

Accuracy landing stages

chapter 9



Accuracy landing stages are landing exercises in which the desired touch-down point of the aircraft is a fixed spot on the runway. Planning and good judgment are essential in making the actual touch-down as near as possible to this spot. Many of the approaches and landings you will make in the course of everyday flying are identical with those covered in this chapter. However, to stress and perfect the *precision* required by various techniques, you will be placed in a controlled situation where you will be required to use a designated technique.

It is important for you to develop a high degree of proficiency, judgment, and accuracy in performing the accuracy landing stages. You can then use this skill in making landings at strange fields, in the event of an emergency landing, as well as in all other landing situations. You should fully understand the air pattern, ground track to be followed, and procedures to be employed to successfully complete the following stages:

1. 90° Power-off Approach for a 3-point Landing
2. 90° Power-off Cross-wind Approach for a 3-point Landing
3. 90° Power-on Approach for a 3-point Landing

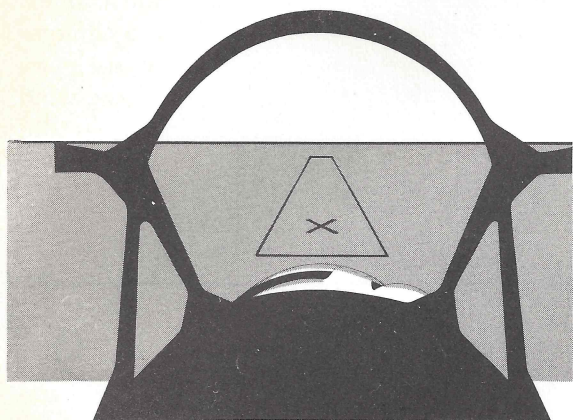
4. 90° Power-on Approach for a Wheel Landing
5. 180° Side Approach for a 3-point Landing
6. 360° Overhead Approach for a 3-point Landing

In order for you to understand fully the material to be discussed, you should know that the *key position* is that position on the base leg, generally on a 45° angle from the point of touch-down, used as a reference point for accuracy landings. It is at this point in the 90° stages that the throttle is usually retarded to start descent for landing.

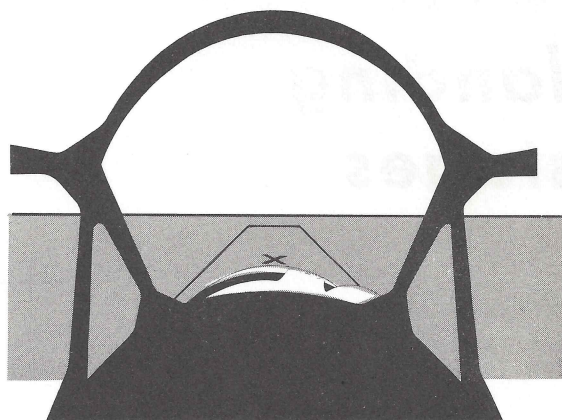
You should know that a power-off approach is an approach to a landing with the power off (throttle closed) and one in which gravity is the major propelling force. Remember that a power-on approach is an approach in which partial power is used to bring the aircraft from the key position on the base leg to the round-out position of intended landing.

90° POWER-OFF APPROACH FOR A 3-POINT LANDING

This is an accuracy landing stage in which the power is retarded completely at the key point for a power-off approach and a 3-point attitude touch-down on a designated area. You will perform this stage in order to develop



90 MPH Full Flap Approach Attitude



90 MPH No Flap Approach Attitude

judgment of gliding angles and distances and to develop gliding proficiency for both normal and emergency landings.

Fly a normal rectangular traffic pattern, entering the down-wind leg from the 45° entry leg. Accomplish your pre-landing check on the 45° entry leg at 800 feet above the terrain. Maintain 120-MPH airspeed. Make your turn from the entry leg to the down-wind leg so that upon roll-out you will be approximately a wing-tip distance from the runway. All of your turns will be medium-banked turns. Maintain altitude at 800 feet above the ground and maintain 120-MPH airspeed. This will require approximately a 22" Hg throttle setting.

Turn on to the base leg at the proper point and have a drift correction applied on rolling out of this turn. Now reduce your throttle slightly (to approximately 19" Hg) to decrease your airspeed to 110 MPH. Maintain your altitude, 110-MPH airspeed, and drift correction which on the base leg; determine your key position and remaining technique and attempt to follow a plan, taking into consideration all factors which can affect you.

