



Takeoff 1: Normal and Crosswind Takeoff and Climb

Procedure:

1. After clearance is received, landing light on, transponder to altitude, check and record time (add 1 minute for straight-out to first point, or 2 minutes of making a downwind to first point).
2. Before crossing hold-bars, check for traffic on downwind, base, or final.
3. Taxi onto the runway and align the airplane with the centerline.
4. If a cross-wind exists, begin rolling with full aileron deflected into the wind. As you increase in speed, reduce it to a slight deflection for takeoff, just enough to keep the wings level.
5. Advance the throttle smoothly to full power.
6. Maintain the centerline with the rudder.
7. Accelerate to 55 kts and rotate. Climb at 75 kts.
8. Establish a crab and level the wings to track the runway centerline.
9. At 500' AGL, you may make your turn, whether it is to remain in the pattern, or towards your first navigational fix.
10. At 1000' AGL, complete a cruise climb checklist.

Things to Think About:

1. Do not steer the airplane like a car. Unless there is a crosswind, the ailerons shouldn't be used much.
2. If tower tells you to expedite, think about canceling your clearance, do you really want to rush it?

PTS Standards:

Aligned with centerline; $V_y + 10/-5$ kts; corrects for crosswind throughout climb; completes the appropriate checklists.



Landing 1: Normal and Crosswind Approach and Landing

Procedure:

1. Assuming you have remained in the pattern, from 500', look right, clear right, and turn right as to fly a 90 degree flight path to the upwind (crosswind).
2. Continue climbing at V_y and in 3-5 seconds, turn downwind and level off once at pattern altitude with a full 7-down flow.
3. Complete a half-7-down flow at the departure end of the runway for a descent check, and check seatbelts, shoulder harnesses, doors and windows. End with carb heat on.
4. Announce abeam the tower or midfield if not cleared to land, or downwind at an uncontrolled airport.
5. Abeam the numbers, reduce power to 1700 RPM, set flaps to 10 degrees once below 110 kts, and pitch for 80 kts.
6. At the 45 degree angle to the approach end of the runway, turn base, set 20 degrees of flaps once below 85 kts, and pitch for 75 kts.
7. Once in a position to turn a nice square final, do so and set 30 degrees of flaps, and pitch for 65 kts. Pitch for Airspeed, Power for altitude.
8. Set-up an aiming point and a crab to maintain the centerline.
9. Once over the runway and VERY close to the aiming point, reduce power to idle, move the eyes to the end of the runway, kick the nose towards the centerline, utilize ailerons to hold the centerline, and flare, trying to hold the airplane as low to the ground as possible to bleed off the airspeed for a nice, slow, smooth touchdown.

Things to Think About:

1. Don't dance too much on the controls, and try not to slip until you are over the runway or very close to it.
2. HOLD YOUR AIRSPEED! Remember, never low, never slow! Try to get a power setting that is consistent and gives you your desired descent path so that you aren't pushing it in and out, over and over again.
3. Do Not do anything on the runway except for brake, and then get off. Complete your after landing checklist once clear and in between completing tower's last instruction and communicating with ground control.

PTS Standards:

Corrects for crosswind throughout descent, flare, and rollout; Approach speed +10/-5 kts; Touchdown within 400ft; completes the appropriate checklists.



Takeoff 2: Soft-Field Takeoff and Climb

Procedure:

1. Set flaps to 10 degrees, and once rolling for takeoff, do not utilize brakes at all if able, or extremely lightly.
2. Position the elevator as far back as possible.
3. After clearance is received, landing light on, transponder to altitude, check and record time (add 1 minute for straight-out to first point, or 2 minutes of making a downwind to first point).
4. Before crossing hold-bars, check for traffic on downwind, base, or final.
5. Taxi onto the runway and align the airplane with the centerline, keeping the elevator all the way back.
6. If a cross-wind exists, begin rolling with full aileron deflected into the wind. As you increase in speed, reduce it to a slight deflection for takeoff, just enough to keep the wings level.
7. Advance the throttle smoothly to full power and the airplane will do a wheelie. Reduce a little of the elevator back pressure to prevent the tail from scraping, but also the nose wheel from touching the ground.
8. Maintain the centerline with the rudder.
9. Once the airplane lifts off of the ground, level off in ground effect, as close as possible to the ground without actually touching the ground again.
10. Establish a crab and level the wings to track the runway centerline.
11. If a 50' obstacle, accelerate to 59 and climb past it, once clear, retract flaps, accelerate to 75 kts and continue your climb. If no obstacle is present, retract flaps at a safe airspeed, accelerate to 75 kts, and continue climb.
12. At 500' AGL, you may make your turn, whether it is to remain in the pattern, or towards your first navigational fix.
13. At 1000' AGL, complete a cruise climb checklist.

Things to Think About:

1. Do not steer the airplane like a car. Unless there is a crosswind, the ailerons shouldn't be used much.
2. If tower tells you to expedite, think about canceling your clearance, do you really want to rush it?

PTS Standards:

Aligned with centerline; V_x or $V_y + 10/-5$ kts; corrects for crosswind throughout climb; completes the appropriate checklists.



Landing 2: Soft-Field Approach and Landing

Procedure:

1. Assuming you have remained in the pattern, from 500', look right, clear right, and turn right as to fly a 90 degree flight path to the upwind (crosswind).
2. Continue climbing at V_y and in 3-5 seconds, turn downwind and level off once at pattern altitude with a full 7-down flow.
3. Complete a half-7-down flow at the departure end of the runway for a descent check, and check seatbelts, shoulder harnesses, doors and windows. End with carb heat on.
4. Announce abeam the tower or midfield if not cleared to land, or downwind at an uncontrolled airport.
5. Abeam the numbers, reduce power to 1700 RPM, set flaps to 10 degrees once below 110 kts, and pitch for 80 kts.
6. At the 45 degree angle to the approach end of the runway, turn base, set 20 degrees of flaps once below 85 kts, and pitch for 75 kts.
7. Once in a position to turn a nice square final, do so and set 30 degrees of flaps, and pitch for 65 kts. Pitch for Airspeed, Power for altitude.
8. Set-up an aiming point and a crab to maintain the centerline.
9. Once over the runway and VERY close to the aiming point, reduce power to about 1200 RPMs, move the eyes to the end of the runway, kick the nose towards the centerline, utilize ailerons to hold the centerline, and flare, trying to hold the airplane as low to the ground as possible to bleed off the airspeed for a nice, slow, smooth touchdown.
10. Try to touch down the mains as softly as possible, reduce the power to idle, and hold the nose off in the process until it absolutely will not stay up any longer. Then, let it settle softly to the ground using your elevator and use minimal to no braking unless instructed to do so or you are reaching the end of the runway.

