordination, orientation and division of attention, and control techniques necessary to make maximum performance turns when the airplane is near performance limits.

Steep Turns should be continued until 360 or 720 degrees of turn have been completed. An airplane's maximum turning performance is its fastest rate of turn and its shortest radius of turn. An airplane's turning performance is limited by engine power, structural strength, and its aerodynamics.
In all constant altitude, constant airspeed turns, it is necessary to increase the angle of attack of the wing (raise the nose of the airplane) when rolling into the turn by applying up elevator. This is required because a part of the vertical lift has been diverted to horizontal lift.





OVERBANKING TENDENCY: The problem with Steep Turns

When the pilot changes from a shallow turn to a steep turn, the speed of the wing on the outside of the turn becomes much faster than the speed of the wing on the inside of the turn. Since the outside wing is traveling faster, it creates more lift on that wing.

More lift on the wing causes:
1) **Overbanking tendency (the turn will get steeper) – this is controlled by using more ailerons.**
2) **More lift causes more induced drag (a slight slip) – this is controlled by using more rudder.**

Sometimes in early training in steep turns, the student may allow the nose of the airplane to get excessively low which results in a large altitude loss. To recover, the student must first shallow the bank using both rudder and ailerons and then raise the nose of the airplane to level flight with the elevator. If recovery is attempted with elevators alone, the bank will steepen and the added forces can overstress the airplane.

Method of Making a Steep Turn

To establish the desired angle of bank in the steep turn, the student should use visual reference points outside the airplane.

1) **Start the steep turns from slow cruise speed (approx 95 kts). Add 100-300 RPM of power after rolling past 30 degrees of bank.**
2) **At 30 degrees of bank, start raising the grease spot until it is about two inches above the horizon.**
3) **Roll in and out slowly. Use 45 degrees of the turn to complete the roll in and 45 degrees of the turn to roll out.**
4) **G forces must be felt pushing us down into the seat or the turn is too shallow and the nose of the airplane is below the spot.**
5) **45 degrees before completing the circle, begin lowering the nose and reducing the bank. Reduce the power when the bank is rolling out past 30 degrees.**
6) **Constantly monitor that the grease spot remains in place. This assures adequate back pressure.**

Instructor Emphasis Items

DEMONSTRATE THIS MANEVER FIRST TURNING TO THE LEFT AND THEN TO THE RIGHT. MAKE CERTAIN TO POINT OUT TO THE STUDENT WHERE HE/SHE SEES THEIR SPOT ON EACH DIRECTION OF TURN.

SLOW FLIGHT & MINIMUM CONTROLLABLE AIRSPEED

SLOW FLIGHT

Pilots must learn the flight characteristics of their aircraft in all portions of the flight envelope. Slow flight can be thought of as any speed that is less than cruise flight speed. **The objective of maneuvering during slow flight is** to develop the pilot's ability to use the controls correctly and become proficient in maneuvers that require slow air speeds.

In pilot training slow flight is broken down into two separate divisions;

1) establishing, maintaining and maneuvering the aircraft at air speeds and configurations needed for take-offs, climbs, descents, landing approaches and go-arounds.
2) maneuvering at the slowest air speeds that the airplane is capable of without stall indications – usually 3-5 knots above stall speed.

TRANSITION TO SLOW FLIGHT:

1) To begin the maneuver, the throttle is reduced from the cruise power setting.
2) As the airspeed decreases, the spot on the windshield should be raised above the horizon as necessary to maintain altitude.
3) As the airspeed decreases, the flight controls will become less responsive and larger control movements become necessary to maneuver the airplane.
4) Re-trim the airplane as necessary to correct changes in control pressures.
5) Cross-check airspeed, altimeter, heading indicator & attitude indicator as well as the outside references (windshield spot) to maintain accurate control of the airplane.

MINIMUM CONTROLLABLE AIRSPEED

"Flight at Minimum controllable airspeed" means a speed at which any further increase in angle of attack or load factor or reduction in power will cause an immediate stall. **Minimum Controllable airspeed demonstrates** the changes in the handling characteristics of the aircraft at its minimum flight speed and prepares the student for the techniques and positive aircraft control that will be needed for future take-off and landing practice.

Students practicing this maneuver will learn:

1) Precise airspeed and altitude control,
2) the effect of high power at low air speeds, and
3) techniques for operating the aircraft in the area of reverse command (behind the power curve).

When practicing minimum controllable airspeed and slow flight, the student will notice the constant pressure needed on the right rudder control to offset the effects of the airplane's left turning tendencies which become very apparent at high angles of attack and high power settings.

Instructor's Emphasis Items

STUDENTS MUST LIMIT CLIMBING TURNS TO STANDARD RATE. HAVE THE STUDENT ESTABLISH THE PROPER BANK ANGLE USING OUTSIDE REFERENCES (THE SPOT ON THE WINDSHIELD), THEN VERIFY TURN RATE WITH THE TURN COORDINATOR.

SLOW FLIGHT:

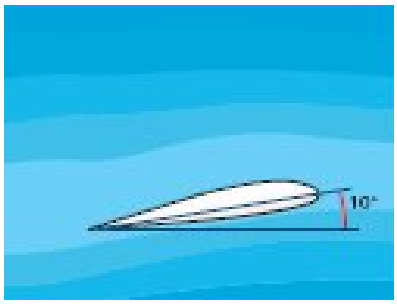
CONSTANTLY MONITOR SLOW FLIGHT & CLIMBS FOR PROPER RIGHT RUDDER USE

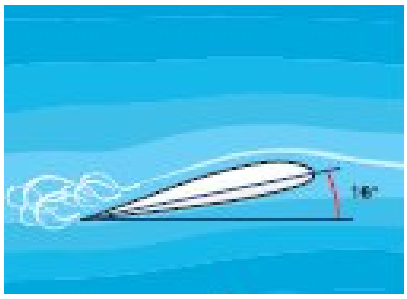
GLIDES:

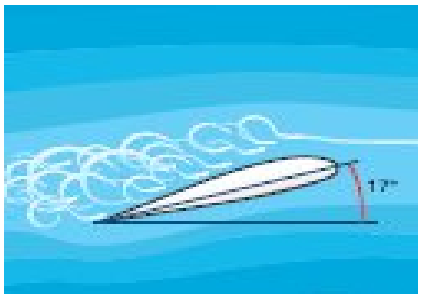
THE STUDENT SHOULD UNDERSTAND THAT, FOR A GIVEN AIRSPEED, THE NOSE MUST BE HIGHER WITHOUT FLAPS THAN WITH FLAPS. THIS IS BECAUSE FLAPS ACHIEVE A HIGH ANGLE OF ATTACK WITH LESS PITCH ATTITUDE.

STALLS

Pilots must recognize the flight conditions that can produce stalls and they must know how to apply the necessary corrective action. The practice of stall recovery and the development of awareness of stalls are of primary importance in pilot training. **The objectives in performing intentional stalls are;** 1) to familiarize the pilot with the conditions that produce stalls, 2) to assist in recognizing an approaching stall, and 3) to develop the habit of taking prompt preventative or corrective action when a stall occurs.







A stall occurs when the smooth airflow over the wing is disrupted, and lift degenerates rapidly. Stalls occur when the wing exceeds the critical angle of attack. Stalls can occur at any airspeed, in any attitude and with any power setting.

Stall Recognition

When the student practices intentional stalls, <u>it is not</u> to learn how to stall the airplane.
The student should be learning how to recognize an approaching stall and how to take prompt corrective action to prevent it.

Stall Recognition Signals in the Cockpit

Vision – See the spot on the windscreen unusually high above the horizon (indicating a nose high attitude).
Hearing - Decreasing wind noises around the airplane as the airspeed slows. Engine sounds decrease as the airplane slows.
Control - As speed lessens, resistance to pressures on the controls **Pressure** becomes less and the lag time between control movements and airplane responses become greater until, at full stall, controls can be moved with no resistance.
Feel - Just before the stall occurs; buffeting pitch changes & vibrations may begin.

Fundamentals of Stall Recovery

1) LOWER THE NOSE
Since the basic cause of a stall is an excessive angle of attack, the cause must be removed by releasing the back elevator pressure that was needed to hold that angle of attack. Reducing the angle of attack is the only way of recovering from a stall regardless of the amount of power used.

2) ADD FULL POWER
Prompt & smooth application of maximum allowable power. Full power helps to increase the airplane's airspeed and assists in reducing the wing's angle of attack.

3) REGAIN STRAIGHT & LEVEL FLIGHT
Apply coordinated use of all flight controls to regain level flight.

Imminent Stalls

An imminent stall is one in which the airplane is approaching a stall but is not allowed to completely stall. These stalls may be entered and performed with the same configurations and attitudes as full stalls but, instead of allowing a complete stall, when the first buffeting or decay of control effectiveness is noted, the angle of attack must be reduced and power applied as needed. This stall maneuver is primarily for practice in keeping (or regaining) full control of the airplane immediately upon recognizing that a stall is likely to occur if timely, preventative action is not taken.

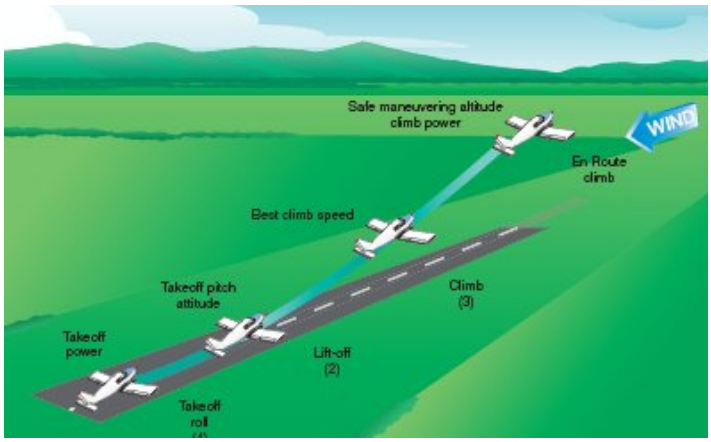
Instructor Emphasis Items

TEACH "POWER UP, NOSE UP, FLAPS UP" FOR RECOVERY FROM STALLS AND FOR GO-AROUNDS.

NORMAL TAKEOFFS

A NORMAL TAKE-OFF IS WHEN:

1) The airplane is headed into a wind that is nearly aligned with the runway .
2) The takeoff surface is firm and of sufficient length.
3) There are no obstructions along the takeoff path.



1) TAKEOFF ROLL:

A) The airplane should be aligned on the runway centerline with the nosewheel straight or centered.
B) Advance the throttle smoothly to takeoff power. An abrupt power application may cause the airplane to yaw sharply left because of torque effects from the engine and propeller.
C) **Pilot has both heels on the floor so the toes are on the rudder pedals – NOT THE BRAKES!!!**
D) Monitor engine instruments for any malfunctions.
E) Maintain directional control with smooth rudder corrections since torque and P-factor will tend to pull the nose of the airplane to the left.

Establishing a Proper Takeoff Attitude

2) LIFTOFF: A good takeoff depends on the proper takeoff attitude!

Rotation (Establishing Takeoff Attitude)
As the airplane gains speed and the flight controls become more effective during the takeoff roll, the pilot gradually adds back elevator pressure to raise the nosewheel of the airplane slightly off the runway.

The position of the nose (the spot on the windshield) in relation to the horizon should be noted and elevator pressure applied as needed to hold that attitude. The airplane is allowed to fly off the ground while in this attitude.

As the airplane leaves the ground, the pilot must look outside the airplane to maintain the proper bank angle (wings level) as well as the proper pitch attitude rather than concentrate on the flight instruments.

3) CLIMBOUT:

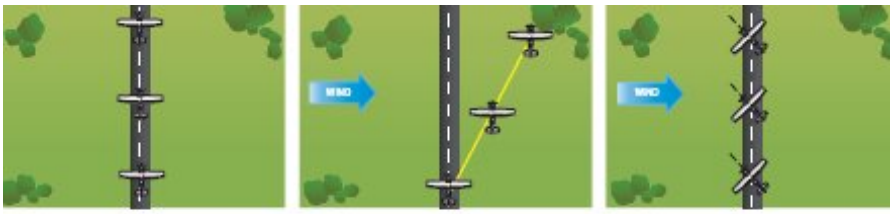
The airplane will pick up speed rapidly after takeoff since it should be flying at the pitch attitude that will allow it to accelerate to V_y, the speed at which the airplane will gain the most altitude in the shortest time. The pilot will make slight pitch changes using the elevators while using the spot on the windshield and the horizon for reference and then crosscheck the airspeed indicator for verification.

The airspeed indicator should be used only as a check to determine if the attitude is correct.

Proper trim settings will make it easier to hold a constant attitude and airspeed during climbout. Takeoff power should be maintained until the airplane has reached at least 500 ft. above the ground.

It is [illegible] drifting into obstructions or the path of another airplane taking off from a parallel runway.

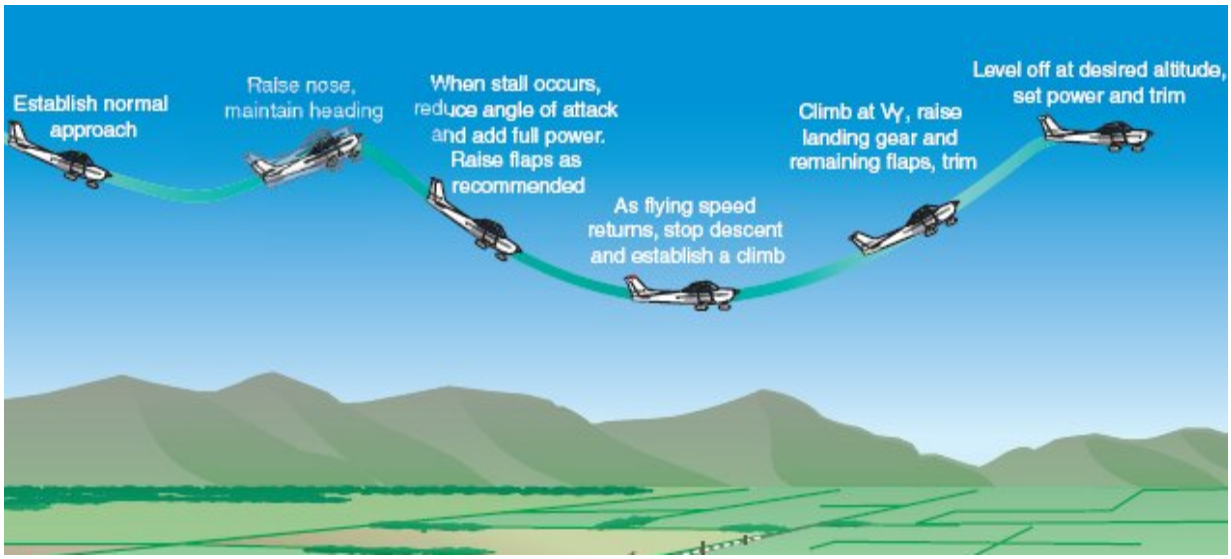
Careful scanning techniques are critical to a safe takeoff and climb, not only for maintaining attitude and direction, but also for collision avoidance in the crowded airport environment!!



No Wind - No Drift | With any wind, the airplane drifts downwind unless corrected. | With proper correction, airplane stays on intended course.

(APPROACH TO LANDING STALLS)

Power-off stalls are usually performed to simulate an accidental stall which would occur during a landing approach. Recovery from power-off stalls should also be practiced from shallow banked turns simulating a stall during a turn from base leg to final approach.



Power-Off Stall Recognition

Starting the stall, raise the spot to the horizon and hold it there. That will gently induce the stall. The stall will feel like a gentle shake (buffet) and the spot will lower itself to about 1-2 inches below the horizon.

Power-Off Stall Recovery

1) Apply Full Power

2) Shut Off Carb. Heat

3) Apply Right Rudder

The nose of the airplane will move to the left and raise to the horizon when full power is applied. Hold the spot on the horizon with the elevator and apply rudder to stop left yaw.

4) Raise the Flaps

POWER UP!!

NOSE UP!!

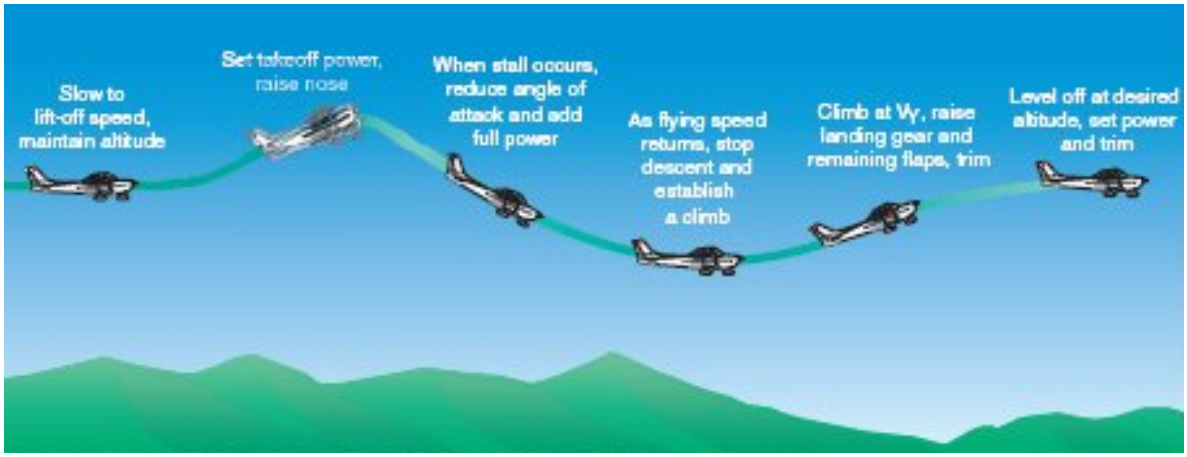
FLAPS UP!!

Instructors Emphasis Items

INTRODUCE POWER OFF STALLS DURING MINIMUM CONTROLLABLE AIRSPEED BY ALLOWING THE WING TO GENTLY "NIBBLE" AT A STALL AS A RESULT OF EXCESSIVE PITCH.

POWER ON STALLS
(DEPARTURE STALLS)

Power-on stalls simulate an accidental stall most frequently occurring shortly after takeoff. This stall can happen if the pilot attempts to lift off and climb out at an airspeed below the normal takeoff speed or if the pilot establishes an excessively high pitch attitude during the initial stage of climb out.



Stall Recognition

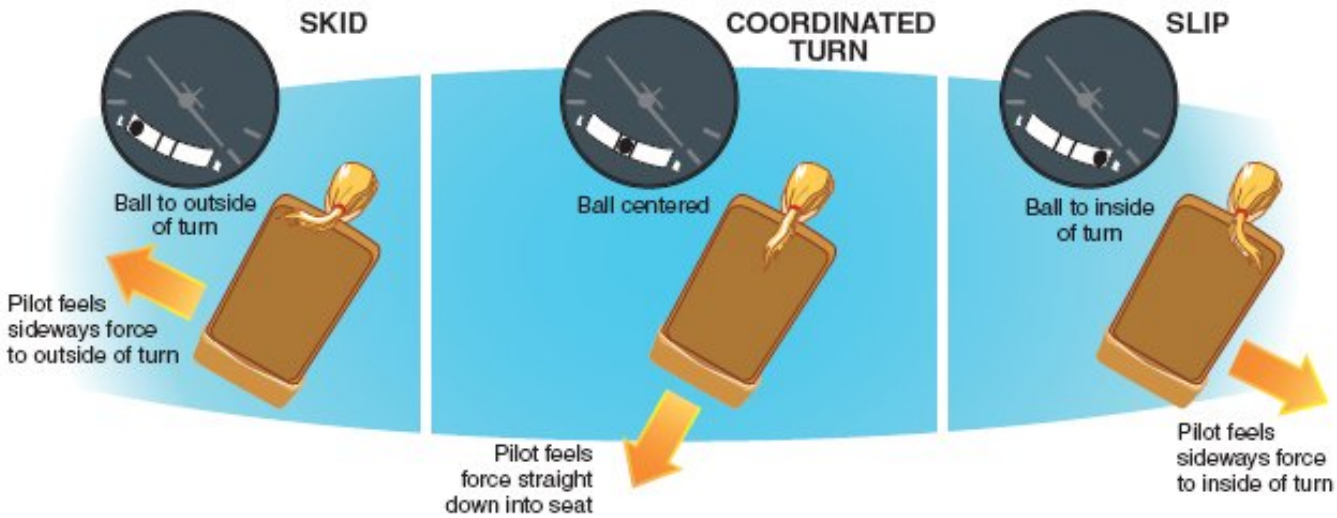
The area is cleared as the airplane is slowed to lift off speed while maintaining a constant altitude. As lift off speed is reached, back pressure is added to increase the angle of attack, and full power is applied. Right rudder pressure is increased as power and pitch are increased to maintain directional control and coordination.

The noise of the slipstream passing over the airplane deceases while the engine noise becomes more labored. The flight controls become more sluggish as the spot on the windshield now is over 6 inches above the horizon.

Stall Recovery

The recovery from the stall consists of reducing the angle of attack (putting the windshield reference spot back on the horizon), adding full power (if not already at full power), and using coordinated control pressures to return the airplane to straight and level flight.

Slips and Skids



A skid occurs when the aircraft slides sideways away from the center of the turn. The skid is caused by too much rudder pressure in relation to the aileron pressure used in establishing the turn. If you increase the rate of turn by use of the rudder without increasing the angle of bank, the aircraft will skid sideways away from the center of the turn. Skids also occur in level flight if the nose of the aircraft is rotated sideways around the vertical axis.

Unintentional slips are most often the result of uncoordinated rudder/aileron applications!!!

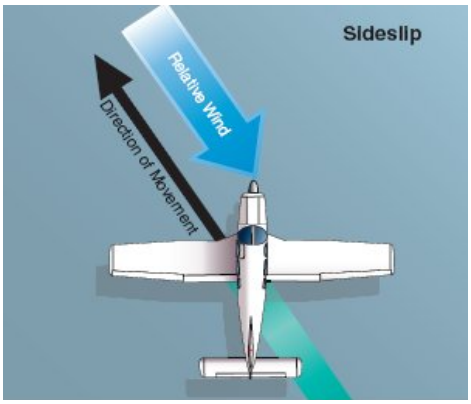
The ball is not "centered". The pilot can correct the skid/ Slip by "Stepping on the Ball"

A slip occurs when the aircraft slides sideways and downward toward the center of the turn. A slip is caused by too small amounts of rudder pressure in relation to the amount of aileron pressure used when establishing a turn.

If you roll into a turn applying more aileron than rudder, the aircraft will slip sideways and downward toward the center of the turn and lose altitude.

INTENTIONAL SLIPS

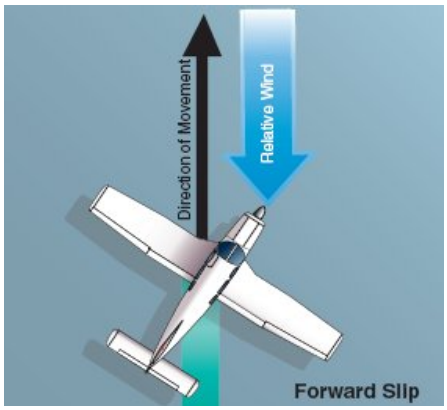
A slip is a combination of both forward and sideward movement of an aircraft. Since an airplane in a slip is, in fact, flying sideways, this results in a change in the direction the relative wind strikes the airplane. Slips are characterized by a marked increase in drag caused by the relative wind striking the side of the fuselage during the slip.



Intentional Slips

1) Lose altitude without increasing Airspeed.
2) Adjusting an airplane ground track During a crosswind.
3) Rapidly losing airspeed where wing Flaps are not installed or inoperative.
4) Clearing obstacles during approachesTo confined areas.

Because of the location of the pitot tube and the static ports, airspeed indicators in some airplanes may have a large error when the airplane is in a slip.



Enter a sideslip by lowering a wing and applying just enough opposite rudder to prevent a turn.
The horizontal component of lift forces the airplane to move sideways toward the lowered wing.
The amount of slip, and the sideward movement, is determined by the bank angle; steeper bank – more slip. As bank angle steepens, more opposite rudder is needed to prevent a turn from occurring.

In the forward slip, the airplane's direction of movement continues the same as before the slip was begun.
The wing on the side toward the slip is lowered and the airplane's nose is yawed in the opposite direction from the bank to maintain the original ground track.
The amount of the slip, as well as the sink rate, is determined by the bank angle. The steeper the bank – the steeper the descent rate.

GROUND REFERENCE MANEUVERS

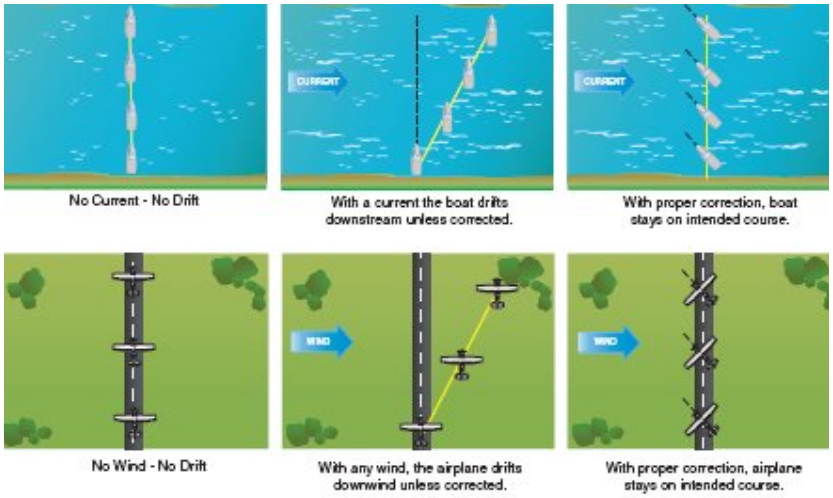
What is the Purpose of Ground Reference Maneuvers?

Ground reference maneuvers are used to develop a high degree of pilot skill. They aid the pilot in developing control touch, coordination, and the division of attention necessary for accurate and safe maneuvering of the airplane. The early part of pilot training is conducted at high altitudes for the purpose of developing skill in handling the airplane and learning the results of control inputs on the action and attitude of the airplane. As soon as the pilot shows proficiency in the fundamental maneuvers, he is introduced to maneuvers requiring attention outside of the airplane while applying the maneuvers and skills that were learned at altitude.

What are Ground Reference Maneuvers?

Ground Reference Maneuvers are performed at low altitude while applying wind drift correction as needed to follow a planned track or path over the ground. The maneuvers are meant to develop the ability to control the airplane and to correct for the effects of the wind while looking for other air traffic in the area and dividing attention among other matters.

Ground Reference Maneuvers should be flown between 600-1000 ft. above the ground so that the path of the airplane over the ground can be easily noted and changes planned and effected as needed. The altitude should be low enough so any gain or loss is apparent to the student as well as any wind drift effects on the ground path. The area chosen for practice should be away from crowds or communities to prevent annoyance or hazards to others. During these maneuvers, both the instructor and student should be alert for available fields for possible forced landings.



No Current - No Drift

With a current the boat drifts downstream unless corrected.

With proper correction, boat stays on intended course.

No Wind - No Drift

With any wind, the airplane drifts downwind unless corrected.

With proper correction, airplane stays on intended course.

EFFECTS OF WIND DRIFT

As soon as the airplane is airborne, it is free of ground friction. Its path will be affected by the air mass it is flying in so it's path along the ground will not always be in the exact direction in which it is headed.