At your selected key position close your throttle and maintain altitude until the speed dissipates to 100 MPH. When this speed is attained, lower the nose into the 100-MPH gliding attitude and trim the aircraft to hold

this attitude. Start a medium-banked turn at such a point as to be aligned with the runway on roll-out.

You are now on the final approach. Lower flaps the desired amount, adjust the pitch to the 90-MPH gliding attitude and trim the aircraft to hold this attitude. This gliding attitude should give the impression that the aircraft is pointed just short of the landing spot. The stronger the wind is blowing, the nearer the aircraft's nose should point to the spot.

When you have determined your final-flap setting and gliding attitude, concentrate on making a good, safe, three-point landing. Don't worry about the spot. Your ability or inability to land on the spot was determined by your judgment used on the base leg and by the final-approach flap setting. It is better to make a good, three-point landing two hundred feet from the selected spot than to make a very bad landing on the spot. Remember your pattern and analyze your technique so that corrections can be made for subsequent landings.

If the wind is very light, or if the base leg is in too close, the throttle should be closed sooner on the base leg because there is less air to fly through before the intended point of landing is reached. If the wind is strong, or if the base leg is out too far, the throttle should

be closed later because there is more air to fly through before the intended point of landing is reached. Remember that it is much easier to judge the landing spot if the gliding attitude is held constant.

The use of flaps on the base leg is optional, but do not exceed one-half flaps. Any need of flaps (in excess of one-half flaps) shows improper planning, and in succeeding landings you should make corrections by placing the base leg farther out. Flaps should not be lowered in the final-approach turn.

When taking off for a subsequent pattern and landing, climb straight ahead and make the first 90° turn at 500 feet above the terrain. Continue to climb on the cross-wind leg. If you reach the 800 feet of altitude on this leg, level off and hold the altitude constant. Then when you have reached a point where you are approximately a wing tip distance from the runway, turn to the down-wind leg. As soon as the wings become level on the down-wind leg, you should accomplish the pre-landing check. Lower the landing gear with a normal gear check and continue around the pattern the same as originally. If you desire to change gas tanks, change them during the pre-landing check on the down-wind leg. Do not change the gas selector on the ground between landings and take-offs.

90° POWER-OFF CROSS-WIND APPROACH FOR A THREE-POINT LANDING

You will now be introduced to the second type of accuracy landing stage — the 90° power-off cross-wind approach for a 3-point attitude landing. The procedure will vary from the normal 90° power-off approach as follows: Anticipate the turn to the final approach to correct for the drift caused by the existing cross-wind. To correct for drift after turning onto the final approach, use aileron pressure to lower the wing that points into the wind. Then apply whatever pressure on the rudder necessary to keep the longitudinal axis of the aircraft aligned with the runway. This rudder pressure will always be in the opposite direction from the lowered wing because the air-

craft will tend to turn toward the low wing. This is referred to as the down-wind rudder. Remember your cross-wind landing technique during this stage. You must actually use more aileron into the wind, and more down-wind rudder through the round-out than you did during the final approach. These pressures should then increase constantly until the touch-down is made. At this point the stick should be moved as far as possible into the wind, and you should concentrate on the down-wind rudder to maintain directional control.

When taking off for a subsequent pattern and landing, the same pattern, altitudes, and airspeeds will apply as for the preceding power-off landing pattern.

If you find, during these power-off approaches, that you are lower than you should be, the proper procedure is to apply power and hold the altitude and airspeed constant. This will necessitate raising the pitch attitude slightly. Continue to fly with this attitude and power setting until you reach a point where the normal gliding angle can once again be assumed. Close the throttle and resume a normal glide.

If you are excessively low on the approach and a lot of power must be used to drag you up to the runway, *go around*.

If you are high on the approach and have committed yourself with full flaps to a landing, continue the approach. If you find that you will land excessively long, apply power and execute a go-around. Execute this go-around as soon as you recognize that your touch-down would be too far past the spot. Remember to use the flap guide in a cross-wind approach.

90° POWER-ON APPROACH FOR A 3-POINT LANDING

This is an accuracy landing stage in which partial power is used from the key point of the pattern to the round-out position of intended landing with a three-point attitude touch-down. You will use it to develop proficiency in power approaches, which are normally used for landings at strange fields, and by many tactical aircraft.

