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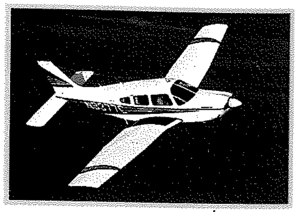

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- The production and distribution of a continuously updated series of safety pamphlets, video tapes, and newsletters, all of which are available at a nominal cost or free of charge.
- A nationwide series of free aviation safety seminars, in which the nation's most respected aviation educators conduct training sessions on topical aviation issues.
- A nationwide series of training and recertification programs for flight instructors, who distribute the latest safety and regulatory information throughout the aviation community.

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Safe Pilots. Safe Skies.

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PINCH-HITTER® COURSE

PILOT TRAINING MANUAL

A Safety Project of the AOPA Air Safety Foundation

Reprinted November, 1999
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Introduction

As an aircraft passenger, have you ever wondered what it would be like to be the pilot?

Or wondered what makes an airplane fly?

Have you ever wished you knew enough about flying that you could participate in the flight instead of just riding along?

We intend to answer your questions and put any concerns to rest. The AOPA Air Safety Foundation designed this Pinch-Hitter® video and book specifically for non-pilots. You will learn not only about flying, but also how to enjoy it more. After you complete your Pinch-Hitter® flight training, you will be able to function effectively as a cockpit crew member. You will gain the emergency coping skills required to take over the controls, navigate to the nearest suitable airport and land.

Although this is not a student pilot course, the dual flight instruction you receive as a Pinch-Hitter® may be credited toward obtaining a pilot certificate. In fact, many Pinch-Hitter® graduates find the experience so gratifying that they enroll in formal flight training and obtain a pilot certificate (and yes, a few others have "taken over" in emergency situations and landed safely).

You may find some minor differences between the "generic" instruments and equipment described in this book and those installed in your aircraft. The operating principles, however, are unchanged. You will learn how to fly straight and level, make turns, climb and descend. Later, you will move on to navigation, communication and flying to an airport for landing.

It is our sincere hope that you enjoy and benefit from all aspects of the experience. You are about to discover that flying is fun and not that difficult!

Contents

The Magic of Flight

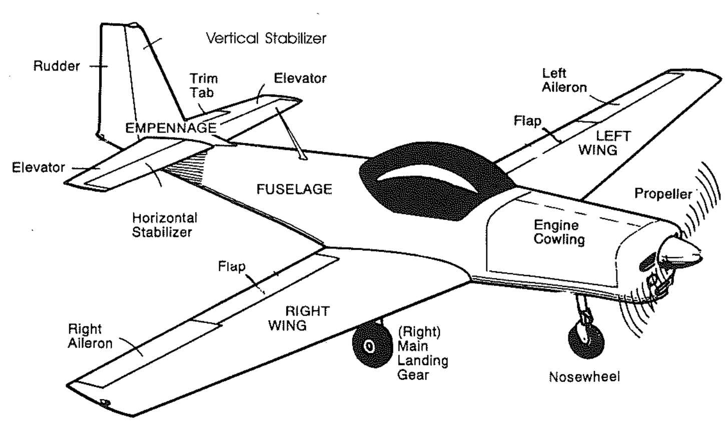
Flight may seem magical and mysterious but there are some very logical reasons why airplanes fly. We'll look at some of them briefly before getting directly into aircraft control. But first, let's look at some of the terms used by pilots in talking about aircraft so we can begin our study of flying with a common understanding of the aircraft components.

Parts of an Airplane

Although there are many types of aircraft constructed from many types of materials, most modern day planes are made of metal and share common features.

The **FUSELAGE** is the main structure of an aircraft that carries the pilot and passengers. The other parts that make up a complete aircraft are attached to the fuselage.

EMPENNAGE is the collective name given to several components located on the tail section of the airplane. These parts help to provide stability and balance while the airplane is in flight.



The parts of an airplane. Note the control surfaces: ailerons, rudder, and elevator.

WINGS are the structures that support the airplane in flight. Without them we would have nothing more than a strange looking car! They may be located above the fuselage, in which case the aircraft is referred to as a high-wing, or below the fuselage and called a low wing. Where the wings are placed is not important. Understanding that they generate lift and how this happens is important. More about that later.

AILERONS are the movable control surfaces near the end of the wings. They are controlled with a control wheel by the pilot and move in opposite directions from each other, meaning when one goes up, the other goes down. The ailerons are used to turn the airplane.

The **RUDDER** is attached to the vertical stabilizer, which is part of the empennage of the aircraft. It is controlled with floor pedals and moves either left or right, depending on which way the pilot needs to move them. It has a number of specific uses, but most pilots use the rudder to help them make smooth turns.

The **ELEVATOR** is the movable structure attached to the horizontal stabilizer, and can be moved up or down with a control wheel by the pilot. Doing so will cause the aircraft to climb or descend. In some aircraft the whole horizontal tail surface moves and this is called a stabilator.

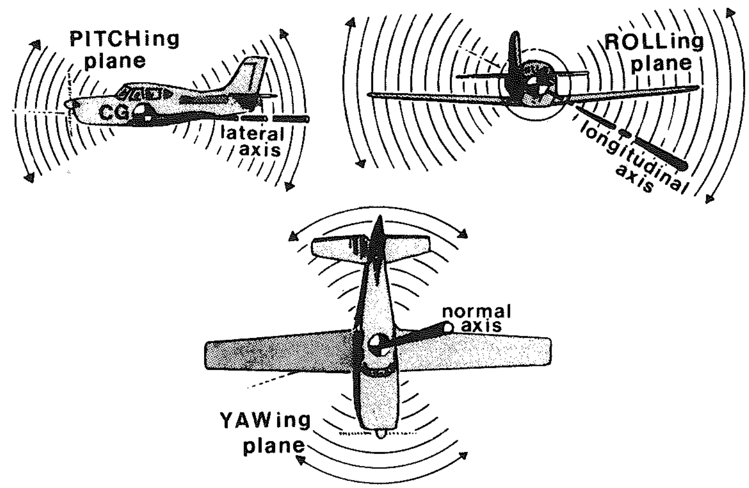
FLAPS are the movable control surfaces on the part of the wing closest to the cabin. They are generally used to help slow the aircraft for landing. The flaps are controlled by the pilot from the cockpit and are slanted downward during slow flight and landings, and retracted during cruise flight.

Aircraft Movement

"Pitching" is the nose-up or nose-down movement of the aircraft. The pilot controls aircraft pitch by moving the elevator.

"Rolling" is the left or right banking motion of an aircraft. The pilot moves the ailerons to roll the aircraft left or right for turns, just as a bicyclist would lean left or right in a smooth turn.

"Yawing" refers to moving the nose of the airplane left or right. The pilot banks into a turn with the ailerons and moves the nose in the proper direction with the rudder. It is possible to turn an aircraft using rudder or aileron alone, but the turn will be smoother if both controls are used.



The airplane is controlled by the pilot through the movable control surfaces

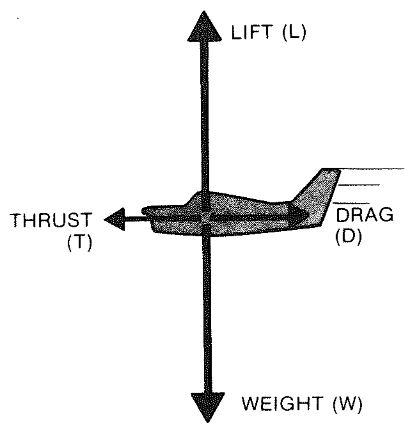
Unseen Forces

There are four forces acting on an airplane in flight.

THRUST is the combined action of the engine and propeller. This force pulls the aircraft forward, much as the engine and propeller of a ship provide thrust in the water.

DRAG is the force that opposes thrust. It's the same force you feel if you extend your arm out the window of a fast-moving car. As you might imagine, drag becomes greater as speed increases.

WEIGHT is caused by gravity, the force pulling objects toward the center of the earth.

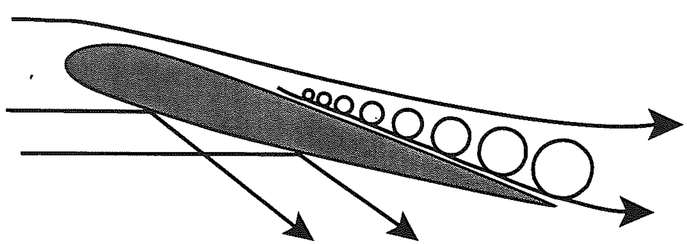


The four forces of flight are Thrust, Drag, Lift, and Weight.

LIFT is perhaps the most mysterious and important force acting on the aircraft. As such, it deserves some extra attention. Lift is the force acting opposite of gravity and is generated whenever air flows smoothly over a wing. A technical discussion of how lift is created is beyond the scope of this booklet, but when lift exceeds gravity, the aircraft will leave the ground and climb. The amount of lift an aircraft wing will generate depends on several factors. One very important factor to pilots is a concept called angle of attack.

Angle of Attack

The angle at which the wing is slanted toward the airflow is referred to as its "angle of attack." Generally, increasing the angle of attack increases lift. That's why the airplane is pitched up in a climb, But, like other things in life, too much of a good thing can cause problems. If we slant the wing up too much, the airflow above the wing becomes turbulent, and only a smooth flow of air gives us lift. Once this happens we begin to lose lift. If we continue to increase the "angle of attack" we will eventually reach a point where there is not enough lift to support the weight of the airplane. This is called the "critical angle of attack" and it is the point at which the wing stops flying. It is also referred to as an "aerodynamic stall." This "stall" is different from what you might think of in a car. When a car "stalls" we mean the engine has quite. When a plane stalls it means the wings have exceeded their critical angle of attack and can no longer support the weight of the airplane. The solution to this problem is very simple—lower the nose of the airplane to smooth out the airflow and you will regain lift.