WIND CORRECTION ANGLE

The preferred method of correcting for wind drift is to head the airplane into the wind enough (wind correction angle) to cause the airplane to move forward into the wind at the same rate the wind is moving the airplane sideways. When the wind drift has been neutralized, the airplane will follow the desired ground track.

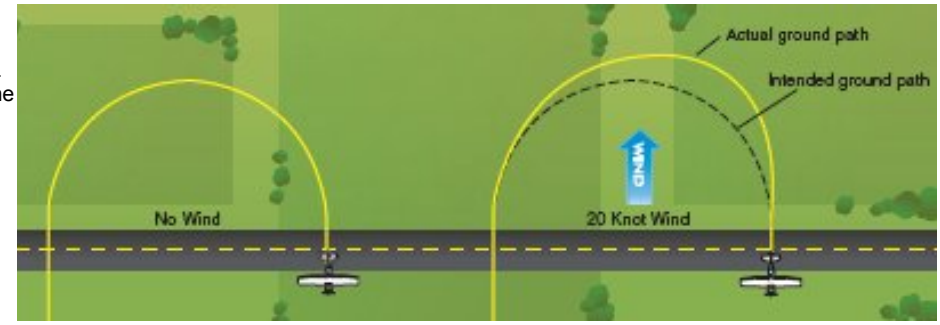
Effects of Wind on Turns

GROUNDSPEED

In a turn, the wind is acting on the airplane from constantly changing angles. The wind angle and wind speed control the time it takes to go through any part of the turn. This is due to the changing groundspeed.

When the airplane is headed into the wind its groundspeed is slower.

When the airplane is traveling with the wind, its groundspeed is faster.



Through the crosswind portion of a turn, the airplane must be turned into the wind enough to counteract the effects of wind drift on the ground track.

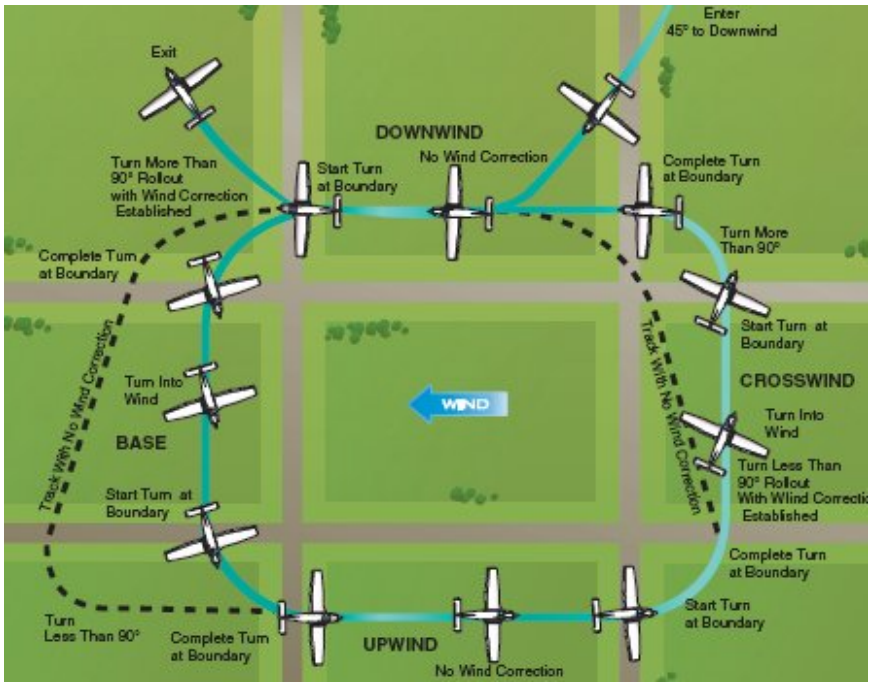
GROUND REFERENCE MANEUVERS

RECTANGULAR COURSE

The rectangular course is a training maneuver in which the ground track of the airplane is equidistant from all sides of a selected rectangular area on the ground. The maneuver simulates conditions found in an airport traffic pattern.

Objectives of the Rectangular Course

1) To develop division of attention skills between the flight path and ground references while controlling the airplane and watching for other air traffic in the area.
2) To develop the recognition of drift toward or away from a line parallel to the intended ground track which will be helpful in recognizing drift toward or from an airport runway during various legs of the traffic pattern.



DOWNWIND LEG: The tailwind on this leg results in an increased groundspeed which causes the turn onto the next leg to have a steeper bank and a high rate of roll into the turn. As the turn progresses, the bank angle is gradually reduced as the tailwind decreases.

BASE LEG: On this leg the wind will tend to drift the airplane away from the course. The amount of the turn will be more than 90 degrees and, on rollout, the airplane will be turned slightly toward the field to correct for drift. As the upwind leg is approached and the turn is into the wind, the turn will be less than 90 degrees and the bank angle will shallow out as the turn into the wind reduces the groundspeed of the airplane.

UPWIND LEG: Since the wind on this leg is a headwind, it will reduce the groundspeed and will attempt to drift the airplane toward the field on the turn to the crosswind leg. For this reason, the roll-in to the turn will start slow and the bank angle will be shallow. As the turn continues to crosswind, the headwind decreases and the groundspeed increases so the bank angle and the rate of turn will gradually increase so the same distance from the edge of the field is maintained.

CROSSWIND LEG: As the turn is completed, the proper drift correction is established by turning the airplane into the wind until a uniform distance from the field boundary is maintained. With the proper wind corrections in place, the turn will be less than a 90 degree change in heading.

Rectangular Course Set-Up

1) A square field or area with sides approx. 1 mile in length bounded on all sides by section lines or roads and away from other air traffic.
2) The airplane should be flown parallel to the field boundary at a distance half way up the wing strut. (Approx. ½ mile)
3) The closer the airplane track is to the field boundary, the steeper the bank needed at the turning points.
4) Enter the rectangular course with the wind behind the airplane so the first bank turn is the steepest. (No more than 45 degrees.)
5) All turns should be started when the airplane is abeam the corner of the field boundaries.

Instructor's Emphasis Item

It is important for the student to learn to anticipate the turns to correct for groundspeed, drift and turning radius.
When the wind is behind the airplane, the turn must be faster and steeper.
When the wind is ahead of the airplane, the turn must be slower and shallower.

GROUND REFERENCE MANEUVERS

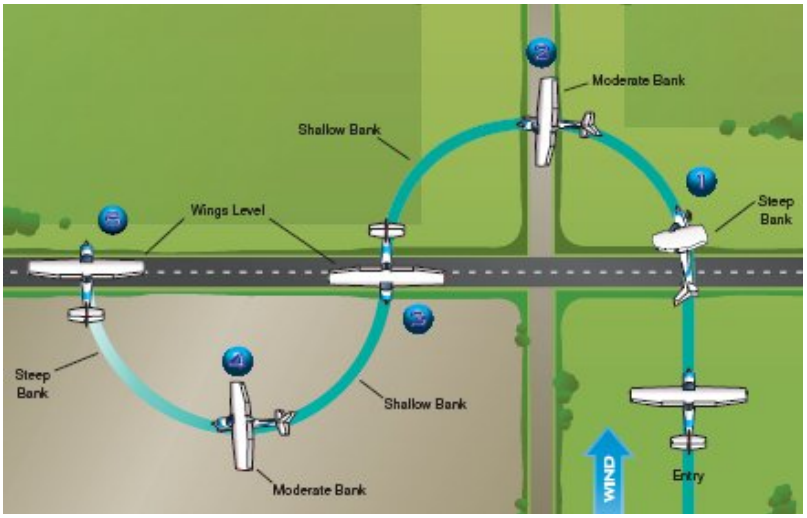
S TURNS ACROSS A ROAD

What Are S Turns Across a Road?

An S Turn Across a Road is a maneuver where the airplane's ground track describes semicircles of equal size on each side of a road or other straight line on the ground. A constant altitude is maintained throughout the maneuver.

Why Do S Turns Across a Road?

S-Turns develop the pilot's ability to adjust for wind drift during turns, follow an assigned flight path, arrive at a specified on assigned headings, and divide the pilot's attention. S turns provide a practical application of both the turn and the correction for wind drift in turns.



1) Entry

Approach the road on a downwind heading at the selected altitude. The turn should be started immediately over the road. With the wind behind the airplane, the groundspeed is the greatest and the roll into the turn will be the steepest to gain the proper wind correction angle and keep the airplane from getting too far from the road.

2) Mid Turn 1

Now the airplane's heading is changing from downwind to crosswind. The groundspeed is lessening and the angle of bank is decreasing. The wind correction angle is the greatest when the airplane is crosswind. As the turn continues, and the headwind component grows, the groundspeed keeps decreasing and the bank angle shallows until the wind correction angle is gone and the wings level as the road is crossed.

3) Start Turn 2

As the road is crossed, a turn in the opposite direction is immediately started again. With the airplane heading into the wind, the groundspeed will be slow and the bank angle will start shallow and gradually steepen. The airplane's bank starts increasing as the airplane turns to the crosswind part of the turn and the wind correction angle increases, the bank angle will steepen and the groundspeed will speed up until an arc the same size as the one in turn1 is started.

4) Mid turn 2

Now the airplane will start turning more downwind and the groundspeed will increase and so will the rate of turn and angle of bank. The turn will be completed at the same time the airplane crosses the road and the airplane is in straight and level flight.

5) Turn 3

A turn in the opposite direction is started as soon as the airplane crosses the road.

Throughout the maneuver, a constant altitude must be maintained and the bank should be constantly changing to achieve a semicircular ground track.

Instructor's Emphasis Items

CRABS AND SLIPS:

STUDENTS SHOULD BE ABLE TO GLIDE ALONG A ROAD OR RAILROAD TRACK IN FINAL APPROACH CONFIGURATION, MAINTAINING THE CENTERLINE POSITION, AT FIRST WITH A CRAB AND THEN, AFTER THE CRAB IS MASTERED, WITH A SIDESLIP.

RECTANGULAR COURSE:

- **THE PATTERN SHOULD BE A RECTANGULAR PATH OVER THE GROUND.**
- **STUDENTS MUST CRAB AS REQUIRED ON EVERY LEG THAT HAS A CROSSWIND.**
- **THEY MUST BE ABLE TO RECOGNIZE DRIFT ON ALL PORTIONS OF THE COURSE.**

THE RECTANGULAR COURSE LEGS SHOULD BE SPACED SO THAT THE ROAD IS HALF WAY UP THE WING STRUT. THE STUDENT WILL BE ABLE TO TRANSFER THIS SIGHT PICTURE TO THE TRAFFIC PATTERN IN LATER LESSONS.
ONLY WHEN THE STUDENTS HAVE MASTERED THE SLIP AND CAN FLY A SIMULATED PATTERN AT ALTITUDE, USING A ROAD AS A REFERENCE, ARE THEY READY FOR SERIOUS PATTERN WORK AT AN AIRPORT.

TURNS AROUND A POINT

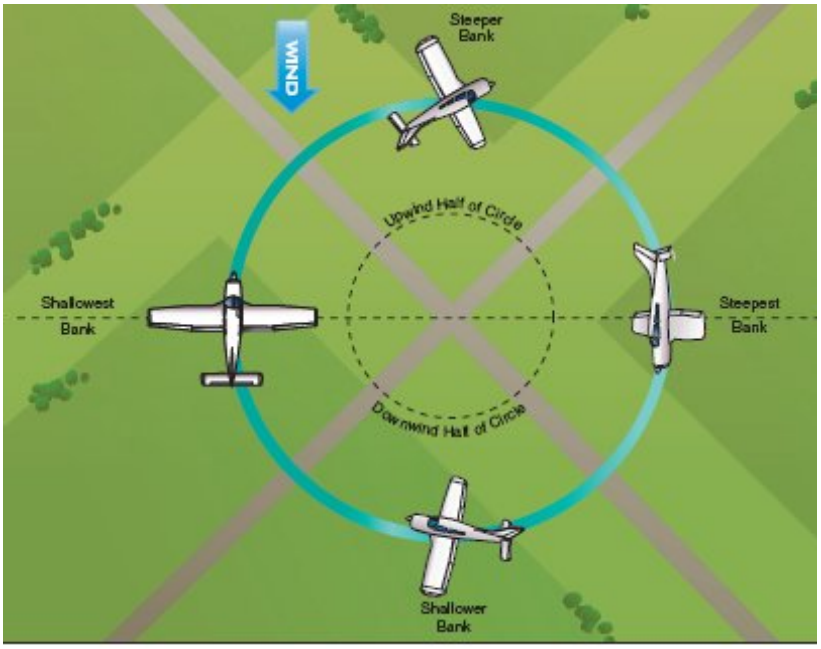
Turns Around a Point should not be confused with the steep turns you have previously done at altitude. Steep turns are done with a constant angle of bank while Turns Around a Point have constantly changing bank angles around a pre-selected point on the ground.

Why Do Turns Around a Point?

The purpose of Turns Around a Point is to help the student perfect the turning technique and improve the ability to correct for wind drift while in turns. The student also develops the ability to subconsciously control the airplane while dividing attention between the flight path and the ground references and will develop a good perception of altitude.

What Are Turns Around a Point?

In turns around a point, the airplane is flown in two or more complete circles of uniform distance from a prominent ground reference point using a bank angle of approximately 45 degrees while maintaining a constant altitude. The point selected should be prominent enough to be easily distinguished by the pilot, such as a tree or small building, yet small enough to present precise reference. As with other ground reference maneuvers, a constant radius around a point will, if any wind exists, require a constantly changing angles of bank and wind correction.



Wind Correction Angles

During the downwind half of the circle the airplane's nose is pointed more and more to the inside of the circle.

During the upwind half of the circle the airplane's nose is turned more and more to the outside of the circle.

Groundspeed Corrections

1) Entry

The airplane will enter the maneuver downwind to one side of the point at a distance equal to the radius of the turn. When any significant wind exists, it will be necessary to roll into the initial bank rapidly so that the steepest bank is abeam the reference point when the airplane is headed directly downwind and the groundspeed is the fastest.

The distance from the point must permit the pilot to see the point throughout the maneuver even with the wing lowered. If the turn radius is too large, the lowered wing will block the pilot's view of the point.

2) Downwind Abeam

After the steepest bank abeam the point, the bank will be gradually lessened until the bank is shallowest as the airplane is abeam the point and headed into the upwind. This is where the groundspeed is the slowest.

3) Upwind Abeam

At this point the bank will start increasing as the airplane starts turning downwind and the groundspeed increases. The bank will continue to steepen until the airplane is headed downwind at the entry point where the maneuver was started.

WHEN ARE WE READY FOR THE TRAFFIC PATTERN?

- **WHEN THE STUDENT HAS MASTERED THE SLIP AND CAN FLY A SIMULATED PATTERN AT ALTITUDE, USING A ROAD AS A REFERENCE, THEN THEY ARE READY FOR SERIOUS PATTERN WORK AT AN AIRPORT**
- **THE STUDENT MUST BE ABLE TO VARY AIRSPEED WHILE MAINTAINING DIRECTIONAL & ALTITUDE CONTROL**
- **GLIDES AND GLIDING TURNS SHOULD BE UNDER GOOD AIRSPEED CONTROL**
- **GROUND REFERENCE MANEUVERS NEED TO HAVE GOOD ALTITUDE AND ATTITUDE CONTROL WHILE KEEPING THE DIVISION OF ATTENTION GOING**

BOTTOM LINE: NO PATTERNS UNTIL THE AIRWORK IS SOLID.

THIS DOES NOT MEAN PVT PILOT PTS STANDARDS BUT WITHIN IN THE TOLERANCES OF SYLLABUS COMPLETION STANDARDS.

WE HAVE FOUND IT IS MUCH BETTER TO DELAY CONCENTRATED PATTERN WORK UNTIL THE AIRWORK AND GROUND REFERENCE WORK ARE ACCEPTABLE RATHER THAN RUSH OUR STUDENTS INTO TAKEOFFS AND LANDINGS HOPING THAT THINGS WILL SMOOTH OUT IN THE PATTERN. THEY RARELY DO!!!

GENERAL OBSERVATIONS WHILE TEACHING THE TRAFFIC PATTERN.

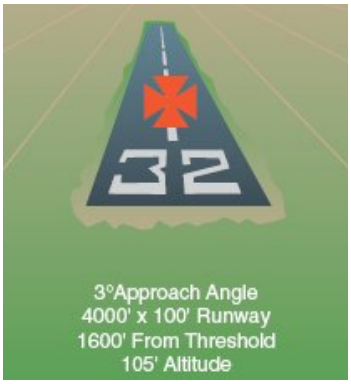
PATTERNS SHOULD BE A RECTANGULAR PATH OVER THE GROUND. STUDENTS MUST CRAB AS REQUIRED ON EVERY LEG THAT HAS A CROSSWIND. STUDENTS MUST BE ABLE TO RECOGNIZE DRIFT PARTICULARLY ON DOWNWIND AND FINAL.

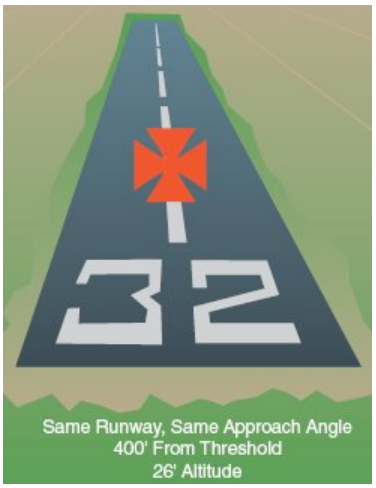
STUDENTS FATIGUE EASILY WITH CONCENTRATED T. O. & LANDING PRACTICE. GRINDING AROUND THE PATTERN HOUR AFTER HOUR IS AN INDICATION THAT THE BASICS OF FLYING THE AIRPLANE HAVE NOT BEEN MASTERED.

WIDE PATTERNS ARE USUALLY COUNTERPRODUCTIVE AND EXTEND THE LEARNING PROCESS.

THE MOVING SPOT TECHNIQUE

THE MOVING SPOT TECHNIQUE SHOULD BE TAUGHT. IT CAN BE DEMONSTRATED ON THE GROUND BY WALKING TOWARD A SMALL OBJECT ON THE GROUND AND NOTING THAT IT MOVES TOWARDS US AS WE ADVANCE. BY BENDING OUR KNEES WHILE ADVANCING WE CAN SEE THAT THE SPOT STANDS STILL IF WE GLIDE AT THE CORRECT ANGLE.





Aiming points are the point on the ground where an airplane on a constant glidepath would strike the ground if it was not flared for a landing. To a pilot moving straight ahead toward an object, it will appear stationary (Not moving). Objects in front and behind the aiming point will appear to move in opposite directions as you get closer, **but the aiming point will not move.**

PROVEN TECHNIQUES WITHIN THE PATTERN:

Although it is very tempting to have the student fly the entire pattern and have them land after each pattern, we find that we can break the pattern down into three different parts. Each part must be mastered separately prior to having consistent traffic patterns and landings. To accomplish this, the following procedures are highly recommended.

1. **Ensure all air work is solid before even attempting the traffic pattern.** If the student has not mastered the ability to recognize/perform: 1) Precision Glides, 2) Flap Use with Pitch and Attitude Control, 3) Precise Airspeed Control and Airspeed changes, 4) Altitude Control, 5) ground track drift and can correct it, 6) all the above tasks in different combinations, then it would be a waste of time to attempt the traffic pattern.

2. **Break the pattern and landings into three different components:**
   a. The traffic pattern legs and the Roundout
   b. The Flare/Touch Down
   c. Communications

3. Begin with the pattern. First, Instructor flies each part of the pattern with the student following along on the controls. This will overwhelm the students at first. After all, this will be the student's first attempt at putting all their newly developed skills to work at the same time. It is recommended that you further break down the process of the pattern into two elements.
   a. Aircraft Control Surfaces
   b. Power Controls

4. After demonstrating one complete pattern, **begin by having the Student operate just the throttle and carburetor heat.** The student's job will be to tell you when to turn. They are to make all power setting changes with your coaching.

   When you can make a complete pattern without having to say anything to the student about power settings or when to turn the aircraft (with you on the controls) you should be ready to trade jobs.

   You are working on getting the student into the flow of the pattern without giving him all the tasks to perform at once. If you give them too much and they go into overload, you will be driving around the pattern getting frustrated.

   Proceed through each pattern without landing the aircraft. You should simply get down to the level off point and then have the student add enough power to hold the aircraft in ground effect. This is an excellent way for the student to begin to develop some feel for his height above the ground as well as viewing the level off point. The amount of power needed to keep the aircraft from landing is learned in this exercise as well.

   Another good thing that will come from all these patterns is the development of the ability to go around. Fundamentally, each pattern will result in a go around and as long as you use "go around" terminology when you are done flying the runway then your student will quickly get comfortable doing them.

5. When you switch to managing the power, the Student should continue to need a little coaching while getting used to what skills are needed to control the pitch and trim changes as you manage the power. After one or two patterns, it is very important that you only do what the student tells you with the power. This will have the effect of flying it without really having to move the hands.

Be very precise in your flying. This is not the time to be testing them to pick up on your errors. Save that for when they no longer need your help.

6. **When your student becomes very comfortable with flying the pattern (you will know this because you are not saying anything to them other than "go around"), you are ready to work on communications**. This skill can be added at anytime you feel they are ready, even if they do not have the entire pattern figured out yet. However, often you find that the radio becomes a focus of the student's attention and the rest of the pattern skills may vanish because of a missed radio call. If you let the student have a good foundation and comfort level with the other two tasks prior to adding in the radio, you will find less of a set back when you finally do add the communications task to the mix.

   If you wait too long, your student may tend not to talk on the radio. Try adding the task in when you think they can handle it. If the task messes things up too badly, then delay it and get the flying finished first.

7. When all three tasks are in sync and the patterns require minimal coaching on your part, then it is time to have the student pull the throttle to idle and hold the nose up to land rather than add the power and do a go around. Have the student follow along with you on the first one or two attempts. Once the student gets a sight picture as the ground rises and he feels the slight g-forces associated with the flare, he usually will only take a few more patterns before they are consistently flaring and landing the aircraft without your help.

8. When the student starts to develop solid, consistent patterns and landings with minimal coaching, it is then time to make sure you get the recoveries from bounced landings and some of the other pattern emergencies out of the way so your student is comfortable knowing what can be done if something goes wrong.

9. Pattern emergencies should include:
   a. No Power from the downwind to touchdown
   b. Loss of engine on take off
   c. Engine loss on the climb out
   d. Engine fire
   e. Electrical fire
   f. Loss of communications
   g. No Flap landings
   h. Others as you think of them

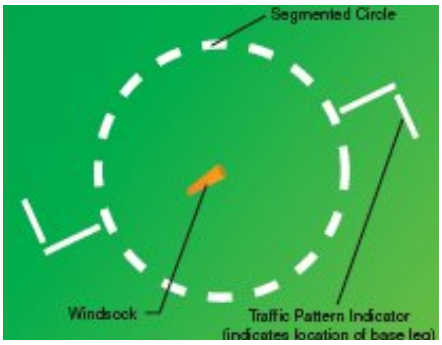
10. **If you cannot get your student past flying the traffic pattern unassisted, then it is not worthwhile starting on the landings.** Go back to the air-work and fix whatever is skill is lacking before starting the attempts to flare and to land. You will only frustrate yourself and your student and lengthen the time it takes to solo your student.

Using the above technique, you should find that, after the student is able to fly an unassisted pattern, you will have them landing on their own (comfortably) within 10 to 12 patterns. Many students seem to come together sooner.

AIRPORT TRAFFIC PATTERNS

Traffic patterns provide specific routes for takeoffs, departures, arrivals and landings. Their objective is to keep air traffic moving with maximum safety and efficiency. The exact make-up of each pattern depends on the runway in use, wind direction, obstructions, and other factors appropriate to local conditions. Since airports have different levels of complexity, pilots must know and comply with the rules and general operating procedures that apply to the airport being used. The pilot is not expected to know about all traffic patterns at all airports, but if he is familiar with the basic traffic pattern, it will be easy to make proper approaches and departures from most airports.

The Segmented Circle



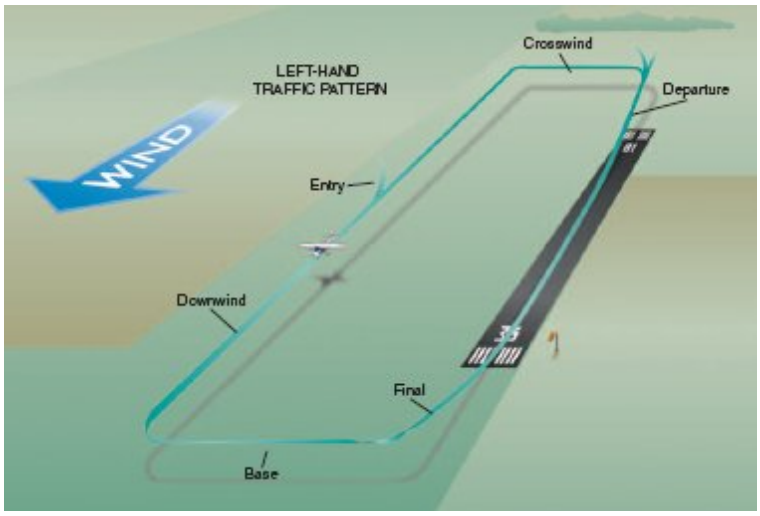
When entering the traffic pattern of an airport without an operating control tower pilots are expected to observe other aircraft already in the traffic pattern and conform to the traffic pattern in use.

If other aircraft are not in the pattern, then traffic indicators and wind indicators (the windsock) must be checked to determine which runway and which traffic pattern direction should be used.

Many airports have an L-shaped traffic pattern indicator within a segmented circle next to the runway. The short member of the L shows the direction in which traffic pattern turns should be made when using the runway parallel to the long member of the L.

These indicators should be checked from well away from any pattern that may be in use or from a height well above the generally used traffic pattern altitude. When the correct traffic pattern direction has been determined, the pilot will proceed to a point clear of the traffic pattern and then descend to pattern altitude before making an entry 45 degrees to the downwind leg.

The Standard Traffic Pattern



TRAFFIC PATTERN BASICS:

DIRECTION: All turns are to the left. ALTITUDE: Usually 1000 feet. AIRSPEED: No more than 200 knots.

PATTERN ENTRY:

The pattern should be entered in level flight at traffic pattern altitude. The entry must be at a 45 degree angle to the downwind leg with the airplane headed toward a point abeam of the midpoint of the runway to be used for landing. The entry leg should be long enough to provide a clear view of the entire pattern and to allow enough time to plan the pattern and landing approach.

DOWNWIND LEG:

This leg should flown in the opposite direction to the landing runway and approx. ½ to 1 mile out. The downwind leg continues past the approach end of the runway to a point approx. 45 degrees from the approach end of the runway. A medium bank turn is made to the base leg.

BASE LEG:

The base leg is perpendicular to the landing runway. Depending on wind conditions, it is far enough from the approach end of the runway to allow a gradual descent to the touchdown point. The pilot must ensure before turning to final approach that there is no danger of colliding with another aircraft that is already on final approach.

FINAL APPROACH:

Final approach stars with the completion of the base to final turn and continues to the touchdown point. Aircraft on final approach have the right-of-way over other aircraft in flight or on the surface. The pilot workload is highest on this leg since he must accurately control both airspeed and descent angle while approaching the intended touchdown point.

UPWIND LEG:

The upwind leg is flown parallel to the runway but is flown in the same direction as the intended landing direction. The upwind leg is the transition from final approach when a go-around is started and the climb to crosswind is begun.