Perform your pre-landing check on the 45° entry leg and roll onto the down-wind leg a wing-tip distance from the runway. The altitude should be 800 feet above the terrain, with a 120-MPH airspeed. The base leg should be set slightly farther out than for the power-off approach. The speed should be reduced to 110 MPH on the base leg and one-half flaps may be lowered. When at the key position, close the throttle substantially and attain a 100-MPH gliding attitude. This speed should be maintained throughout the turn onto the final approach. When the wings become level on the final approach, raise the nose slightly and lower remaining desired flaps. Adjust the power as necessary, and trim the aircraft to hold a 90-MPH gliding attitude.

The descent from the key position to the point of round-out should be accomplished with a constant rate of descent. The use of power should be smooth, with power changes as small as possible and held to a minimum. Hold a constant pitch attitude with the stick and control the rate of descent with the throttle. This will cause the glide to be fairly flat. Continue the approach until the normal round-out position is reached.

At this point, begin rounding out for the landing and closing the throttle at the same time. Time the closing of the throttle with the rate of round-out so that just as the aircraft contacts the ground in the 3-point attitude, the throttle is completely retarded. If you are going to land a little short, merely apply slightly more power to hold the aircraft off the ground and fly up to the point of round-out. If you are going to overshoot, merely reduce the power slightly and allow the aircraft to descend a little faster.

Do not allow yourself to get excessively low on the final approach so that you have to drag the aircraft up to the spot. Instead, apply power sooner and come in with a more normal gliding attitude. If you are over-shooting excessively, take it around and try again. Use minimum flaps in a cross-wind.

When taking off for another pattern and

landing, the same pattern, altitudes, and airspeeds will apply as for the power-off landing pattern, except that the base leg will be out slightly farther.

