FLIGHT TRAINING CURRICULUM

T-28-B/C/D

TRANSITION STAGE

A. **Fundamental Flight Attitudes and Transitions**

1. There are four fundamental flight attitudes, all of which are used at least once during every normal flight. These conditions of flight are: (1) straight and level flight, (2) the climb, (3) the descent, and (4) the turn. These four basic attitudes and their various combinations are recognized and maintained by using three of the five physical senses: sight, sound, and feel.

a) Through your sense of sight, note the nose position of the aircraft in relation to the horizon; how far it is above or below, the angle formed between the top of the cowling and the horizon. Observe the angle formed by the wing tips and the horizon, the amount of space between the wing tips and the horizon, or the point at which the horizon intersects the high wing. Remember that a correct and constant seat position is very important. If you sit high in the cockpit one time and low the next, your points of reference will be meaningless.

b) Fix in your mind the sound of the engine under the various conditions of flight. In a climb or a descent, the relative pitch of the engine noise is much the same as that of an automobile going up or down a steep hill.

c) Learn to recognize the relative speed of the aircraft through the feel of the pressure acting on the control surfaces and the rapidity with which the aircraft responds to control movement. At high airspeeds, the controls will be firm and the aircraft will respond immediately to their slightest movement. At
low airspeeds, the controls will feel "sloppy" or "mushy" and the aircraft will react sluggishly to their movement.

2. Straight and level flight is a condition in which the aircraft is flown in balanced flight, holding a constant altitude and heading. The T-28 can be flown in straight and level flight at varying airspeeds; however, the most common condition, known as normal cruise, is 180 knots of airspeed, 2000 rpm, with sufficient manifold pressure to maintain altitude, approximately 28 to 30 inches, mixture normal.
   a) Your instructor will introduce straight and level flight at normal cruise. As you gain in experience, you will be able to sense the straight and level attitude of the aircraft. At first, however, keeping the aircraft in the straight and level flight attitude will be a matter of conscious control adjustment.
   b) For straight and level flight, it is necessary that a certain heading and altitude be maintained. The throttle primarily controls the altitude: Reducing power will cause the aircraft to lose altitude; increasing power will cause the aircraft to gain altitude. The nose attitude primarily controls the airspeed: While maintaining a constant throttle setting, lowering the nose will cause the airspeed to increase; raising the nose will cause the airspeed to decrease.
   c) It is important in maintaining straight and level flight to develop the proper scan pattern. Both wing tips should be the same distance below the horizon and the nose should maintain its same relative position below the horizon without any lateral motion.
d) Straight and level flight requires almost no pressure on the controls, provided the aircraft is properly trimmed and the air is smooth. However, when the air is rough and you are flying through thermals of varying intensities, the flight attitude may change with each bump. Do not fight the controls to prevent these bumps from occurring. Just make smooth adjustment in the flight attitude. As in driving over a very bumpy road, you can't keep the car from bouncing, but you can keep it in your lane.

e) Common errors of the student in maintaining straight and level flight are:

1. Over-controlling; making the control movements too great for the amount of correction necessary.
2. Holding one wing low. Keep checking both wing tips.
3. Fighting the controls; attempting to correct immediately for all minor changes in attitude caused by rough or gusty air. Give the aircraft a little time to make its own corrections.
4. Over-concentration. Focusing your attention too long on one reference point; remember, you must refer constantly to all check points in order to maintain the proper attitude.
5. **Failing to use trim tabs** to relieve unnecessary control pressures. Proper utilization of the trim tabs will make you a smooth, precise pilot.

3. The climb is accomplished by combining nose attitude and power. The normal climb is the attitude and airspeed at which an aircraft climbs most efficiently at
climbing power. The most efficient climbing airspeed for the T-28 is 140 knots at sea level. This airspeed will decrease 1 knot for each 1000 feet of altitude while maintaining a constant nose attitude in relation to the horizon at climbing power; this is the climb schedule for the T-28. When the climb is introduced by your instructor, take particular notice of the position of the nose in relation to the horizon. Placing the nose in the same relative position with the horizon each time a normal climb is effected will assure you of the proper climb-schedule airspeed, requiring only occasional cross-checks of the airspeed indicator and permitting you to maintain a good scan pattern. Remember, the same attitude and power settings will always produce the proper airspeed for your climb.

a) To make the transition to a climb from normal cruise:

(1) Raise the nose to the climbing attitude.