Things to Think About:

1. Don't dance too much on the controls, and try not to slip until you are over the runway or very close to it.
2. HOLD YOUR AIRSPEED! Remember, never low, never slow! Try to get a power setting that is consistent and gives you your desired descent path so that you aren't pushing it in and out, over and over again.
3. Do Not do anything on the runway except slow down and get off. Complete your after landing checklist once clear and in between completing tower's last instruction and communicating with ground control.

PTS Standards:

Corrects for crosswind throughout descent, flare, and rollout; Approach speed +10/-5 kts; completes the appropriate checklists.



Takeoff 3: Short-Field Takeoff and Climb

Procedure:

1. After clearance is received, landing light on, transponder to altitude, check and record time (add 1 minute for straight-out to first point, or 2 minutes of making a downwind to first point).
2. Before crossing hold-bars, check for traffic on downwind, base, or final.
3. Taxi onto the runway and align the airplane at the very beginning of the runway so as to utilize the most available runway possible. Apply full braking and hold your position.
4. If a cross-wind exists, begin rolling with full aileron deflected into the wind. As you increase in speed, reduce it to a slight deflection for takeoff, just enough to keep the wings level.
5. Advance the throttle smoothly to full power release the brakes. Keep the tail low to allow the airplane to accelerate faster.
6. Maintain the centerline with the rudder.
7. Accelerate to 55 kts and rotate. Climb at 59 kts until 50ft obstacle is clear.
8. Lower the nose to accelerate to 75 kts and continue climb.
9. Establish a crab and level the wings to track the runway centerline.
10. At 500' AGL, you may make your turn, whether it is to remain in the pattern, or towards your first navigational fix.
11. At 1000' AGL, complete a cruise climb checklist.

Things to Think About:

1. Do not steer the airplane like a car. Unless there is a crosswind, the ailerons shouldn't be used much.
2. If it is a busy day, you might want to tell tower that you need a delay on the runway.
3. If tower tells you to expedite, think about canceling your clearance, do you really want to rush it?

PTS Standards:

Aligned with centerline; V_x and $V_y +10/-5$ kts; corrects for crosswind throughout climb; completes the appropriate checklists.



Landing 3: Short-Field Approach and Landing

Procedure:

1. Assuming you have remained in the pattern, from 500', look right, clear right, and turn right as to fly a 90 degree flight path to the upwind (crosswind).
2. Continue climbing at V_y and in 3-5 seconds, turn downwind and level off once at pattern altitude with a full 7-down flow.
3. Complete a half-7-down flow at the departure end of the runway for a descent check, and check seatbelts, shoulder harnesses, doors and windows. End with carb heat on.
4. Announce abeam the tower or midfield if not cleared to land, or downwind at an uncontrolled airport.
5. Abeam the numbers, reduce power to 1700 RPM, set flaps to 10 degrees once below 110 kts, and pitch for 80 kts.
6. At the 45 degree angle to the approach end of the runway, turn base, set 20 degrees of flaps once below 85 kts, and pitch for 75 kts.
7. Once in a position to turn a nice square final, do so and set 30 degrees of flaps, and pitch for 60 kts. Pitch for Airspeed, Power for altitude.
8. Set-up an aiming point well before your desired touchdown point so that your flare will allow you to touchdown on or very soon after your chosen point. DO NOT LAND EARLY! Crab to maintain the centerline.
9. Once over VERY close to the aiming point, reduce power to idle, move the eyes to the end of the runway, kick the nose towards the centerline, utilize ailerons to hold the centerline, and flare, trying to hold the airplane as low to the ground as possible to bleed off the airspeed for a nice, slow, smooth touchdown right on your point.
10. Immediately retract the flaps and apply full braking without skidding the tires.

Things to Think About:

1. Don't dance too much on the controls, and try not to slip until you are over the runway or very close to it.
2. HOLD YOUR AIRSPEED! Remember, never low, never slow! Try to get a power setting that is consistent and gives you your desired descent path so that you aren't pushing it in and out, over and over again.
3. Do not land short. If you feel as if you are coming up short, GO AROUND! Nobody every failed a test for safely executing a safe decision such as a Go Around!
4. Do Not do anything on the runway except for retract the flaps, brake, and then get off. Complete your after landing checklist once clear and in between completing tower's last instruction and communicating with ground control.

PTS Standards:

Corrects for crosswind throughout descent, flare, and rollout; Approach speed +10/-5 kts; Touchdown within 200ft; completes the appropriate checklists.



Landing 4: Forward Slip to Landing

Procedure:

1. Assuming you have remained in the pattern, from 500', look right, clear right, and turn right as to fly a 90 degree flight path to the upwind (crosswind).
2. Continue climbing at V_y and in 3-5 seconds, turn downwind and level off once at pattern altitude with a full 7-down flow.
3. Complete a half-7-down flow at the departure end of the runway for a descent check, and check seatbelts, shoulder harnesses, doors and windows. End with carb heat on.
4. Announce abeam the tower or midfield if not cleared to land, or downwind at an uncontrolled airport.
4. Abeam the numbers, reduce power to 1700 RPM, and pitch for 80 kts.
5. At the 45 degree angle to the approach end of the runway, turn base, and pitch for 75 kts.
6. Once in a position to turn a nice square final, do so and pitch for 60 kts. Pitch for Airspeed, Power for altitude.
7. Set-up an aiming point well before your desired touchdown point so that your flare will allow you to touchdown on or very soon after your chosen point. **DO NOT LAND EARLY!**
8. Reduce the power to idle, and establish a full forward slip by applying full rudder opposite to the wind crosswind or with the wind another words, and lower the opposite wing using the ailerons into the wind as much as is required to move towards and maintain a centerline ground track.
9. Once over VERY close to the aiming point, move the eyes to the end of the runway, kick the nose towards the centerline, utilize ailerons to hold the centerline, and flare, trying to hold the airplane as low to the ground as possible to bleed off the airspeed for a nice, slow, smooth touchdown right on your point.
10. Immediately apply full braking without skidding the tires.