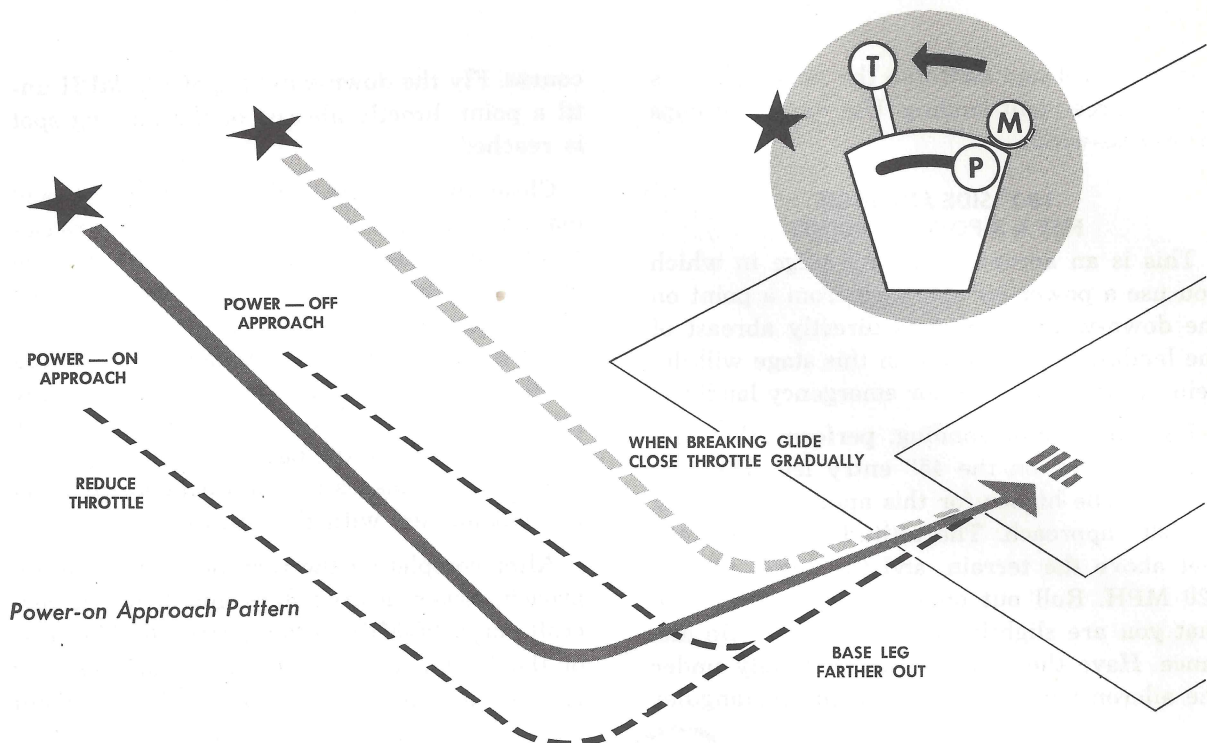
90° POWER-ON APPROACH FOR WHEEL LANDING

The same position and throttle technique will apply for this approach as for the power-on 3-point landing, except that the landing technique is different. This type of approach is used by some pilots when flying conventional aircraft to cope with strong cross-winds. For all practical purposes the winds you will fly in will not require the use of this technique. However, many an attempted 3-point landing will actually result in a wheel landing. Thus, it will pay you to perfect this stage.

This is an accuracy landing stage in which partial power is carried from the key point on the base leg to the round-out position of intended landing. The touch-down is made in a tail-low, wheel-landing attitude. Practice of this stage will enable you to attain proficiency in landing the aircraft in attitudes which may be encountered in more advanced aircraft. It will also help familiarize you with unusual touch-down attitudes which may occur.

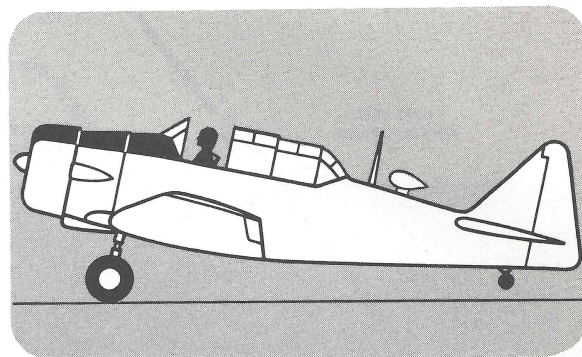
Use the stick to control the pitch attitude and the airspeed and use the throttle to control the rate of descent on the final approach to the point of round-out. The glide is broken at this point, and a level flight attitude attained without changing the slight amount of power that is being held. Allow the aircraft to fly up to just short of the landing spot, holding the aircraft approximately 3 feet off the ground with a slight amount of back-stick pressure and possibly a slight increase of power. You should be slowly and constantly raising the pitch attitude to increase the angle of attack sufficiently to maintain lift but not increase altitude.

When just short of the landing spot, reduce the power slightly. Since the aircraft was just a little above the ground when this action was taken, the slight reduction of power should



cause a slight amount of lift to be lost. This should cause the aircraft to settle to the ground in the attitude that is being held, that is, a tail-low, wheel-landing attitude.

When the wheels contact the ground, do not apply strong forward-stick pressure to force the wheels to stay on the ground, and do not try to bring the stick back to get the tail on the ground. Instead just relax slightly the pressure that was on the stick when the aircraft settled to the ground. The friction of the wheels with the ground trying to hold the aircraft back, and the inertia of the aircraft trying to move it ahead, should be just enough to cause the weight to go forward slightly and hold the wheels on the ground. This slight forward pitching effect will also lower the angle of attack somewhat, causing the wings to have less lift. If you apply too much forward pressure to the stick, the propeller may hit the ground; and if you try to get the tail on the ground too quickly with back-stick pressure, you may increase the angle of attack sufficiently to cause the aircraft to fly off the ground again.



Tail-Low Wheel Landing Attitude

If all the power was not reduced prior to touch-down, close the throttle as soon as the wheels are on the ground and the aircraft is rolling. Allow the tail to settle — or fly itself — to the ground. Be careful to maintain directional control throughout this transition since this is the point where the aircraft has its greatest swerving tendencies.

As soon as you feel the tail wheel contact the ground, bring the stick all the way back to hold the tail on the ground for better direc-

tional control and continue the landing roll as in any three-point landing. Use minimum flaps in a cross-wind.