(2) Place your mixture rich.

(3) Then advance the propeller control to 2400 rpm. Make certain that the area ahead of and above you is clear of other aircraft.

(4) Advance the throttle to 36 inches or the stop. Retrim for the climbing airspeed and adjust the cowl and oil cooler flaps as necessary to maintain cylinder-head and oil temperatures within limits. Make gentle "S" turns during the climb in order to clear the area in front of the nose. An "S" turn is accomplished by using approximately 10 degrees angle of bank and allowing the heading to change approximately 30 degrees. Since altitude is gained rapidly, frequent throttle adjustments will be necessary to maintain 36 inches of MAP.
b) As the airspeed decreases and the power increases, slip stream effect will be more noticeable. To maintain heading and balanced flight, it will be necessary to increase right rudder pressure smoothly as the airspeed decreases and to relieve this increasing rudder pressure by constantly trimming the aircraft with right rudder.

c) 500 feet prior to the desired level-off altitude, cowl and oil cooler flaps should be closed, temperatures permitting. The transition from a climb to normal cruise is started approximately 100 feet prior to the desired altitude or by a ratio of 10% of climb rate, by smoothly lowering the nose toward the level-flight attitude. As the airspeed increases, apply forward stick to prevent the aircraft from climbing and left rudder to prevent yaw. Constantly retrim to relieve the control pressures. When the airspeed has increased to 170 knots, retard the throttle to 28 inches of manifold pressure, adjust the propeller to 2000 rpm, and place the mixture in normal and retrim.

d) Common errors are:

(1) Pulling the nose up to the wrong climb attitude.
(2) Not adding power as the nose is raised.
(3) Not selecting rich mixture.
(4) Not holding a constant attitude during the climb.
(5) Not retriming for the new power/attitude.
(6) Not re-adjusting cowl flaps.
(7) Forgetting to execute "S" turns to clear the airspace ahead.
4. An aircraft can descend at various airspeeds and power settings; however, the normal descent is performed in the T-28 at 170 to 220 knots. The speed brake may be used if a greater rate of descent is desired. When your instructor introduces these descents, notice the position of the nose in relation to the horizon. You are learning to fly by attitude; a constant nose position will maintain a steady airspeed and a constant rate of descent.

a) To transition from normal cruise to a normal descent, lower the nose smoothly to a descending attitude, and adjust map so as not to exceed limits. Allow airspeed to increase as desired. Retrim the aircraft.

b) To return to normal cruise from a normal descent, smoothly advance the throttle to normal cruise power when about 50 feet above the desired altitude and simultaneously raise the nose to the normal cruise level-flight attitude. Level off at the desired altitude with 180 knots or more of airspeed. Allow the airplane to seek the airspeed consistent with the power setting and retrim.

c) The transition from normal cruise to a speed-brake descent is accomplished by extending the speed brake, and lowering the nose. Adjust rate of descent and airspeed with power and pitch.

d) The return to normal cruise from a speed-brake descent is accomplished by smoothly advancing the throttle to normal cruise power 150 feet above the desired altitude and raising the nose to the normal cruise level-flight attitude. Retract the speed brake as the nose approaches the level-flight attitude. Retrim when on airspeed.

e) Common errors of the student in performing descents are:
(1) Failure to maintain a constant attitude. This is usually the result of "chasing" the airspeed indicator in an effort to maintain the proper airspeed.

(2) Failure to maintain balanced flight.

(3) Going below the desired level-off altitude.

(4) Failure to have electrical control when lowering the speed brake.

(5) Not raising the speed brake on level-off.

(6) Failure to adjust manifold pressure within limits.