Things to Think About:

1. Don't dance too much on the controls, and try not to slip until you are over the runway or very close to it.
2. **HOLD YOUR AIRSPEED!** Remember, never low, never slow! Try to get a power setting that is consistent and gives you your desired descent path so that you aren't pushing it in and out, over and over again.
3. Do not land short. If you feel as if you are coming up short, **GO AROUND!** Nobody every failed a test for safely executing a safe decision such as a Go Around!
4. Do not do anything on the runway except for brake, and then get off. Complete your after landing checklist once clear and in between completing tower's last instruction and communicating with ground control.

PTS Standards:

Corrects for crosswind throughout descent, flare, and rollout; Touchdown within 400ft; completes the appropriate checklists.



Landing Abort: Go-Around/Rejected Landing

Procedure:

1. Once you decide that the landing cannot be made, don't try to save it!
2. Apply full throttle and simultaneously bring the pitch of the nose just underneath the horizon as to level off and build airspeed. Be careful because the airplane is probably trimmed up which means applying power will make it wants to pitch up very strongly. Counter whatever forces you are encountering and keep that nose pitched for level flight.
3. Immediately reduce the flaps to 20 degrees.
4. Accelerate to 59 kts, and reduce the flaps to 10 degrees and start pitching up.
5. As the airspeed continues to rise, retract the flaps completely and accelerate to 75 kts and continue the climb.
6. Announce go-around to tower as soon as practical.
7. Establish a crab to maintain the centerline.
8. At 500' AGL, you may make your turn to remain in the pattern.
9. At TPA, level-off, choose a landing procedure, and continue.

Things to Think About:

1. Watch out for the potential elevator trim stall.
2. Don't allow the plane to get too high initially while the airflow is still very slow.

PTS Standards:

Aligned with centerline; $V_y + 10/-5$ kts; corrects for crosswind throughout climb; completes the appropriate checklists.



Performance Maneuver 1: Steep Turns

Procedure:

1. Complete a Triple A Checklist, checking for Airspace (Clearing Turns, 2 90's or 1 180 degree turn), Altitude (more than 1,500' AGL), and 7-down to about 2300 RPM so that the plan is no faster than 95 kts.
2. Choose a prominent reference point in the distance to begin the maneuver so that you can easily identify a heading for rollout and align the plane to it.
3. Set the power to 2400 RPM while simultaneously rolling into a 45 degree bank to the left or right.
4. As the bank passes through 15 degrees, begin trimming the plane up by grabbing the very top of the trim tab and trimming it up two-and-a-half full swipes for a steep turn to the left and three full swipes for the right. (These are approximates and should be worked individually to discover what setting achieves level flight.
5. Keep the ball centered with the rudder; maintain your bank with slight opposite aileron, and altitude gently with the elevator to assist the trim.
6. As you reach the reference point, begin an early rollout so that the plane levels off pointing directly at the reference point, while simultaneously pushing forward on the yoke to counteract the trim and maintain your altitude. DO NOT UNTRIM YET; LEAVE IT IN FOR THE OTHER SIDE.
7. Begin a roll towards 45 degrees in the opposite direction, and upon passing through 15 degrees, begin releasing forward pressure on the yoke to maintain level flight. If you are now turning to the left, trim half a swipe down, otherwise, add a half-swipe trim up for the right side.
8. Keep the ball centered with the rudder; maintain your bank with slight opposite aileron, and altitude gently with the elevator to assist the trim.
9. As you reach the reference point, begin an early rollout so that the plane levels off pointing directly at the reference point, while simultaneously pushing forward on the yoke to counteract the trim and maintain your altitude.
10. Trim away the pressure and return to cruise power.

Things to Think About:

1. Keep your eyes outside the plane. The more they are focused on the instruments, the more the maneuver will become a game of cat and mouse instead of a smooth graceful maneuver. Learn to visualize the bank angle and level flight for that angle outside by referencing it with the dashboard.

PTS Standards:

+/- 100ft from entry altitude; Airspeed +/- 10 kts; Bank angle +/- 5 degrees; Entry heading +/- 10 degrees on rollout.



Performance Maneuver 2: Maneuvering During Slow Flight

Procedure:

1. Complete a Triple A Checklist, checking for Airspace (Clearing Turns, 2 90's or 1 180 degree turn), Altitude (more than 1,500' AGL), and 7-down with carburetor heat on and power to idle, while simultaneously pitching up to maintain altitude by bleeding off airspeed.
2. For slow flight clean, simply bring power back between 1700 and 1800 RPM once the airspeed falls back to about 60 kts.
 - a. Pitch for 47-50 kts and adjust power as necessary to maintain altitude. Keep your nose aligned to a prominent reference point or on the compass using your rudders.
 - b. Use standard rate turns and an extra 100 rpm when making turns.
 - c. Use full power with carburetor heat in to climb and then return to carburetor heat on and whatever power setting works for level flight once at the desired altitude.
 - d. For a descent, reduce enough power to maintain a 500ft per minute descent, while maintaining airspeed.
3. For slow flight dirty, set flaps to full once within the white arc (85 kts), bring power back between 2000 and 2200 RPM once the airspeed falls back to about 55 kts.
 - a. Pitch for 41-45 kts and adjust power as necessary to maintain altitude. Keep your nose aligned to a prominent reference point or on the compass using your rudders.
 - b. Use standard rate turns and an extra 100 rpm when making turns.
 - c. Use full power with carburetor heat in to climb and then return to carburetor heat on and whatever power setting works for level flight once at the desired altitude.
 - d. For a descent, reduce enough power to maintain a 500ft per minute descent, while maintaining airspeed.
4. To recover, 7-up using full power and pushing the carburetor heat in, while pitching down to maintain altitude as airspeed builds, adding right rudder for torque to maintain heading. If flaps are extended, reduce flaps immediately upon adding power to 20 degrees, allow the airplane to stabilize, then 10 degrees, stabilize, and finally, fully retract. Finally, return the power to a cruise setting and the maneuver is complete.