If the wing is slanted up too much, the smooth flow of air that creates lift is disrupted. The result is a "stall," which is remedied by lowering the nose of the airplane.

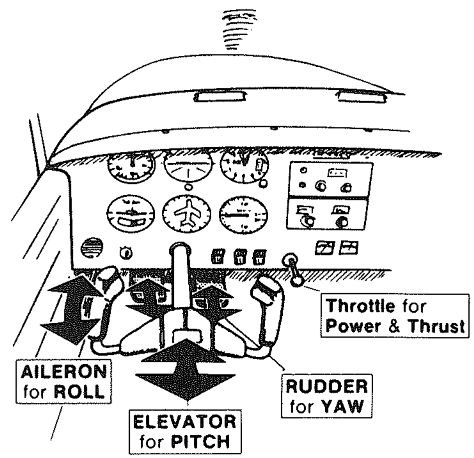
Aircraft Control

Before discussing aircraft control, you should know that airplanes are designed to be stable. In fact, even without an autopilot, "hands off" flight usually results in only a gradual climb, turn or descent. You needn't worry about the airplane getting "away" from you. As you'll discover when you take flight instruction, controlling an aircraft is only a little bit more complicated than driving a car.

You will learn that it doesn't take much pressure on the control wheel to make the aircraft respond. Even the weight of your hand or a tight grip on the controls can cause unwanted turning or climbing. So, stay relaxed and fly with your fingertips.

As you may have noticed in flights with your pilot companion, the control wheel is used to bank the airplane. Turning the control wheel to the right results in a bank to the right. Likewise, moving the control wheel to the left results in a left bank. When the bank is as steep as you want it to be, center the control wheel so the bank won't get steeper.

The control wheel, through "push-pull" movement, also moves the elevator. Pulling the control wheel toward you causes the elevator to go up and the nose of the aircraft goes up. Pushing the control wheel forward moves the elevator down, causing the nose of the aircraft to lower.



The three main flight controls.

The foot pedals move the rudder. In a turn to the right, we move the control wheel to the right and press the right rudder pedal a bit to coordinate the turn. (On a bicycle, we would lean to the right and add some right handlebar).

The rudder pedals on most aircraft control steering on the ground. During taxi, the pilot uses right rudder pressure to turn the aircraft right and vice versa. Aircraft brakes are usually built-in to the tops of the rudder pedals. Applying pressure to both "toe" brakes stops the aircraft. Pressing only the right brake causes the right main wheel to slow down, resulting in a tighter right turn than is possible with the steering system alone. Again, aircraft systems vary, and your flight instructor will provide you with information on your aircraft.

By the way, steering on the ground often seems a bit unnatural for new pilots. That's because, ever since childhood, we've been steering machines with our hands. You may find it helpful to place your hands on your lap while taxiing the aircraft. If you find that steering on the ground is challenging, don't be discouraged. It only takes a bit of practice to master the skill.

Aircraft Control Summary

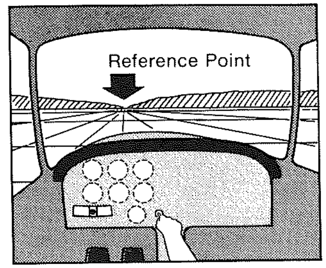
- Pulling the control wheel toward you will cause the nose to rise (move upward). This will cause the aircraft to slow down much the same as a car climbing a hill slows down.
- Pushing the control wheel away from you will cause the nose to lower (move downward). This will cause the speed to increase just as a car's speed will increase going downhill.
- A slight turn of the wheel to the left will bank the wings to the left and start a turn in that direction. A slight turn of the wheel to the right banks the airplane in that direction.
- Applying rudder pedal pressure in the direction of a turn assists the turn entry.
- Controls should be neutralized (relaxed) when the turn is established.

Maneuvering by Outside References

We should learn how to use the flight controls in straight and level flight, climbs, turns and descents. In this discussion, we will stress the use of OUTSIDE references; in other words, using the natural horizon to judge our flight attitude. If looking at the horizon and figuring out whether the aircraft is banking or pitching seems pretty simple, you're right.

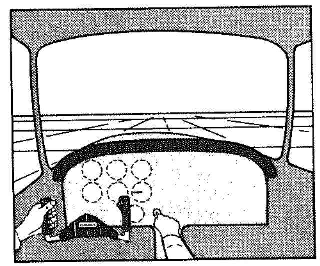
Level Flight

First, we need to recognize what the outside picture looks like when the aircraft is in level flight. A good technique is to pick a landmark (not a cloud that moves!) on the horizon ahead and note its position within the windshield. If you keep the landmark in the same place on the windshield, the airplane will stay in level flight. Usually, the horizon is about a hand's width above the top of the instrument panel. Unfortunately, many front-seat passengers are shorter than their pilots and have never seen over the instrument panel! If you find yourself sitting low in the saddle, bring a pillow or something else to sit on.

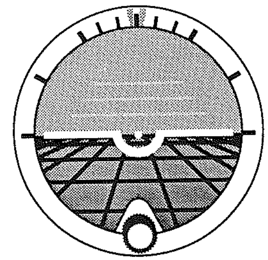


A level-flight "reference point" on the horizon.

Also look out the side windows and note the position of the wing tips relative to the horizon; they should each appear to be the same distance above (in high wing aircraft) or below (in low wing aircraft) the horizon. This confirms that the aircraft is not banked to the left or right.

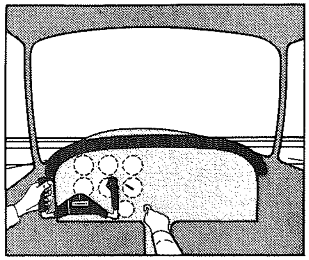


Level

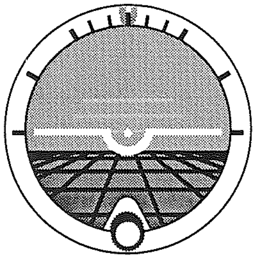


Outside references and Attitude Indicator depictions of a level flight.

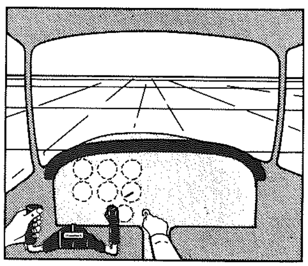
Level flight can be verified by the attitude indicator, the instrument that mimics the aircraft's position on the horizon. During level flight, the miniature airplane in the instrument will appear aligned with the horizon line. Your flight instructor will demonstrate level flight and point out the associated visual cues during your first flight.



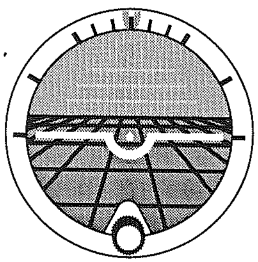
Climb



Outside references and Attitude Indicator showing a climb.



Descent



Outside references and Attitude Indicator showing a descent.

Climbs

From level flight, we may need to climb to a higher altitude to clear terrain or to increase the range of the communication radio. (The higher you are, the farther you can communicate.)

Again, it's important to become familiar with the visual reference. A maximum performance climb in most light aircraft involves a pitch-up angle so steep that the natural horizon is hidden below the nose of the aircraft. For most operations, a more comfortable (and only slightly less efficient) climb can be obtained by placing the nose of the aircraft on the horizon.

Much as a car going uphill needs more power, an airplane may need extra power to climb. That means you may have to push the throttle forward to maintain a safe airspeed and a good climb rate. (Power control is covered later in this book).

Just as in level flight, a climb attitude can be verified on the attitude indicator. During the climb, the miniature airplane in the instrument is above the horizon line.

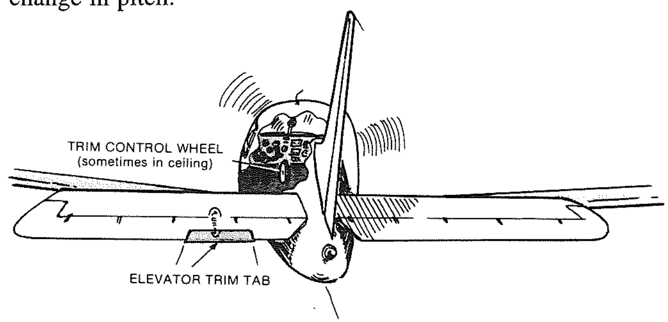
Descents

To enter a descent from level flight, reduce power by pulling the throttle out slightly. This will

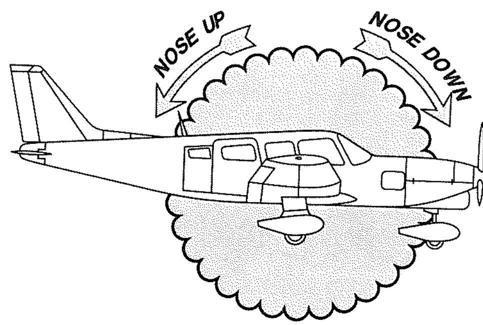
cause the nose to pitch down of its own accord—let it. During the descent, the nose should be only slightly lower (compared to the horizon) than in level flight. On the attitude indicator, the miniature airplane is below the horizon line.