180° SIDE APPROACH FOR A 3-POINT LANDING

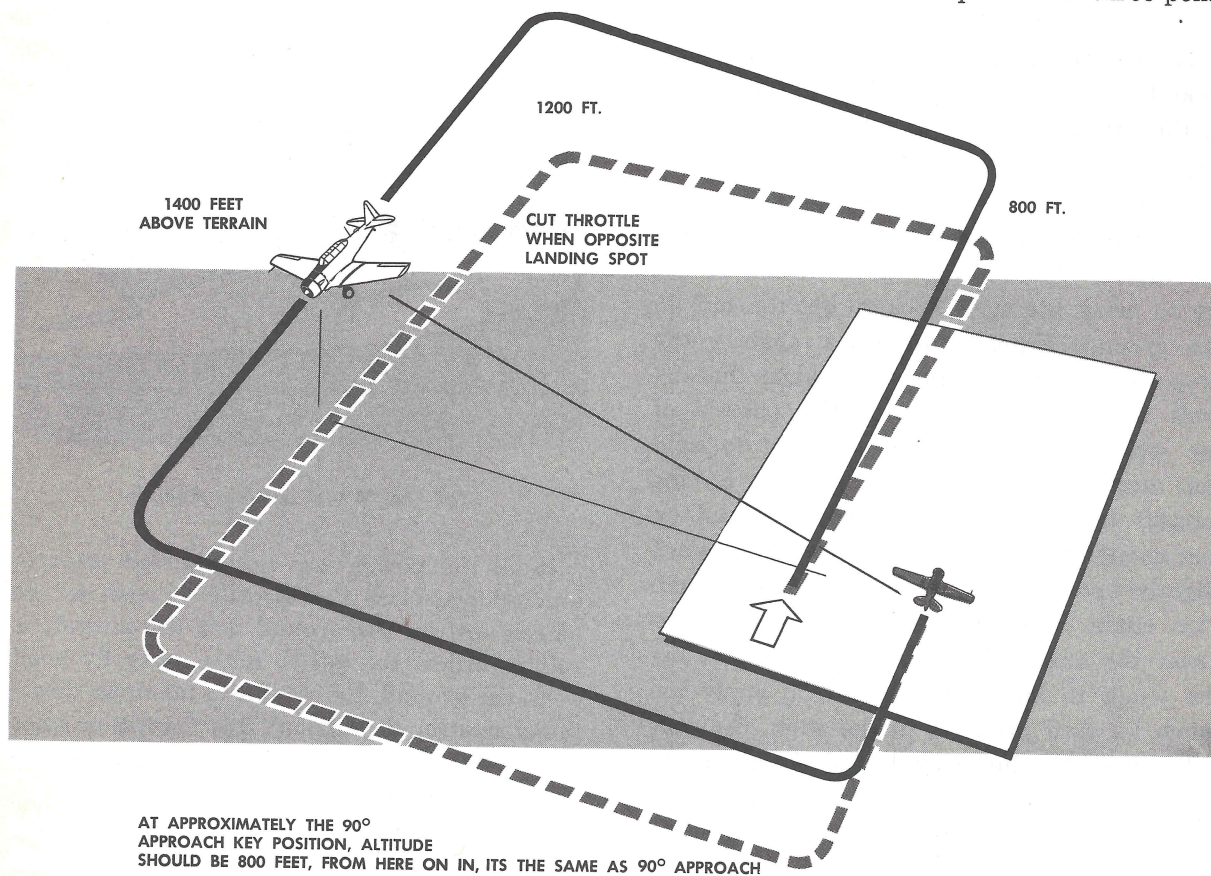
This is an accuracy landing stage in which you use a power-off approach from a point on the down-wind leg that is directly abreast of the landing spot. Practice in this stage will develop your proficiency for emergency landings.

For the initial landing, perform the pre-landing check on the 45° entry leg. The altitude will be higher for this approach than for the 90° approach. The altitude will be 1,400 feet above the terrain, and the speed will be 120 MPH. Roll out on the down-wind leg so that you are slightly closer than wing-tip distance. Have the runway approximately under the aileron trim-tab as it is in the rectangular

course. Fly the down-wind leg at 120 MPH until a point directly abreast of the landing spot is reached.

Close the throttle fully at this point and maintain altitude until the airspeed decreases to 100 MPH. Then lower the nose and trim the aircraft for a 100-MPH gliding attitude. The first gliding turn (to the base leg) should be made at an altitude high enough to permit you to glide to what would normally be the key position in a 90° power-off approach pattern. Continue on down the base leg until you are in a position to make a medium-banked turn and roll out aligned with the runway.

After completing the turn onto the final approach, lower desired flaps and trim the aircraft for a 90-MPH gliding attitude. The rest of the final approach, round-out, and landing is the same as in the power-off three-point



180° Side Approach

landings. The use of flaps on the base leg is optional, but do not exceed one-half flaps. Any need of flaps in excess of one-half shows improper planning. During succeeding landings this should be corrected by placing the base leg farther out. Flaps should not be lowered in the final approach turn. Use minimum flaps in a cross-wind.