Things to Think About:

1. Because of the high angle of attack in slow flight, you will most likely need quite a bit of right rudder in order to maintain the heading off the nose. Be careful though, the rudder will be very responsive because the lack of airflow stabilizing the plane, and the maximum amount of thrust on the control surface so don't jab on the controls.
2. Many turning tendencies will be magnified in slow flight such as slipstream, torque, gyroscopic precession, p-factor, and definitely adverse aileron yaw. Learn to see each one of them before they happen and take the appropriate counter measures with rudder and aileron combinations.

PTS Standards:

+/- 100ft from entry altitude; Completes maneuver no lower than 1500ft; Heading +/- 10 degrees; Airspeed +10/-0 kts; Bank angle +/- 10 degrees; Entry heading +/- 10 degrees on rollout.



Performance Maneuver 3: Power-On Stalls

Procedure:

1. Complete a Triple A Checklist, checking for Airspace (Clearing Turns, 2 90's or 1 180 degree turn), Altitude (more than 1,500' AGL), and 7-down to about 2000 RPM to slow down to takeoff speed (V_y 75 kts), while simultaneously pitching up to maintain altitude by bleeding off airspeed.
2. If Straight ahead, Upon reaching 75 kts, apply full power with right rudder and pitch up at 1 kt per second until the stall warning horn goes off, the airplane buffets, and then stalls.
3. If Turning, roll into a 20 bank in either direction and Upon reaching 75 kts, apply full power with right rudder and pitch up at 1 kt per second until the stall warning horn goes off, the airplane buffets, and then stalls. You will need to make sure and keep the plane coordinated at all times with rudder and maintain your bank angle using the ailerons as necessary.
4. To recover, bring the nose down to just below level flight (about a fist-and-a-half below the horizon), 7-up using full power and pushing the carburetor heat in, while pitching down to prevent the plane from entering another stall, and finally, if in a bank, level the wings. Add right rudder for torque to maintain heading as airspeed builds. Upon reaching 90 kts, begin reducing the power to a cruise setting and the maneuver is complete.

Things to Think About:

1. At the top of the stall, be very careful where you place your controls. Adding aileron opposite to rudder or too much rudder can cause a spin. You may notice that when you reach the peak of the stall you actually need to release the right rudder as the airplane stalls (because the rudder is still effective while everything else isn't, causing the rudder to do more harm than good), and then bring the rudder back in as the nose drops and airspeed starts to build.
2. If you pull up too fast, your residual momentum will put you into what we call an "ozone layer" stall. You will be pitched up extremely high and have a very violent drop upon stalling. Be calm, slow, and smooth in your pitching up into the stall.
3. Many turning tendencies will be magnified in a stall such as slipstream, torque, gyroscopic precession, p-factor, and definitely adverse aileron yaw. Learn to see each one of them before they happen and take the appropriate counter measures with rudder and aileron combinations.

PTS Standards:

Completes maneuver no lower than 1500ft; Heading +/- 10 degrees; Bank angle no more than 20 degrees and +/- 10 degrees;



Performance Maneuver 3: Power-Off Stalls

Procedure:

1. Complete a Triple A Checklist, checking for Airspace (Clearing Turns, 2 90's or 1 180 degree turn), Altitude (more than 1,500' AGL), and 7-down with carburetor heat on and power to idle, while simultaneously pitching up to maintain altitude by bleeding off airspeed.
2. If Straight ahead, upon reaching V_{fe} 85 kts, fully extend the flaps and pitch up at 1 kt per second until the stall warning horn goes off, the airplane buffets, and then stalls. Your nose should be just above the horizon upon stall. You do not need a very high pitch attitude because there is no power preventing you from stalling.
3. If Turning, roll into a 20 bank in either direction and Upon reaching V_{fe} 85 kts, fully extend the flaps, and pitch up at 1 kt per second until the stall warning horn goes off, the airplane buffets, and then stalls. You will need to make sure and keep the plane coordinated at all times with rudder and maintain your bank angle using the ailerons as necessary.
4. To recover, bring the nose down to just below level flight (about a fist-and-a-half below the horizon), 7-up using full power and pushing the carburetor heat in, while pitching down to prevent the plane from entering another stall, if in a bank, level the wings. If flaps are extended, reduce flaps immediately upon adding power to 20 degrees, allow the airplane to stabilize, then 10 degrees, stabilize, and finally, fully retract. Finally, return the power to a cruise setting and the maneuver is complete.. Add right rudder for torque to maintain heading as airspeed builds. Upon reaching 90 kts with flaps up, begin reducing the power to a cruise setting and the maneuver is complete.

Things to Think About:

1. At the top of the stall, be very careful where you place your controls. Adding aileron opposite to rudder or too much rudder can cause a spin. You will not need a great deal of rudder when in a straight stall or a turn to the left because there is no power causing any of the turning tendencies. To the right, you will need just a little right rudder to maintain coordinated flight.
2. If you pull up too fast, your residual momentum will put you into what we call an "ozone layer" stall. You will be pitched up extremely high and have a very violent drop upon stalling. Be calm, slow, and smooth in your pitching up into the stall. A power-off stall doesn't require a very high pitch attitude at all so don't make it harder than it needs to be.
3. While turning tendencies will be minimized while in the stall, they will come out of nowhere when you add power. Be prepared to add right rudder when your wings are level and applying full power.

PTS Standards:

Completes maneuver no lower than 1500ft; Heading +/- 10 degrees; Bank angle no more than 20 degrees and +/- 10 degrees;



Performance Maneuver 4: Spin Recovery

Procedure:

1. Upon entering a spin, immediately neutralize the ailerons both in pitch and bank, allow the nose to drop to gain airspeed, but not too far down.
2. Reduce power to idle immediately.
3. Apply full rudder in the opposite direction of rotation until the wings are in a level attitude and right side up.
4. Slowly pull out of the dive (altitude allowing) and level off. Try not to pull more than a couple g's, especially in turbulent air.
5. As the airspeed reaches a more manageable rate, smoothly apply power and return to cruise.

Things to Think About:

1. Do not enter a spin intentionally. This is a procedure to save you, not turn you into Evil Kinevil.
2. If you pull up too fast, you'll leave your wings behind so be careful!

PTS Standards:

Not Applicable.