Pitch Trim

While on the subject of pitch control, it's important to consider the operation of elevator "trim." Trimming is "fine tuning" the elevator for comfortable flight. By turning the trim wheel in the cockpit, the pilot can adjust the "feel" of the aircraft and prevent undesirable tendencies to climb or descend. Trim is necessary because the airplane flies over a wide range of airspeeds, with higher speeds creating more lift. If it weren't for the trim control, any speed increase would require continuous forward pressure on the control wheel to prevent a climb. Relaxing this pressure would result in a change in pitch.



A Trim control in the cockpit allows the pilot to "fine tune" the pitch feel of the aircraft.



An easy way to remember which way to turn the trim wheel is to think of a giant wheel attached to the aircraft. Rolling it forward causes the nose to pitch down; backward causes the nose to pitch up.

Using nose-up or nose-down trim allows us to compensate for airspeed variations or other aerodynamic changes (such as lowering flaps). A properly trimmed airplane will fly hands-off, allowing the pilot finger-tip control. An out-of-trim aircraft, on the other hand, requires muscle to control.

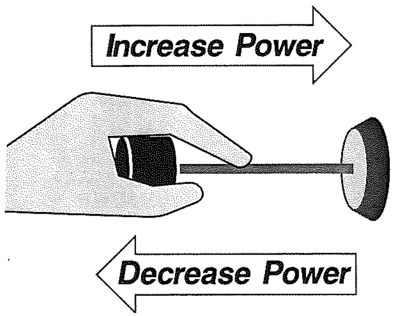
It's important to become familiar with the trim control in your aircraft, and to use it as necessary to maintain a smooth, balanced control feel.

Power

The power controls of an aircraft may seem complicated. But from a Pinch-Hitter® perspective, power control is straightforward.

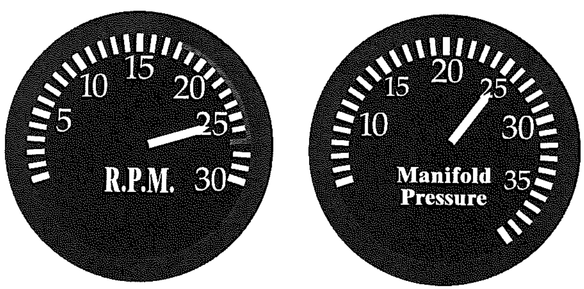
Throttle

The throttle operates just like the accelerator pedal in your car: to increase power, push the throttle forward; to decrease power, pull the throttle back. If the power controls in your aircraft are color coded, the throttle is black. In any event, it will be labeled as the throttle.



The throttle control is comparable to the accelerator pedal in a car.

As discussed previously, it may be necessary to add power in climbs and reduce power for descents. But by how much?



A tachometer (left) and a Manifold Pressure gauge. In aircraft equipped with both, the Manifold Pressure gauge is the one to watch. A power setting of "25" might be used for high-speed cruise or in a climb.

Some airplanes have only a tachometer (RPM gauge); if so, that's the instrument to watch when making power adjustments. Some also have a Manifold Pressure gauge, in which case it becomes the power instrument to watch.

In either case, cruising flight generally involves a reading of 20 to 25 on the tachometer or Manifold Pressure gauge. When adding power in a climb, the reading may be above 25, which is normal for a climb. A descent calls for a power setting of 18 to 20.

Note: This course uses approximations on such subjects as power settings. These are general references, and will be refined during flight training.

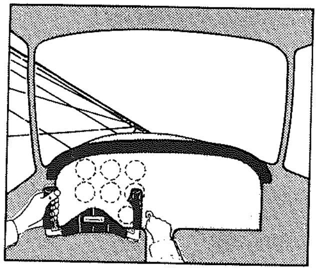
Mixture Control

The engine "mixture" control adjusts the ratio of fuel to air provided to the engine. It allows the pilot to compensate for decreased oxygen at higher altitudes, sending the ideal "mix" of fuel and air to the engine for combustion. This control is near the throttle and, if color coded, is red. At lower altitudes, the mixture control is usually pushed all the way in and this is called the "full rich" position. If the mixture is "leaned" during high-altitude cruise, it will need to be pushed in to the "full rich" position before landing.

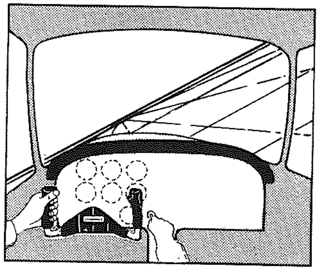
Propeller Control

Many high-performance aircraft have controllable-pitch propellers. A control near the throttle and mixture allows the pilot to set the "pitch" or blade angle of the propeller for maximum performance. If color coded, the propeller control will be blue.

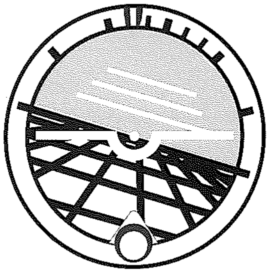
From a Pinch-Hitter® perspective, the propeller control is not a priority, since its primary purpose is to enhance aircraft performance. Just like the mixture control, it is desirable to push the propeller control completely forward before landing.

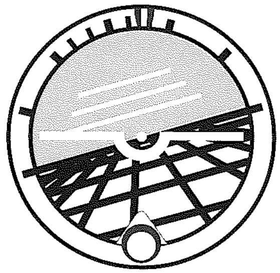


Left Turn



Right Turn





Outside references and Attitude Indicator depictions of a left turn and a right turn.

Turns

Having considered climbs, descents, and the trim and power aspects of these maneuvers, turns will complete our aircraft control education. When you think about it, all aircraft maneuvers involve straight and level flight or a combination of climbs, turns and descents.

Fortunately, turns are a simple matter. If you turn the control wheel left, the airplane banks left. As noted previously, a touch of rudder in the direction of the turn helps to smooth the maneuver. After entering the turn, return the control wheel to near neutral to keep from overbanking. The aircraft will keep turning until you apply opposite control wheel and rudder pressure.

During a level turn, the horizon seems slanted. However, the nose of the aircraft remains in a constant place in relation to the turning horizon. With steeper banks, the aircraft may tend to descend during

a turn. Pulling back slightly on the control wheel will restore the aircraft to its level flight attitude.

Turns should be a gentle, graceful maneuver. Your flight instructor can help you recognize 20° to 30° banked turns, which are adequate for routine flying.

"Rolling out" of a turn is best described as starting a turn in the opposite direction until the wings are level. Back in straight flight, you may need to relax any back pressure on the control wheel you added during the turn.

Autopilots

While we're on the subject of aircraft control, let's introduce the autopilot. This device is found in many general aviation aircraft and can be very helpful. An autopilot is a device that will fly the aircraft for you. Different autopilots have different capabilities, but they all do basically the same thing. As usual, we recommend that you get training on the specific model installed in your aircraft.

There are three types of autopilots. The simplest autopilot is called a wing leveler. When turned on, it will move the controls to keep the wings level at all times. The advantage of the wing leveler is that it will keep the aircraft flying straight while the pilot concentrates on other tasks. The wing leveler, however, will not fly a particular heading or maintain altitude. Like a car without a driver, the aircraft will gradually change its heading and wander from the desired course and altitude. You must maintain or change altitude using the elevator.

The second type of autopilot is a bit more sophisticated. It will keep the wings level and fly a specific heading. The pilot can set the desired heading using a "heading bug" which is on, appropriately enough, the heading indicator. Once the desired heading has been selected, the autopilot will keep the wings level and maintain the selected heading. These autopilots will not maintain altitude, so over time you can expect to gain or lose altitude depending on how well the aircraft is trimmed. Again you will need to provide the pitch input.

The third and final type of autopilot includes an altitude hold function which will keep the aircraft at a constant altitude. This type of autopilot is found on the more complex and sophisticated single and multi-engine aircraft. Pilots normally activate this feature after reaching their cruising altitude. If you want to change altitude while this autopilot is on—turn it off—make your change and then turn it on again. Do not attempt to override the autopilot.

Your pilot should acquaint you with the controls and features of the autopilot in your aircraft. While it may seem complicated at first, in fact, it is very simple. The controls generally consist of an on/off switch that provides power to the autopilot, switches or buttons that activate the wing leveler, heading hold and altitude hold features of the autopilot, and the "heading bug." Knowing how to turn on and control the autopilot can be very helpful in an emergency situation, and is worth the small investment in time to learn the system.

There are two rules you should observe if acting as a Pinch-Hitter®. If the autopilot is on and flying the airplane, leave it alone while you deal with the situation at hand and establish radio communication. If the autopilot is off, leave it off unless you're absolutely certain how it works.

Control Summary

Your impression at this point may be that all of this sounds pretty complicated. It really isn't. Be assured that your flight instructor will have you flying straight and level, climbing, turning and descending in the first flight period. An almost universal reaction after the first flight is, "It's much easier than I expected."

Aircraft control can be summarized in a few simple steps, which we have condensed for your reference:

Climbs:

1. Raise the nose to the horizon.
2. Add power (full power in most light aircraft).
3. Maintain an airspeed well above the bottom of the green arc on the airspeed indicator.
4. Trim to "hands off" pressure.

Descents:

1. Decrease power (below "20").
2. Allow the nose to lower slightly below your "level flight" reference.
3. Maintain an airspeed within the green arc of the airspeed indicator.
4. Trim to "hands off" pressure.