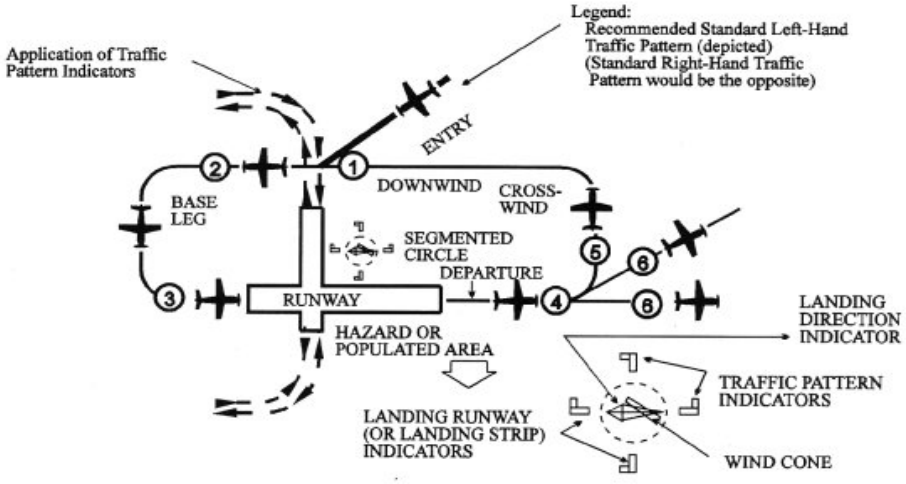
DEPARTURE LEG:

This leg starts where the airplane leaves the ground and continues until the turn onto the crosswind leg begins. If the airplane stays in the pattern, the pilot will climb to within 300 ft of the pattern altitude and turn to crosswind beyond the departure end of the runway. If the airplane departs the pattern, the airplane will continue straight out or turn 45 degrees to the left (in a left handed pattern) after passing beyond the departure end of the runway after reaching pattern altitude.

CROSSWIND LEG:

This leg of the pattern is perpendicular to the extended centerline of the runway on the departure end of the runway. It is entered with a 90 degree turn from the upwind leg of the runway. The airplane will proceed to the downwind leg of the pattern on the crosswind leg of the traffic pattern.

TRAFFIC PATTERN ENTRY PROCEDURES:



BY FAA RECOMMENDATION, ALL TRAFFIC PATTERN ENTRIES WILL BE MADE ONLY ON THE LEFT DOWNWIND LEG OF THE TRAFFIC PATTERN. UNLESS SPECIFIED IN AFD OR LOCAL POSTING TO USE RIGHT TRAFFIC.

IF APPROACHING THE AIRPORT FROM THE OPPOSITE SIDE OF THE TRAFFIC PATTERN, CROSS THE AIRPORT AT AN ALTITUDE AT LEAST 500FT ABOVE THE TRAFFIC PATTERN ALTITUDE. APPROXIMATELY TWO MILES BEYOND THE TRAFFIC PATTERN, A DESCENT TO PATTERN ALTITUDE CAN BE MADE AND THE TRAFFIC PATTERN CAN BE ENTERED ON THE LEFT DOWNWIND LEG.

THE APPROVED AIRPORTS FOR FLIGHT ACADEMY

Airport	Identifier	Pattern Altitude	CTAF

If another airport is to be used other than the airports listed here, a complete briefing identifying operational procedures both in the air and on the ground is required.

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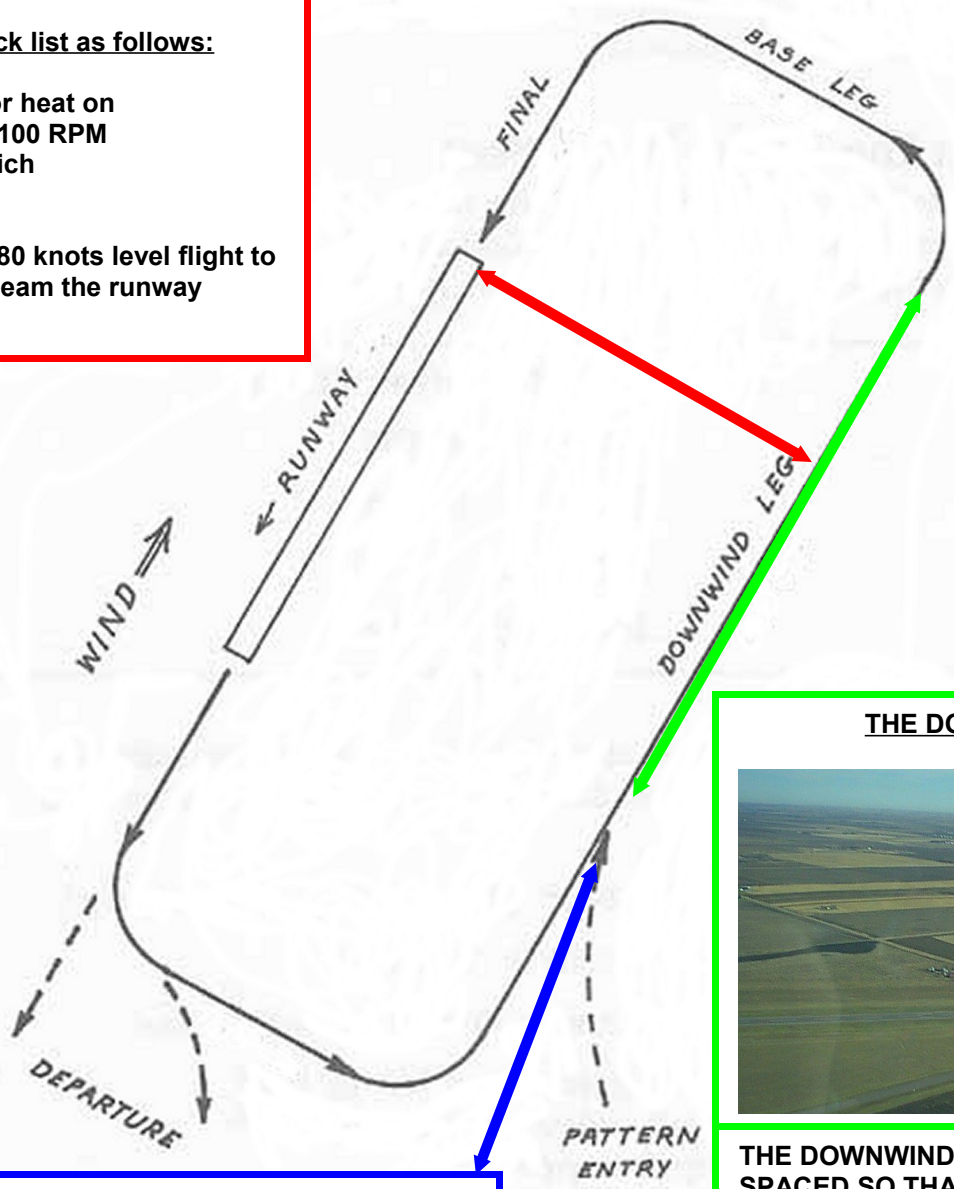
THE TRAFFIC PATTERN

PATTERN ENTRY AND DOWNWIND

Initial Aircraft Setup:

Flow Check list as follows:

Carburetor heat on
Throttle 2100 RPM
Mixture Rich
Fuel Both
Flaps 10°
Airspeed 80 knots level flight to a point abeam the runway numbers



THE DOWNWIND LEG

THE DOWNWIND LEG SHOULD BE SPACED SO THAT THE RUNWAY IS HALF WAY UP THE WING STRUT. THE SPACING MAY BE MODIFIED FOR STRONG CROSSWINDS.

STUDENTS SHOULD HAVE ONE HAND ONLY ON THE YOKE!! THE OTHER HAND SHOULD BE ON THE THROTTLE WHEN NOT SELECTING FLAP SETTINGS OR ADJUSTING THE TRIM.

USE A LIGHT GRIP AND AVOID "CHOKING" THE YOKE.

THE PATTERN ENTRY

AS SOON AS THE PATTERN ALTITUDE IS REACHED, THE POWER SHOULD BE SET AT APPROX. 2100 RPM. THIS WILL AVOID GETTING TOO FAST, POSSIBLY ABOVE FLAP SPEED.

THE STANDARD FAA RECOMMENDED TRAFFIC PATTERN ENTRY IS 45° TO THE DOWNWIND LEG. THE STUDENT WILL AIM FOR THE POINT ON THE RUNWAY WHERE AIRCRAFT WILL TOUCH DOWN (USUALLY THE NUMBERS). THE ENTRY IS SIMILAR TO USING AN ON-RAMP TO MERGE WITH TRAFFIC ON THE FREEWAY

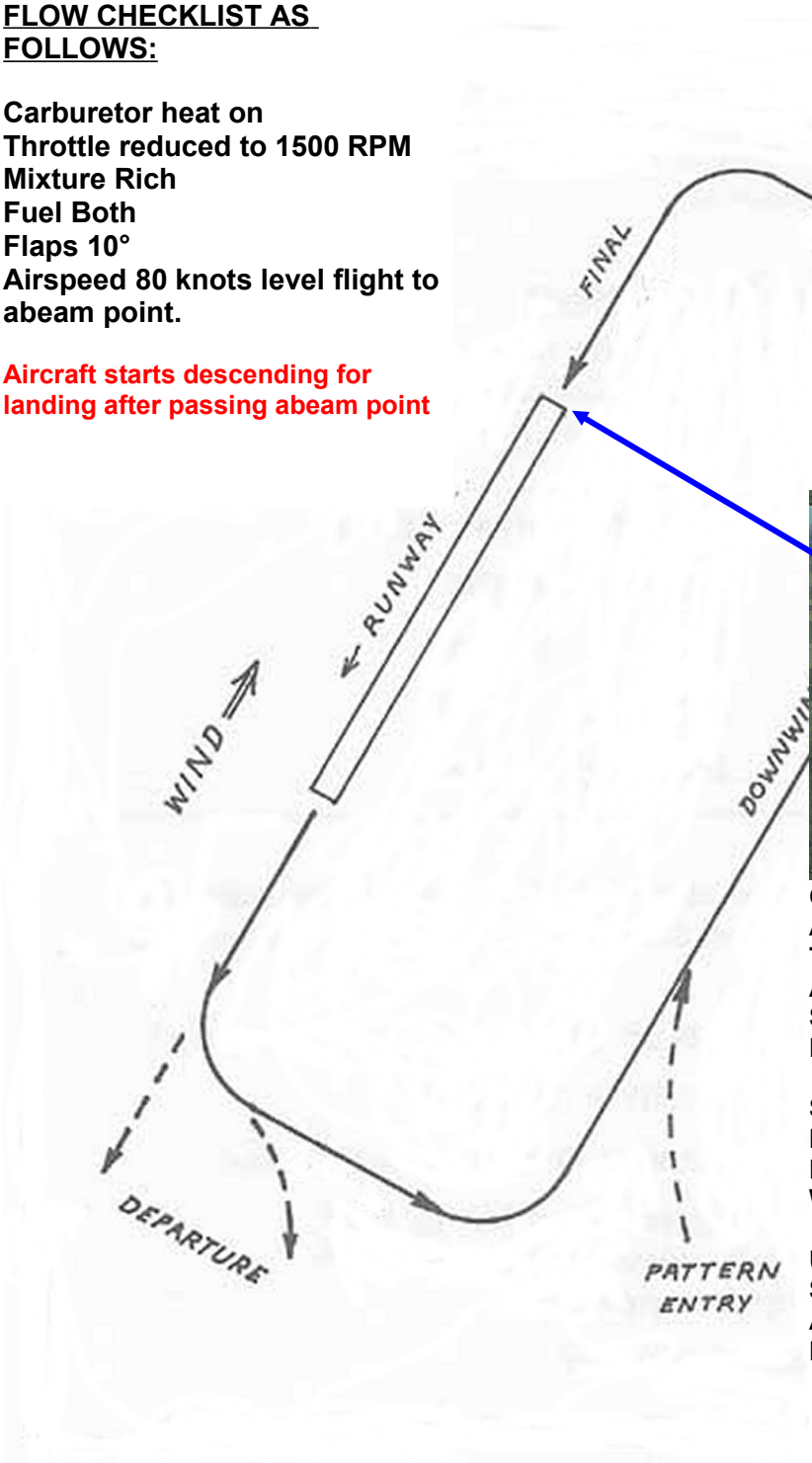
THE TRAFFIC PATTERN
ABEAM THE NUMBERS

ABEAM THE NUMBERS SETUP:

<u>FLOW CHECKLIST AS FOLLOWS:</u>

Carburetor heat on
Throttle reduced to 1500 RPM
Mixture Rich
Fuel Both
Flaps 10°
Airspeed 80 knots level flight to abeam point.

Aircraft starts descending for landing after passing abeam point



<u>ABEAM THE NUMBERS</u>

CARBURATOR HEAT SHOULD BE APPLIED AND THE POWER REDUCED TO APPROXIMATELY 1500 RPM. THE AIRCRAFT SHOULD BE ALLOWED TO SLOW DOWN TO APPROXIMATELY 80 KTS IAS WITHOUT LOSING ALTITUDE.

STUDENTS MUST KNOW HOW TO TELL IF CARBURATOR ICE IS PRESENT BY NOTING THE BEHAVIOR OF THE TACH. WHEN CARB. HEAT IS APPLIED.

UPON REDUCING THE POWER THE STUDENT WILL BE ABLE TO LET THE AIRPLANE NATUALLY DESCEND AT 80 KNOTS.

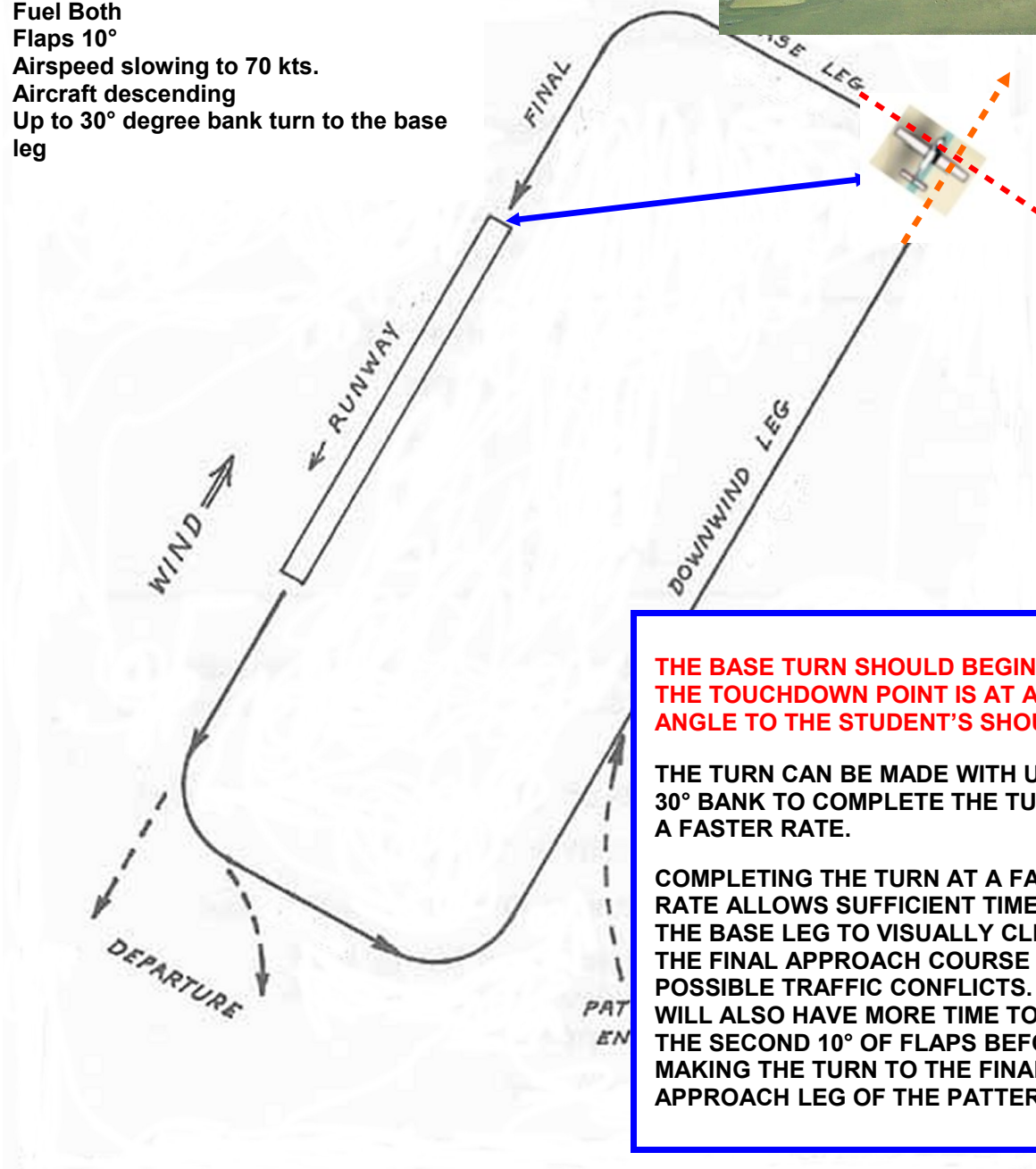
THE TRAFFIC PATTERN
TURNING TO BASE LEG

45° BASE TURN POINT

BASE TURN SETUP:

<u>Flow Checklist as follows:</u>

Carburetor heat on
1500 RPM
Mixture Rich
Fuel Both
Flaps 10°
Airspeed slowing to 70 kts.
Aircraft descending
Up to 30° degree bank turn to the base leg



THE BASE TURN SHOULD BEGIN WHEN THE TOUCHDOWN POINT IS AT A 45° ANGLE TO THE STUDENT'S SHOULDER.

THE TURN CAN BE MADE WITH UP TO A 30° BANK TO COMPLETE THE TURN AT A FASTER RATE.

COMPLETING THE TURN AT A FASTER RATE ALLOWS SUFFICIENT TIME ON THE BASE LEG TO VISUALLY CLEAR THE FINAL APPROACH COURSE FOR POSSIBLE TRAFFIC CONFLICTS. YOU WILL ALSO HAVE MORE TIME TO APPLY THE SECOND 10° OF FLAPS BEFORE MAKING THE TURN TO THE FINAL APPROACH LEG OF THE PATTERN.

THE TRAFFIC PATTERN

THE BASE LEG AND FINAL APPROACH

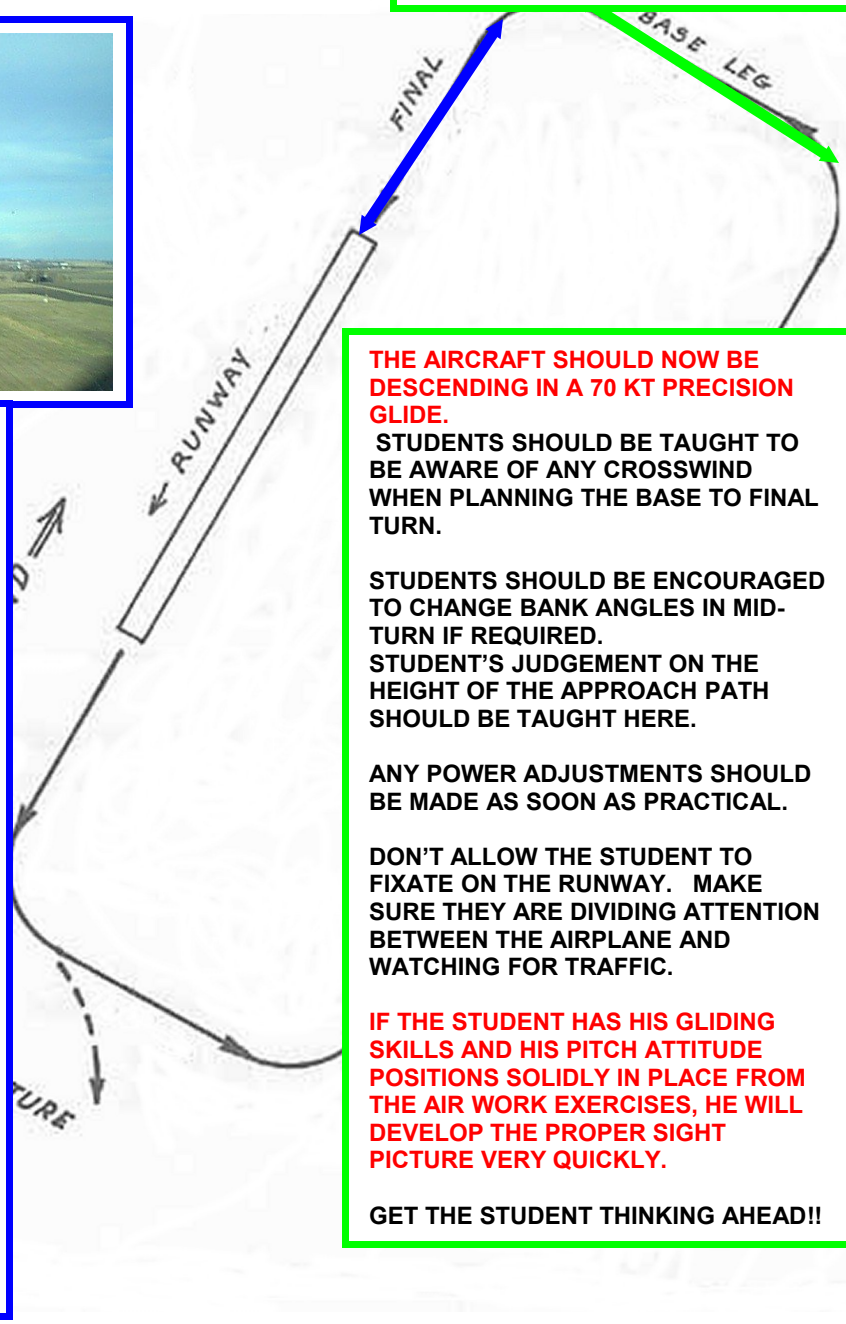
Final Approach Setup:

<u>Flow Check list as follows:</u>

Flaps 30° (Full Flaps)
Airspeed 60 – 65 knots on Short final
Pitch for airspeed
Power for Glide Path

Base Leg Setup:

<u>Flow Check list as follows:</u>
Carb. heat on
Mixture Rich
Fuel Both
Flaps 20°
Airspeed 70 knots
Aircraft Descending
DO NOT EXCEED 30° OF BANK IN THE BASE TO FINAL TURN



STUDENTS SHOULD USE THE ALTIMETER ON ALL LEGS OF THE PATTERN. IN A NORMAL SIZE PATTERN, FINAL SHOULD BE TURNED AT ABOUT 400 - 500 FT. AGL. IF THIS IS UNLIKELY, POWER SHOULD BE ADDED AS SOON AS THE PROBLEM IS RECOGNIZED RATHER THAN WAITING TO BE TOO LOW ON FINAL.

A CRAB SHOULD NOT BE USED ON FINAL APPROACH BECAUSE STUDENTS NEED ALL THE SLIP PRACTICE THEY CAN GET.

STUDENTS SHOULD UNDERSTAND THAT THE GLIDE ANGLE WILL BE STEEPER WITH MORE HEADWIND ON FINAL.

USE THE RUNWAY MARKERS OR THE NUMBERS AS A REFERENCE ON FINAL. AT FIRST THE STUDENT WILL HAVE TO BE VERY CLOSE TO SEE ANY SPOT MOTION. WITH PRACTICE, THEY WILL PICK UP THE SPOT MOTION FURTHER OUT ON FINAL. ON FINAL, IF IN DOUBT, ADD POWER.

GOOD TRIM HABITS ARE ESSENTIAL TO ALLOW THE STUDENT TO PROGRESS QUICKLY IN THIS PHASE OF TRAINING.

THE AIRCRAFT SHOULD NOW BE DESCENDING IN A 70 KT PRECISION GLIDE.
STUDENTS SHOULD BE TAUGHT TO BE AWARE OF ANY CROSSWIND WHEN PLANNING THE BASE TO FINAL TURN.

STUDENTS SHOULD BE ENCOURAGED TO CHANGE BANK ANGLES IN MID-TURN IF REQUIRED.
STUDENT'S JUDGEMENT ON THE HEIGHT OF THE APPROACH PATH SHOULD BE TAUGHT HERE.

ANY POWER ADJUSTMENTS SHOULD BE MADE AS SOON AS PRACTICAL.

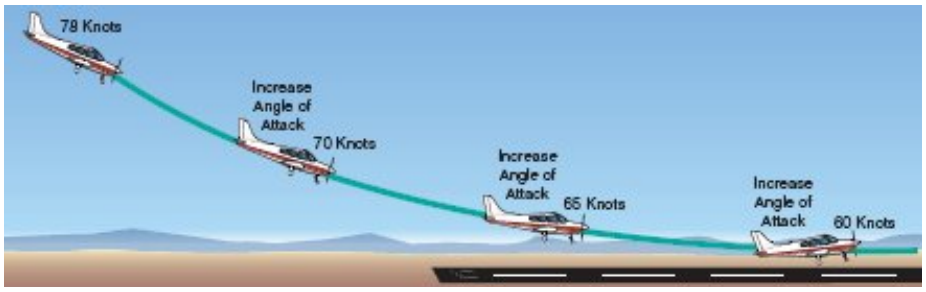
DON'T ALLOW THE STUDENT TO FIXATE ON THE RUNWAY. MAKE SURE THEY ARE DIVIDING ATTENTION BETWEEN THE AIRPLANE AND WATCHING FOR TRAFFIC.

IF THE STUDENT HAS HIS GLIDING SKILLS AND HIS PITCH ATTITUDE POSITIONS SOLIDLY IN PLACE FROM THE AIR WORK EXERCISES, HE WILL DEVELOP THE PROPER SIGHT PICTURE VERY QUICKLY.

GET THE STUDENT THINKING AHEAD!!

THE LANDING PROCESS

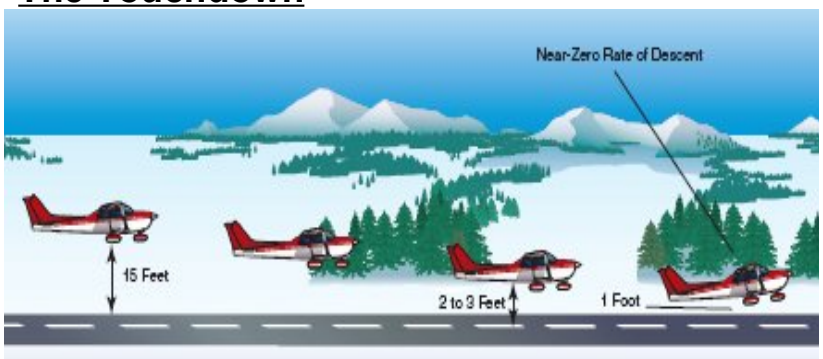
The RoundOut (Flare)



The roundout starts when the airplane approaches to within 10-20 feet of the ground. Back pressure is applied on the elevator to slowly increase the pitch attitude and the angle of attack at a rate that will allow the airplane to continually settle slowly as the forward speed decreases. Power is normally reduced to idle during the roundout causing the airspeed to gradually slow to touchdown speed.

Once the process of rounding out has started it should be a continuous back pressure until the airplane touches down. If too much back pressure has been used, the elevator should not be pushed forward. The pressure should be held constant and it may be necessary to add power slightly to prevent an excessive rate of sink or a hard touchdown.