Ground Reference Maneuver 1: Turns Around a Point

Procedure:

1. Complete a Triple A Checklist, checking for Airspace (Clearing Turns, 2 90's or 1 180 degree turn), Altitude (800' AGL), and set power to 2300 RPM or whatever achieves 95 kts to begin the maneuver.
2. Choose a prominent point that is located along flat terrain and away from houses, vehicles, structures, and persons.
3. Find out which way the wind is coming from by looking for smoke in the air, ripples in bodies of water, ground track of the airplane, or perhaps a nearby ATIS, AWOS, or ASOS.
4. Fly away from the point as to enter downwind. Line up the point on either side. When the point is abeam the wing, roll into a bank. Your first bank will be steepest because it is the fastest.
5. Vary your bank angle to keep the point a fixed distance away. You will begin with a steep bank and progress towards a shallow bank, and back to a steep bank.
6. Once complete, roll out to wings level, climb back up to a safe altitude (unless continuing on with more ground reference maneuvers), and return to cruise speed.

Things to Think About:

1. When you fly into the wind you will initially pick up lift and the airplane will probably want to climb a little, followed by a loss in airspeed when flying downwind which will make the airplane descend a little. Add a little power on the downwind side and decrease a little power into the wind to compensate for this.
2. Remember that as airspeed increases, your radius of turn will increase for a given bank angle. Downwind you will need to fly a steep bank and shallow it out on the upwind side in order to maintain a fixed radius.
3. Pick four landmarks that are fixed distances around the point and fly over each of them to make this maneuver a little easier.
4. Keep the flight coordinated or this maneuver will be very difficult and the bank angles will not work to prove our little theory of wind, rate, and radius.

PTS Standards:

Enters the maneuver at 600-1000ft AGL; Altitude +/- 100ft; Airspeed +/- 10 kts.



Ground Reference Maneuver 2: S-Turns Across a Road

Procedure:

1. Complete a Triple A Checklist, checking for Airspace (Clearing Turns, 2 90's or 1 180 degree turn), Altitude (800' AGL), and set power to 2300 RPM or whatever achieves 95 kts to begin the maneuver.
2. Find out which way the wind is coming from by looking for smoke in the air, ripples in bodies of water, ground track of the airplane, or perhaps a nearby ATIS, AWOS, or ASOS.
3. Try to find a long, straight road that is nearly perpendicular to the oncoming wind.
4. Fly away from the road as to enter wings parallel to the road and downwind.
5. When the middle of the road is abeam the wing, roll into a bank towards the longest portion of the straight road. Your first bank will be steepest because it is the fastest.
6. Vary your bank angle to fly a fixed radius semi-circle, back towards the road. You will begin with a steep bank and progress towards a shallow bank, and try to time it so that you end up wings perfectly level just as you cross the road.
7. When the middle of the road is abeam the wing again, roll into a bank in the opposite direction. This bank will initially be shallower because it is slowest, and progressively get steeper as the wind ends up behind you, until eventually you roll from steep to level in one instance as you cross the road.
8. Repeat steps 5-8 as necessary to continue the maneuver. The maneuver is successful if the plan draws what looks like partial figure 8's along the road.
9. Once complete, roll out to wings level, climb back up to a safe altitude (unless continuing on with more ground reference maneuvers), and return to cruise speed.

Things to Think About:

1. When you fly into the wind you will initially pick up lift and the airplane will probably want to climb a little, followed by a loss in airspeed when flying downwind which will make the airplane descend a little. Add a little power on the downwind side and decrease a little power into the wind to compensate for this.
2. Remember that as airspeed increases, your radius of turn will increase for a given bank angle. Downwind you will need to fly a steep bank and shallow it out on the upwind side in order to maintain a fixed radius.
3. On your upwind side, be careful not to enter too steep of a bank, otherwise when you turn around with the wind, your bank angle will increase to an unmanageable angle. On the flipside, if on your downwind side initially, choose a nice bank angle to make a nice, wide, quarter mile semi-circle, rather than jumping into a steep turn. The maneuver will be much easier and more enjoyable. Remember there is no real size limit that the semi circles have to be and so the larger they are, the easier they will be to manage.
4. Keep the flight coordinated or this maneuver will be very difficult and the bank angles will not work to prove our little theory of wind, rate, and radius.

PTS Standards:

Enters the maneuver at 600-1000ft AGL; Altitude +/- 100ft; Airspeed +/- 10 kts.



Ground Reference Maneuver 3: Rectangular Pattern

Procedure:

1. Complete a Triple A Checklist, checking for Airspace (Clearing Turns, 2 90's or 1 180 degree turn), Altitude (800' AGL), and set power to 2300 RPM or whatever achieves 95 kts to begin the maneuver.
2. Find out which way the wind is coming from by looking for smoke in the air, ripples in bodies of water, ground track of the airplane, or perhaps a nearby ATIS, AWOS, or ASOS.
3. Find a nice rectangular stretch of ground with easy to identify corners and sides. Farming patches work great for this maneuver but in some areas are hard to find. Just try to make sure that your rectangular pattern isn't over a housing development or anything that could become cause harm to others or property in an emergency.
4. Fly away from the point as to enter on a 45 degree angle to the downwind leg.
5. Once between $\frac{1}{4}$ and $\frac{1}{2}$ mile away from the rectangle, turn to enter downwind. Maintain a fixed distance at all times from the rectangle.
6. At your first corner, you will probably need to make a fairly steep bank if the winds are significant, because you are fastest. Furthermore, you will have to turn more than 90 degrees to establish a crab so that you fly a flight path that maintains your fixed distance from the edge of the rectangle.
7. At corner 2, you'll have a shallower bank because you will have slowed down quite a bit. Also, the turn will be less than 90 degrees due to the fact that you were crabbing along the way.
8. At corner 3, you will have a very shallow turn because this will be your slowest point. The turn will also be less than 90 degrees so that you end up with a crab angle and the desired flight path.
9. At the final corner, you will have a steeper turn because you will have gained airspeed since you aren't flying directly into the wind anymore. The turn will be more than 90 degrees and now your back where you started.
10. Repeat steps 6 through 9 as necessary to continue the maneuver.
11. Once complete, roll out to wings level, climb back up to a safe altitude (unless continuing on with more ground reference maneuvers), and return to cruise speed.