5. The turn is the most complex of all the basic flight maneuvers. During the execution of a turn, coordinated use of all three flight controls is required. Although there are other important considerations, the first requirement for the execution of a turn is that balanced flight be maintained. Failure to maintain balanced flight not only produces a sloppy, inefficient turn, but also places the aircraft in an unsafe flight condition during the landing approach.

a) Establishing the desired angle of bank will require coordinated aileron and rudder. As the aircraft reaches the desired angle of bank, most of the rudder pressure must be relaxed and the ailerons neutralized. Some rudder, in the direction of turn, must be maintained, since the high wing is traveling at a slightly higher airspeed and thus creating a greater amount of drag than the low wing. Since this same difference in airflow over the two wings will result in slightly more lift being generated by the high wing, some aileron opposite to the direction of turn must be maintained.
b) When the aircraft is in a bank, only a portion of the lift generated by the wings acts vertically; the remainder acts horizontally in the direction of the turn. The proportion of lift acting to overcome the weight of the aircraft varies inversely as the angle of bank. Since the weight of the aircraft must be overcome by lift to accomplish a level turn, the nose of the aircraft must be raised to increase the angle of attack. As the angle is increased, drag will also increase, and additional power will be required to maintain airspeed.

c) As the aircraft approaches the desired heading, the wings must be leveled. Just as rudder was required rolling into the turn, rudder will be required while rolling out. When the wings are level, both aileron and rudder must be neutralized and power required during the turn reduced to avoid gaining airspeed. In addition, as the wings are leveled, the back elevator pressure required to maintain altitude during the turn must be relaxed or the nose will rise above the desired attitude.

d) Common errors are:

   (1) Little or no rudder in the direction of turn.

   (2) Over-controlling with too much rudder in the direction of turn.

   (3) Not releasing back pressure on the stick during roll-out.

   (4) Not maintaining a constant nose attitude during turn.

B. **Take-off**

1. Taxi into position on the active runway in accordance with local airport regulations.
2. To take off, advance the throttle smoothly 1800 RPM, holding the brakes. Check engine instruments (last chance to determine if the engine is operating properly); recheck the propeller control at full increase rpm. Normally, it will move slightly and this will ensure you full increase rpm when 48 inches are applied for take-off. Release the brakes, put your heels on the deck, position the stick in neutral, and smoothly advance the throttle to 48 inches. Directional control during the take-off roll is maintained with rudder alone. It is important to detect any small changes in heading and to make corrections immediately. Remember that torque effect will tend to pull the nose of the aircraft to the left and roll to the left; just as full power becomes effective, right rudder pressure will be necessary to maintain a straight heading along the runway, left aileron will be necessary to maintain wing level in calm wind. Use aileron as necessary to compensate for crosswind. To help detect slight changes in heading, select a reference point directly ahead of you at the end of the runway (runway center line, or obstacles such as buildings, fences, trees, etc.) and keep the nose of the aircraft pointed directly at this reference point. As the speed increases and the controls become more effective, the effect of torque will become less noticeable. When the elevator control becomes effective, apply back pressure to the stick and position the nose to the take-off attitude, approximately 10 degrees of nose-up pitch. Maintain this attitude and allow the aircraft to fly smoothly off the deck at 75 or 80 knots of airspeed in balanced flight. Just after lift-off, additional right rudder pressure will be necessary to compensate for torque yaw until the aircraft has accelerated to 120 knots. When comfortably airborne with positive rate of climb and when a safe landing
can no longer be made on the runway, retract the landing gear. At 500 A.G.L. slowly and smoothly reduce power: (1) MAP to 36 inches; (2) rpm to 2400. Maintain the take-off attitude until the airspeed has reached 120 knots. After power reduction transition to the 140-knot climbing attitude. After take-off and while accelerating to the 140-knot climbing attitude, it will be necessary to retrim the aircraft to relieve control pressures. This will involve left rudder trim and nose down trim.

Common errors:

a) Not maintaining directional alignment because of improper application of rudders.
b) Not relaxing back pressure as necessary to maintain the take-off attitude as the airspeed increases during the take-off roll, resulting in an excessively nose-high attitude during lift-off.
c) Pulling the aircraft off the runway prematurely in a nose-high attitude instead of letting it fly off in the proper take-off attitude.
d) Accelerating past 90 knots before liftoff.
e) Failure to retrim after takeoff.

C. **General Procedures**

1. **Fuel/Canopy Checks.**

Gas and canopy checks will be performed every 15-20 minutes during all flights. The fuel quantity in each tank, as well as the total quantity, is checked in order to detect excessive consumption or uneven fuel flow. The canopy check is performed to prevent fumes from entering the cockpit should the canopy
creep and to determine normal system hydraulic pressure. This check is done by depressing the canopy handle button and observing the hydraulic pressure gage for an indication of normal system pressure. The canopy handle must be in the hydraulic close position.