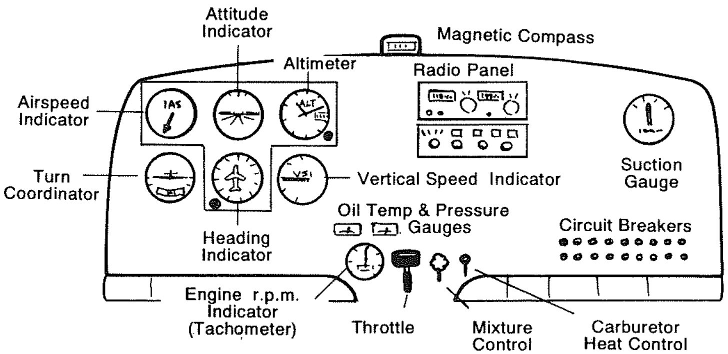
Turns:

1. Roll into the turn with the control wheel while adding slight rudder pressure in the same direction.
2. Neutralize or center the control wheel when the bank is as steep as you want.
3. Maintain proper horizon spacing (use back pressure as needed).
4. At the desired heading, begin a turn in the opposite direction to return to straight flight.

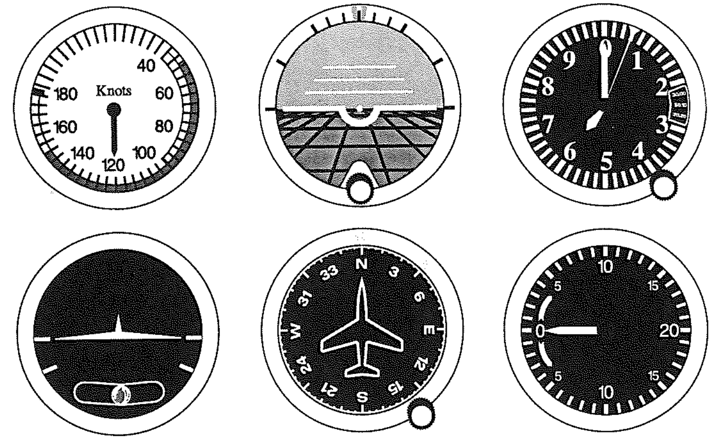
Instruments

Most non-pilots are at least impressed, if not intimidated, by the complex array of dials and gauges on the instrument panel of an aircraft. This apparent complexity discourages many would-be pilots from attempting even a first flying lesson. Fortunately, you need not have super-human abilities to learn to fly. We do most of our flying without depending on instrument references. Also, the instruments we do need to check are simple to read and understand.

Aircraft instruments can be divided into three groups: flight, navigation, and engine. In this section, we will address flight instruments. These are usually located directly in front of the pilot.



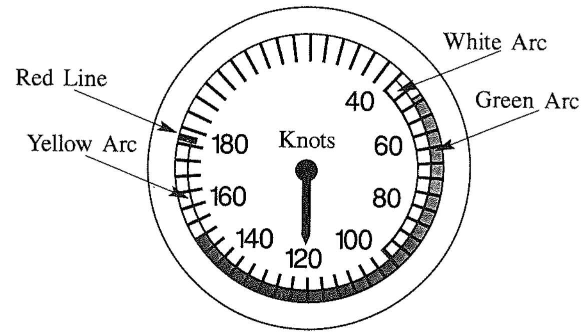
The instrument panel may seem complicated, but things make more sense after the purpose of each instrument becomes clear.



The flight instruments, sometimes called the "basic six." In the top row (left to right): Airspeed Indicator, Attitude Indicator and Altimeter. Bottom row: Turn Coordinator, Heading Indicator, and Vertical Speed Indicator.

Airspeed Indicator

The airspeed indicator is, perhaps, the simplest instrument to read. Just like a car's speedometer, the needle points to the aircraft's speed through the air. On the outer edge, color coded rings show safe speeds for various operations.



An airspeed indicator showing 120 knots. This is within this airplane's "normal operating range" of airspeeds.

As you might expect, a red line indicates the aircraft's "speed limit." This speed should never be exceeded. The yellow arc suggests "caution," but the aircraft can be flown safely in this speed range if the air is smooth. In straight and level flight, the needle should be in the green arc, or its "normal operating range." The lowest figure on the green arc is the airplane's stalling speed. (Remember, "stall" refers to the wings, and describes the speed at which there's no longer enough lift to support the weight of the airplane—see "Angle of Attack" on page 4). You should maintain a speed at least 15 knots (or miles per hour) above that figure until landing. Your instructor will tell you the speed to use for your approach to landing.

Remember, if your speed gets too fast or too slow: adding power and slightly lowering the nose of the airplane increases speed, decreasing power and slightly raising the nose decreases speed.

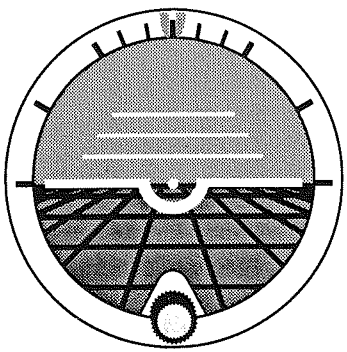
The white arc shows the speed range in which flaps may be used and the landing gear lowered. The use of wing flaps and landing gear will be further explored in the "Landing" section.

A Note on Airspeed:

What is a "Knot"? Technically, a Knot is a speed measured in Nautical Miles per Hour. Since a nautical mile is 1.15 statute miles, a Knot is slightly faster than a statute mile per hour. Most newer aircraft use Knots as their measuring standard, while many older aircraft use statute MPH. The difference, however, is small. Although this text refers to "Knots," the same concepts apply to aircraft with airspeed indicators calibrated in MPH.

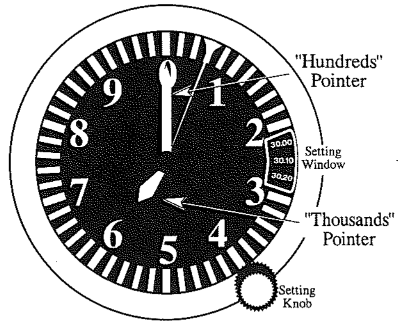
Attitude Indicator

As described previously, the attitude indicator mimics the pitch and bank of the airplane and shows the attitude of the aircraft. It is a useful reference when flying in the clouds ("on instruments") or at night. However, in fair weather, the natural horizon is a superior reference.



Altimeter

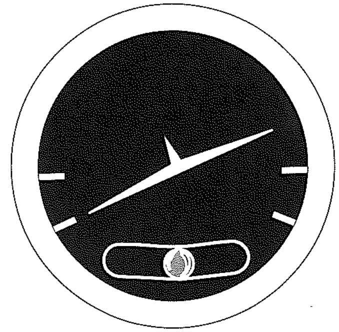
The altimeter uses air pressure to estimate the aircraft's height above sea level. It does not show the aircraft's height above the ground. Being able to read the altimeter is important. Anyone who can tell time can figure out this instrument. Think of the pointers as "hour" and "minute" hands. The hour hand points to thousands of feet and the minute hand points to hundreds of feet. For example, the small hand at 6 and the large hand at 0 indicate 6,000 feet. Another hand points to 10's of thousands of feet, and is of less interest to low-altitude pilots.



An Altimeter indicating 6,000 feet.

Turn Coordinator

Although housed in a single unit, the turn coordinator is actually two instruments in one. First, there's the miniature airplane (or needle, depending on the type of indicator) in the center of the instrument. When the airplane turns, the miniature airplane (or needle) slants to the left or right and confirms what you see looking at the horizon outside, or at the attitude indicator inside.



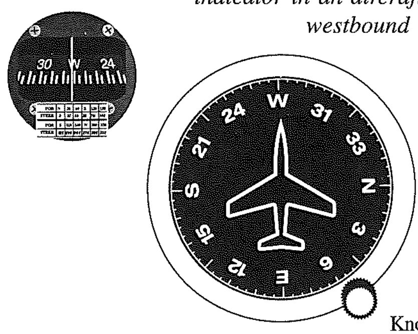
Turn Coordinator showing a standard-rate turn to the left of 3 degrees per second. The ball in the center suggests that the turn is well coordinated.

The second instrument is the ball in the curved glass tube at the bottom of the unit. The position of the ball suggests whether the aircraft is "coordinated," or well-balanced in terms of yaw and roll. Ideally, the ball should stay centered during a turn, but this is not a priority for a Pinch-Hitter®.

Compass and Heading Indicator

Most aircraft have two instruments that show flight direction: a Magnetic Compass and a Heading Indicator (sometimes called a "Directional Gyro" or "Gyro Compass"). The magnetic compass uses the earth's magnetic field to show direction. But its tendency to bounce in turbulent air makes it difficult to read sometimes. The heading indicator provides a more stable indication. The heading indicator cannot sense direction. The pilot sets it periodically to agree with compass indications. Setting the heading indicator involves pushing the set knob in, then turning it so the rotating card in the heading indicator matches the current indication of the compass. After setting, it will show the aircraft's heading accurately throughout turns, climbs and descents. However, the heading indicator will "drift" over time, and it should be reset (to match the compass indication) about every 15 minutes.

The compass (left) and heading indicator in an aircraft flying westbound (270°).