Things to Think About:

1. When you fly into the wind you will initially pick up lift and the airplane will probably want to climb a little, followed by a loss in airspeed when flying downwind which will make the airplane descend a little. Add a little power on the downwind side and decrease a little power into the wind to compensate for this.
2. Remember that as airspeed increases, your radius of turn will increase for a given bank angle. Downwind you will need to fly a steep bank and shallow it out on the upwind side in order to maintain a fixed radius.
3. Keep the flight coordinated or this maneuver will be very difficult and the bank angles will not work to prove our little theory of wind, rate, and radius.

PTS Standards:

Enters the maneuver at a 45 degree angle 600-1000ft AGL; Altitude +/- 100ft; Airspeed +/- 10 kts.



Navigation Systems and Radar Services

Procedure:

1. To intercept and fly towards a VOR:
 - a. Tune in and identify the VOR and center the OBS on a TO.
 - b. Turn towards the heading listed at the top center of the VOR needle and fly towards the VOR.
2. To intercept and fly towards a VOR on a specific radial:
 - a. Tune in and identify the VOR.
 - b. Set the OBS: If given an outbound radial to intercept and fly inbound on, set its reciprocal in the OBS. A TO indication should be present.
 - c. Visualize the airplane flying the heading listed at the top center of the VOR needle, and decide whether the airplane is to the right of the radial or left.
 - d. If a full deflection, turn 90 degrees towards the needle (and radial) from the heading listed at the top center of the VOR.
 - e. As the needle comes in, at 5 degrees of deflection, reduce the intercept to 30 degrees and hold until centered.
 - f. Once the needle centers, turn towards the heading listed at the top center of the VOR needle and fly towards the VOR.
3. To intercept and fly outbound from a VOR:
 - a. Tune in and identify the VOR and center the OBS on a FROM.
 - b. Turn towards the heading listed at the top center of the VOR needle and fly away from the VOR.
4. To intercept and fly outbound from a VOR on a specific radial:
 - a. Tune in and identify the VOR.
 - b. Set the OBS: When the specific radial is twisted to the top of the VOR, a FROM indication should be present.
 - i. If a TO indication is shown, follow step 2d through 2f and fly towards the VOR. After passing over the VOR, you will then be tracking outbound on the desired radial.
 - c. If a From indication is shown, Visualize the airplane flying the heading listed at the top center of the VOR needle, and decide whether the airplane is to the right of the radial or left. If needed, turn the airplane to the heading at the top center of the VOR needle and then look at the needle deflection.
 - d. If a full deflection, turn 90 degrees towards the needle (and radial) from the heading listed at the top center of the VOR.
 - e. As the needle comes in, at 5 degrees of deflection, reduce the intercept to 30 degrees and hold until centered.
 - f. Once the needle centers, turn towards the heading listed at the top center of the VOR needle and fly away from the VOR.

Things to Think About:

1. Don't chase needles! Wind will be depicted by the side that the needle is deflected to. Assuming the heading indicator is accurate and you are flying the right heading, learn to "bracket." Try a heading slightly into the wind and find a heading that will maintain the needle. Wind drift, bracketing, and chasing needles.
2. Calculate reciprocals quickly by using the +2/-2 or -2/+2 rule.

PTS Standards:

Altitude +/- 200ft; Heading +/- 15 degrees; airspeed +/- 10 kts.



Basic Instrument Maneuvers

Procedure:

1. Use a positive exchange of controls while you put on the hood, gain orientation, and set your attitude indicator.
2. Scan the instruments and give each instrument a full second, scanning in the following order: Attitude Indicator, Altimeter, Attitude Indicator, VSI, Attitude Indicator, Heading Indicator, Attitude Indicator, Turn Coordinator, Attitude Indicator, Airspeed Indicator.
3. Maintain straight and level flight using the primary flight controls and referencing what the instruments indicate. If the altimeter shows a climb, the VSI will show a climb, the attitude indicator will show a pitch up, and the airspeed will decrease. It is through your instrument scan that you will crosscheck, interpret, and make corrections for the desired results.
4. To initiate a climb, smoothly and slowly pitch for 75 kts (V_y), 7-up to full power, add right rudder to coordinate the flight and trim away the pressure. Once near the desired altitude. Pitch down for level flight on the attitude indicator (also known as bringing it home), 7-down to cruise as power increases, and trim away the pressure. Release rudder pressure as necessary to maintain heading.
5. To initiate a descent, 7-down with carburetor heat out to approximately 1700 RPM while maintaining pitch attitude to bleed off airspeed. At 80 kts, smoothly and slowly allow the nose to pitch down to a 500ft/min descent and adjust power as necessary to maintain this descent rate. Finally, trim away the pressure and use rudder as necessary to keep the flight coordinated. Once near your target altitude, 7-up with carburetor heat in to cruise, bring the dot home on the attitude indicator, and trim away the pressure.
6. To execute a level turn, smoothly and slowly roll the plane into a standard rate bank (3 degrees per second) using either the standard rate mark on the turn coordinator, or a simple math calculation (Airspeed divided by 10, plus 5). Pitch up slightly to maintain level flight and trim away the pressure. Plan to level off early enough so that you don't over-fly your heading, lower the nose, and trim away the pressure.

Things to Think About:

1. Trust your instruments! No matter what your inner ear tells you, it is probably wrong. Keep the plane straight and level using the instruments.
2. Don't Fixate, Omit, or Emphasize too much during your scan. It will cause you to have tunnel vision/mind and lose control of other variables. Keep up your instrument scan, using the recommended order and interpretation time at each instrument.
3. Don't forget to set your heading indicator when initially putting the hood on. Students come in all shapes, sizes, and heights. Chances are slim that it will be adjusted perfectly for you. Once you put the hood on, get zero VSI and altimeter change and then set it to depict straight and level flight.
4. For the climbs, descents, and turns, try to memorize the picture. This means that you should remember where 75 kts was (just touching the first bar above the horizon), or where 80 kts is for a descent (just about a dot or two below the horizon). This will make it easier to get to the desired airspeeds faster.
5. Keep in mind that when you are turning the attitude indicator will be above the horizon (and so will the dot) in turns to the right, and below the horizon (and so will the dot) in turns to the left.

PTS Standards:

Altitude +/- 200ft; Heading +/- 20 degrees; airspeed +/- 10 kts.