The Touchdown



LOOK DOWN THE RUNWAY ABOUT A FOOTBALL FIELD IN LENGTH. WHEN THE RUNWAY APPEARS TO RISE, LEVEL OFF ABOVE THE RUNWAY HOLDING THAT LEVEL FLIGHT ATTITUDE FOR A COUPLE SECONDS. THE RUNWAY RISING PICTURE CAN BE TAUGHT ON THE GROUND. BEND AT THE WAIST WHILE LOOKING AHEAD AND NOTE THAT THE GROUND APPEARS TO RISE.

AFTER THE LEVEL OFF, SLOWLY RAISE THE NOSE TO A SLIGHTLY NOSE HIGH POSITION AND HOLD IT THERE WITH INCREASING BACK PRESSURE UNTIL TOUCHDOWN. IT IS BETTER TO BE TOO SLOW WITH RAISING THE NOSE THAN TOO FAST. LANDING IN A LEVEL ATTITUDE IS NOT UNSAFE EVEN THOUGH IT IS UNDESIRABLE.

NO “FEELING” FOR THE RUNWAY BY ALTERNATELY RAISING AND LOWERING THE NOSE SHOULD BE ALLOWED!!

ONCE THE NOSE STARTS UP IT SHOULD NOT BE LOWERED EXCEPT IN A HIGH LEVEL OFF WHICH USUALLY RESULTS IN A GO AROUND ANYWAY. NO ATTEMPT SHOULD BE MADE TO SALVAGE A BAD LANDING WITH POWER. THIS IS A GOOD TIME TO PRACTICE ONE OF THE THREE REQUIRED GO AROUNDS.
STUDENTS WILL FEEL A LITTLE G LOAD PUSHING THEM DOWN IN THE SEAT WHEN THEY RAISE THE NOSE AFTER LEVEL OFF. IT FEELS AS THOUGH THEY ARE BALLOONING AND, AT FIRST, MAKES THEM WANT TO DROP THE NOSE. THIS NATURAL FEELING SHOULD BE EXPLAINED.

STUDENTS MUST RECOGNIZE WHEN THEY ARE UNLIKELY TO LAND ON THE FIRST THIRD OF THE RUNWAY, OR IN THE MIDDLE THIRD LATERALLY, AND SHOULD INITIATE A GO-AROUND AS SOON AS THE PROBLEM IS RECOGNIZED

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THE LANDING PROCESS

THE LANDING ROLLOUT

Instructor Emphasis Items

STUDENTS MUST BE TAUGHT TO BE SENSITIVE TO DIRECTIONAL CONTROL DURING LANDING ROLLOUT AND ANY SUBSEQUENT TAKEOFF. PARTICULAR ATTENTION MUST BE PAID TO THE RUDDER AND ITS IMPORTANCE IN ASSISTING WITH DIRECTIONAL CONTROL.

THE YOKE SHOULD BE GRADUALLY TURNED INTO THE WIND AS THE AIRPLANE SLOWS (UNTIL THE YOKE IS AGAINST THE STOP FOR A FULL STOP LANDING). ON A TOUCH AND GO THE RIGHT RUDDER MUST BE ADDED AS THE THROTTLE IS ADVANCED.

Flight Academy – Middle East Region
Ft Pickett, Virginia

Supplement to CAP Flying Handbook

Information Specifically Applicable to
Ft Pickett / BKT

Flight Academy (Power)
Middle East Region
Ground School Syllabus - 2016

Day	Student Pilot(SP) Handbook	Gleim (G) Handbook	CAP (CAP) Handbook	Next Day Student Homework*	Student Deliverables
Sat	Private Pilot Requirements Pages iv to vii and 5-1 to 5-3)	Airplanes & Aerodynamics Chapter 1	Pages 1-8	SP: Pages 4-1 to 4-6 G: Chapter 1 CAP: Pg 9-15 & Airport Ops	Emergency Procedures from Checklist
Sun	Pre/Post Flight Prep & Procedures Section 1-1 to 1-8 & 4-1 to 4-6	Airplane Instruments, Engines, & Systems Chapter 2	Pages 9-15 & Ops at Tower & Non Tower Airports	SP: Pages 4-7 & 2-2 to 2-4 G: Chapter 2 CAP: Pg 16-19	Airplane and Airport Work Sheet (CAP Handbook)
Mon	Airport Operations Pages 4-7 & 2-2 to 2-4	None	Pages 16-19	SP: 1-9 to 1-10; 4-8 & 9	
Tue	Slow Flight & Stalls SP: 1-9 to 1-10; 4-8 & 9	None	Pages 20-30	SP: Pages 4-11 & 5-6 G: Chapter 3 CAP: Pg 20-30	
Wed	Takeoffs & Landings Pages 4-11 & 5-6	Airports, ATC, & Airspace Chapter 3		SP: Pages 4-11 to 4-15 & 1-12	
Thu	Ground Reference Pages 4-11 to 4-15 & 1-12	None		G: Chapter 4 & 5 and FAR/AIM	Pre-Solo Exam
Fri	Emergency Ops Pages 3-1 to 3-8	FARs Chapter 4		SP:6-1 to 6-10	
Sat	None	Performance; Weight & Balance Chapter 5			

* Expected to be read PRIOR to class

Student Pilot Worksheet

Airplane Worksheet

N-Number		
Make & Model		
Gross Weight		
Fuel Capacity		
Min. Fuel for Flight		
Oil Capacity		
Min. Oil for Flight		
V_{S0}		
V_{S1}		
V_R		
V_X		
V_Y		
V_{FE}		
V_A		
V_{NO}		
V_{NE}		

Best Glide Speed

Battery Voltage

Alternator Voltage

Fuel Color

Airport Worksheet

Airport Name		
Identifier		
Elevation		
ATIS		
Ground		
Tower		
Unicom		
Runway		
Length		
Traffic Pattern	Left or Right	Left or Right
Obstructions		
Runway		
Length		
Traffic Pattern	Left or Right	Left or Right
Obstructions		
Runway		
Length		
Traffic Pattern	Left or Right	Left or Right
Obstructions		
Runway		
Length		
Traffic Pattern	Left or Right	Left or Right
Obstructions		
Traffic Pattern Altitude		

Sec. 61.87 Solo requirements for student pilots.

(a) *General*. A student pilot may not operate an aircraft in solo flight unless that student has met the requirements of this section. The term “solo flight” as used in this subpart means that flight time during which a student pilot is the sole occupant of the aircraft or that flight time during which the student performs the duties of a pilot in command of a gas balloon or an airship requiring more than one pilot flight crewmember.

(b) *Aeronautical knowledge*. A student pilot must demonstrate satisfactory aeronautical knowledge on a knowledge test that meets the requirements of this paragraph:

(1) The test must address the student pilot’s knowledge of—

(i) Applicable sections of parts 61 and 91 of this chapter;

(ii) Airspace rules and procedures for the airport where the solo flight will be performed; and

(iii) Flight characteristics and operational limitations for the make and model of aircraft to be flown.

(2) The student’s authorized instructor must—

(i) Administer the test; and

(ii) At the conclusion of the test, review all incorrect answers with the student before authorizing that student to conduct a solo flight.

(c) *Pre-solo flight training*. Prior to conducting a solo flight, a student pilot must have:

(1) Received and logged flight training for the maneuvers and procedures of this section that are appropriate to the make and model of aircraft to be flown; and

(2) Demonstrated satisfactory proficiency and safety, as judged by an authorized instructor, on the maneuvers and procedures required by this section in the make and model of aircraft or similar make and model of aircraft to be flown.

(d) *Maneuvers and procedures for pre-solo flight training in a single-engine airplane*. A student pilot who is receiving training for a single-engine airplane rating must receive and log flight training for the following maneuvers and procedures:

(1) Proper flight preparation procedures, including preflight planning and preparation, powerplant operation, and aircraft systems;

(2) Taxiing or surface operations, including runups;

(3) Takeoffs and landings, including normal and crosswind;

(4) Straight and level flight, and turns in both directions;

(5) Climbs and climbing turns;

(6) Airport traffic patterns, including entry and departure procedures;

(7) Collision avoidance, windshear avoidance, and wake turbulence avoidance;

(8) Descents, with and without turns, using high and low drag configurations;

(9) Flight at various airspeeds from cruise to slow flight;

(10) Stall entries from various flight attitudes and power combinations with recovery initiated at the first indication of a stall, and recovery from a full stall;

(11) Emergency procedures and equipment malfunctions;

(12) Ground reference maneuvers;

(13) Approaches to a landing area with simulated engine malfunctions;

(14) Slips to a landing; and

(15) Go-arounds.

…

(l) *Limitations on student pilots operating an aircraft in solo flight*. A student pilot may not operate an aircraft in solo flight unless that student pilot has received:

(1) An endorsement from an authorized instructor on his or her student pilot certificate for the specific make and model aircraft to be flown; and

(2) An endorsement in the student's logbook for the specific make and model aircraft to be flown by an authorized instructor, who gave the training within the 90 days preceding the date of the flight.

(m) *Limitations on student pilots operating an aircraft in solo flight at night*. A student pilot may not operate an aircraft in solo flight at night unless that student pilot has received:

(1) Flight training at night on night flying procedures that includes takeoffs, approaches, landings, and go-arounds at night at the airport where the solo flight will be conducted;

(2) Navigation training at night in the vicinity of the airport where the solo flight will be conducted; and

(3) An endorsement in the student's logbook for the specific make and model aircraft to be flown for night solo flight by an authorized instructor who gave the training within the 90-day period preceding the date of the flight.

(n) *Limitations on flight instructors authorizing solo flight*.

(1) No instructor may authorize a student pilot to perform a solo flight unless that instructor has-

(i) Given that student pilot training in the make and model of aircraft or a similar make and model of aircraft in which the solo flight is to be flown;

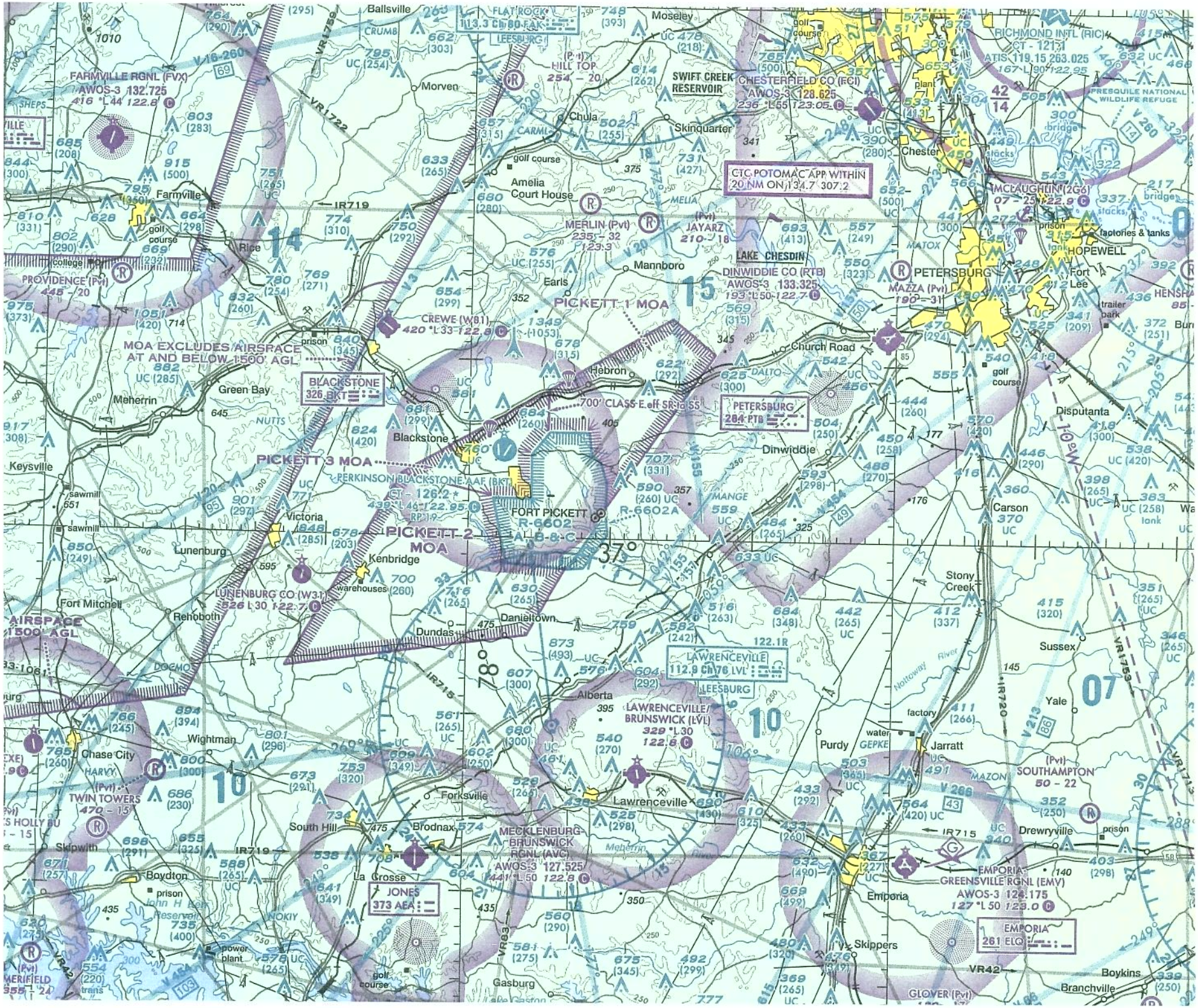
(ii) Determined the student pilot is proficient in the maneuvers and procedures prescribed in this section;

(iii) Determined the student pilot is proficient in the make and model of aircraft to be flown;

(iv) Ensured that the student pilot's certificate has been endorsed by an instructor authorized to provide flight training for the specific make and model aircraft to be flown; and

(v) Endorsed the student pilot's logbook for the specific make and model aircraft to be flown, and that endorsement remains current for solo flight privileges, provided an authorized instructor updates the student's logbook every 90 days thereafter.

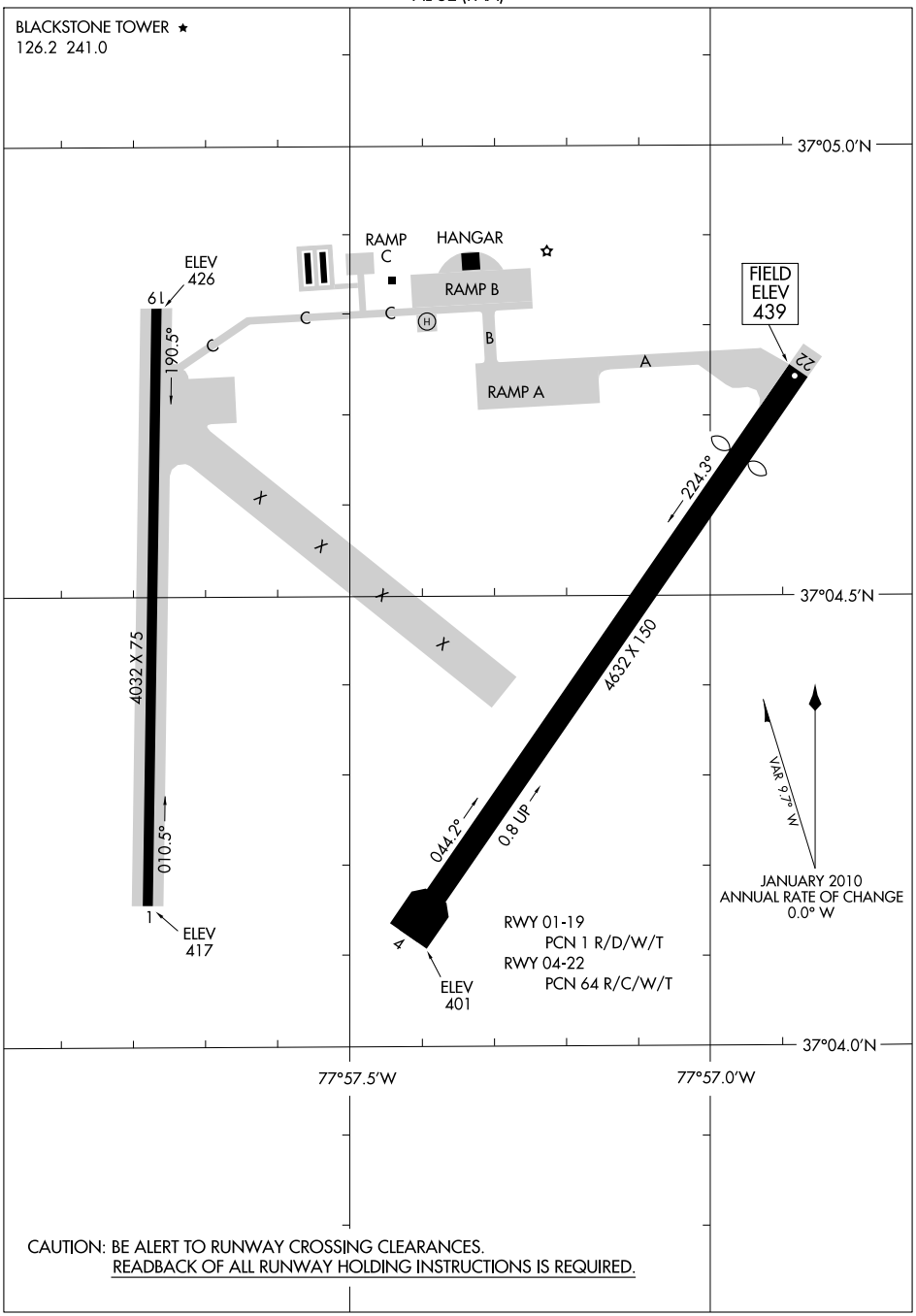
(2) The flight training required by this section must be given by an instructor authorized to provide flight training who is appropriately rated and current.[Amdt. 61-102, 62 FR 16298, Apr. 4, 1997; Amdt. 61-103, 62 FR 40902, July 30,1997, as amended by Amdt. 61-104, 63 FR 20287, Apr. 23, 1998]


FARMVILLE RGNL (FVX)
AWOS-3 132.725
Farmville
Rice
PROVIDENCE (Pvt)
Ballsville
Morven
Chula
Amelia Court House
Moseley
SWIFT CREEK RESERVOIR
CHESTERFIELD CO (FCI)
AWOS-3 128.625
Chester
RICHMOND INTL (RIC)
ATIS 119.15 263.025
PRESQUILE NATIONAL WILDLIFE REFUGE
CTC POTOMAC APP WITHIN 20 NM ON 134.7 307.2
MCLAUGHLIN (2G6)
HOPEWELL
PETERSBURG
MAZZA (Pvt)
LAKE CHESDIN
DINWIDDIE CO (RTB)
AWOS-3 133.325
MERLIN (Pvt)
JAYARZ
Mannboro
Earls
PICKETT 1 MOA
CREWE (W81)
MOA EXCLUDES AIRSPACE AT AND BELOW 1500' AGL
BLACKSTONE
326 BKT
Green Bay
Meherrin
Hebron
Church Road
700' CLASS E off SR-10 SS
PETERSBURG
284 PTB
Disputanta
Dinwiddie
Blackstone
PICKETT 3 MOA
PERKINSON BLACKSTONE AAF (BKT)
Keysville
Victoria
FORT PICKETT
R-6602
R-6602A
PICKETT 2 MOA
Lunenburg
Kenbridge
Carson
Stony Creek
LUNENBURG CO (W31)
Fort Mitchell
Rehoboth
Dundas
Danieltown
LAWRENCEVILLE
112.9 Ch 76 LVL
LEESBURG
Alberta
LAWRENCEVILLE/BRUNSWICK (LVL)
Sussex
Yale
Purdy
Jarratt
Wightman
Chase City
TWIN TOWERS
Forksville
Lawrenceville
SOUTHAMPTON
South Hill
Brodnax
MECKLENBURG-BRUNSWICK RGNL (AVC)
AWOS-3 127.525
Drewryville
Skipwith
Boydton
La Crosse
JONES
373 AEA
EMPORIA
GREENSVILLE RGNL (EMY)
AWOS-3 124.175
Emporia
EMPORIA
261 ELG
Skippers
Gasburg
GLOVER (Pvt)
Boykins
Branchville

AIRPORT DIAGRAM

BLACKSTONE/ALLEN C. PERKINSON/BAAF (BKT)
BLACKSTONE, VIRGINIA

AL-52 (FAA)



CAUTION: BE ALERT TO RUNWAY CROSSING CLEARANCES.
READBACK OF ALL RUNWAY HOLDING INSTRUCTIONS IS REQUIRED.

NE-3, 09 FEB 2012 to 08 MAR 2012

NE-3, 09 FEB 2012 to 08 MAR 2012

AIRPORT DIAGRAM
BLACKSTONE, VIRGINIA
BLACKSTONE/ALLEN C. PERKINSON/BAAF (BKT)
10210

A Short Primer on Aircraft Radio Usage

In general at an airport without a fully functional control tower, your radio calls should follow this generic format: **Who** you are calling, **Who** you are, **Where** you are, **What** you want or are doing, **Who** you are calling.

Traffic: Preface your radio call with the word "**Traffic**", as in **Blackstone Traffic**, when making a general broadcast in the blind to all other aircraft in the vicinity of Blackstone, like talking on a party line or in a chat room when the tower is not in operation.

Tower or UNICOM: Preface your radio call with the word "**Tower**" or "**UNICOM**", as appropriate, as in **Blackstone Tower**, when calling an entity on the ground, wishing to establish communication and expecting a reply.

Sample Phraseology If the Tower Is <u>Not</u> In Operation:

Blackstone Traffic, CAP 2557, taxi Runway XX, Blackstone

Blackstone Traffic, CAP 2557, taxiing on Runway XX for departure, Blackstone

Blackstone Traffic, CAP 2557, departing Runway XX to the southwest, Blackstone

Blackstone Traffic, CAP 2557, clear of the pattern to the southwest, Blackstone

Blackstone Traffic, CAP 2557, 10 miles southwest, in bound landing, will enter downwind for Runway XX, Blackstone

Blackstone Traffic, CAP 2557, entering downwind, Runway XX, Blackstone

Blackstone Traffic, CAP 2557, base, Runway XX, Blackstone

Blackstone Traffic, CAP 2557, final, Runway XX, Blackstone

Blackstone Traffic, CAP 2557, clear of the active and taxiing to parking, Blackstone

Sample Phraseology If the Tower Is In Operation:

Blackstone Tower, CAP 2557, radio check

Blackstone Tower, CAP 2557, ready to taxi from “B” (or “C”) Ramp for departure to Area XXXX

Blackstone Tower, CAP 2557, ready for departure Runway XX, departing for Area XXXX

Blackstone Tower, CAP 2557, is clear of the airport traffic area to the north/south/east/west

Blackstone Tower, CAP 2557, 10 miles southwest in bound landing, requesting winds and active

Blackstone Tower, CAP 2557 is downwind/base/final Runway XX

Blackstone Tower, CAP 2557 is clear of the runway, taxi to B/C/Refuel Ramp

Blackstone Tower, CAP 2557 at the fuel pit, taxi to parking

Operations at Towered Airports

There are two kinds of airports—those with operating control towers and those without. When a part-time tower is closed, the airport is considered nontowered. Every year, there are more than 40 million arrivals and departures at FAA ATC towered airports. Nearly half of these are general aviation operations.

Although it's possible for a pilot to avoid towered airports, doing so impacts the flexibility and utility of flying. Two things distinguish a towered airport. One is the presence of air traffic controllers (ATC), whose primary function is to coordinate traffic flow and prevent collisions. The second is that a pilot must maintain two-way radio contact with ATC and obtain clearances to land, taxi, and take off.

Because ATC coordinates traffic at towered airports, pilots generally follow different procedures than at nontowered fields. For example, a pilot approaching a nontowered airport would normally plan the arrival to make a 45-degree entry to the downwind leg of the active runway. As you approach a *towered* airport, however, ATC can clear you to enter the pattern at any leg. The entry point will depend on

View from the Tower

A great way to get an all-encompassing view of a towered airport and also learn about operating procedures is to visit a control tower. Because of security considerations, it's a good idea to telephone ahead to make an appointment. Take a diagram of the airport and charts (sectional or IFR enroute) with you to ask questions.

Every year, there are more than 40 million arrivals and departures at FAA ATC towered airports. Nearly half of these are general aviation operations.

the runway in use, the direction of arrival, and the locations of other arriving aircraft.

The key to safe operations at towered airports, both in the air and on the ground, is **awareness.** Good preflight planning is essential. Focus on the task at hand, organize the cockpit to minimize your work load, and know where you are in relation to other aircraft in the vicinity.

Planning Your Flight

The basic aircraft requirement for operating at a towered airport is a two-way radio. If your flight involves a takeoff or landing at a Class B or C airport, the aircraft also must be equipped with a Mode C transponder.

Basic planning should include knowledge of local departure and arrival procedures for noise abatement, obstacle clearance, and traffic flow in busy terminal areas. When obtaining your preflight weather briefing from flight service, ask for any special procedures, and if you are unsure, check with an instructor based at the airport. FBOs sometimes post notices about special noise-abatement departure procedures and routes that avoid obstacles or controlled-access airspace.

When planning your flight to or from a towered airport, look at the big picture. Is the airport near or within Class B or C airspace that will require you to communicate with approach/departure controllers, in addition to tower controllers? If you want to avoid entering Class B or C airspace (assuming that the towered airport you are using is not within the airspace), be sure you are aware of any altitude restrictions. Know the route you will use and how you will navigate—visually using landmarks depicted on the chart, or with VORs or GPS. Do large aircraft operate from your departure or destination airport? Be aware of potential jet or propeller blast from larger aircraft when taxiing, and avoid wake turbulence on takeoff and approach.

Information about individual towered airports can be found in the (Airport/Facility Directory), as well as in *AOPA's Airport Directory*. Changes will be publicized in notices to airmen—notams—which should be included in your preflight briefing from Flight Service or DUAT/DUATS.

Noise Abatement

Flying neighborly isn't *just* a good idea. At some airports, *it's policy*. Before flying to or from an unfamiliar airport, check the Airport/Facility Directory or call the airport manager or FBO to see if noise-abatement procedures apply. Noise-abatement procedures avoid noise-sensitive areas near the airport such as hospitals or residential areas. On arrival, that could mean adjusting course to avoid those areas or remaining above traditional pattern altitudes. Departure noise-abatement procedures usually call for turning to a specified heading soon after takeoff to avoid noise-sensitive areas. Many airports place a sign near the departure end of noise-sensitive runways specifying noise-sensitive departure procedures pilots should fly. Use a best rate of climb speed, reduce to climb power, and retract flaps as soon as practical after takeoff to minimize the noise of your aircraft.

Wake Turbulence

Wake turbulence is a concern whenever small aircraft share an airport with larger ones. The powerful vortices that spiral off the wing tips of heavier aircraft—turboprops and business jets, as well as airliners—can suddenly and unexpectedly toss a small airplane out of control. **Always avoid the area below and behind a large aircraft.** Standard air traffic control spacing of four to six miles between aircraft on approach, and two or three minutes between departures from the same or closely spaced parallel runways, offer protection. For extra insurance, be aware of wind speed and direction and adjust your approach and/or departure path to stay above and upwind of where wake vortices might linger. When in doubt, ask for extra spacing or time to allow wake vortices to dissipate.