2. Cowl and Oil Cooler Flap Operation.

The cowl and oil cooler flaps shall be used as necessary throughout the flight in order to maintain the desired CHT of 180-200 degrees and oil temperature of 75-90 degrees.

3. Assuming control of the aircraft.

When assuming control of the aircraft on dual flights, energize the control shift switch and report, "I have electrical control. I have the aircraft."

D. Steep Turns

1. The steep-turn maneuver is a level turn using 45 degrees angle of bank. This maneuver is practiced to show the use and effect of control to maintain a desired angle of bank, nose attitude, and balanced flight. It also affords practice in maintaining orientation while undergoing a rapid change in heading.

2. Procedures

a) Establish the aircraft in normal cruise, aligned with a reference point on the horizon section line on the ground, or cardinal heading. Before you enter a steep turn, as in any other turn, look in the direction of the turn to
ascertain that the area is clear of other aircraft or clouds. If clear, commence a turn in either direction. Remember that the aircraft will remain trimmed for normal cruise throughout the maneuver.

(1) The pressures applied to the controls to begin a steep turn are the same as the pressures used in all other turns. You merely apply them for a longer period of time, until the aircraft has assumed the desired angle of bank. However, as the bank steepens, more back pressure on the stick must be applied to increase the angle of attack in order to compensate for the loss of vertical lift. When 45 degrees of bank are established, the aileron and rudder pressures are relaxed smoothly at the same rate at which they were established. The back-stick pressure is not released but is held constant.

(2) Throughout the turn, the degree of bank should be held constant with the ailerons. This may necessitate holding side pressure on the stick in the direction of the high wing, top aileron, to counteract an over-banking tendency of the aircraft, and bottom rudder. However, the over-banking tendency is not so pronounced in a steep turn as in a shallow or medium-banked turn, because, in a steeply banked turn, the arcs through which the wings are traveling are more nearly equal.

(3) Complete a turn through a 360-degree change of direction. Since the aircraft will continue to turn as long as there is any bank, start the roll-out approximately 15 degrees before reaching your original heading. As the wings are approaching the level position, relax the
control pressures smoothly until they are neutralized and the aircraft is again in straight and balanced flight. Without hesitation, roll into a steep turn in the opposite direction for 360 degrees of turn and recover on the original heading in normal cruise, again leading your roll-out by approximately 15 degrees.

b) The aircraft will not be trimmed for neutral pressure throughout the steep-turn pattern; primary controls will be used.

c) Common errors.

   (1) Misapplication of control pressure during the entry into the steep turn; that is, applying the control pressures too rapidly and abruptly, or using too much back-stick pressure before it is actually needed. Remember, the aircraft is flown through a medium-banked turn before it reaches a steep turn.

   (2) Incorrect posture in the cockpit; leaning into or away from the turn.

   (3) Staring at the nose and consequently applying control corrections too late. Divide your attention. Look around! Scan!

   (4) Poor planning; failure to anticipate the roll-out and continuing the turn beyond the 360-degree point.

   (5) Not releasing the back-stick pressure as the wings approach the level position. Remember that the increase in vertical lift as the wings approach the level position will cause the aircraft to climb.

E. **Slow Flight**
1. Slow flight is a condition in which the aircraft is flown in balanced flight, with an airspeed which is reduced to a point near the minimum at which controlled flight can be maintained. Slow flight is practiced to develop your coordination and "sense of feel" of the controls at low airspeeds. Since it may be executed with a relatively high power setting, torque effect will be prominent. It is an excellent torque and trim exercise. Slow flight will acquaint you with the flight characteristics and help you to develop the feel of the aircraft while changing airspeeds and configurations.

2. The slow flight exercise will be the core maneuver of the flight training/transition syllabus. The slow flight entry and recovery teaches airspeed changes, configuration changes, power/engine management, flight and trim operation over a wide range of speeds, flight at minimum control speeds, traffic patterns, energy management through configuration changes, stalls and stall recovery, and go arounds.

   Energy management through configuration change is the key not only to good engine life (minimum power changes, etc.) but to accurate traffic pattern and precise control of touchdown point (accuracy and short field landings). It has the added benefit of making every traffic pattern an energy management exercise. You learn to better control your aircraft in the event of a power failure and forced landing.