Recovery From Unusual Attitudes

Procedure:

1. Upon looking up, immediately look at the airspeed indicator.
2. If the airspeed is increasing:
 - a. Immediately reference the attitude indicator and return the wings to a level flight attitude.
 - b. Reduce the power to idle.
 - c. Pitch up and bring the dot home quickly but safely.
 - d. Return to normal cruise as airspeed bleeds off and a safe speed can be maintained.
3. If the airspeed is decreasing:
 - a. Immediately reference the attitude indicator and return the dot to the horizon.
 - b. Apply full power.
 - c. Level the wings by referencing the attitude indicator.
 - d. Return to normal cruise as airspeed increases off and a safe speed can be maintained.
4. Return to an appropriate and positive instrument scan in cruising flight and maintain the scan to prevent from entering an unusual attitude.

Things to Think About:

1. Trust your instruments! No matter what your inner ear tells you, it is probably wrong. Keep the plane straight and level using the instruments.
2. Do not pull up first if you see an increasing airspeed. You may be inverted which would only pull you steeper into the descent. Level the wings and reduce power to idle first!
3. Do not level the wings first if you see a decreasing airspeed. Your airspeed may be nearing a stall which could create a spin if you try to utilize the ailerons without appropriate airflow over them. Lower the nose and add full power first!

PTS Standards:

Students must quickly identify the problem and safely execute the appropriate action to correct the problem.



Diversion

Procedure:

1. Choose an appropriate airport to divert to based on the situation, i.e. low fuel, medical emergency, weather, etc.
2. Estimate an octant that the plane will need to fly to get to the destination (North, Northeast, East, etc.) and turn towards that octant.
3. Align the plotter on the map with the present location and diversion location. Measure the distance and then slide the plotter over a compass rose of a nearby VOR to determine the appropriate direction to fly. Try not to change the alignment of the plotter as you slide it over the compass rose in order to get the most accurate estimate of Magnetic Course.
4. Estimate the time enroute if able without calculating. If necessary, use the E6-B to calculate the ETE.
5. Climb or descend as appropriate to allow adequate clearance of the ground, good visibility, and an approach if necessary at the destination.

Things to Think About:

1. Be sure to use Pilotage and VORs to back yourself up if needed for the diversion.
2. Trust your numbers. You might want to slide the plotter over a compass rose a few times to make sure that you got an accurate Magnetic Course, but once you feel its accurate, trust it.
3. Watch out for terminal charts and sectional scaled plotters. Divide the distance in half! And half of that half will give you the ETE if traveling 120 kts!
4. Be prepared to land at this airport so make sure you plan early to get ATIS, frequencies dialed in, etc. if applicable in order to make a safe approach and land.

PTS Standards:

Altitude +/- 200ft; Heading +/- 15 degrees.



Lost Procedures

Procedure:

1. CIRCLE – Stop getting more lost! As long as you continue on, you are simply getting more lost. Hold your position and place the plane into a constant 20-30 degree bank and trim it for level flight.
2. CLIMB – As you climb, the topography will begin to look closer and closer to how it looks on your map, allowing you to more easily identify landmarks which could give away your position. Also, by climbing, you will see more of an area which may also help you identify your position. Also, altitude will help you communicate better and use radio navigation aids better because you will increase your line of site to these stations. Finally, if an emergency does occur, altitude will give you more time and options to explore.
3. ESTIMATE – Think about where you came from, and where you were trying to go. Check the direction you've been heading on the heading indicator and reference it with the compass. Is your heading indicator off? If so, which direction have you actually been heading? For how long? Try to narrow off large areas of the map where you at least know that the plane is definitely not lurking within. Now, in the areas of possibility, try to dial in a nearby VOR or other navigational aid and use the device to find your present position.
4. CONFESS – If none of the previous steps helped, try the last approach frequency you communicated with if applicable, or communicate a MAYDAY on 121.5 Mhz, and squawk 7700. Get as much altitude as needed to get a hold of somebody and tell them that you are LOST!!!

Things to Think About:

1. Be careful on this maneuver. Unless you are in an actual emergency situation or you are lost by yourself, you must still remain clear of any airspace in the area like B, C, or D. be careful how high you climb unless you are sure that there isn't any airspace above you, or you really are lost.

PTS Standards:

Student must safely discover their location by any means necessary and safely return to their original course or if necessary divert to a new location.



Emergency Procedure 1: Engine Failure Enroute

Procedure:

1. Upon engine failure, establish best glide (65 kts).
2. Look for a place to land, head to, and circle over it. Plan to make your final approach into the wind.
3. At 2000ft AGL, attempt a restart with a 7-up to full throttle with carburetor heat out. Try to start the engine with the mags, and perhaps even prime the engine. If the engine starts and dies with the primer, you may be able to keep pumping the primer and produce partial power, allowing you to have more options for landing points. If more time is available, attempt another restart or two.
4. At 1500ft AGL, communicate a MAYDAY 121.5 Mhz and Squawk 7700.
5. At 1000ft AGL, start setting up for the approach by flying a fairly normalized downwind, base and final. Do not fly out too far or you won't make it to your point. Remember you only get one chance so stay a little on the high-side, and make your turns a pinch early. You can always burn altitude, s-turn, slip, etc. to get down.
6. At 750ft AGL, brief your passengers on the emergency and tell them to cover their faces with something, jacket, blanket, pillow, etc. Unlock and crack the doors in case impact causes damage to them in order to allow everyone to evacuate.
7. At 500ft AGL, turn off the bomb. 7-down, throttle out, mixture out, fuel selector off, and key off.
 - a. If just practicing, bring the power back in here and recover to a safe altitude and cruise setting.
8. Line up the landing area on a well judged final approach, and bring in full flaps when the runway is made for sure.
9. Hold the nose off as long as possible at touchdown, and use minimal braking.

Things to Think About:

1. Hold your best glide speed! It will buy you options and time.
2. If you are below one of the altitudes above at failure, skip the step. At a very minimal though, glance over the controls to make sure nothing is out of place, and squawk 7700. Always try to get in a restart, but if you are too low, focus on landing the plane. Engine failures in small planes are extremely survivable if one focuses on the task at hand, rather than expecting an engine restart all the way until the last minute.
3. Remember that if you are practicing this procedure, it is a simulation, so don't really turn anything off, or when restarting turn everything back on. Just communicate what you are doing and pretend. The only steps that you should really do are 1, 2, 6, and all of step 7a.