Charts

You'll need the appropriate sectional aeronautical charts and, if the airport is within or under Class B airspace, the appropriate terminal area chart. Towered airports are depicted in blue. Information printed next to the airport symbol includes: (see terminal area chart next page)

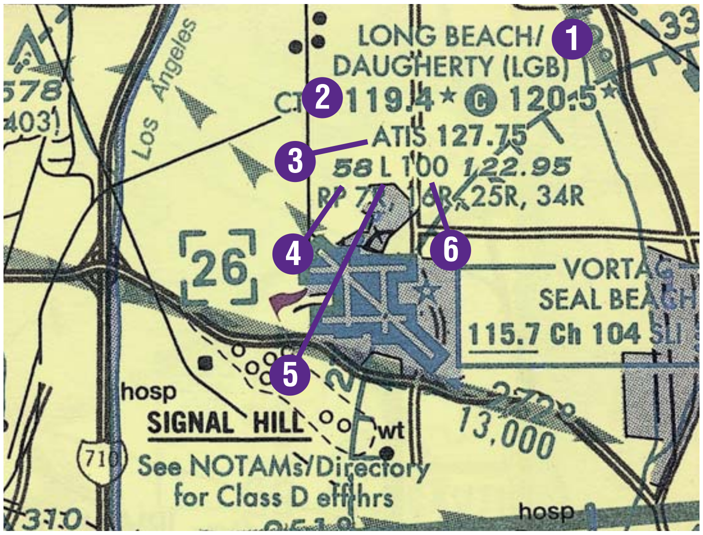
1. The airport name and 3-letter identifier;
2. Control tower frequency;
3. ATIS (automated terminal information service), ASOS (automated surface observation system), or

AWOS (automated weather observation system) frequency, whichever is applicable to the airport;

4. Airport elevation in feet;
5. Runway lighting; and
6. Length of longest runway in hundreds of feet.

VFR charts also note if a flight service station facility is on the field, airport surveillance radar is available, the tower is part-time or a non-federal facility, if special VFR is not permitted, and the unicom and VFR advisory frequencies, if applicable. A complete explanation is printed on the chart's legend and in the NACO *Aeronautical Chart User's Guide*.

VFR Terminal Area Chart



Airport/Facility Directory

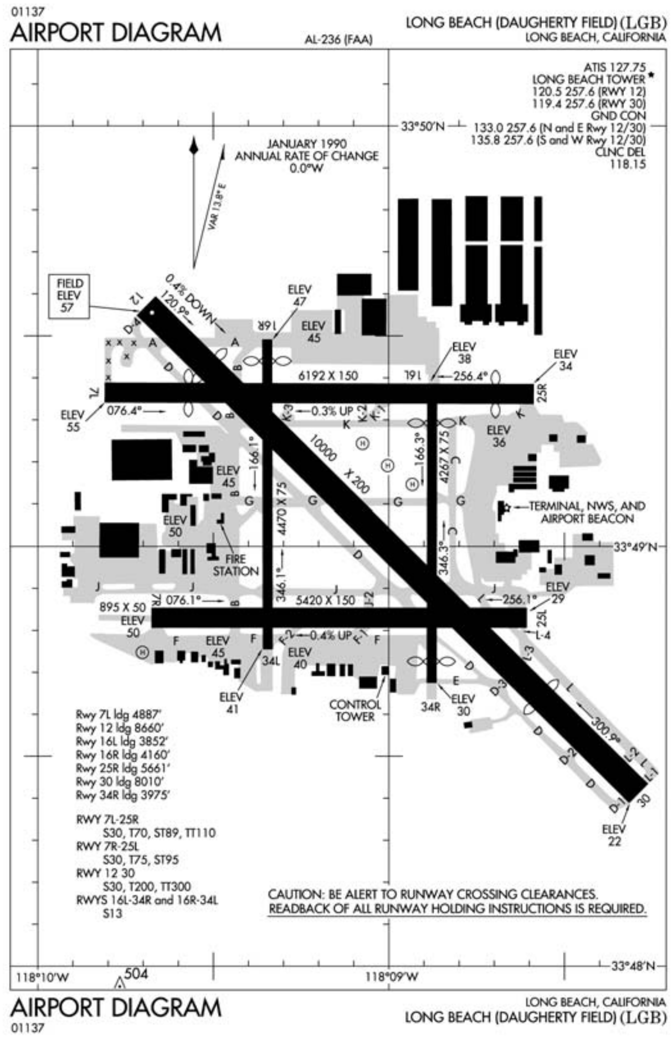
CALIFORNIA 101

LONG BEACH (DAUGHERTY FLD) (LGB) 3 NE UTC–8(–7DT) N33°49.06′ W118°09.10′ **LOS ANGELES**
58 B S4 **FUEL** 100LL, JET A OX 1, 2, 3, 4 LRA ARFF Index C **COPTER**
RWY 12–30: H10000X200 (ASPH–GRVD) S–30 +, D–200, DT–300 HIRL 0.4% up NW **H–2B, L–3B, A**
RWY 12: VASI(V4L)—GA 3.0° TCH 47′. Thld dsplcd 1340′. Railroad. **IAP, AD**
RWY 30: MALSR. PAPI(P4L) —GA 3.0° TCH 70′. Thld dsplcd 1990′. Tree.
RWY 07L–25R: H6192X150 (ASPH–PFC) S–30, D–70, DT–110 MIRL 0.3% up W
RWY 07L: Thld dsplcd 1305′. Railroad.
RWY 25R: REIL. VASI(V4L)—GA 4.0° TCH 57′. Thld dsplcd 531′. Road. Rgt tfc.
RWY 07R–25L: H5420X150 (ASPH) S–30, D–75 HIRL 0.4% up W
RWY 07R: Tower. Rgt tfc. **RWY 25L:** REIL. VASI(V4L)—GA 4.0° TCH 58′. Trees.
RWY 16R–34L: H4470X75 (ASPH) S–12.5
RWY 16R: VASI(V4L)—GA 4.0° TCH 36′. Thld dsplcd 310′. Fence. Rgt tfc. **RWY 34L:** Road.
RWY 16L–34R: H4267X75 (ASPH) S–12.5
RWY 16L: Thld dsplcd 415′. Fence. **RWY 34R:** Thld dsplcd 292′. Road. Rgt tfc.
AIRPORT REMARKS: Attended continuously. All rwys CLOSED 0600–1500Z‡ except Rwy 12–30. Flocks of seagulls on and invof arpt especially during rain. Airships moored in infield and operating invof arpt. Rwy 07R lgtd twr 152′ AGL 2500′ W and 500′ S of rwy thld. 6′ lgtd chain link fence located 130′ S of centerline of Twy F. Fence begins NW corner of twr and extends 400′ to W. Prior notice requested for military jets and civilian Non–Stage III Jets, ctc Noise Abatement 562–570–2635 or frequency 122.85 Mon–Fri 1530–0030Z‡. Noise limits (decibels single event noise exposure level), Rwy 25R tkf 92.0–ldg 88.0; Rwy 07L tkf 88.0–ldg 92.0; Rwy 25L tkf 95.0 ldg 93.0; Rwy 07R tkf 95.0 ldg 92.0. Rwy 12 and 30 1500–0600Z‡ tkf 102.5 ldg 101.5; 1400–1500Z‡ and 0600–0700Z‡ tkf 90.0 ldg 90.0; 0700–1400Z‡ tkf 79.0 ldg 79.0. Touch and go, stop and go, low apch only permitted 1500–0300Z‡ weekdays and 1600–2300Z‡ weekends and holidays only on Rwy 07L–25R and Rwy 07R–25L unless weather conditions require twr to direct such ops to Rwy 16R–34L and Rwy 16L–34R. Rwy 12–30 maximum ldg weights A–330 347,000 pounds; A–340 379,000 pounds; DC–10–10, DC 10 30/40 and MD–11 379,000 pounds; L–1011 354,000 pounds. Rwy 12–30 maximum tkf weights DC–10 30/40 and MD–11 588,000 pounds; C–17 538,600 pounds. Maximum ldg weight for C–17 at or byd glide slope or rwy aiming point marking 538,600 pounds. Rwy 30 ldg prior to rwy aiming point marking 344,000 pounds. Taxiways D3 and L3 weight limits A–340, DC–10 30/40 and MD–11 541,000 pounds, C–17 450,000 pounds. No twy access to Rwy 07L W of Twy D, 4897′ remaining on Rwy 07L from Twy D. Twy K east of Twy C clsd to acft with a wingspan greater than 117′. Engine run–ups other than preflight are limited to hours of 1500–0500Z‡ weekdays and 1700–0500Z‡ weekends and holidays. ACTIVATE MALSR Rwy 30 when tower clsd—CTAF. Rwy 12–30 HIRL lighted during hours tower clsd. NOTE: See Land and Hold Short Ops Section.
WEATHER DATA SOURCES: ASOS (562) 424–0572.
COMMUNICATIONS: CTAF 119.4 **ATIS** 127.75 (562) 595–8564 **UNICOM** 122.95
HAWTHORNE FSS (HHR) TF 1–800–WX–BRIEF. NOTAM FILE LGB.
Ⓡ **SOCAL APP CON** 124.65
Ⓡ **SOCAL DEP CON** 127.2
LONG BEACH TOWER 119.4 (Rwy 30 apch, Rwy 12 dep) 120.5 (Rwy 12 apch, Rwy 30 dep) (1415–0745Z‡)
GND CON 133.0 (North and East of rwy 12–30) 135.8 (South and West of rwy 12–30). **CLNC DEL** 118.15
AIRSPACE: CLASS D svc 1415–0745Z‡ other times CLASS G.
RADIO AIDS TO NAVIGATION: NOTAM FILE HHR.
SEAL BEACH (L) VORTACW 115.7 SLI Chan 104 N33°47.00′ W118°03.29′ 278° 5.3 NM to fld. 23/15E.
HIWAS.
BECCA NDB (LOM) 233 LG N33°45.40′ W118°04.64′ 301° 5.2 NM to fld.
ILS 110.3 I–LGB Rwy 30. LOM BECCA NDB. Unmonitored when twr clsd. MM unmonitored.
• •
HELIPAD H1: H20X20 (ASPH–CONC)
HELIPAD H2: H20X20 (ASPH–CONC)
HELIPAD H3: H20X20 (ASPH–CONC)
HELIPORT REMARKS: Training helipads H1, H2 and H3 located N of Rwy 12–30 midfield between Taxiways G and K.

LONNIE POOL FLD/WEAVERVILLE (See WEAVERVILLE)

LOS ALAMITOS AAF (ARMED FORCES RESERVE CENTER) (SLI) N33°47.40′W118°03.12′ **LOS ANGELES**
NOTAM FILE LGB. **L–3B, A**
AIRSPACE: CLASS D svc Sat–Mon 1600–0000Z‡, Tue–Fri 1500–0600Z‡ other times CLASS G.

Airport Diagram Page



NOT TO BE USED FOR NAVIGATION

To avoid runway incursions, and keep from getting lost, study the airport layout. ***Instrument approach procedure (IAP) charts are required for IFR operations, and they are also a great reference for the VFR pilot.*** All pertinent information about the airport is provided, including elevation, navigation aids and communications frequencies, as well as a small diagram of the runway, taxiways and ramps. If the airport has a complex runway or taxiway configuration, the IAP charts will include a separate, detailed airport diagram page. These airport diagrams are invaluable for finding your way around large airports, but never hesitate to ask for progressive taxi instructions if needed. Airport diagrams can also be

found online (www.asf.org/taxi) or in the back of the Airport/Facility Directory (A/FD).

Navigation Aids

Become familiar with the terminal area navigation aids—the VOR, ADF, localizer, and glideslope—at the airports you'll be using. They are critical to instrument operations and can be very helpful to VFR pilots as well. It can be a challenge to find an unfamiliar airport if it's immersed in an urban sea of

buildings and lights or hidden among hills. On-airport navaids, or GPS, make the job a lot less stressful.

Communication

Because two-way communication is required to operate at towered airports, good radio skills go a long way toward ensuring smooth operations.

A good communications system includes at least one 720- or 760-channel transceiver with enough power to transmit and receive communications without static or interference. If the aircraft transceiver is not working properly, the communications process will be difficult and could be unsafe. Get it fixed before operating at a towered airport. A

Controller with light gun

Light Gun Signals

Color and Type of Signal	Aircraft on the Ground	Aircraft in Flight
Steady green	Cleared for takeoff	Cleared to land
Flashing green	Cleared for taxi	Return for landing (to be followed by steady green at the proper time)
Steady red	Stop	Give way to other aircraft and continue circling
Flashing red	Taxi clear of the runway in use	Airport unsafe do not land
Flashing white	Return to starting point on airport	Not applicable
Alternating red and green	Exercise extreme caution	Exercise extreme caution

headset with an attached boom microphone and a push-to-talk switch greatly simplifies the task of flying and communicating simultaneously. Just be sure the airplane is equipped with a handheld microphone and speaker as backup in the event the headset or intercom system fails.

Even the best radios fail occasionally. When that happens, you can still receive tower instructions via light gun signals. Because we get very little practice with these signals, they're easily forgotten. We suggest you copy the light gun signal chart above and tape it to your clipboard. Acknowledge the signals by rocking your wings or flashing your landing light.

Clearances

Flying to and from towered airports involves a series of controller instructions and clearances. It's vital that both the pilot and the controller recognize and understand each instruction, clearance, and acknowledgment. Communications should be simple and clear. You'll take up minimum time on the frequency, and controllers will understand you the first time. A misinterpretation by either party can have serious consequences. *To ensure mutual understanding, read back the clearance.* **Controllers are required to get an acknowledgment of "hold short" instructions, so a "hold short" clearance must be read back—but you should really read back every clearance.** Controllers issue clearances using specific words and phrases. If you don't fully understand a controller's instructions, ask for clarification. The "Pilot/Controller Glossary" in the AIM is an excellent source for reviewing the terms and phrases.

ATC Instructions

ATC instructions common at towered airports include:

- **"Taxi to...."** In the absence of holding instructions, a clearance to "taxi to" any point other than an assigned takeoff runway is a clearance to cross all runways that intersect the taxi route to that point. It does not include authorization to taxi onto or cross the assigned takeoff runway at any point.
- **"Taxi to—hold short of...."** A clearance to begin taxiing, but enroute to the taxi clearance limit you *must* hold short of another taxiway or a crossing runway as specified by the controller.
- **"Cross runway...."** You are cleared to taxi across the runway that crosses your taxi route and continue to the taxi clearance limit.
- **"Hold short...."** *Do not* enter or cross the taxiway or runway specified by the controller. If there is a painted hold line, do not cross it.
- **"Cleared for immediate takeoff."** A clearance to initiate the takeoff without delay. This clearance usually means another aircraft is on final approach. If you are not ready, do not accept this clearance.
- **"Report location...."** Identify your location on the airport ("Five-Eight Quebec at the transient ramp") or in the air with respect to the airport ("Five-Eight Quebec is seven miles southeast of the airport at one thousand five hundred").
- **"Squawk...."** Tune a discrete four-digit code into your transponder (the controller will specify the code or say "VFR," which is 1200). Make sure the transponder is in the "alt" mode.

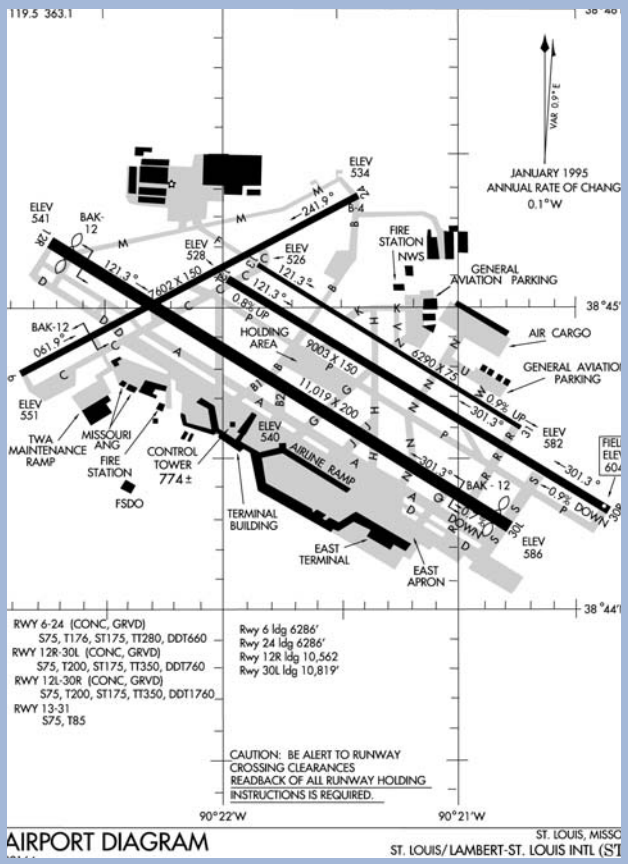
- **"Report entering...."** Call the tower when you are turning onto a leg in the airport pattern specified by the controller. For example, "Report entering left downwind for Runway Two-Three."
- **"Cleared to land ... cleared for touch and go ... cleared for the option."** A controller may issue this clearance, even though one or more aircraft will land ahead of you.

"Cleared for the option" is usually requested by instructors during training flights. It means you are cleared for either a full-stop landing, a stop and go,

Ground Fatality

St. Louis, MO

During the takeoff roll on Runway 30R, an MD-82 with 140 people on board collided with a Cessna 441 with two people on board. The Cessna pilot had received clearance to back-taxi into position and hold on Runway 31. The pilot taxied into position at an intersection of Runway 30R, which was the assigned departure runway for the MD-82. Both people aboard the Cessna were killed; there were a few minor injuries to the passengers on the MD-82.



NOT TO BE USED FOR NAVIGATION

Departure Procedures

Plan	Radios	Organize	Clearance	Exercise Caution	Expedite	Depart
Plan your route. Get a preflight weather briefing. Consider filing a VFR flight plan.	Tune before taxiing or at the runup pad—*not* while taxiing or in the terminal area.	Have charts and notes handy for ready reference. Minimize cockpit distractions.	Get ATIS, AWOS, or ASOS before calling clearance or ground control. Read back all clearances.	Heed all taxiway and runway hold markings. Be extra careful at night or in low visibility.	When cleared to cross an active runway, or for takeoff, scan the area and comply quickly or notify ATC if unable to expedite.	Scan the final approach area as you taxi into position for takeoff.

touch and go, low approach, or missed approach—whatever you or an instructor aboard the aircraft decides to do.

- **"Go around!"** Abort the final approach! The tower controller may issue the instructions, or the pilot can state the fact. Unless otherwise instructed, the pilot should overfly the runway while climbing to traffic pattern altitude and reenter the pattern on a crosswind leg.
- **"Contact...."** Switch frequencies and communicate with another specified controller.
- **"Expedite...."** Comply promptly to avoid a conflicting situation.
- **"Traffic...."** Other aircraft are in your vicinity. For example, "Traffic, nine o'clock, one-two miles, southeast bound, one thousand feet below you."
- **"Report traffic/runway/airport in sight."** Advise the controller when you visually identify the other aircraft, runway, or airport.
- **"Land and hold short."** At busy airports with intersecting runways, controllers often use more than one runway for arrivals and/or departures. Be prepared for a controller to issue a "land and hold short" (LAHSO) restriction when flying to such an airport. You can ask the controller for the landing distance available to you. That information, along with details on land and hold short operations, can be found in the (Airport/Facility Directory) listing for the airport. Configure the airplane for a short-field landing if necessary, and fly a precise final approach airspeed. If you have doubts about being able to comply with the hold-short restriction, inform the controller immediately. Don't wait until you're rolling out too fast and too far down the runway to stop before the hold-short line.

Runway Incursion

Burbank, CA

A Piper PA-32 was issued a landing clearance on Runway 8 and instructed to hold short of Runway 15. A Beech Baron was issued a landing clearance on Runway 15. The Piper landed and continued past the hold-short line, entering the runway intersection. The Baron was unable to stop prior to the Runway 8 hold-short bars, but did stop before the Runway 8 edge line.

Nonstandard Procedures

Be flexible. Controllers at busy airports use a variety of techniques to keep traffic flowing smoothly. You may be asked to:

- Fly a faster than normal final approach;
- Extend your downwind;
- Switch to another runway at the last minute;

Safety Tip

A clearance to "maintain runway heading" after takeoff means that you should maintain the compass alignment of the departure runway, not track the extended runway centerline. In other words, after takeoff, do not make heading corrections to account for wind drift.

Safety Tip

To reduce work load and improve visual scan, program GPS and radios prior to departure, when clear of the terminal area, or prior to arrival in the terminal area.

- Do a 360-degree turn or S-turns on final to allow preceding traffic to clear; or
- Taxi around another aircraft in the runup area.

Be proficient so you can handle such unusual procedures safely. Remember: The pilot in command has the right to decline *any* procedure that may put the flight in jeopardy. Cooperate, but don't hesitate to decline a request or to *change your mind* if something isn't working out.

How the Pros Do It

The airlines and many corporate pilots have detailed procedures for operations at towered airports. While the following list of procedures is not exhaustive, it gives many useful piloting techniques that will make all ground operations more professional.

- The airport diagram is reviewed during preflight planning.
- The current position of the aircraft is noted relative to the active runways, the most likely route to the runway, and any special notes. (Many of the airlines provide notes and list restricted taxiways.)
- The first officer communicates with ground control, while the captain taxis the aircraft. When communicating with ATC, both pilots focus on what is being said and no other cockpit duties are accomplished during this time.

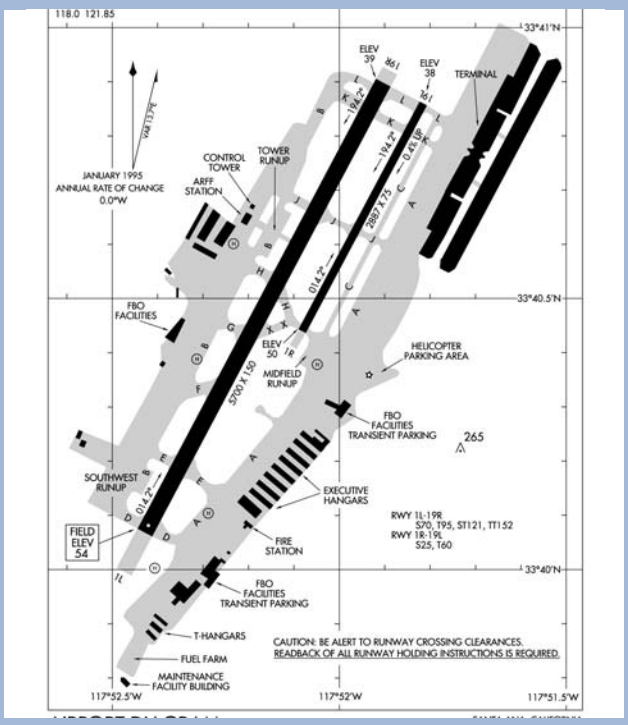
Sterile Cockpit

This is a term coined by the airlines to limit conversation topics to flight operations when pilot work load is high—which, in high density airspace, can be as far as 20 miles from an airport. Ask passengers to avoid unnecessary conversation until safely out of the terminal area or parked on the ramp. They should, as always, point out a potential hazard, but this is not the time to talk about how small the houses look.

Runway Incursion

Santa Ana, CA

A C-188 Agwagon was told to taxi across 19L and hold short of Runway 19R. The pilot correctly read back the instructions but proceeded across the hold bars and did not stop. A Boeing 757 had been cleared for takeoff on Runway 19R and successfully aborted its takeoff 1,000 feet into the takeoff roll.



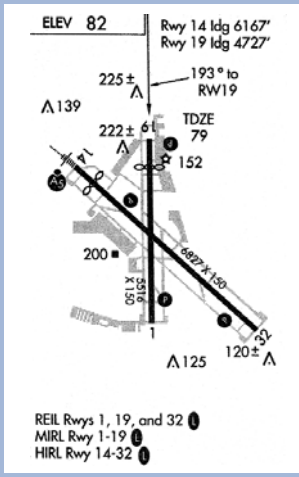
NOT TO BE USED FOR NAVIGATION

Arrival Procedures

ATIS	**R**eview	**R**adios	**I**nbound	**V**isual Check	**A**rrival	**L**anding
Before calling approach or tower controllers, check ATIS, AWOS, or ASOS.	Study the airport diagram, anticipate the active runway, and visualize your taxi route.	Preset the tower and ground frequencies.	Turn on lights when 5-10 miles out. Begin the before-landing checklist.	Look for traffic when approaching the airport. Be accurate in your position reports.	Complete the before-landing checklist. Follow tower's instructions for landing.	Clear the runway ASAP. Don't switch to ground control until instructed.

Midair Collision

East Farmingdale, NY



On April 9, 1994, a Cessna 152 collided with a Piper PA-24 and crashed into a factory building in East Farmingdale, New York. The airplanes were on final approach to Runway 19 at Republic Airport. The ceiling was 25,000 feet with scattered clouds and 25-mile visibility. The pilots were in radio contact with the tower. The Cessna, occupied by a student and an instructor, was doing touch-and-go landings in a *right-hand traffic pattern on Runway 19*. The Piper pilot, with one passenger, was returning to the airport from East Hampton, New York. They were instructed to enter *a left downwind for Runway 19*. At the time, the traffic pattern extended to about a six-mile final leg. The Cessna was on final approach about 200 to 300 feet agl. The Piper was above, making a descending left turn. The Piper pilot had been advised that the Cessna was on final; he was looking, but did not see it and descended into it. All four people aboard were killed.

- If there is any doubt by either pilot about what is said or intended by ATC, they ask for clarification.
- The first officer writes down complex taxi instructions and asks for a repeat, if needed.
- A full readback of all ATC instructions on the ground is required.
- An airport diagram is used while taxiing, and both pilots listen to ATC and visualize the positions of other aircraft.
- Other cockpit duties stop just prior to crossing a runway to focus on the event. Both pilots must agree that ATC has cleared them to cross, and both pilots must visually check the runway in both directions.
- Taxi lights are used day and night to communicate with other aircraft on the ground. If the aircraft is moving, or has received clearance to taxi, the taxi light is turned ON. When the aircraft stops, the taxi light is turned OFF. When ATC issues a takeoff clearance, landing and strobe lights are turned ON to let other aircraft know they are beginning the takeoff roll.

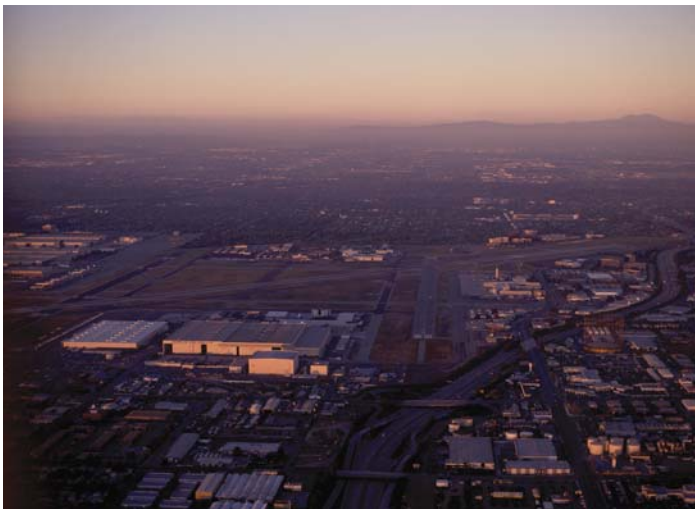
Once you understand towered airport operating rules and procedures and have thoroughly prepared, you should have no trouble working with tower and approach controllers.