When taking off for another pattern and landing, conform to the following pattern: Climb straight ahead and make the first 90° turn at 800 feet above the terrain. Start the turn to the down-wind leg so that you can roll out the same distance from the runway as for the original pattern and landing (aileron trim tab on the runway). Continue to climb on the down-wind leg until an altitude of 1,400 feet above the terrain has been reached. Perform the pre-landing check on the down-wind leg when in straight and level flight and close throttle again when opposite the landing spot.

360° OVERHEAD LANDING PATTERN (3-POINT LANDING)

This is an accuracy landing stage in which an approach to a landing is made from a point halfway down the landing runway, and with the aircraft flying into the wind. This pattern is designed to simulate, as closely as possible, the type of approach you will fly when you advance to tactical-type aircraft.

More proficiency and judgment are required in this pattern than in the 90° approach. You must be able to do a precision, level turn while the gear is being lowered and the airspeed is dissipating. During this pattern the proper wind-drift correction must be applied throughout the approach, whether you are turning or flying straight and level.

The initial approach altitude is 1000 feet above the terrain.

Legs of the Traffic Pattern

In order to help you understand how each part of the pattern affects the approach, the pattern will be broken down into integral parts and explained separately. You should remember, however, that the entire pattern is executed as one constantly changing maneuver.

Traffic entry and pattern: Before descending to traffic altitude, visualize an imaginary track across the ground for the 45° entry leg. (This will prevent you from entering the initial approach leg from the wrong side as well as help you determine where the 45° leg will intercept the initial approach.) Plan the entry leg so that it will intercept the initial approach approximately two miles from the landing runway and in the direction of traffic.

45° entry leg: Just as in the other types of traffic patterns that you have practiced, a 45° entry leg is used to enter the pattern. However, it is executed to an initial approach leg rather than to a down-wind leg. As in the other types of patterns, the prelanding procedure is accomplished on this leg. Accomplish all of the pre-landing procedure except the actual lowering of the gear. Do not lower the gear at this time but check the horn. The gear is lowered during the cross-wind 180° pitch out.

Initial approach: From the 45° entry leg execute a 45° turn to align the aircraft with the center line of the runway. This is the starting point of the initial approach leg. The initial approach is a leg that is started approximately two miles from the runway at 1,000 feet above the ground and continued to a point midway down the runway. The conditions of flight are the same as the 45° entry leg. A throttle setting of 25" Hg must be used to maintain a normal cruising airspeed of 140-150 MPH. At a point midway down the runway, the 180° cross-wind pitch-out is executed.