Knob used to set Heading Indicator

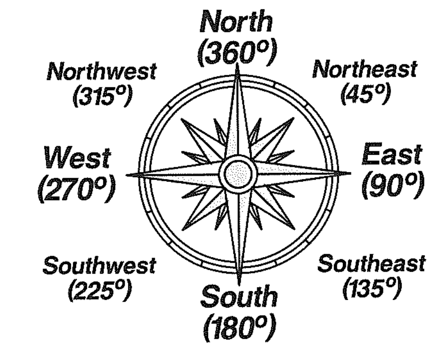
The numbers on the heading indicator describe the aircraft's direction relative to the 360° compass rose. Flying eastbound, for example, the heading indicator should show E (90°). A turn toward the south causes the heading indicator to rotate to S (180°). The heading indicator does not display the last digit of the compass direction. For instance, 30° becomes "3", 120° becomes "12", etc.

A Note on Directions:

For more precise navigation, pilots assign numbers to the compass directions. North is 0° or 360°, East is 90°, South is 180°, and West is 270°. As you might guess, the direction "northeast," which falls between 0° and 90°, is assigned the number 45°. As you continue your flights, you'll become more comfortable with the "by the numbers" method of describing direction.

Compass Orientation

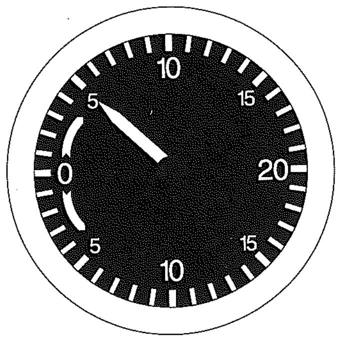
If you can look at a map and tell North, East, South, and West, you have what it takes to be a star navigator. In rough terms, any flight can be described as following one of the four "cardinal" directions or a combination of two cardinal directions. For example, a flight from Las Vegas to Fresno would be described as a **westbound** flight. A trip from Atlanta to Washington, DC would take you to the **northeast.**



The compass rose.

Vertical Speed Indicator

Although less important than the instruments covered previously, the Vertical Speed Indicator is a useful instrument to understand. It tells the pilot how fast the aircraft is climbing or descending, in hundreds of feet per minute. In level flight, the needle points to "0," while a climb will cause the needle to swing upward (and vice versa for descents). A moderate rate of climb or descent is 500 feet per minute, while 1,000 feet/minute is considered rapid. Faster rates are possible in many aircraft, but may cause ear discomfort for some passengers.



The Vertical Speed Indicator showing a 500 foot-per-minute climb.

The vertical speed indicator does not respond immediately and will not accurately show the rate of climb or descent for a few seconds after a change is made. Pilots use it as a general reference.

Communication

If you can tune in a radio station on your car radio, you're all set to use your airplane radio. You will notice that it has the same controls as most other radios: a tuning system, a volume control, and sometimes, a "squelch" control (which allows background noise to be muted). In a few short minutes, your flying companion or flight instructor can teach you how the radio system in your aircraft operates.

NOTE: 121.5 is the Emergency Frequency

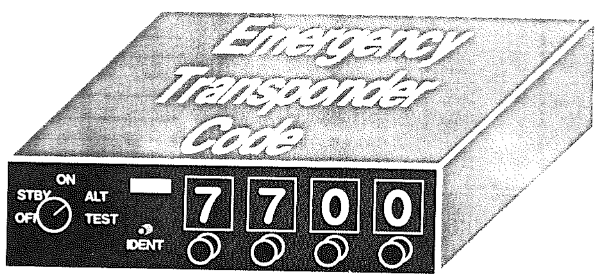
If your aircraft is equipped with headsets, there will be a push-to-talk switch on the pilot's control wheel and, in some cases, on the co-pilot's control wheel as well. This switch, when pushed, allows you to be heard when you speak. You must release it to hear the response. If your aircraft has only a microphone, it also has a push-to-talk switch on the microphone which functions exactly the same way. Put the mic directly in front of your lips, almost touching them, and push the switch in when speaking. It's good to practice speaking on the radio from time to time. You'll feel a little awkward at first, but that will change with a few practice sessions. If you find yourself in an emergency, first try using the radio without switching the frequency. If you get no response, change all the frequencies to 121.5. This is the emergency frequency, and should be committed to memory. On this frequency, you can talk to one of the hundreds of nationwide ground stations that monitor 121.5. If you still can't get a response, remember that climbing to a higher altitude will allow you to transmit farther. Also, be sure to turn up the volume on the receiver.

"But," you may ask, "What should I say?" The simple answer is just COMMUNICATE! In an emergency, don't worry about phraseology.

A good, convincing "help" always gets attention. Ideally, voice communication should include who you are, where you are, and what you want. This can be as simple as "Help, I'm Chris and I'm a non-pilot flying an airplane. I need assistance." The matter of "where you are" can be resolved later. Even if we're completely disoriented (pilots are never lost), we can at least say "We left Pittsburgh an hour ago for a flight to Indianapolis." Air Traffic Controllers in Columbus, Ohio would then know that you are close to their facility.

Upon receiving your call, ground personnel will do everything possible to help you. It is likely that your aircraft can be picked up on radar for navigational assistance. In any event, talk as clearly and calmly as possible, and listen attentively. Don't worry about using "pilot words," and don't be reluctant to ask for assistance.

Your airplane probably has a "transponder." It's usually mounted in the aircraft panel close to the radio. Like the radio, it has numbers that can be dialed in. Turn it "on" or to "ALT" and set the emergency transponder code of 7700. The transponder will automatically notify nearby radar operators that you have an emergency. They can pinpoint your position and, once you've made voice contact, they can guide you to an airport. But remember that the transponder is not your first priority. Fly the airplane first and initiate voice communication next.



The transponder should be set to "ON" or "ALT" and, in an emergency, the code set to 7700.

Navigation

Navigation by Pilotage

Navigation is nothing new. In a car, you find your way around by watching street names and landmarks and, if necessary, comparing what you see with information on a map. Pilots often use the same system, using rivers, mountains, cities, highways and railways as landmarks. This is called "pilotage."

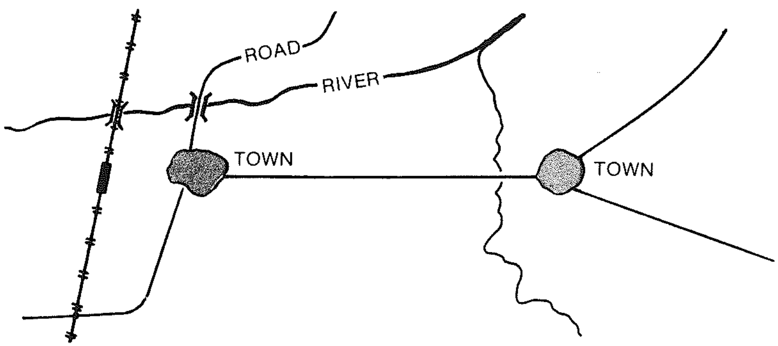
Of particular interest to Pinch-Hitters® is locating an airport for landing. After getting acquainted with some basic information, and practicing your navigation skills with your flying companion, you'll find that getting around in the air and locating airports is simple.

First, let's reinforce the information about compass directions we learned in the last section. You'll recall that north is 360° or 0°, east is 90°, south is 180°, and west is 270°. These are called the "cardinal points" on the compass. Remember, the numbers on your heading indicator omit the last zero, so "9" indicates 90° "25" is 250°, etc.

For practice, let's imagine we are flying south (180°) and you want to change your direction to 60° You know the new direction will be between north and east, so you turn the plane left until the heading indicator points to 6 (60°). You can change your direction by turning either right or left, but in this example, left is the shortest turn. To further reinforce your understanding, think of car trips you plan to take, and try to figure out an approximate heading.

The VFR Sectional Chart

Pilots use Sectional Charts to navigate under VFR, or Visual Flight Rules. To fly in the clouds or on a murky day, a pilot might fly under IFR, or Instrument Flight Rules. Then, the pilot uses special IFR maps that omit terrain features (since they might not be visible anyway). For this discussion, we'll concentrate on VFR Sectional Charts, from which you can (and should) follow along during flights with your cockpit companion. Ask your flying companion to give you old sectional charts (these charts expire every six months) so you can build your own library of follow-along charts. **But be sure to mark your charts to prevent inadvertent use of expired charts by the pilot.**



Roads, rivers and railroads are excellent check-points. For accurate position information, look for intersections of these landmarks.

You may wonder how a pilot chooses a safe altitude for a flight. Looking at a sectional chart from a distance, you'll notice that it has a certain overall color. This is a quick way to judge the elevation of the terrain. A legend strip on the chart's front cover shows the meaning of each color. Pale green suggests terrain elevations of sea level to 1,000 feet, darker green for 2,000 feet, tan for 3,000 feet, and so on. A more precise way of deciding a minimum safe altitude is to look for Maximum Elevation Figures. One MEF appears in each rectangle formed by the ticked black lines of latitude and longitude. MEFs are blue in color, with one large number followed by a superscript small digit (i.e. **1**^{8}). This is the elevation of the highest obstruction in the rectangle. Here, "**1**^{8}" suggests that the highest obstacle is 1,800 feet above sea level. Flying above 3,000 feet in this area would provide a comfortable clearance from terrain and obstructions.

By far, the most important features of sectional charts are landmarks and airports. **Notice the sectional chart excerpt on the back inside cover of this booklet.** Cities and towns are marked clearly. Notice the roads and highways, the railroads (marked by black lines) and the blue rivers. Each chart has a legend panel that describes various symbols.

As we follow along on a chart, we can pinpoint our position using landmarks, like the intersection of a highway and a railroad track. You should always confirm your location by using more than one ground checkpoint.

You'll find that some landmarks are better than others. The charts show radio towers, for example, but they are difficult to see from above in the daytime. At night, their red or white flashing lights increase their landmark value.