When things get busy in the cockpit, stay focused on the critical task—flying the airplane. Trying to do too many things at once—shuffle through charts, read the airport diagram, tune the radios, program the GPS, configure the aircraft, jot down a clearance—can quickly overwhelm a single pilot. The result may be a missed critical clearance, such as "hold short of the runway," and a potentially disastrous runway incursion. **Aircraft control takes priority over communication.** Act first, talk second. Think ahead of the aircraft and stay flexible, ready to change to plan B if necessary.

Let's Go Flying!

Preflight

Our flight plan calls for flying VFR into Long Beach, California's Daugherty Field (LGB) and then departing the airport. LGB is a large Class D airport



that lies under the floor of Los Angeles Class B airspace and in close proximity to several Class C airports in the busy Los Angeles Basin. Long Beach has six published instrument approaches, scheduled airline service, and a high volume of general aviation piston and jet aircraft, including flight training activity. With two sets of parallel runways—one set perpendicular to the other—and a long, main runway that bisects the other four, LGB presents a significant challenge, both on the ground and in the air, to any pilot not familiar with it.

Our aircraft more than meets the minimum equipment requirements for operating at a Class D

airport and within a Class B Mode C veil—two-way communications transceiver and Mode C transponder. For navigation guidance, we'll use the current Los Angeles VFR Terminal Area Chart for maximum detail and scale.

Given the complexity and activity level at LGB, referring to an airport diagram from an instrument approach booklet is an excellent idea, even though we'll be flying VFR. Both NACO *Terminal Procedures* and *Jeppesen's Airway Manual* devote a separate page to a plan view graphic of LGB's airport/taxiway configuration. (Refer to the airport diagram for LGB on pg. 3.) It'll be a big help in planning the arrival and negotiating the complex taxiway layout. The frequency listing for the airport will also be helpful in planning and preparing for controller handoffs.

Arrival

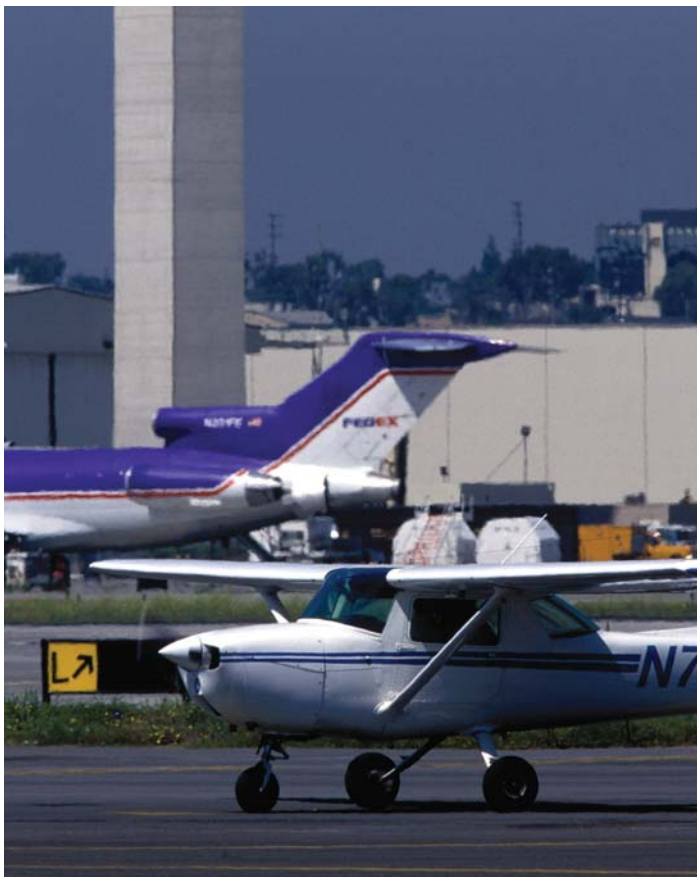
We're arriving from the east, and because of the traffic congestion, we ask for and receive traffic advisories from SoCal Approach Control. About 15 minutes east of our destination, we tune LGB's ATIS frequency on the number-two radio and listen to the current report, "Hotel," while also monitoring the approach control frequency on radio number one.

ATIS says that runways 25L, 25R, and 30 are active. Separate tower frequencies are in effect for the north and south runways. Because intersecting runways are in use, we mentally prepare for a "land and hold short" instruction.

About five miles east of the airport, we inform SoCal Approach that we have Long Beach in sight, we have ATIS information Hotel, and we're requesting 25L, the runway most convenient to our destination on the airport. The controller says to expect 25L and instructs us to switch to the Long Beach Tower—south frequency. We've already obtained the frequency from the airport diagram page and loaded it in the standby window on the number-one com, so we're prepared for the handoff.

Safety Tip

If you have difficulty with reading runway markings or airport signs at a particular airport, contact the airport manager and report the problem. Also file a report with NASA's Aviation Safety Reporting System (http://asrs.arc.nasa.gov).



"Long Beach Tower, Cessna Seven-Zero-Five-Eight Quebec, five east, inbound to Two-five Left."

"Cessna Five-Eight Quebec, Long Beach Tower. Make straight in Runway Two-five Left."

"Cleared for the straight-in to Two-five Left. Five-Eight Quebec." Great! This is going to be easier than we thought. We'll be able to exit the runway right onto the ramp where we'll be parking to refuel. Then the tower controller throws us a curve.

"Cessna Five-Eight Quebec, change to Runway Two-five Right. I have an aircraft stopped on Two-five Left. Contact tower one-two-zero point five."

"Roger, contact tower on one-two-zero point five. Five-Eight Quebec." We don't know what the trouble is on 25L, but there's no point in worrying about it. As we bank into a right turn and then back to the left to line up with 25R, we tune the tower frequency and check in. The tower controller is ready for us.

"Cessna Seven-Zero-Five-Eight Quebec, Runway Two-five Right, cleared to land. Hold short Runway Three-zero."

"Cleared to land Two-five Right. Five-Eight Quebec." The controller immediately responds to my readback with an insistent voice, "Five-Eight Quebec, HOLD SHORT RUNWAY THREE-ZERO."

"Roger, hold short Three-zero. Five-Eight Quebec." Oops. Fortunately, the controller caught my negligence. I shudder as I think about the potentially catastrophic consequences of rolling out on Runway Two-five Right and blithely crossing Runway Three-zero—just as another airplane comes barreling down the crossing runway.

As it turns out, the hold-short restriction is unnecessary because we easily slow and exit the runway long before reaching the intersection of 25R/30. After completing the after-landing checklist, we are told to contact ground control. "Long Beach Ground, Cessna Seven-Zero-Five-Eight Quebec off of Two-five Right at Kilo 2, going to the south ramp. Request progressive taxi instructions." It looks like a long, complicated route to the south side of the airport, and we can use the controller's help in getting there safely.

"Five-Eight Quebec, Ground. Taxi west on Kilo, hold short of Runway Three-zero."

"West on Kilo, hold short of Three-zero. Five-Eight Quebec."

Just as we roll to a stop on Kilo at the hold line for 30, a Learjet glides past on the runway. If we hadn't stopped….

A few seconds later, the ground controller instructs us to "Cross Three-zero, then left on Bravo. Taxi south on Bravo, hold short of Runway Two-five Left."

"Roger, cross Three-zero, left on Bravo, hold short of Two-five Left. Five-Eight Quebec."

Evidently the problem that forced us to switch runways has cleared, because we watch an airplane slow on 25L and exit the runway to the south.

"Five-Eight Quebec, cross Two-five Left, turn left on Foxtrot. The south ramp will be on your right."

"Cross Two-five Left, left on Foxtrot to the ramp. Five-Eight Quebec. Thanks for your help."

After turning left on Foxtrot, we confirm that we can cross the approach end of 34L and then taxi onto the ramp. A lineman directs us to a parking spot, and we shut down. Time to refuel and grab some lunch before heading back out.

Departure

The drill on departure will be the same as the arrival, only in reverse. After completing the appropriate checklists, starting the engine, and powering up the avionics, we configure the communications radios based on the frequencies specified on the airport diagram, with LGB ATIS in

the active window and ground control in the standby window. Next we set up the navigation radios with the appropriate VOR frequencies and radials for the outbound course. We want to have everything done before leaving the ramp so that all we have to do is taxi to the assigned runway—a difficult enough challenge when the airport is as large and complex as LGB.

The first task is to get the current ATIS information. According to "India," land and hold-short operations are still in effect for 25 Right and 30. Because LGB

is a Class D airport, a VFR departure clearance isn't necessary, but local procedure recommends we call clearance delivery. The controller there prepares a "flight strip"—a document that includes information about our aircraft and runway assignment. This is passed to ground control. Because the strip is prepared for them, ground controllers can keep focused on the aircraft and vehicles moving on the field. So, we call clearance, tell the controller our position on the airport and that we have India, and will be departing to the east. We then contact ground control.

"Cessna Five-Eight Quebec, Long Beach Ground. Taxi to Runway Two-five Left at Delta via Foxtrot. Would you like to depart Two-five Left from intersection Delta?"

Hmmm. I study the airport diagram and see that an intersection takeoff from Delta would give me approximately 4,000 feet of runway. Based on my preflight planning, I know that's plenty of runway for the airplane's weight and the weather conditions, but if more runway is available, why not use it?

"Ground, thanks, but I'd like full length on Two-five Left."

"Five-Eight Quebec, Runway Two-five Left. Taxi via Foxtrot and Delta to Delta Three, hold short Runway Three-zero."

"Roger, taxi to Two-five Left via Foxtrot and Delta to Delta Three. Hold short of Three-zero. Five-Eight Quebec."

At the hold line on Taxiway Delta Three, we watch a DC-10 on final for 30 sink toward the runway. Twin puffs of blue smoke trailing from the main gear bogies announce the touchdown.

"Cessna Five-Eight Quebec, cross Runway Three-zero, left on Lima to Lima Four, call the tower when ready to depart."

"Roger, cross Three-zero, left on Lima to Lima Four, contact the tower. Five-Eight Quebec."

We contact the tower and are issued a clearance to take off. Following takeoff and initial climb, we turn left to an easterly heading as instructed by the tower on our takeoff clearance. Soon we've flown out of the LGB terminal area and are heading east toward our home base. It's been a hard-working lunch flight but worth it. We've negotiated Long Beach for the first time, with no trouble. In fact, the flight was virtually without error—an accomplishment we rightfully attribute to the study and preparation done before ever climbing into the airplane.

Airport Pavement Markings

(For further information, refer to the Aeronautical Information Manual, Chapter 2, Section 3.)

All runway markings are white.

Taxiway markings are yellow. The centerline is a single yellow line, and the taxiway edge is marked by a double yellow line. Dashed edge markings allow the aircraft to cross to the adjoining apron.

Runway holding position markings consist of four yellow lines—two solid and two dashed (see picture below). Aircraft should stop on the solid-line side. ***A pilot should not cross this marking without ATC clearance.*** An aircraft exiting the runway is not clear of the runway until all parts of the aircraft have crossed the holding position marking. These markings are installed on runways only if the runway is normally used by ATC for Land and Hold Short (LAHSO) or taxi operations.

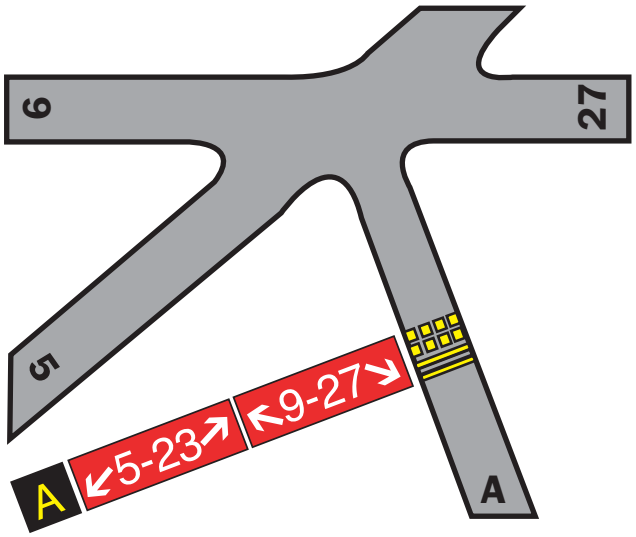
Airport Signs

There are many types of signs on airfields. The information on the signs may also be painted on the airport pavement. The following examples are described as if you were on the taxiway or runway, looking at the sign.

Taxiway location sign: Indicates the taxiway you are on.

Holding position sign: Hold here. From your position on the taxiway, the threshold for Runway 15 is to your left and the threshold for Runway 33 is to your right. This sign is located next to the yellow holding position markings painted on the taxiway pavement.

Runway boundary sign: This sign faces the runway and is visible to pilots exiting the runway. Taxi past this sign ("dash past the dashed lines") to be sure you are clear of the runway.



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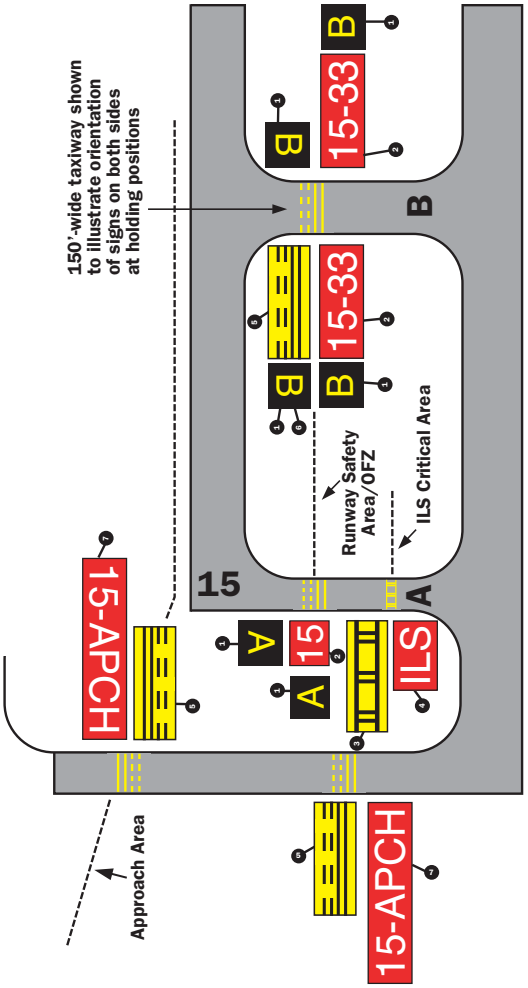

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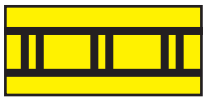
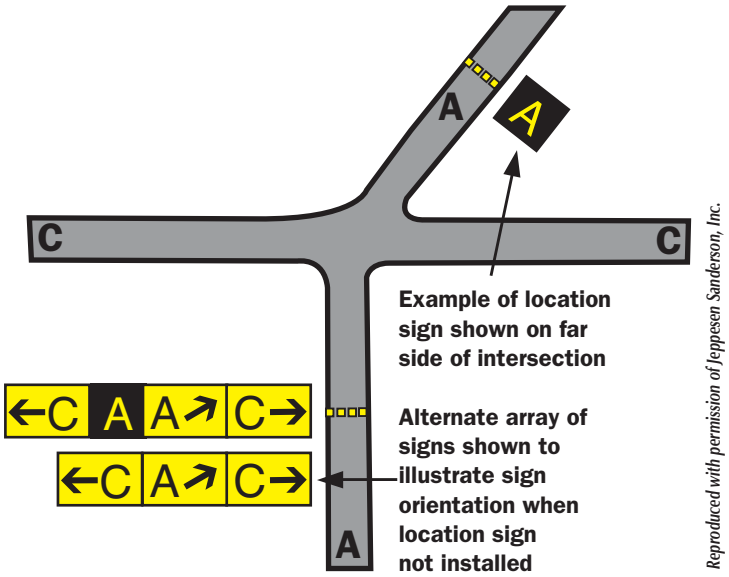
ILS holding position sign: ATC may hold you at this sign when the instrument landing system is being used at the airport. Aircraft taxiing beyond this point may interfere with the ILS signal to approaching aircraft.



ILS critical area boundary sign: Seen when **exiting the runway**, this sign marks the boundary of the ILS critical area. When ILS approaches are in use, be sure your aircraft has passed beyond this sign before stopping on the taxiway.

Holding position sign for approach areas: If instructed by ATC, hold here until cleared to cross. Taxiing past this sign may interfere with aircraft arriving on Runway 15 or departing on Runway 33.

Taxiway entrance at intersection of two runways (see left). You are on Taxiway A. The arrows pointing to



Runways 5-23 and 9-27 indicate the approximate alignment of the runways relative to you and point to each runway threshold.

Taxiway intersection (see above). You are on Taxiway A. The orientation of these signs is from left to right in a clockwise manner. Left turn signs are on the left side of the location sign and right turn signs are on the right side of the location sign.

No entry sign: Do not enter this area. Aircraft are prohibited. This sign would be found at the entrance to a one-way taxiway or at the intersection of a road intended for vehicles.

Inbound destination sign: The military installation is to your right. Other information signs are "Cargo," "Term" (Terminal), "Ramp," etc.

Outbound destination sign to different runways: Runways 27 and 33 are to your right.

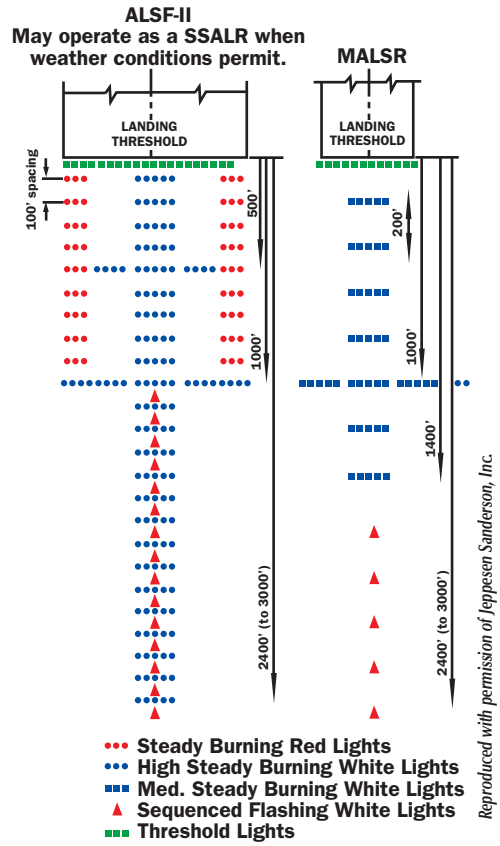
For more information, see www.faa.gov/runwaysafety.

Airport Lighting

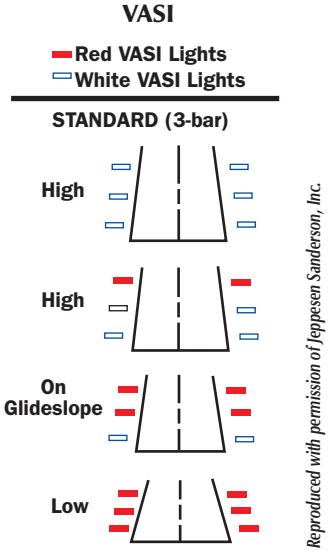
(For further information and a complete set of approach lighting system diagrams, refer to the Aeronautical Information Manual, Chapter 2, Section 1.)

Approach lighting systems provide the basic means to transition from instrument flight to visual flight for landing.

Two Kinds of Approach Lighting Systems



Approach light systems are a configuration of signal lights starting at the landing threshold and extending into the approach area a distance of 2,400 to 3,000 feet for precision instrument runways and 1,400 to 1,500 feet for nonprecision runways.



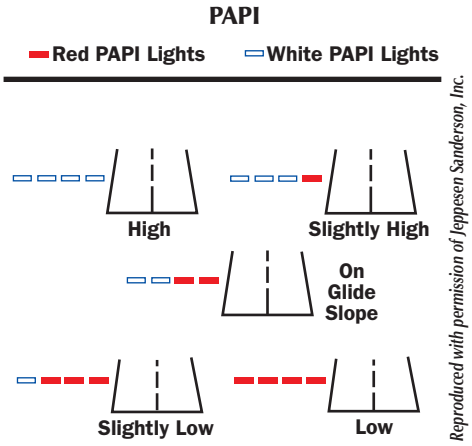
Visual approach slope indicators (VASIs) provide visual descent guidance during the approach to a runway. The lights are arranged in bars and vary in number from two to 16.

Lights Up

Tower controllers can operate many of the airport's lights at various intensities. Ask them to turn up runway and lead-in lights when you're trying to locate the field. Most pilots prefer these lights to be dimmed for landing.

The lights are arranged so that the pilot will see the combination of lights shown here.

Precision approach path indicators (PAPIs) use light units similar to the VASI but are installed in a single row of either two or four light units. They are normally installed on the left side of the runway.

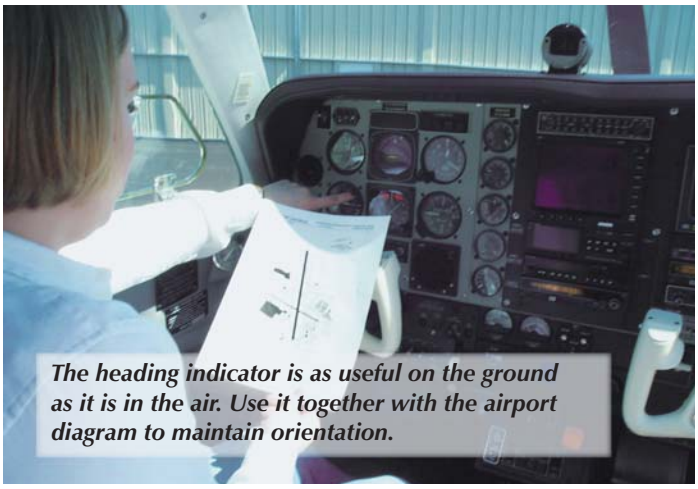


Runway end identifier lights (REILs) consist of a pair of synchronized flashing lights located on each side of the runway threshold.

Runway edge lights are white and outline the edges of runways at night or in restricted-visibility conditions. On instrument runways, yellow replaces white on the last 2,000 feet or half the runway length. The lights marking the ends of the runway are red for departing aircraft and green for landing aircraft. Blue *taxiway edge lights* outline the taxiways. Green lights

mark the taxiway centerline as well as taxi paths. Yellow *clearance bar lights* are installed at holding positions on taxiways and at the location of an intersecting taxiway. Flashing yellow *runway guard lights* are installed at taxiway/runway intersections. *Stop bar lights* consist of a row of red lights that extend across the taxiway at the runway holding position. Following the ATC clearance to proceed, the stop bar is turned off and the lead-on lights are turned on. **Pilots should never cross a red illuminated stop bar, even if an ATC clearance has been given to proceed.**

Note: Not all airports are equipped with taxiway centerline lights, yellow clearance bar lights, runway guard lights, or stop bar lights.



The heading indicator is as useful on the ground as it is in the air. Use it together with the airport diagram to maintain orientation.

Taxi Tips

- If in doubt about where you are while taxiing on the airport, bring the aircraft to a stop and ask Ground Control for progressive taxi instructions: "Ground, Five-Eight Quebec requests progressive taxi instructions." *Never* stop on an active runway after landing to ask for directions. *Clear the runway first, then stop on a taxiway.*

- Do not taxi onto or across a runway unless you are certain the ground controller has given you clearance to do so. *If there is the slightest doubt, ask.*

- At night, taxi with other pilots in mind. Minimize use of distracting aircraft lights. Use position lights at all times and the taxi light as needed, but keep strobes and landing lights off until the tower controller has issued you a takeoff clearance. Then turn on all lights. Adhere to operating time limits on lights if specified by the manufacturer.

- Always have an airport diagram available and check your assigned route against the chart before moving.

Airport taxi diagrams are available via the Web at www.asf.org/taxi.

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Publisher: Bruce Landsberg
Editors: David Wright, Brian D. Peterson, Andy Sable
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Edition 4, 9/2008, 380007

Operations at Nontowered Airports

Nontowered airports—those not served by an operating air traffic control (ATC) tower—are much more common than towered fields. In fact, nearly 20,000 airports in the United States are nontowered, compared to approximately 500 that have towers.

Millions of safe operations in all types of aircraft are conducted at nontowered airports in a variety of weather conditions. The process works because pilots put safety first and use recommended procedures.

A word about procedure: There are several sources of information that explain official FAA-recommended procedures at nontowered airports. FAR 91.113 cites basic right-of-way rules, and FARs 91.126 and 91.127 establish traffic-flow rules at nontowered airports. The *Aeronautical Information Manual (AIM)* and FAA Advisory Circular 90-66A expand on the regulations. Together, these documents define procedures for nontowered flight operations.

Regulations and procedures can't cover every conceivable situation, though, and the FAA has wisely avoided imposing rigid operating regulations at nontowered airports. What is appropriate at one airport may not work at the next. Some airports have special operating rules due to obstacles or hazards, while other rules may promote a smooth and efficient flow of traffic or keep aircraft from overflying unsympathetic airport neighbors.

Right-of-way rules, along with nontowered airport traffic patterns and procedures, exist to prevent collisions in the air and on the ground. There are other benefits to adhering to the rules, such as an orderly traffic flow, noise abatement, and defusing potential right-of-way conflicts. However, traffic separation is the prime concern. This Safety Advisor covers the "rules of the road" at nontowered airports.

> Some people use the term "uncontrolled airport" to mean the same thing as "nontowered airport," but nontowered airports are anything but "out of control."

We'll cover the following topics:

- Traffic pattern procedures and techniques
- Communication
- Collision avoidance
- VFR and IFR operations
- Nonstandard flight operations you're likely to encounter at nontowered airports with helicopters, gliders, and parachutists
- Courtesy and safety tips
- Information for flight instructors

Things to Know Before You Go

The Traffic Pattern Structure

A standard traffic pattern is comprised of six legs to create a logical, safe flow of traffic at an airport. Turns are normally made to the left.

Let's Fly!