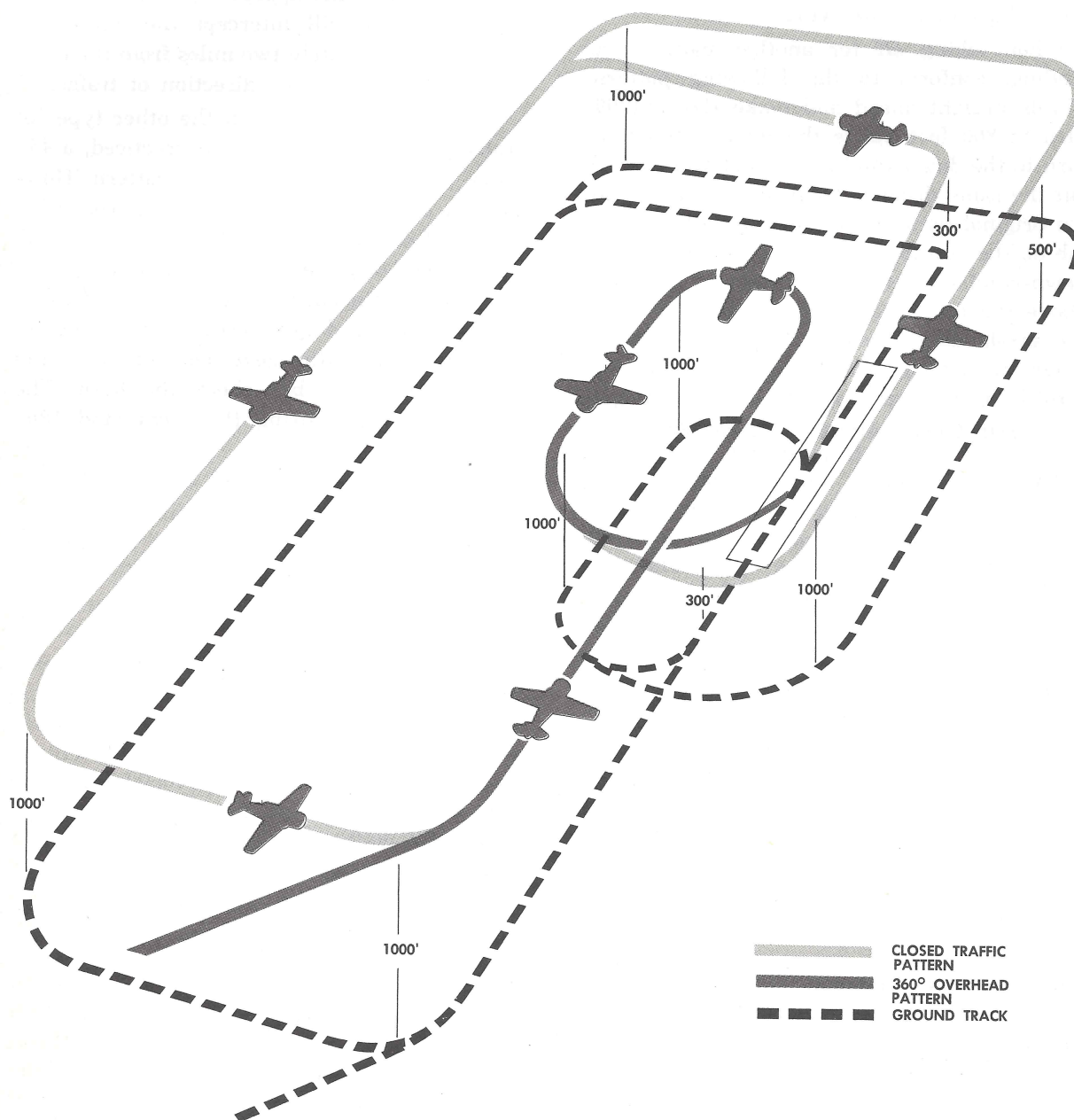
It is important that the track across the ground be perfectly aligned with the center line of the runway so that you will be in the proper position after the 180° cross-wind pitch-out is executed. When a cross-wind is present, you must apply the proper correction to maintain this track.

180° cross-wind pitch-out: In the other types of traffic patterns, the cross-wind leg is a straight track across the ground perpendicular to the runway. In this pattern, however,

it is a level medium-banked 180° turn. The throttle settings remain at 25" Hg and the landing gear is lowered in the turn.

When you reach the midway point down the runway (or approximately 2,500 feet from the

approach end where runway lengths are less than 5,000 feet), roll into a level medium-banked turn in the direction of the traffic pattern. As you enter the turn, lower the landing gear.



NOTE

It is not necessary to check the horn since it was checked on the 45° entry leg. As the gear comes down, the airspeed will start dissipating so the pressure on the controls will be changing constantly.)

Immediately after rolling out of the turn, retard the throttle to 15" Hg and re-trim the aircraft. Watch for wind drift and maintain across the ground a track that is parallel to the runway. Continue trimming the aircraft as the airspeed dissipates.

Down-wind leg: After rolling out on the down-wind leg, maintain 1000 feet above the ground and allow the airspeed to dissipate to 120 mph. In the event your down-wind leg is of such length that the airspeed would drop below 120 MPH at this throttle setting, add sufficient power to maintain 120 MPH.

Continue the down-wind leg past the approach end of the runway by at least two wing-tip widths. At this point close the throttle momentarily to check your horn.

180° base leg turn. After you have checked your horn, roll into a medium bank for your last 180° turn. This turn is accomplished with whatever amount of power that is necessary and you gradually lose airspeed and altitude as you continue it. Speed should dissipate from 120 MPH to 100 MPH in this turn. Use whatever flaps you determine are necessary anywhere in the turn. Plan your turn and use of power and flaps so that after the first 90° of turn you are at least 800 feet above the ground and at the completion of the last 90° of turn you are at least 300 feet above ground.