Roads, railroads and rivers are the most valuable landmarks for most pilots. The "three r's" always pass through cities, and most cities have at least one airport. Remember that airports are usually at the edge of town so look for a clearing. Airport buildings are often easier to find than the runways. Notice how many airports appear on the chart. Each magenta (reddish brown) or blue airport symbol is a potential landing site. The larger airports with longer runways are preferred, but it's good to know that there are so many choices.

Under the name of each airport is a block of data with some important information. The first item is the airport name followed by it's three letter identifier in parentheses. Below that you will find radio freguencies and airport data such as the field elevation and runway lengths. The airports elevation above sea level will be useful information when we discuss landings.

The easiest way to an airport is to follow a course marked on the chart before you began your flight. If you are on course and following landmarks, simple pilotage will lead you to the airport. All you have to do is maintain the heading and pick out checkpoints ahead to verify your progress. Checkpoints can be towns, rivers, lakes and other prominent features on the ground. Aim for a checkpoint some distance ahead, then pick another point before passing over the first one. If you use the checkpoint method regularly, you will soon find that you can navigate like an expert.

If a course is not marked on your chart and you are uncertain of your position, remember the "three r's" and watch for a road, railroad or river to follow. Of course, you will want to try to find the landmark on the chart. It will be reassuring when you can positively identify a landmark and its proximity to an airport.

It's possible to see a city or other landmark in the distance, and have difficulty deciding whether you are south, north, east or west of it. In that case, flying directly to the landmark gives you a known "starting point" for proceeding to an airport.

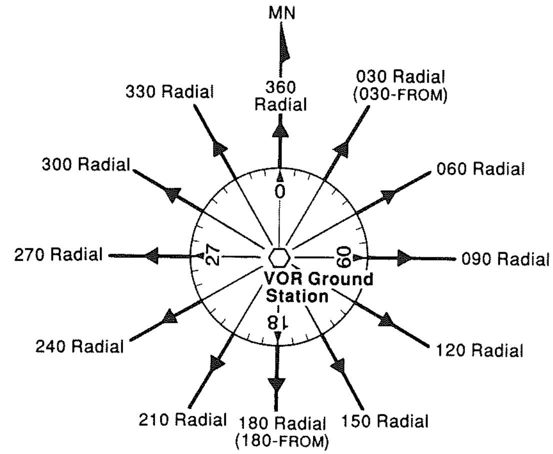
The final charting symbology we should mention relates to airspace. Many types of flying activities share our sky. These include airline, general aviation and military operations. The diverse needs of these users required the development of different types of airspace, each with distinct operating rules. You may notice tinted bands, lines and circles on the chart that depict various types of airspace. From a Pinch-Hitter® perspective, airspace is not an important issue. Federal regulations provide you with the flexibility to do anything necessary to cope with an emergency.

In an emergency however, you may not need these navigation skills. If you can contact Air Traffic Control by radio, they will guide you to a nearby airport and even coach you through the landing.

VOR Navigation

A second kind of air navigation is called radio navigation. This is the use of special radio transmitters on the ground to create electronic highways in the sky. Aircraft with this equipment (and most General Aviation aircraft have them) can receive these signals and fly selected courses between stations. The technical name for these transmitters is Very High Frequency Omni-Directional Range stations, but pilots call them VOR for short and that's what we will use. VOR stations are depicted on aviation charts surrounded by a compass circle. The reason for this is simple. VORs transmit signals that correspond to particular directions. We call these signals "radials." Pilots use radials to fly a course between two stations. You may recall from our earlier discussion on pilotage that the compass rose also corresponds to these radials. For example, a heading of North is the same thing as the 360° radial. A heading of South corresponds to the 180° radial. As you can see from the diagram on the next page, these radials are like the spokes of a wheel with each one having a particular "name" that corresponds to a direction. These spokes form the invisible airway system that most aircraft travel on.

Although learning to use the VOR system is an important task for pilots, Pinch-Hitter's really only need to know a few things about it. The first is what it does—and we just covered that. The second is how to operate the equipment and the third is how to fly to a VOR station. Our explanations will, of necessity, be simplified. As we have done throughout this booklet, we encourage you to discuss the particulars of your aircraft's equipment with your flying companion.



VOR Stations usually are surrounded by a compass circle. They transmit 360 "radials," each named for its position in the compass circle.

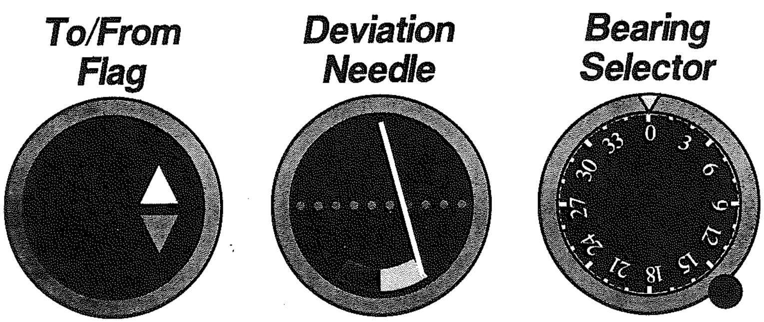
Also, don't be discouraged if the details of VOR navigation seem a bit hazy. Much like riding a bicycle, using a VOR is best learned by doing.

So, what should a Pinch-Hitter® know about using VORs?

First, as a flying companion you can be a big help to the pilot by learning how to identify a VOR on the chart, tune in the correct frequency and select the proper course for the direction of travel. (Remember, this should never be done without the permission of the pilot.) As you become more familiar with the equipment and procedures, you'll find that sharing the navigation duties makes for a more relaxed, enjoyable and safe flight. It will also make you more aware of the flight's progress. But there is another reason for learning how to use a VOR. This skill may help you locate an emergency airport or provide you with valuable information to tell ATC where you are. So with that as our goal, let's dig in.

VOR equipment installed in today's aircraft usually consists of two components, a receiver and an indicator. The receiver is very much like the communications radio we discussed earlier. It has an on/off switch (which doubles as the volume control), a knob for tuning in the frequency and maybe a flip/flop button that switches between two selected frequencies. Once you have tuned in the proper frequency there is not much to do with this "box." All the steering information is contained in the VOR indicator. This instrument is normally located in front of the pilot and is made up of three different components. As you can see in the figure below, they are the TO/FROM flag, the Course Deviation Indicator (CDI) and the Omni Bearing Selector (OBS). The bearing selector is the only part of the VOR indicator that you can change. The TO/FROM flag and the Course Deviation Indicator tell us if we are going to or from the station and whether we are on or off course.

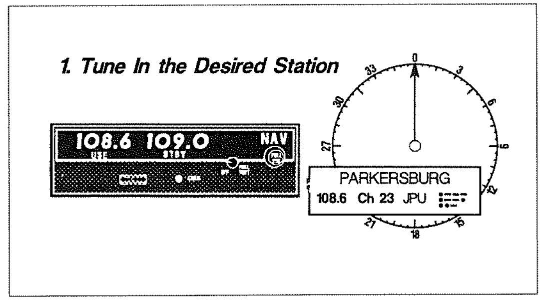
Now, let's put all this information together and outline the 5 simple steps you need to take in order to fly TO a particular VOR station.



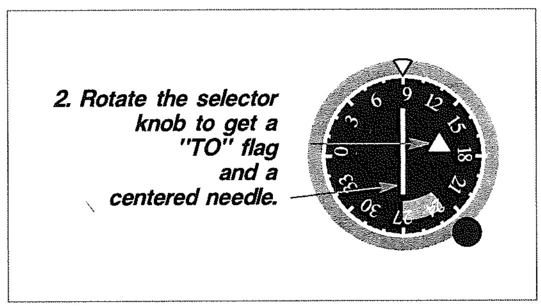
The three components of the VOR "head," separated for clarity (normally all three are within the same display).

Flying TO a VOR station

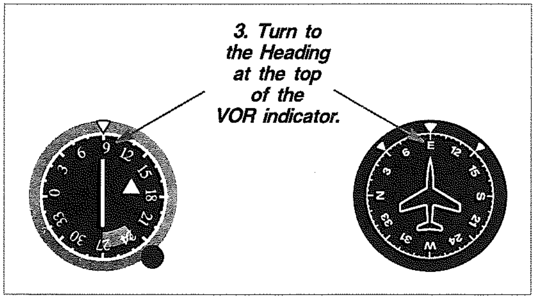
1. **Tune in the frequency of the desired VOR station.** The frequency for the station can be found on your chart in a blue box near the VOR compass circle. This box contains the three letter identifier for the station and its frequency. The frequency number is what you will be entering into the aircraft's VOR receiver.



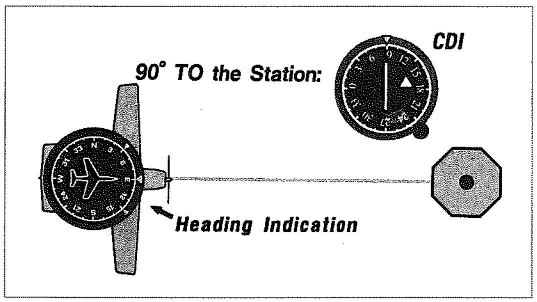
2. **Rotate the bearing selector knob on the VOR indicator until the TO/FROM flag indicates "TO" (or points up) and the course deviation indicator is centered.** You may find the CDI needle a bit sensitive at first, so it's best to do this slowly. Also, remember to check for both conditions (a centered needle AND the flag showing TO the station) since it is possible to have the needle centered with a FROM indication.