We'll begin a flight of takeoff and landing practice (closed traffic) in the runup area at the end of Runway 23 at Frederick, Maryland (see Figure 1). The before-takeoff checklist is complete and the aircraft is

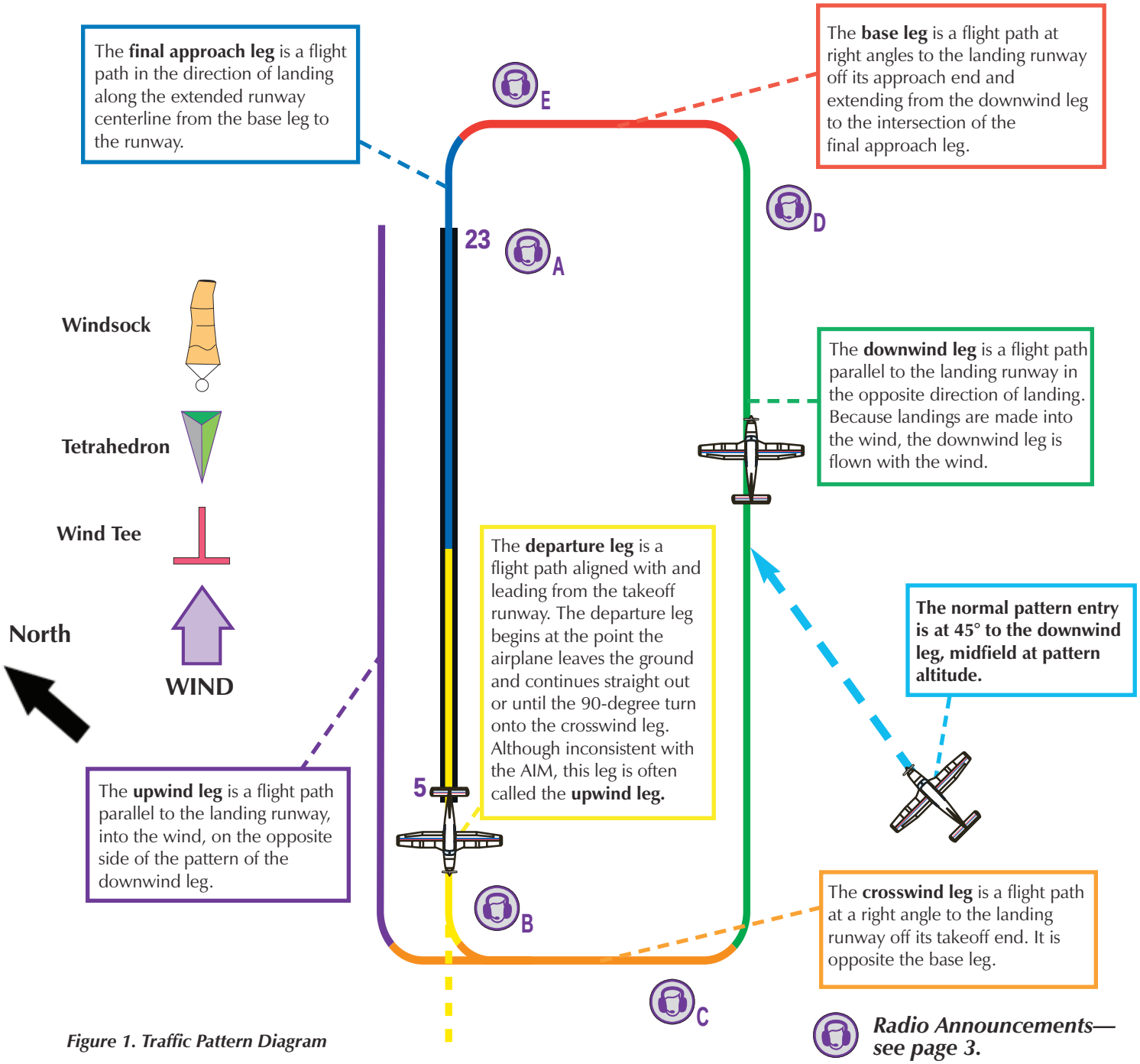

Figure 1. Traffic Pattern Diagram

Radio Announcements—see page 3.

positioned just short of the holding position (or hold short) line, where you can see the downwind, base, and final legs. The radio is tuned to the common traffic advisory frequency (CTAF), and you've heard traffic in the pattern.

◆ You scan the pattern for traffic and spot a Tampico on downwind. It looks like there'll be plenty of room, so to begin the takeoff you:

- Announce ***"Frederick traffic, Skyhawk Four Zulu Sierra departing Runway Two-Three, closed traffic, Frederick."*** A
- Line up. Turn the landing and anticollision lights on. Taxi onto the runway, and **without stopping**, align the aircraft with the runway centerline and take off.

Safety Tip
The AOPA Air Safety Foundation (ASF) does NOT recommend the practice of taking position on the runway and holding at nontowered airports to wait for other traffic to clear. There may be a delay, and you are in an extremely vulnerable position with no way of seeing traffic behind you.

◆ **Departure Leg**

- Climb on the extended runway centerline beyond the departure end of the runway and to within 300 feet of traffic pattern altitude. Frederick's pattern altitude is 1,300 feet msl, so continue the departure leg until the altimeter registers 1,000 feet.
- At 1,000 feet, look to the left and right to be sure there is no traffic conflict and announce ***"Frederick traffic, Skyhawk Four Zulu Sierra turning crosswind Runway Two-Three, Frederick."*** B

◆ **Crosswind Leg**

- Climb to pattern altitude—1,300 feet msl in this case—level off, and reduce power to maintain a safe interval.
- Continue on crosswind until approximately 1/2 mile from the extended runway centerline.
  - To help visualize this distance, use the runway itself. For example, if the runway is approximately one mile long (5,280 feet), use half its length as a guide for the turn to downwind.
- As you approach the turn point, scan for traffic on downwind and announce ***"Frederick traffic, Skyhawk Four Zulu Sierra turning downwind Runway Two-Three, Frederick."*** C

◆ **Downwind Leg**

- Establish the downwind track and begin the before-landing checklist. Perform most of the landing configuration tasks while on this leg.
  - Retractable-gear airplane pilots should confirm the gear is down and locked while passing midfield on downwind.
  - All pilots should be especially vigilant, scanning and listening for traffic entering the pattern on the downwind leg. This could occur anywhere on downwind.
- Select a touchdown spot on the runway, and as you pass that spot, begin the descent for landing by:
  - Reducing power to maintain approach speed
  - Setting approach flaps
- Continue on downwind and plan the turn to base so as to achieve a 1/2 to 3/4-mile final approach leg.
  - Suggestion—turn base when the aircraft is 45 degrees to the approach end of the runway.
- Approaching the turn point, scan for conflicting traffic and announce ***"Frederick traffic, Skyhawk Four Zulu Sierra turning base Runway Two-Three, Frederick."*** D

◆ **Base Leg**

- This leg is flown perpendicular to the runway centerline, but if there is any wind, the airplane will be crabbed toward the wind.
  - If dealing with a left crosswind on final, lead the turn to final approach.
  - Right crosswinds will delay the turn to final.
- **Be especially careful to scan and listen for traffic on base or final.** Once turned toward the runway, it is difficult to see behind the aircraft.
- Continue airplane configuration tasks.
- Approaching the turn point, look out the right side to ensure the final approach path is clear, and then announce ***"Frederick traffic, Skyhawk Four Zulu Sierra turning final, Runway Two-Three, full stop, Frederick."*** E

◆ **Final Approach Leg**

- On final, verify airplane configuration and set landing flaps.
- There is a tendency for pilots to "lock on" to the touchdown zone. It's imperative to **continue scanning** and listening for traffic as we slide down final. Clear both sides of the final approach path.
- Maintain alignment, flare, and wait for that soul-satisfying squeak that says you've made another great landing.

- Be conscious of following traffic; don't dwell on success. Expeditiously taxi to the nearest taxiway and clear the runway for the next arrival.

Safety Tip
For additional clarity, some pilots include the direction of traffic (e.g., left or right) in their traffic pattern announcements. ***Frederick traffic, Cessna Eight-One Tango Foxtrot, turning right downwind, Runway Five, full stop, Frederick.***

Safety Tip
Announcements made just before "turning the corners" give other pilots in the pattern a definite place to look for traffic. Banking airplanes are easier for other aircraft at the same altitude to spot. High-wing aircraft should always "pick up" a wing and look before turning.

One Size Doesn't Fit All

Although pattern nomenclature doesn't change, just about everything else can. Pilots should consult the **Airport/Facility Directory (A/FD)** published by the FAA, ***AOPA's Airport Directory***, **sectional charts**, and other pilot information sources for pattern information on specific airports. Airport management has the final say on many pattern parameters. Here are a few of them:

- All turns are made to the left unless otherwise specified. "RP," listed on the last line of the airport data, designates a right pattern for runways 5 and 12 (see Figure 2).
  - Occasionally a right-hand traffic pattern will be established for terrain clearance or to avoid overflight of noise-sensitive areas.
  - It's not unusual to find a single runway served by a left-hand pattern when landing in one direction and a right-hand pattern when landing in the opposite direction.
- Landing aircraft have the right-of-way over aircraft on the ground.
- The speed of your aircraft determines the size of the traffic pattern.
  - ASF recommends that fixed-gear, single-engine airplanes fly downwind legs about 1/2 mile from the runway.
  - ASF recommends that pilots maneuver so as to be established on final approach 1/2 to 3/4 mile from the end of the runway.

Figure 2. Sectional Chart

  - Many single-engine airplanes fly at 70 to 80 knots during pattern operations. However, it's not unusual for high-performance singles and multiengine airplanes to fly the pattern at 120 knots or more. Obviously the faster aircraft will fly larger patterns.
  - Many antique airplanes and some helicopters fly considerably slower than 70 knots. You'll often see these aircraft flying downwind legs closer than 1/2 mile from the runway.
- No matter what size pattern your aircraft requires, you should follow traffic ahead of you in the pattern. This means that faster aircraft may need to slow down and extend downwind slightly to allow sufficient clearance from slower traffic.
- To reduce the risk of a stall/spin at a low altitude, bank angles should not exceed 30 degrees in the pattern.
  - Flying a pattern of the recommended size will require bank angles of approximately 20 to 30 degrees.
- The recommended pattern altitude for piston single-engine aircraft is generally 1,000 feet agl. There may be local exceptions; check the A/FD for details.
- The recommended pattern altitude for twins, turboprops, and jets is generally 1,500 feet agl. Again, there may be local exceptions; check the A/FD for details.

Communication

VFR charts depict towered airports in blue, and nontowered airports are shown in magenta. The basic difference between operating at a tower-controlled airport and one without an operating control tower is the difference between instructions and advisories. Tower controllers issue taxi, departure, and arrival instructions for pilots to follow on specific ATC frequencies. At nontowered airports, you will hear advisories on a CTAF, but the responsibility for collision avoidance, sequencing, and knowing the local procedures lies solely with the pilot.

Safety Tip
All aircraft should monitor the CTAF when operating in the vicinity of nontowered airports.

The CTAF frequency can be found on **sectional charts,** in the **AF/D,** ***AOPA's Airport Directory,*** **instrument approach charts,** or other airport directories. Frequencies do change, so use current references.

Nontowered airports without a flight service station (FSS) generally will have a unicom frequency. These are usually staffed by fixed-base operation (FBO) employees who provide airport information. The unicom is usually the CTAF.

Note: Unicom operators are not required to communicate with pilots, and if they do, there are no standards for the information conveyed.

- Some airports have part-time control towers. When the tower is closed, usually at night, nontowered operating procedures apply. The tower frequency usually becomes the CTAF when the tower is closed.
- Other airports have part-time FSSs that advise pilots of the winds, weather, and known traffic. Usually the FSS advisory frequency will become the CTAF when the FSS is closed.

Nontowered communication is not always easy, especially in metropolitan areas where there never seem to be enough frequencies to go around. It's not unusual for several airports within radio range to share the same CTAF. Make sure to state the airport name at the beginning and end of each transmission for the sake of both clarity *and* safety. ***"Lake Elmo traffic, Warrior Five-Four Charlie entering downwind Runway Three-Two, Lake Elmo."***

Safety Tip
The CTAF should be used for two reasons only:
- Collision avoidance
- Airport advisory

Listening to a busy CTAF for only a few minutes will reveal too many long-winded conversationalists. Don't use this vital collision-avoidance resource for aircraft or lunch scheduling, formation flying, saying hello to friends on the ground, discussing sports scores, or expressing your displeasure at the pilot who just pulled out on the runway while you were on short final.

Courtesy Tip
Listen before you speak. When two aircraft transmit at the same time, the frequency is blocked, resulting in a loud squeal. Plus, you can gain valuable information from listening to other pilots' radio calls.

Safety Tip
ASF recommends that pilots of nonradio aircraft use a hand-held transceiver at busy nontowered airports. This is an essential piece of safety equipment.

There are two golden rules for nontowered airport communication:

1. Be Specific
- When you transmit, begin by stating the name of the airport, followed by the model of your aircraft (Skyhawk, Cherokee, Bonanza, etc.) and the last three alphanumerics of the aircraft N number.
- It's common practice for pilots of homebuilt and other aircraft certificated in the experimental category to identify their airplanes as "experimental." There is a tremendous performance differential between a Lancair and a Baby Ace. Likewise, an RV-4 silhouette is altogether different from an Acro Sport. In order to aid identification and predict performance, ASF recommends that all traffic-pattern announcements include the aircraft type.

2. Be Brief
- It's more important for pilots to know what kind of airplane you're flying than to know your complete call sign. Knowing the model of airplane will help other pilots plan their pattern flight relative to you. The abbreviated version of your call sign takes up less of valuable air time. It's also easier for other pilots to remember a short call sign if they need to request an update on your position.
- To prevent confusion, use your full call sign whenever you hear another aircraft with a similar call sign.

Courtesy Tip
These days, a lot of pilots wrap up their initial position announcements with a request: "Traffic in the area, please advise." Don't be one of them. The phrase is redundant (we're all supposed to be listening and self-announcing anyway), and it contributes to frequency congestion. In fact, according to the AIM, it is "not a recognized self-announce position and/or intention phrase, and should not be used under any condition."

Figure 3. AWOS on Sectional Chart

Automated Weather Information

Some nontowered airports are served by AWOS (Automated Weather Observing System) or ASOS (Automated Surface Observing System). Pilots should monitor these systems, if available, before takeoff and 20 to 30 miles out when approaching the airport to land. AWOS/ASOS frequencies are shown on sectional charts (see Figure 3). Obtaining airport information this way will decrease congestion on the CTAF and allow more time for those all-important traffic announcements. At airports without automated information, you'll need to contact unicom for information: ***"Wings unicom, Conquest Three-Niner Alpha, 10 miles south, request airport advisory."***

Be Prepared

Familiarity breeds comfort and confidence. If you're not familiar with communication frequencies, pattern altitudes and procedures, or any other item at your departure or destination airport, look them up *before* becoming airborne.

Noise Note: Ask an instructor or FBO employee at your departure airport about special procedures such as noise-abatement departure routes or local protocols. You can telephone your destination field for the same information. One inconsiderate act, even inadvertently, can undo months of good will by conscientious pilots.

Carry current charts for the airport, and become familiar with the location of the airport with respect to landmarks and airspace. If it's your first flight to the airport, learn the orientation of the runways and the communications frequency. This will avoid a scramble to find information as you approach the airport.

Safety Tip

ASI recommends using instrument approach charts if they are available for the airports you are using.

With these useful charts, you'll:

- Have an airport diagram and CTAF frequency.
- Know where to expect inbound IFR aircraft.
- Know what ATC frequencies they will be monitoring.
- Know the location of significant obstacles.

If you cannot afford a set of instrument approach charts, consider acquiring an airport information guide or make a sketch of the airport diagram and other pertinent information. AOPA members may download and print free instrument approach procedure (IAP) charts from the *AOPA Airport Directory Online,* **www.aopa.org/members/airports.**

Collision Avoidance

At nontowered fields, it's possible that pilots in non-radio aircraft are practicing landings, IFR students and their instructors are practicing instrument approaches, helicopter pilots are perfecting their autorotation skills, or sailplanes are floating overhead. Not all pilots in the

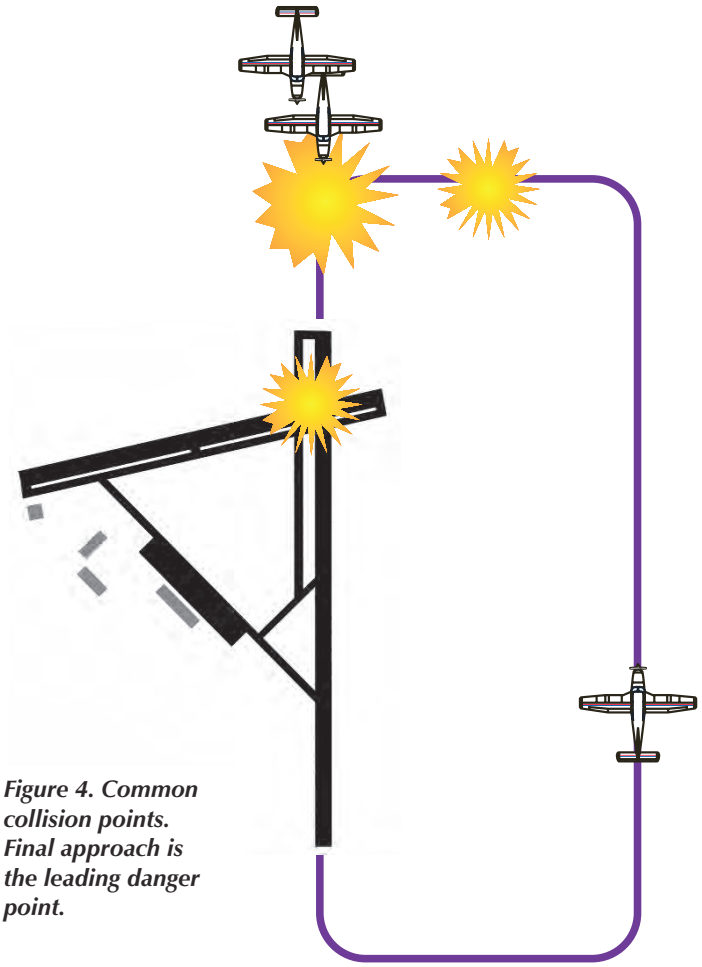

Figure 4. Common collision points. Final approach is the leading danger point.

area are announcing their positions and intentions on the CTAF, or even looking out the window!

Safety Tip
Use landing lights within 10 miles of the airport. Put it on your takeoff and descent checklists—it is the mark of a professional.

Midair collisions are the primary hazard associated with flying at nontowered airports. Most midair collisions occur in clear weather within five miles of an airport and below 3,000 feet, which is where aircraft congregate. Most collisions occur on final approach, generally when a faster aircraft overtakes a slower one (see Figure 4). For more ASI resources on collision avoidance, visit **www.asf.org/ca.**

Safety Tip
The airlines use the "sterile cockpit" concept to minimize distractions by restricting conversation to operationally pertinent topics. Brief your passengers or copilot that, within 10 miles of the airport, either inbound or outbound, they should not disturb you other than to point out traffic or significant aircraft-related items. It is not a time to answer general questions about the aircraft or sightseeing.

Takeoff and landing are the busiest times. There are many distractions—configuring the aircraft, checklists, setting equipment, and communicating—but this is precisely the time to be looking outside. Preset everything that can be done on the ground—navigation and communication frequencies, programming a GPS receiver, chart positioning, etc. Inbound, have the cockpit and your mind clear of distractions. Know the airport layout and have the frequencies set so **most of your attention can be directed outside.**

Managing Your Focus of Attention

Pattern flying requires pilots to focus their attention in several areas at once. When pilots concentrate on landing, they sometimes neglect collision avoidance tasks with disastrous results.

Items to consider:

Sequence
- Where is your place in the pattern?
- Who are you following?
- Are you faster or slower than the traffic ahead?
- Is someone overtaking or converging on you?

Airplane configuration
- Is the airplane set up for landing?

Track
- Are you following a ground track that conforms to the traffic pattern, and will it put you in a position for a stabilized approach?

Landing
- Are you aligned with the landing runway?
- Is the final approach leg clear?
- Is the runway clear?
- Have you verified airplane configuration?

Safety Tip
Stay alert all the way to the hangar. Final approach is the place where pilots narrow their focus to concentrate on landing. They "lock on" to the touchdown zone and stop scanning for traffic. This may be why most midair collisions occur on final approach to nontowered airports. Concentrating too much on landing may also contribute to landing with the gear up.

Figure 5. Blossom Effect

Safety Tip
An aircraft on a collision course will have no apparent movement relative to you, and the target will "blossom" just a few seconds before impact (see Figure 5). Survivors of midair collisions frequently have no recollection of seeing the other aircraft. In addition, it is easy to lose a target in the ground clutter—be at pattern altitude *before* entering the pattern.

Collisions also occur on the ground, both on runways and taxiways. This is especially a problem at dusk, night, or during periods of low visibility. Plan ahead: Download free airport/taxi diagrams from **www.asf.org/taxi.**

In calm or nearly calm wind conditions, be especially cautious. Another pilot may choose a different runway from the one you have selected. If the runway has a blind intersection or you cannot see the opposite end, be prepared. Remember that not everyone is on the CTAF.

Figure 6. Turn From Downwind to Base

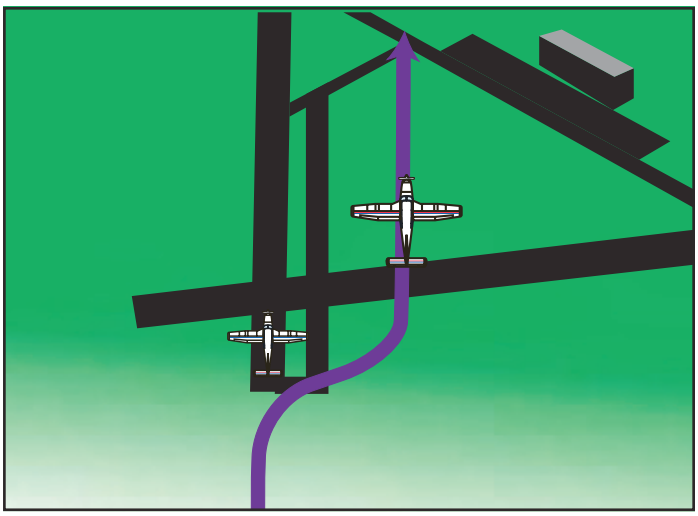

Figure 7. Aborted Landing on Short Final

Pattern Notes

- If an aircraft is ahead of you in the pattern, start your turn to base when you are abeam the other aircraft (see Figure 6). On final, use the approach slope guidance system (VASI, PAPI, etc.), if installed, to fly the proper glidepath.

- On short final, check that no other aircraft are on the runway. If you have to abort the landing because another aircraft is taking off, fly parallel to the runway on the opposite side of the pattern (an upwind leg) and keep the traffic in sight (see Figure 7). Maintain a safe distance from the other aircraft, and rejoin the pattern when it's safe.

- Announce your landing type on final. ***"Culpeper traffic, Warrior Eight-Six Uniform turning final, Runway Four, touch and go [or full stop], Culpeper."*** This allows pilots behind to gauge how long you are likely to be on the runway.

- If you fly a retractable, make it a habit to double-check the gear-down selector and indicator on final approach.

Departing the Airport

When departing a nontowered airport, monitor and communicate on the CTAF from engine start until you're 10 miles from the airport, so you'll be aware of other traffic that could conflict with your route. The exception is if you need to switch frequencies after departure to talk to ATC or the FSS.

Safety Tip
Remember to scan for traffic while talking on the radio.

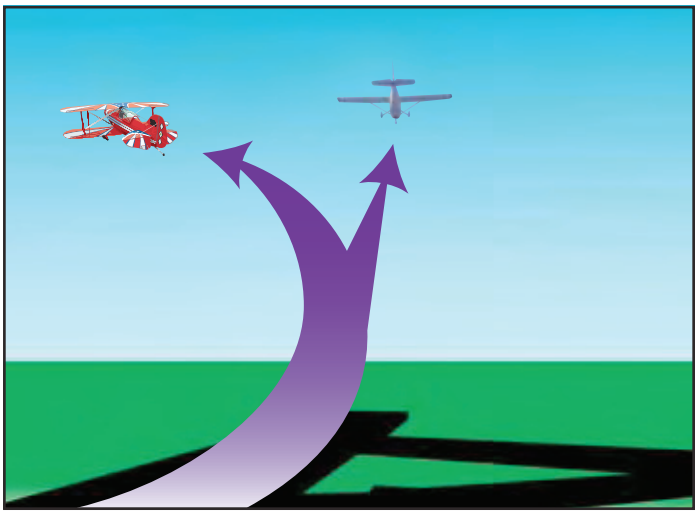

Figure 8. Departure

It's helpful to other pilots if you state what your intentions are after takeoff. For example: ***"Frederick traffic, Bonanza One-Three Charlie departing Runway Two-Three, to the west, Frederick"*** or ***"closed traffic,"*** as the case may be.

After takeoff, climb on the extended runway centerline beyond the departure end of the runway up to pattern altitude. At this point, you can continue straight ahead or make a 45-degree turn to the left (see Figure 8), or to the right if the airport has a right-hand pattern.

If you will be departing against the flow of the pattern, wait until you are at least at pattern altitude plus 500 feet before making a turn, and be sure to advise on the CTAF ***"Westco traffic, Arrow Four-Seven Romeo departing the pattern Runway One-Eight, right turn westbound, Westco."***

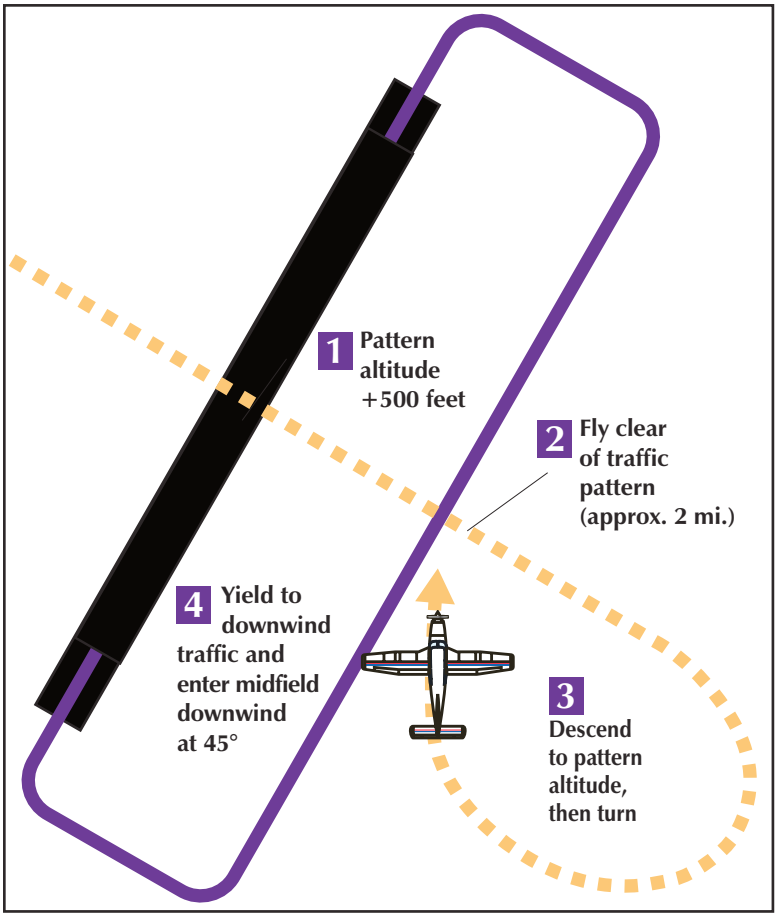

Figure 9. Preferred Entry from Upwind Leg Side of Airport

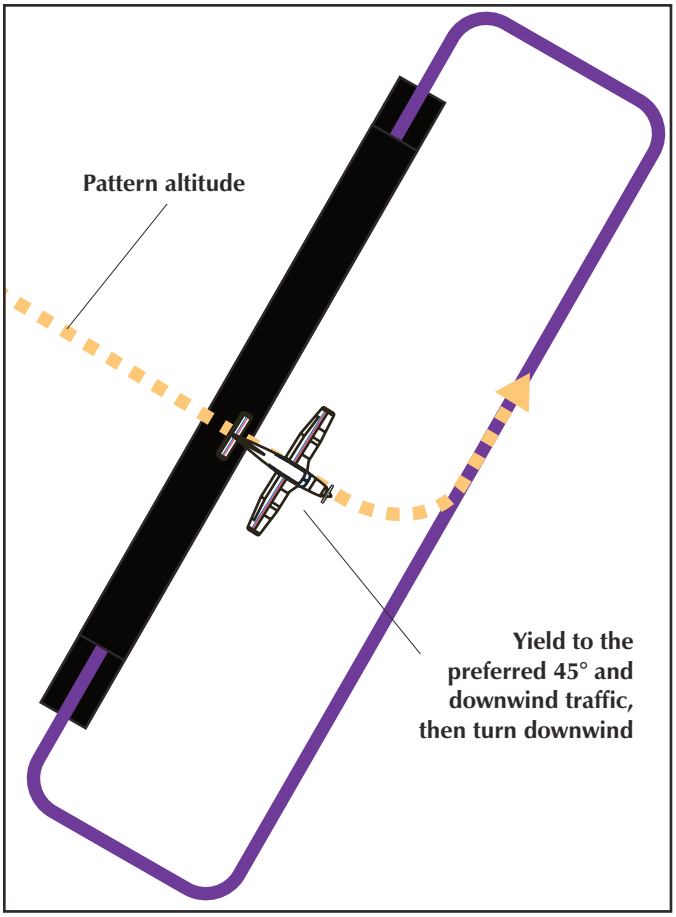

Figure 10. Alternate Midfield Entry from Upwind Leg Side of Airport

Noise Note: Use the full length of the runway and climb at V_Y to gain altitude as quickly as possible, unless an obstacle dictates the use of V_X. Upon reaching pattern altitude, reduce to climb power, or less if remaining in the pattern. This will help to decrease your noise footprint.