PTS Standards:

Student must safely perform all steps within this maneuver while maintaining positive control of the airplane and consistently scanning the environment for other aircraft.



Emergency Procedure 2: Engine Failure to Landing

Procedure:

1. 7-down and reduce the throttle to idle abeam the numbers of the runway.
2. Upon engine failure, establish best glide (65 kts).
3. Attempt a restart with a 7-up to full throttle with carburetor heat out. Try to start the engine with the mags, and perhaps even prime the engine.
4. Communicate a MAYDAY with tower or 121.5 Mhz and Squawk 7700 (only if an actual emergency exists).
5. Start setting up for the approach by flying a fairly normalized downwind, base and final. Do not fly out too far or you won't make it to your point. Remember you only get one chance so stay a little on the high-side, and make your turns a pinch early. You can always burn altitude, s-turn, slip, etc. to get down.
6. At 750ft AGL, brief your passengers on the emergency and tell them to cover their faces with something, jacket, blanket, pillow, etc. Unlock and crack the doors in case impact causes damage to them in order to allow everyone to evacuate.
7. At 500ft AGL on base, turn off the bomb. 7-down, throttle out, mixture out, fuel selector off, and key off.
8. Line up the runway on a well judged final approach, and bring in full flaps when the runway is made for sure.
9. Hold the nose off as long as possible at touchdown, and use minimal braking.

Things to Think About:

1. Hold your best glide speed! It will buy you options and time.
2. If you are below one of the altitudes above at failure, skip the step. At a very minimal though, glance over the controls to make sure nothing is out of place, and squawk 7700. Always try to get in a restart, but if you are too low, focus on landing the plane. Engine failures in small planes are extremely survivable if one focuses on the task at hand, rather than expecting an engine restart all the way until the last minute.
3. Remember that if you are practicing this procedure, it is a simulation, so don't really turn anything off, or when restarting turn everything back on. Just communicate what you are doing and pretend. The only steps that you should really do are 1, 2, 5, 6, 8, and 9.

PTS Standards:

Best-Glide Airspeed +/- 10 kts; Student must safely land on the available runway within a reasonable distance, after performing all steps within this maneuver and maintaining positive control of the airplane while consistently scanning the environment for other aircraft.



Emergency Procedure 3: Engine Fire

Procedure:

1. Turn off the bomb. 7-down, throttle out, mixture out, fuel selector off, and key off.
2. Pitch for 105+ kts to put out the fire.
 - a. If practicing, announce that the fire has been extinguished after a second or two and continue.
3. Once the fire is out, establish best glide (65 kts).
4. Look for a place to land, head to, and circle over it. Plan to make your final approach into the wind.
5. At 1500ft AGL, communicate a MAYDAY 121.5 Mhz and Squawk 7700.
6. At 1000ft AGL, start setting up for the approach by flying a fairly normalized downwind, base and final. Do not fly out too far or you won't make it to your point. Remember you only get one chance so stay a little on the high-side, and make your turns a pinch early. You can always burn altitude, s-turn, slip, etc. to get down.
7. At 750ft AGL, brief your passengers on the emergency and tell them to cover their faces with something, jacket, blanket, pillow, etc. Unlock and crack the doors in case impact causes damage to them in order to allow everyone to evacuate.
 - a. At 500ft AGL, If just practicing, bring the power back in here and recover to a safe altitude and cruise setting.
8. Line up the landing area on a well judged final approach, and bring in full flaps when the runway is made for sure.
9. Hold the nose off as long as possible at touchdown, and use minimal braking.

Things to Think About:

1. Don't attempt a restart once the fire has been extinguished!
2. If the fire isn't extinguished, hold 105 all the way to the ground. You'll lose your options of this landing area or that, but remember, you are burning alive at this point. Get down, flare, land, and GET OUT!
3. If the fire does get extinguished, establish and hold your best glide speed! It will be by your options and time.
4. If you are below one of the altitudes above at failure, skip the step. At a very minimal though, squawk 7700 and brief the passengers.
5. Remember that if you are practicing this procedure, it is a simulation, so don't really turn anything off, or when restarting turn everything back on. Just communicate what you are doing and pretend. The only steps that you should really do are 2, 3, 4, 6, 7, and all of step 7a.

PTS Standards:

Student must safely perform all steps within this maneuver while maintaining positive control of the airplane and consistently scanning the environment for other aircraft.



Emergency Procedure 3: Electrical Fire

Procedure:

1. Turn off the Master Switch and extinguish the fire with an extinguisher, jacket, blanket, etc.
2. Close the lower vents and open the upper vents. Smoke has probably filled the cabin and you need to breathe to make it through this.
3. Turn off any and all electrical components individually.
4. Isolate the problem:
 - a. Do not reset any circuit breakers or turn on any components with a popped breaker.
 - b. Turn on only desired and needed equipment, one at a time, smelling for burning plastic, burning wires, or smoke.
 - c. If no new smells are encountered, continue turning on other equipment or avionics as needed to make it to a nearby airport. Follow the same method as in step b. If a smell is encountered at any time, turn off that device and do not attempt to turn it back on.
5. Divert to an airport with services and land as soon as practical.

Things to Think About:

1. This is not an engine fire and nothing is wrong with the engine. Do not cut engine power, establish best glide, etc. Do not confuse this emergency with others.

PTS Standards:

Student must safely perform all steps within this maneuver while maintaining positive control of the airplane and consistently scanning the environment for other aircraft.



Emergency Procedure 4: Emergency Descent

Procedure:

1. 7-down with carburetor heat on, and power to idle.
2. Below V_{fe} (85 kts), fully extend flaps while simultaneously rolling into a 45 degree coordinated bank.
3. Maintain between 75 and 80 kts in the turn.
4. To recover, roll out and pitch up for level flight.
5. 7-up with full power and carburetor heat off.
6. Reduce the flaps to 20 degrees; stabilize; 10 degrees; stabilize; then fully retract the flaps.

Things to Think About:

1. Don't let your airspeed get too fast or you'll leave your flaps behind, both during the maneuver and on recovery.

PTS Standards:

Student must safely perform all steps within this maneuver while maintaining positive control of the airplane and consistently scanning the environment for other aircraft.