3. During the entry or recovery from slow flight, you will be required to maintain altitude and heading. Therefore, to practice this maneuver, line up on a section
line or adjust heading toward a reference point, and level off at an altitude that will provide easy altimeter readability (any thousand or thousand-plus-five-hundred-foot altitude).

a) Transition from normal cruise to slow flight will be accomplished as follows:

1. Deploy speed brake.
2. Retard manifold pressure to 23 inches.
3. Retard propeller to 1850 RPM.
4. Mixture control full rich.
5. Retrim as airspeed reduces to 140 KIAS.

Once the airspeed has been reduced to 140 knots or below, your instructor will command further configuration changes or target air speeds. The purpose of the slow flight practice maneuvering is to develop your skill in identifying pitch attitude for each [air speed] power setting. For each power setting and configuration, certain performance can be expected from the aircraft. As the air speed slows and the aircraft drag index increases, more power will be required to maintain altitude and subsequently more trim must be used to maintain balanced flight. Your practice maneuvering will involve varying air speeds with varying angles of flap deflection. When the instructor commands, "Configure for landing," this is your signal to lower full flaps, lower the landing gear, and extend the speed brake. This configuration will be preparatory to simulated airborne traffic pattern exercises, wave-offs, or landing approach stalls.

b) Trim the aircraft as frequently as possible throughout the changing flight conditions. As the power is reduced to 23 inches/1850 RPM, it will be
necessary to prevent yaw with rudder pressure. Simultaneously, as the speed brake is extended, the nose of the aircraft will tend to pitch up; therefore, forward stick pressure will be necessary to prevent gaining altitude. As the landing gear is lowered, the nose attitude must be increased to prevent losing altitude. When the flaps are lowered, it will be necessary to lower the nose attitude to compensate for the added lift. More small changes in nose attitude will be necessary as the airspeed decreases. When the throttle is advanced below 100 knots, considerable right rudder pressure and trim will be necessary. Back elevator trim must be used along with a little aileron trim to relieve stick pressure and assist in maintaining the wings-level, nose-high attitude.

c) Once the transition to slow flight has been completed, practice flying the aircraft in straight and level flight until you are satisfied with your ability to maintain a constant altitude and airspeed. You will find it necessary to coordinate throttle with elevator. That is, when you make a change in nose attitude, you will have to make a proportionate adjustment in the throttle setting, or vice versa, in order to maintain a constant altitude and airspeed.

d) Then make at least two 90-degree level turns, maintaining 20 degree angle of bank. Add throttle in order to maintain airspace in level turns. If you are already at a near-minimum airspeed, raising the nose any appreciable amount is obviously impractical. The rate at which the aircraft turns is directly proportional to the degree of the bank, but inversely proportional to the airspeed; the slower the aircraft is flying through the air, the greater the angle of turn for any given angle of bank. Therefore, when practicing turns during slow flight, notice the fairly rapid **RATE OF RETURN** that is produced by a shallow
bank. This is mentioned to point out that steep turns are not necessary to execute rapid changes in direction at low airspeeds; for example, when executing a wave-off. Steep turns during a wave-off are dangerous; a shallow bank will give you an adequate turning response.

e) Practice losing and gaining altitude by coordinating throttle with nose attitude while in the slow-flight configuration. For these climbs and descents, change altitude at least 200 feet and maintain 90 knots. While practicing the descent and climb, keep in mind that power plus attitude equals performance. To start a descent, reduce throttle to 20 inches and lower the nose to maintain 90 knots; this will be your 90-knot approach attitude. To climb, advance the throttle and raise the nose to maintain 90 knots. Be sure to check all temperatures and compensate with cowl flap adjustments. To level off from a climb, approaching the desired altitude, reduce power and lower the nose to the level-flight attitude. Remember, constant trim changes must be made to relieve control pressure and maintain balanced flight.

f) To return to normal cruise from slow flight, advance RPM to 2400, add throttle to 36 inches simultaneous with closing speed brake, and raise the wheels. When the wheels indicate up, raise the flaps. Maintain altitude and heading while the airspeed increases to 170 knots. It is imperative that, during the transition from slow flight to normal cruise, the trim tabs be used to relieve control pressures. Upon reaching 170 knots, reduce the throttle to 28 inches of manifold pressure, the propeller to 2000 rpm, and the mixture control to normal. When set up in normal cruise, make final trim adjustments as necessary and adjust cowl flaps to control temperatures.
F. **Stalls**

Stalls are taught to develop your ability to recognize a complete stall or an approaching stall and to recover correctly with the least loss of altitude and before the stall develops into a spin. Learn to recognize approaching and/or complete stalls by the senses of:

- **Sight** -- The attitude of the nose and wings, slow airspeed.
- **Sound** -- The sound of the air passing over the canopy, the sound of the engine.
- **Feel** -- The mushy control pressures as the stall approaches and the rapid deterioration of control effectiveness in a complete stall.