A perfectly executed 180° base-leg turn would be one in which you had the maximum amount of bank at the start of the turn. Then as you continued the turn the bank would gradually shallow as your airspeed decreases until the wings are level on the final approach.

If, during this 180° base-leg turn, you have to steepen your bank to keep from overshooting the runway, your judgment has been poor or you are being adversely affected by a cross-wind. If you find that you have to steepen

your bank and tighten your turn, you should effect a go-around immediately or you may find yourself in a dangerous position.

Final approach: When you are aligned with the runway, reduce your airspeed to 90 MPH and use whatever power is necessary to make a normal approach for a 3-point landing on the designated spot.

Closed Traffic Patterns

This maneuver will be practiced as a landing stage, so there will be a series of landings involved. The pattern will be larger than the ones you have been accustomed to, and it will follow a slightly different ground track. The following is the method to be followed in order to remain in an orderly traffic pattern:

Take-off and climb: Execute a normal take-off and climb straight ahead to an altitude of 500 feet above the terrain. At this point, roll into a normal climbing traffic turn to the cross-wind leg. This part is exactly the same as a normal traffic pattern.

Cross-wind leg: You are now on the cross-wind leg. Continue to climb straight ahead, correcting for drift, until you reach an altitude of 1000 feet above the terrain. Execute a normal level-off at this altitude; however, leave the propeller set at 2000 RPM. Continue to fly straight ahead. Be sure to extend this cross-wind leg sufficiently to insure that the down-wind leg of your closed traffic is well outside of the down-wind leg of the landing traffic. This distance should be approximately one mile from the runway.

Outside down-wind leg: At this point, turn to your outside down-wind leg and, when the wings become level on the down-wind leg, perform all the pre-landing checks, except lowering the landing gear. You should now be flying straight and level on the outside down-wind leg, with a 25" Hg throttle setting and a normal cruising airspeed (140-150 MPH). The altitude should be 1000 feet above the terrain. Continue the outside down-wind leg to a point where you can make a 90° turn in the direction of traffic and intercept a 45° entry

leg at the same place you made your original entry.

45° re-entry: Shortly after you make the 90° turn from the outside down-wind leg, you should intercept the 45° entry leg. Keep a careful watch at this point for incoming traffic; roll onto a 45° entry leg the same as you did for the original pattern. Check the horn by retarding the throttle, but do not lower the landing gear. Advance the throttle to 25" Hg and continue the leg, maintaining 140-150 MPH airspeed and 1000 feet altitude. When you reach the initial approach leg, execute the turn to this leg and continue the same pattern that you used originally.

Go-Arounds

If you decide to go around after you have executed the pitch-out, and before you enter the last 90 degrees of the base-leg turn, add power and accomplish the normal go-around cockpit procedure.

Turn toward the initial approach leg, roll the wings level, and fly straight ahead so as to cross under the inbound aircraft on the initial approach. Be sure you are at least 200 feet

below the initial-approach altitude, when you cross this leg. Continue to fly ahead until you are clear of traffic, and to the outside of the runway, which is away from the direction of traffic. At this point you may perform a gentle climbing turn in the direction of traffic and back to traffic altitude. Continue this turn until you are parallel to the runway.

Fly parallel to the runway, the same as in a normal go-around, and enter the closed traffic pattern on the cross-wind leg.

If you decide to go around at a low altitude or after a bad landing, conform to normal go-around procedures and enter the closed traffic pattern on the cross-wind leg.

Tips

Although this approach has been explained in steps, think of it as one continuous and smoothly executed maneuver. Use sound judgment at all times. If you fail to line up properly on the final approach, do not hesitate to go around. Don't make low turns, nor use more than a medium bank. Don't steepen your bank or tighten your turns to keep from overshooting the runway.

Things To Remember

If your key position is properly selected and a constant gliding attitude is maintained you can judge your landing spot more easily.

With a normal gliding attitude, the nose of the aircraft should appear to be pointing just short of the landing spot.

Once you are committed to landing, concentrate on making a good safe landing. Don't worry about the spot.

Use a minimum amount of flaps in a cross-wind.

Control the pitch attitude with stick pressures and, in power-on approaches, control the rate of descent with power.

Don't allow yourself to become excessively low on the final approach; apply power early and resume a normal approach.

If in doubt at any time, don't hesitate to go around.

Always change gas tanks on the down-wind leg — not on the ground.

On wheel landings don't force the tail to the ground. Allow it to settle normally. Be alert.