Safety Tip
The higher the angle of climb, the less visibility you'll have over the nose. Clear the area ahead by lowering the nose occasionally and/or turning slightly side-to-side as you climb.

Coming Home

Nontowered airport traffic patterns are always entered at pattern altitude. How you enter the pattern depends upon the direction of arrival.

- The preferred method for entering from the downwind leg side of the pattern is to approach the pattern on a course 45 degrees to the downwind leg and join the pattern at midfield (see Figure 1 on page 2).

There are several ways to enter the pattern if you're coming from the upwind leg side of the airport.

- One method of entry from the "opposite" side of the pattern is to cross over midfield at least 500 feet above pattern altitude (normally 1,500 feet agl). When well clear of the pattern—approximately two miles—descend to pattern altitude, then turn to enter at 45 degrees to the downwind leg at midfield (see Figure 9).
  - Because large and turbine aircraft fly 1,500-foot-agl patterns, crossing 500 feet above the single-engine pattern altitude might place you in conflict with traffic. If large or turbine aircraft are operating into your airport, 2,000 feet agl is a safer crossing altitude.
- An alternate method is to enter on a midfield crosswind at pattern altitude, then turn downwind (see Figure 10). This technique should not be used if the pattern is busy. Give way to aircraft on the preferred 45-degree entry and to aircraft already established on downwind.

Again, aircraft using the alternate entry should yield to aircraft using the preferred entry and to aircraft on downwind. In either case, it's vital to announce your intentions, and remember to scan outside. Before joining the downwind leg, adjust your course or speed to blend into the traffic. Announce ***"Winfield traffic, Centurion Three-Six Yankee, midfield crosswind Runway One-Eight, Winfield."***

Adjust power on the downwind leg, or sooner, to fit into the flow of traffic. Avoid flying too fast or too slow. Speeds recommended by the airplane manufacturer should be used. They will generally fall between 70 to 80 knots for fixed-gear singles, and 80 to 90 knots for high-performance retractables.

Safety Tip
Slower aircraft should fly a tighter traffic pattern. Practice until you are comfortable making up to 30-degree banks for base and final. Too close leads to a potential overshoot or a stall from an oversteep turn. Too wide leads to a greater noise footprint and a strung-out final, not a good place to be if the engine quits.

Nobody's Home

How do you find the active runway when there are no aircraft in the pattern and no one answers on the CTAF? Overfly the airport at least 500 feet above the traffic pattern, and look for a windsock, wind tee, or tetrahedron. Then fly clear of the pattern, descend to the traffic pattern altitude, and enter the downwind leg as shown in Figure 9.

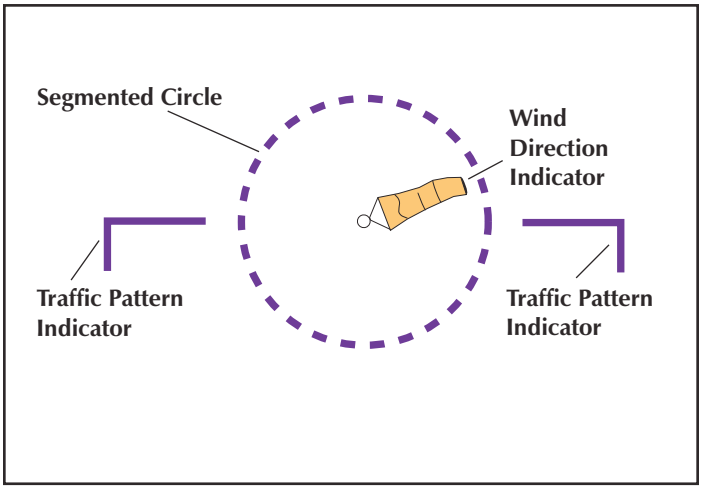

Figure 11. Traffic Pattern Indicator
(See AIM 4-3-4 for more information)

Going Straight

Occasionally you might be inbound to a nontowered airport on a heading that will allow a straight-in approach. Though permissible, **a straight-in approach should only be used when you are certain there will be no conflict.** Straight-ins should yield to other aircraft in the pattern. If another aircraft is ahead of you on base and the spacing will not be sufficient, go around by altering course to the right (on a standard left pattern), enter the upwind leg, and turn crosswind when it's safe.

When straight-in, announce your position on a three-mile final and again on a one-mile final. Use landing lights and strobes to increase the visibility of your aircraft. Report ***"Dodge City traffic, Twin Cessna Three-Eight Golf, three-mile [one-mile] final Runway Three-One, Dodge City."*** Nonradio aircraft should avoid straight-in approaches.

Safety Tip
Large, turbine-powered aircraft make more straight-in approaches than light singles. They frequently conduct instrument approaches, and their high traffic pattern speeds (120-plus knots) make it difficult for them to fit in with light aircraft. Remember that even though an aircraft may be required to yield the right-of-way, it might not always do so. Always announce your position on final, where you're most likely to be overtaken by a faster aircraft.

Courtesy Tip
If there are several aircraft waiting to take off, announce that you are extending downwind to let traffic depart. ***"Findlay traffic, Katana Five-Four Foxtrot, extending downwind Runway Two-One to allow departures, Findlay."***

It's Instrumental

Instrument approaches present special challenges at nontowered airports. Pilots practicing instrument approaches frequently make straight-in approaches to the approach end of the active runway, the departure end, or even to a crossing runway. It all depends on which runway(s) at the airport are served by instrument approaches. This is a potentially confusing situation to VFR pilots flying a standard traffic pattern to the active runway. Add to this mix an unfamiliar IFR vocabulary heard over the CTAF—terms like "procedure turn outbound," "outer marker inbound," or "RICKE [the name of an intersection] inbound," and you have the ingredients for a traffic conflict.

Pilots practicing instrument approaches at nontowered airports on a VFR day should announce their position in

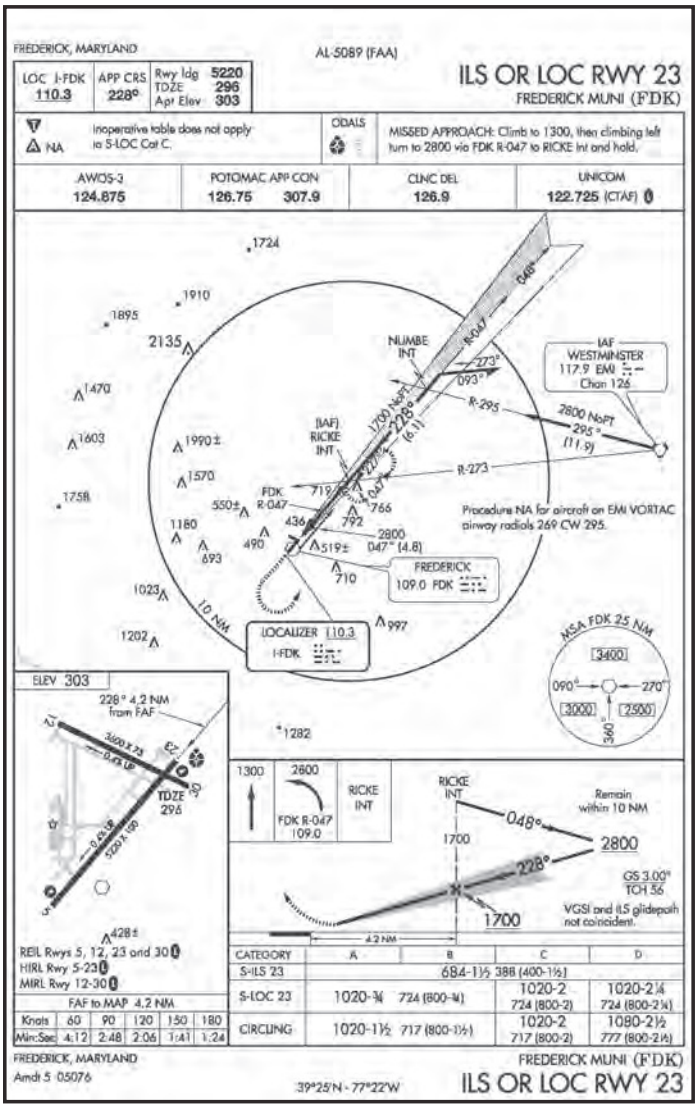

Figure 12. IFR Approach Chart—NOT FOR NAVIGATION

both IFR and VFR terms, ***"Frederick traffic, Seminole Three-Six Lima, RICKE inbound, four-mile final, Runway Two-Three, Frederick. "***

VFR pilots will benefit from a little education about instrument operations at a nontowered airport. Learn if the airport has IFR approaches and, if so, to which runways by referencing the A/FD. Have an instrument-rated pilot or instructor describe the approach procedures and explain the phraseology IFR pilots use to announce their positions and intentions.

A situation that poses special risks is when a nontowered airport is blanketed by a broken or overcast ceiling or visibility is reduced—due to haze, for example—yet visual meteorological conditions (VMC) exist below the cloud layer. In that case, it's possible for a pilot flying an actual IFR approach in the clouds to break out below the ceiling and encounter a VFR pilot turning base for a practice touch and go. While ATC offers traffic advisories before terminating service, it helps if both pilots are diligent in communicating on the CTAF. But even that doesn't guarantee against a conflict on the final approach, because they can't see each other until the IFR aircraft has descended below the cloud layer.

Safety Tip
Instrument flight instructors should exercise particular vigilance during VFR conditions, when it is easy to get distracted by the student's activities. Your primary responsibility is to see and avoid.

Under reduced visibility (but still VMC) and nearly calm conditions, many IFR pilots will opt for a straight-in approach, which may conflict with local VFR traffic. Recognize that the VFR pilot may have a greater level of situational awareness, a more maneuverable aircraft, and possibly a lower fatigue level, because he or she hasn't been flying in the clouds for several hours.

If you know where the missed approach holding fixes are and how instrument traffic navigates to those fixes, you'll know where IFR pilots are headed when they announce on the CTAF they are executing a practice missed approach. You also can calculate how long it will take an IFR aircraft to fly from an instrument approach fix to the runway. The pilot of a high-performance single, who reports crossing a fix five miles from the runway, will take a little more than three minutes to cover the distance to the runway at 90 knots. A 120-knot twin will take about two and 1/2 minutes. If you hear a pilot in a single report "procedure turn inbound," add about a minute to the inbound time.

Once you get a mental picture of instrument operations at the field, you'll be able to anticipate and monitor IFR traffic as you fly your VFR patterns.

Safety Tip
If there is heavy VFR traffic and you're on an instrument approach to other than the active runway, break off the approach before a conflict develops and enter normal traffic. Announce your intentions on the CTAF.

For help in avoiding IFR traffic, ask ATC for radar advisories while en route. The controllers will be handling IFR traffic to and from the airport, and they will help keep you apprised of possible conflicts, but under VFR, you are still responsible to see and avoid.

Figure 13. Freefall Drop Zone

Courtesy Tip
If another aircraft is on a straight-in instrument approach in visual conditions and it will not greatly inconvenience you, consider extending your downwind to follow the aircraft. Be sure to announce your intentions.

Serving Two Masters

Instrument pilots approaching nontowered airports will usually be in radio contact with an air traffic control facility until they are quite close to landing. Many instrument approach procedures have reporting points where pilots must communicate with ATC. At the point the instrument flight breaks out of the clouds and the pilot sees the airport, ATC will generally approve switching to the CTAF for traffic announcements. In good weather, you may hear instrument pilots reporting approach waypoints and fixes on the CTAF. Following are some common calls you'll hear from instrument flights:

- "Outer marker inbound" or name of fix—the instrument flight is approximately three to seven miles out on final approach to land.
- "Procedure turn inbound"— the instrument flight has flown away from the airport, reversed course, and is headed toward the airport. The instrument traffic will be about five to seven miles from the airport and will often be within 30 degrees of the runway heading.
- "VOR [or NDB] inbound"— the instrument flight has passed over an off-airport VOR or NDB navigation aid and is headed toward the field. The distance will vary according to how far away the navigation aid is, but will generally be within 10 miles of the airport.
- You'll also hear calls that identify intersections that are part of instrument approach procedures. Intersection names will vary, but all are comprised of five characters forming one word; e.g., ***"Frederick traffic, Bonanza Three-Six Whiskey, SUSII inbound GPS 5 approach, Frederick."***

Other Operations

Not everyone is, or can be, concerned with adhering to standard nontowered operating procedures. How is a glider pilot to fly a standard traffic pattern, or execute a go-around? Gliders and balloons have the right-of-way over powered aircraft. Sport parachutists maneuver to downwind, base, and final approach legs, but they don't bear much resemblance to a fixed-wing pattern. Helicopters scoot in and out of the airport, from various directions. Pilots of corporate jets and twins are reluctant to fall in behind a two-seat trainer on downwind, and may opt for a straight-in instead.

First, listen to the CTAF. Second, learn about the procedures the local helicopter pilots use (often a right-hand pattern), where the gliders operate and the approach procedure they use to get back on the ground, and where sport parachutists like to drop in for a visit. They usually have a well-defined drop zone.

Parachutists in freefall are virtually impossible to spot, so avoid overflying an airport with an active drop zone. The FSS may be able to tell you if a drop zone is active. Plan to pass five miles from the center of the drop zone. If you are landing at an airport with an active drop zone, descend to lower than 2,000 feet agl by the time you are within five miles of the destination field. Skydivers will have pulled their parachutes by the time they reach 2,500 feet agl, making them much easier to spot.

Safety Tip
Ask ATC for the coordination frequency for skydiving operations and monitor that frequency when you're in the area. This can be a more reliable way of hearing about jump operations than monitoring the CTAF.

You may not hear the altitude of the jump-plane, but you'll get a one-minute warning and a "jumpers away" call. Jumpers will be in freefall for a minute, plus or minus 30 seconds, before deploying their parachutes. They'll usually be on the ground five or six minutes after you hear that they've departed that perfectly good airplane. ASF works with and supports the U.S. Parachute Association in coordinating safe operations for all airspace users.

Common Courtesy

It helps to keep in mind that traffic procedures at nontowered airports are advisory in nature, not regulatory. There frequently is more than one way to fly a safe pattern, final approach, and landing. You'll see a lot of different interpretations of the traffic pattern.

- Taking other pilots to task because they don't exactly follow your interpretation of the local procedures is asking for trouble, especially if you lecture the pilot. If you feel the need to discuss a situation, do it on the ground—politely.
- Use courtesy and respect. There can be honest differences of opinion, and we should be far more courteous to one another than most automobile drivers.
- Give the other pilot the benefit of the doubt to compensate for the time when you were the one who may have made an inadvertent error.
- If all else fails, provide the erring pilot with a copy of this Safety Advisor and know that you have made a small contribution to safe pilots and safe skies.

Safety Tip

Think like an air traffic controller when you fly. Controllers try to maintain an orderly, efficient flow of traffic, meaning you'll slow down or extend to accommodate the traffic ahead or alter your normal pattern slightly to conform to the traffic situation.

Appendix

FAR 91.113 (b)-(g)—Right-of-Way Rules: Except Water Operations

(b) General. When weather conditions permit, regardless of whether an operation is conducted under instrument flight rules or visual flight rules, vigilance shall be maintained by each person operating an aircraft so as to see and avoid other aircraft. When a rule of this section gives another aircraft the right-of-way, the pilot shall give way to that aircraft and may not pass over, under, or ahead of it unless well clear.

(c) In distress. An aircraft in distress has the right-of-way over all other air traffic.

(d) Converging. When aircraft of the same category are converging at approximately the same altitude (except head-on, or nearly so), the aircraft to the other's right has the right-of-way. If the aircraft are of different categories—

(1) A balloon has the right-of-way over any other category of aircraft;

(2) A glider has the right-of-way over an airship, powered parachute, weight-shift-control aircraft, airplane, or rotorcraft.

(3) An airship has the right-of-way over a powered parachute, weight-shift-control aircraft, airplane or rotorcraft.

However, an aircraft towing or refueling other aircraft has the right-of-way over all other engine-driven aircraft.

(e) Approaching head-on. When aircraft are approaching each other head-on, or nearly so, each pilot of each aircraft shall alter course to the right.

(f) Overtaking. Each aircraft that is being overtaken has the right-of-way and each pilot of an overtaking aircraft shall alter course to the right to pass well clear.

(g) Landing. Aircraft, while on final approach to land or while landing, have the right-of-way over other aircraft in flight or operating on the surface, except that they shall not take advantage of this rule to force an aircraft off the runway surface which has already landed and is attempting to make way for an aircraft on final approach. When two or more aircraft are approaching an airport for the purpose of landing, the aircraft at the lower altitude has the right-of-way, but it shall not take advantage of this rule to cut in front of another which is on final approach to land or to overtake that aircraft.

FAR 91.126 (b)

(b) Direction of turns. When approaching to land at an airport without an operating control tower in Class G airspace—

(1) Each pilot of an airplane must make all turns of that airplane to the left, unless the airport displays approved light signals or visual markings indicating that turns should be made to the right, in which case the pilot must make all turns to the right; and

(2) Each pilot of a helicopter or a powered parachute must avoid the flow of fixed-wing aircraft.

FAR 91.127 (b)

(b) Departures. Each pilot of an aircraft must comply with any traffic patterns established for that airport in part 93 of this chapter.

Tips for Airport Managers

- Spreading the word: Airport management is responsible for developing pattern and noise abatement procedures. As time passes, the needs of the airport and the surrounding community change, so it's a good idea to schedule a periodic review of these procedures. AOPA has printed reference materials for a variety of airport-related topics. Call 800/USA-AOPA for details.

- Many nontowered airports with heavy-to-moderate traffic have a "saturated pattern" policy; i.e., touch-and-go landings are not permitted when five or more airplanes are circulating in the pattern. This will help expedite departures.

- The best-laid plans won't succeed if they aren't available to the people who need them. Distribute your traffic pattern and noise-abatement procedures through as many outlets as possible, including:
  - Posters for FBOs on the field
  - Hand-outs for flight schools to distribute to their students
  - Notification of special procedures in ***AOPA's Airport Directory,*** **the A/FD,** and other sources
  - Participation in, or sponsoring of, pilot/community meetings and safety seminars

Tips for Instructors

- Quiz your students. Discuss:
  - Traffic pattern legs;
  - Traffic pattern entry and departure procedures;
  - Use of proper phraseology; and
  - Primary collision points.
- To see how the other half lives, you may want to pick a day when traffic is light and fly the pattern at 120 knots. This will give you and your student a better appreciation for what the twins and business jets have to contend with.

- Students emulate their instructors. That's a good thing, but it also means that they'll pick up any bad habits you may have, as well. Some common problem areas are:
  - Using the CTAF to check your schedule or attend to company business—Your boss may not like it, but if there's a need for radio communication, another frequency is definitely in order.
  - Shortcutting the pattern—If you don't want your students to fly straight-in, you must fly complete patterns yourself or at least instruct them in how to decide when nonstandard pattern flying is appropriate.
  - Chewing out another pilot on the CTAF—The end of a long day of instructing is not the best time to be uncharitable to the pilot who, either deliberately or inadvertently, cut you off in the pattern. If you vent your frustration here, you can be assured your student is just waiting for an opportunity to do the same.

Get more information on safe airport operations at **www.airsafetyinstitute.org/spotlight/airportops**

Summary

1. **Look**
2. **Know before you go**
3. **Fly defensively**
4. **Fly the appropriate pattern**
5. **Use the CTAF**
6. **Use landing lights**
7. **Yield the right-of-way**
8. **Be courteous**
9. **Keep a sterile cockpit within 10 miles of an airport**
10. **Fly quietly**

The way to fly safely at nontowered airports is to REACT.

Radio
Listen to the automated weather observations, if available, and the CTAF for airport information and traffic advisories.

Eyes
Use them! Look for other traffic. This is the top priority when operating in the vicinity of a nontowered airport. Use landing lights so other pilots can see you more easily.

Announce
Report your position and intentions using standard phraseology.

Courtesy
A little courtesy will smooth out most problems. The "me first" attitude is rude and can even be dangerous.

Traffic Pattern
Follow the recommended procedures. Before you fly, research the necessary information about your departure and destination airports.

Generalized Amplified Flight Procedures

(Flight Instructor Preference Takes Precedence)

NORMAL TAKE-OFF & CLIMB

1. Flaps at 0 degrees.
2. Ailerons into the wind and elevator about ½" back from the gust lock hole.
3. Apply smooth full power, then check for at least 2300 RPMs and oil temperature and pressure in the green.
4. Maintain runway alignment with rudder (mostly right).
5. Slowly decrease aileron deflection as the airplane accelerates.
6. At 55KIAS pull elevator back to pull nosewheel off the ground and place the top edge of the cowling on the horizon.
7. Establish Wind Correction Angle to stay over the runway.
8. Keep the top of the cowling on the horizon and the wings level. Climb Speed 70-80 KIAS

LEVEL OFF

1. 20 feet before reaching desired altitude, reduce pitch to level attitude (increasing forward yoke pressure).
2. Accelerate to 100KIAS keeping level attitude.
3. Reduce power to 2400 RPM (throttle back).
4. Trim.
5. Check Heading Indicator.

DESCENT

1. Reduce power to 2000 RPM (throttle back).
2. Allow the cowling to lower and stabilize.
3. Adjust pitch for 110KIAS and 500ft per min. descent.
4. At 50 feet above desired altitude, increase power back to 2400RPM.

LEVEL TURN

1. Lift wing and check for traffic in direction of turn. (Use rudder to hold heading).
2. Smoothly apply aileron deflection and rudder pressure in direction of turn. (Slight left rudder pressure in left turn, more right rudder in right turn). Watch cowling/horizon in turn.
3. As airplane banks, apply slight elevator back pressure proportional to steepness of bank, to hold altitude.
4. When proper bank angle is established – neutralize ailerons to maintain bank.
5. 5 degrees before the desired heading, apply ailerons and rudder opposite the direction of turn, simultaneously reducing elevator backpressure.

STEEP TURNS

1. Ask instructor/examiner/passengers to help look for traffic.
2. Do one 180 degree or two 90 degree clearing turns.
3. When rolling in to the turn, dial in 2 full turns of nose up trim.
4. Establish a 40 to 45 degree banked turn, focusing on the cowling/horizon.
5. If low, rollout the bank slightly and increase the backpressure.
6. If high, roll in steeper and reduce backpressure.
7. 20 degrees before the desired rollout heading, begin a smooth rollout with rudder and ailerons. Hold pitch down and dial out the nose up trim.

SLOW FLIGHT

1. Carb Heat on.
2. Reduce power to 1500RPM, hold heading with rudder (left)
3. Hold altitude with backpressure and trim (three full turns) while decelerating.
4. At 70 KIAS, add power to1850RPM, adjust pitch and trim for 64KIAS.
5. Adjust altitude with power and maintain 64KIAS with pitch. REMEMBER: PITCH CONTROLS AIRSPEED, POWER CONTROLS ALTITUDE.
6.Maintain altitude while making shallow left and right turns.

SLOW FLIGHT TO CRUISE

1. Carb Heat off.
2. Smoothly add full power and forward elevator pressure to hold altitude.
3. Hold heading with rudder (right).
4. Accelerate to 100 Kias
5. Take out 3 turns of nose up trim and reduce power to 2400RPM

POWER OFF STALL (Straight ahead and turning)

1. Do one 180 degree or two 90 degree clearing turns.
2. Carb Heat on, power off, smoothly.
3. Hold altitude with pitch.
4. At stall buffet, simultaneously reduce pitch, level the wings, add full power, and Carb Heat off, right rudder pressure.
5. Smoothly raise the pitch to climb attitude.
6. Transition to cruise.

POWER OFF STALL WITH FLAPS (STRAIGHT AHEAD AND TURNING)

1. Do one 180 degree or two 90 degree clearing turns.
2. Carb Heat on, power to 1700RPM
3. Hold altitude with pitch.
4. Apply full flaps, holding altitude with forward elevator pressure as flaps come down.
5. At final approach speed (65KIAS) smoothly pull off power, establish a descent (as you would coming in for landing), and then raise pitch, simulating a landing stall.
6. At stall buffet, simultaneously reduce pitch, level wings, add full power, Carb Heat off, right rudder pressure.
7. Immediately after power is applied raise flaps to 20 degrees (2 seconds) and raise pitch to climb attitude.
8. As the airplane stabilizes, raise flaps to 10 degrees (2 seconds)
9. Flaps up and transition to cruise.

POWER ON STALL (Straight ahead and turning)

1. Do one 180 or two 90 degree clearing turns.
2. Carb Heat on, power to 1500RPM
3. Hold altitude with pitch, heading with rudder.
4. At 55KIAS Carb Heat off, full power, right rudder.
5. Gradually continue to increase pitch.
6. At stall buffet, lower pitch below the horizon, then smoothly raise pitch to climb attitude and transition to cruise.

EMERGENY LANDING

1. **A**irspeed – Adjust pitch with 3 turns nose up trim to hold 65KIAS.
2. **B**est place to land – select best site considering length, obstructions, surface, wind direction. If high, spiral down over approach end. If not, fly modified pattern.
3. **C**hecklist – Fuel shutoff valve – ON,
   Mixture – RICH
   Throttle – FULL
   Carb Heat – ON
   Mags – CHECK LEFT AND RIGHT
4. **D**eclare – Transponder – 7700, Current frequency or 121.5, Mayday X 3.
5. **E**xit – Just prior to landing –
   Fuel shutoff Valve – OFF
   Mixture – IDLE CUTOFF
   Mags – OFF
   Master switch – OFF (if you don’t need radio, flaps or lights for landing)
   Doors – POP OPEN
   Execute soft field landing

NORMAL LANDING

1. On downwind, abeam the approach end, carb heat on, Power to 1500RPM
2. Hold altitude with pitch. Apply 10 degrees of flaps (within the white arc), and then reduce pitch to hold 75KIAS.
3. When threshold is 45 degrees behind A/C, turn base while applying flaps to 20 degrees. Hold 70KIAS with pitch.
4. Check altitude and adjust with power as needed.
5. Check extended final approach course for traffic and turn final. (Plan to roll out on extended centerline with wind correction angle. Make radio call.
6. Adjust pitch to hold 65KIAS and ajust position on glideslope with power and flaps.
7. Level off at 10ft AGL. Float dowl level to 5ft above the runway.
8. Pull back smoothly and hold A/C off runway as long as possible.
9. Report clear of the runway. Transponder to Standby, Carb Heat-Off, Retract flaps.

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