3. **Identify the course TO the station by reading the number under the index at the top of the VOR indicator.** This is your course to the station and if the number under the VOR index reads 90°, then you will need to fly a heading of 90° to reach the station.



4. **Turn the aircraft to the same heading as the number under the VOR index.** Always match up the selected course with the aircraft heading.



5. **Stay on course by making small corrections left or right of your calculated heading.** If the Course Deviation needle should move a bit left or right (which it probably will), all you need to do is apply a slight correction in the direction of the needle movement (15° or so). For example, if the CDI moves left, turning left a few degrees should get you back to the centerline of your course. If the CDI moves right, the same thing applies. Remember—and this is important—the course you calculated by centering the needle on the VOR indicator must generally agree with your heading indicator if you want to fly TO the station. If there is any large discrepancy, you could actually find yourself flying away from the station! If all else fails and you get confused, simply remember to re-center the CDI with a TO indication and fly the new heading to the station.

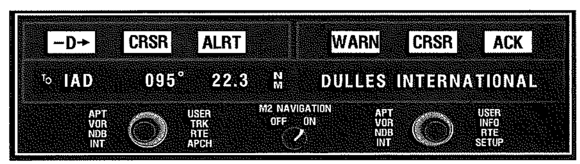
You will know that you have arrived at the VOR station when the flag switches from **TO** to **FROM**. If the VOR station is close to an airport, you should be able to spot it on the ground below. It's really that simple.

GPS/LORAN Navigation

Two relatively new navigation systems are in many cockpits combining the benefits of radio navigation with the power of the computer. They are LORAN (LOng RAnge Navigation) and GPS (Global Positioning System). While there are technical differences between the two systems, they both do the same thing— provide accurate and reliable steering information. Loran depends on a network of ground stations to accomplish this while GPS is a satellite based system.

The computer revolution has made these devices so small and affordable that many come with complete databases of airports and other navigational aids that can be accessed by a simple three letter code. Once dialed into the unit, they provide you with your distance to the selected destination, the course you need to fly, your speed over the ground and how long it will take you to reach your destination. For example, to fly direct to Washington's Dulles Airport, you need only input the three letter code "IAD", press the button indicating you wish to fly direct to the station and read the display. A display similar to the one illustrated below will provide you with all the necessary information to navigate to the airport.

GPS/LORAN Navigation Radio.



GPS and Loran can be especially useful in emergency situations when you want to proceed direct to an airport for landing. Many receivers have a feature that will list the airports closest to your present position.

The displays for these devices differ, and learning how to use them may take a bit of time and patience. The effort, however, is well worth it. For this reason, we recommend that you review the operation of your particular receiver with your flying companion. A little practice in flight will have you navigating like an old pro in no time.

Landing

Selecting an Airport

Selecting the best airport at which to land involves several considerations. If you can't get in touch with Air Traffic Control (ATC), an airport found is the airport of choice. If you are in contact with ATC, they will guide you to a nearby airport. Closest can be best if there's a medical emergency on board that merits immediate attention.

If possible, you should choose to land at a large airport or military base. Besides the luxury of space, such facilities have the best rescue equipment and, often, a ready supply of pilots to provide coaching.

Air Traffic Control will direct you to a runway that will have you landing into the wind. This is ideal, since a headwind allows the aircraft to touch down at a slower groundspeed. Larger airports usually offer more runways and there is a better likelihood that one of them is aligned with the wind.

The Emergency Landing

First, despite what pilots want you to believe, landing an airplane is not complicated. It involves little more than flying the aircraft straight and level near the runway surface. With the throttle pulled out, the airplane will settle to the ground without divine intervention.

Instances of pilot incapacitation are extremely rare. It's highly unlikely you will ever be required to take control of the aircraft in an emergency. However, if a problem arises you can be prepared. Once you are sure the pilot is unable to fly, your job as the Pinch-Hitter® is to take command. If the pilot is unconscious or has slumped over the controls, you will need to reposition him or her so you can fly.

Ask a rear seat passenger to help if one is on board. Pull the pilot back from the control yoke. Tighten the pilot's shoulder harness and, if possible, recline the seat so there is no control interference. Remember to FLY THE AIRPLANE FIRST. You may need to work at repositioning the pilot in steps to maintain aircraft control. Take your time.

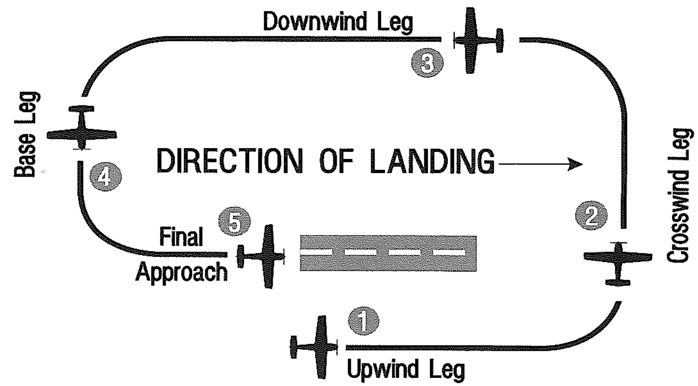
Landing the aircraft is both the most important and most stressful aspect of the situation. It is very rare for passengers to be seriously injured if the airplane is under control at touchdown. The airplane is built to protect its occupants. It will sacrifice its structure before allowing us to get hurt. If you land close to the runway, you have lots of open space. What if you swerve out of control and hit a windsock? It's not desirable, but not calamitous. If you touch down under control, staying under control is the ideal. But nobody's expecting a world-class arrival. If you can put it on the ground and walk away, that is all that matters.

In an emergency situation, the Air Traffic Controller will tell you what heading to fly to get to the airport. You will be told when to descend and when to reduce or add power to maintain a safe path toward the runway. The Controller will not tell you to fly a traffic pattern (discussed in the following section), but will bring you "straight in" to the runway. In other words, when you see the runway ahead of you, you will simply descend to it and land on it. The landing practice that you will receive from your Pinch-Hitter® instructor will help you judge when you are low enough over the runway to reduce power completely and land.

The Standard Traffic Pattern Landing

As a passenger, you've probably noticed that the pilot does not always fly directly to the runway and land. Rather, he or she often flies a traffic pattern. This means that the pilot flies "downwind" parallel to the runway (opposite the direction of landing), turns perpendicular to the runway on a "base" leg, then turns toward the runway until it is lined up in the center of the windshield on "final" approach. This is the normal procedure at all airports without a control tower and is also often used by Air Traffic Control. When you fly with your Pinch-Hitter® instructor, you will practice traffic pattern landings, as well as straight-in landings.

Arriving in the airport vicinity, descend slowly until your altimeter shows you are flying 1,000 feet above the airport elevation. (For example, if the airport elevation is 550 feet, you'd descend to 1,550 feet). Remember, a very slight reduction of power and change in nose attitude will start you on the descent to the proper altitude.

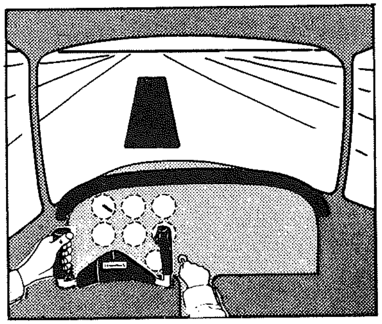


Don't be in a hurry. Review your plan for landing. Adjust your throttle for a slight decrease in speed (17-20 on the engine gauges). You should go through a "GUMP" check. This reminds you to select the fullest GAS tank, put the UNDERCARRIAGE (landing gear) down, push the MIXTURE full forward, and push the PROPELLER control full forward. When you have the runway in sight, fly the aircraft into position parallel to it. You should be pointed away from your direction of landing, since you will be making a U-turn to land. This parallel leg is called "downwind."

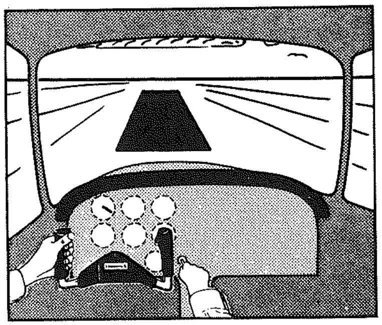
Fly straight ahead on downwind until you reach a point opposite the landing spot, then reduce power and adjust trim to start a gradual descent (300 - 400 feet per minute). In most light aircraft, a power reduction to 17 - 20 is appropriate.

When the end of the runway is about 45° behind your shoulder, make a 90° turn onto a base leg perpendicular to the runway. Adjust power and trim as necessary to maintain a smooth, gentle descent. During your base leg, you should be 500 to 600 feet above the airport elevation. Your flight instructor will show you examples of being too high or too low. Keep the pitch attitude slightly nose down to continue a gentle descent, and make sure the airspeed stays at least 15 knots above the bottom of the green arc. If the airplane gets too slow, don't hesitate to add power.

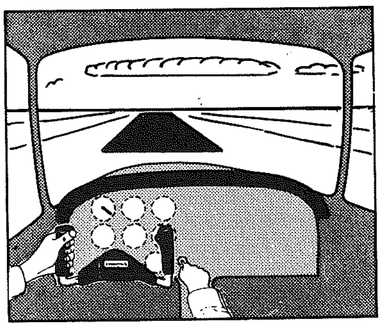
As you come up on the end of the runway, turn toward it. Maintain the same, slightly nose-low pitch attitude and stop the turn when you are lined up with the runway.



Too High



Just Right



Too Low

During your Pinch-Hitter® training, you'll become accustomed to the visual cues during final approach. Above are the cues associated with a high approach (top), correct (center) and low approach (bottom).

If there happens to be some wind, you may have to turn slightly into the wind to stay aligned with the runway. Keep the numbers on the runway in the same place on your windshield, gently pushing or pulling on the control wheel as necessary to keep the runway centered.

As this point, it may be useful to imagine that a housefly just landed on the windshield. It landed directly in front of you, right where the numbers are on the runway. You'll keep that fly pointed right at the runway numbers throughout the final approach.

As soon as the runway starts passing beneath you, reduce power completely by pulling the throttle out (the engine will still be running, but at idle). Now, position the "fly" on the far end of the runway. This will automatically cause you to pitch up slightly to a level flight attitude.

Keep the fly on the far end of the runway. The airplane will settle to the ground. Once on the ground, you'll be moving fast, but resist the temptation to apply brakes suddenly. Concentrate on keeping the plane as straight as possible on the runway by using slight pressure on the right or left rudder pedal.

To stop the engine in an actual emergency, pull the red mixture knob all the way out as soon as the aircraft is on the ground. You'll probably find that landings are the most challenging and satisfying part of your Pinch-Hitter® course. You and your instructor will practice several landings and, with some practice, you'll find that you're doing it all yourself and doing it well!

When you have completed the AOPA Air Safety Foundation Pinch-Hitter® course, you will be confident and proud that you can handle the plane. Flying will take on new meaning. You will understand more, and be of greater help to your flying companion. You may even think about taking further instruction toward a pilot certificate. We encourage you to do so—but no matter what you decide, it's important to practice your new skills regularly. So, congratulations on being a Pinch-Hitter®! Now, get out there and fly!

Appendix 1: An Overview of Aviation Regulations

Aviation is a closely regulated industry. There are Federal Aviation Regulations (FARs) governing everything from medical standards for pilots to airplane and airport certification.

FAR Part 61 provides for pilot certification at fives levels: student, recreational, private, commercial and airline transport. To earn their certificates, all pilots must pass comprehensive knowledge and flight tests. Once issued, pilot certificates are valid forever unless suspended or revoked. However pilots should participate in regular recurrent training and must take a review with an instructor every two years. With additional experience, training and testing, various "ratings" such as "instrument" and "multi-engine" may be added to most pilot certificates.

All pilots must possess a current medical certificate and meet certain "recent experience" requirements. For example, a private pilot must hold at least a 3rd class medical certificate and must have successfully completed a flight review in the past 24 months. To carry passengers, the pilot must have made three takeoffs and landings in the previous 90 days.

Medical certificates are issued in three classes: 1st, 2nd and 3rd, which are valid for 6, 12, and 24 months respectively. First and second class medical certificates are held by pilots who fly for hire, while most private pilots hold a third class medical. A pilot experiencing a medical problem may not fly even if they hold a current medical certificate.

FAR Part 91 describes the aeronautical "rules-of-the-road." These outline the pilot's responsibility for safe operation of the aircraft, and the authority to deviate from the rules to cope with an in-flight emergency. This regulation requires that the pilot perform preflight actions, such as checking the weather, preflighting the aircraft to ensure airworthiness and making sure there is adequate fuel for the flight.

Other rules govern aerial right-of-way (free balloons have precedence over airplanes, for examples) and the procedures for arriving at and departing airports. There are separate rules for aircraft operating under visual flight rules (VFR) and instrument flight rules (IFR). VFR aircraft operate under the see-and avoid principle, while IFR aircraft (those flying in clouds or low visibility) are separated from other aircraft by Air Traffic Control radar guidance. Around all airports with radar installation, Air Traffic Controllers sequence arrivals and departures and maintain an orderly flow of traffic. In an emergency, controllers can provide other services, such as locating lost aircraft and providing radar guidance to an airport. At airports without control towers, pilots provide their own separation and sequencing by following accepted right-of-way and air traffic rules. For example, most non-towered airports use a left-hand traffic pattern, with pilots relaying their positions on a common radio frequency. When two aircraft are in the pattern, the one at the lower altitude has the right-of-way.

Additional information on regulations can be found in publications featuring Federal Aviation Regulations, as well as the FAA Aeronautical Information Manual.

Appendix II: An Overview of Weather

Weather has been of concern to pilots since the days of the Wright brothers. Because of its rapidly changing nature, weather awareness is critical to flight safety. That is why pilots check the weather before each flight and update this information enroute.

Pilots can obtain an aviation weather briefing by contacting an FAA Flight Service Station (FSS) or accessing FSS data through a computer modem. By providing their route of flight, estimated time of departure and approximate cruising altitude, pilots can receive current and forecast weather products tailored to their needs. The briefing usually begins with a regional overview, giving the locations of weather systems and fronts that could affect the weather along the proposed route of flight. Any significant weather such as thunderstorms, low ceilings or fog that might result in a "no-go" decision is given next.

The current and forecast weather at reporting points along the route also is provided, as is a forecast of wind direction and speed for your proposed cruising altitude.

As you might expect, weather information also is available in flight. "Real time" weather information is available on the communication frequency of 122.0. This is a nationwide service called "Flight Watch." "Flight Watch" can be contacted anywhere in the United States provided the aircraft is at least 5,000 feet above ground level (AGL).

A greater understanding of weather systems can be obtained by looking at the forecast weather section of your local newspaper or by viewing the local TV weather forecast. You might want to compare their descriptions of the various air masses and fronts with the actual weather that results. This can provide interesting insights on the movement of fronts and weather systems.

Appendix III: A Note to the PILOT

Your flying companion has just participated in an internationally recognized training program. Among other goals, this program enables the Pinch-Hitter® to take over piloting duties should you become incapacitated in flight. Your Pinch-Hitter® has learned the basic navigation, communication, and piloting skills necessary for this task and, just as important, the confidence to do the job. Much is written these days about Cockpit Resource Management or CRM. This resource management system, spawned in larger, multiple crew, aircraft, has proven to be an important tool for improving the safety and efficiency of flight. Single pilot operations, especially in IFR conditions, can also benefit from CRM principles. CRM is simply an awareness of the resources available and a systematic use of those resources. Passengers, especially those trained in the AOPA Air Safety Foundation Pinch-Hitter® program, are an important resource. This guide offers suggestions for managing these valuable resources that will reduce cockpit workload, increase safety and efficiency, and result in a more enjoyable flight experience for both pilot and companion.

Flying Skills

We know that practice is essential to maintain our piloting skills and confidence. If this is true for veteran pilots, it's even more important for Pinch-Hitters, so be sure to allow your companion to practice piloting skills regularly. Unless you are a flight instructor, this practice should not include takeoffs or landings. We suggest that these maneuvers be practiced occasionally under the direction of a CFI familiar with the Pinch-Hitter® program. Practice turns, climbs, and descents with and without the autopilot. And remember—be patient! Your Pinch-Hitter® learned to land a plane with about four hours of instruction so there will be ample opportunity for polishing piloting skills.

Because a Pinch-Hitter® may have to take over at any time, it is essential that the airplane always be in trim. Also be sure to balance fuel to avoid a "heavy" wing. This will yield the best chance for success in those first few stressful minutes.

Flight Planning

We encourage you to involve your Pinch-Hitter® in the flight planning process. Explain your route selection, destination, and alternate selections. Show where you plan to stop for fuel and how you calculate fuel burn. Your companion can assist in stowing and retrieving required charts and publications. Pinch-Hitters® also can keep track of fuel burn and tank change intervals in flight. One of the first questions an assisting controller will ask is "How much fuel is on board?" The more Pinch-Hitters® know about the flight before takeoff the better they will cope with an emergency in flight.

Navigation

The Pinch-Hitter® program includes instruction in pilotage and VOR navigation. We encourage Pinch-Hitters® to follow flight progress on a VFR chart and to assist in tuning and identification of Navaids. If your airplane is equipped with a LORAN or GPS receiver, instruct your companion in its use. These units are often closer to the right seat so it makes sense to have the right seat passenger responsible for their operation. Be sure to exercise your pilot in command responsibility to confirm the proper programming of the equipment.

Communication

Pinch-Hitters® learn the basics of radio communication and are capable of making emergency calls and receiving instructions. We encourage you to allow directed practice of communication skills. Another person able to use the radio can be very helpful when pilot workload increases. Pinch-Hitters® also can assist in setting transponder codes and pushing the ident button.

Most general aviation airplanes are flown with headsets. An intercom will be much appreciated by pilot and passenger alike. If your airplane is not equipped with a push to talk switch on the copilot's control yoke, consider installing one. The small investment will make it much easier for your Pinch-Hitter® to communicate.

Course Notes

Pinch-Hitter® Checklist

1. Remain calm, take control. Maintain Level Flight - Trim as necessary. If autopilot is on, leave it on.
2. Confirm or set Cruising Power -____________. Cruising Speed is: _____________.
3. Attempt communication on established radio frequency; if no response, set all radios to 121.5.
4. Set Transponder to 7700.
5. Ask for Help: Tell Air Traffic Control you are not a pilot but you have taken the Pinch-Hitter® course.
6. Set a course for the airport.
7. Circle airport 1000 feet above ground. Take your time. Don't rush. You are in control.
8. Remember to check Gas, Undercarriage (landing gear), Mixture, Propeller.
9. Don't worry about damage to the airplane. The passengers are of prime concern.
10. Your approach power setting is __________________, and your minimum speed is ____________________.