Before performing any stall maneuver, there are certain safety precautions that must be observed. First, complete the following stall check-off list and, if on a dual flight, report to your instructor, "Stall check-off list complete." Then ascertain that the airspace above, below, and in the general proximity of the aircraft is clear of other planes or clouds by performing clearing turns.

1. **Check-Off List:**
   a) Commence slow flight.
   b) Retrim aircraft.
   c) Bilges clear of loose objects.
   d) Shoulder harness and seat belt locked and tight.

2. After commencing slow flight, make opposing 180 degree turns, left and right, keeping alert for traffic and airborne conflicts. Care should be taken in
choosing your practice area so as not to be located near airways, VOR sites, and other dense traffic routes.

Minimum altitude for recovery from any stall maneuver is 5000 feet AGL.

G. **Landing-Attitude Maneuver**

1. The landing-attitude maneuver simulates a last-minute wave-off in the landing pattern just prior to touching down on the runway.

2. This maneuver is flown in the slow-flight configuration. Complete the stall check-off list and line up on a section line. Start the clearing turns and when commencing the last 90 degrees of clearing turn, set 20 inches of manifold pressure. Complete the clearing turns on a section line in a 90-knot approach attitude. When on simulated short final, advance propeller control smoothly and slowly!!!! to full forward, being cautious not to over speed engine. Maintain balanced flight and trim for this attitude. Raise the nose smoothly to the landing attitude. When the approaching stall is recognized by the senses of sight, sound, and feel, recover by applying maximum allowable manifold pressure, maintain the landing attitude, and simultaneously close the speed brake. Fly the aircraft out of this dangerous situation in balanced flight without a loss of altitude. When a positive rate of climb and an increase in airspeed have been established, raise the landing gear. Raise the flaps when altitude has increased 300 feet. When the aircraft accelerates to 120 knots, set normal climb power of 36 inches manifold pressure and 2400 RPM. Retrim aircraft as required and adjust cowl flaps to control temperatures.
3. When the throttle is advanced, hold the landing attitude, regardless of the amount of pressure required. The importance of maintaining directional control and balanced flight during a wave-off cannot be overemphasized.

H. **Approach-Turn Stall**

1. The approach-turn stall may occur in any approach to a landing. This stall is a good illustration of what could happen when a pilot is concentrating on reaching the runway and continues to raise his nose to stretch a power-off glide.

2. This stall will be done in the slow-flight configuration. Complete the stall check-off list and line up on a section line. Start the clearing turns and, when commencing the last 90 degrees of clearing turn, set 20 inches of manifold pressure. Complete the clearing turns on a section line in a 90-knot approach attitude. Trim for this approach attitude. Roll smoothly into a 30-degree banked turn. When established with 30 degrees angle of bank and 90-knot descent, raise the nose slowly to the landing attitude. Hold this attitude until the aircraft stalls. When the aircraft stalls, recover by lowering the nose to the 90-knot level flight attitude, close speed brake, simultaneously applying throttle to maximum allowable manifold pressure and rolling the wings level. When flying speed has been regained, raise the nose to stop loss of altitude. When a positive rate of climb and an increase in airspeed have been established, raise the landing gear. Raise flaps when 300 feet of altitude has been gained.
When the aircraft accelerates to 120 knots, set normal climb power of 36 inches manifold pressure, 2400 RPM. Retrim aircraft for balanced flight and 140 knots climb speed. Adjust cowl flaps as required to control temperatures.

3. Consider that, in learning to perform this stall properly, the major concern is stopping the loss of altitude as soon as possible, since this maneuver simulates a stall close to the deck. The approaching stall is accompanied by a very noticeable reduction of slipstream noise, while the actual stall is typically characterized by the immediate pitch-down of the nose. This nose movement, and its accompanying increase in the rate of descent, necessitates a rapid recovery involving expert coordination of controls and power. As throttle is applied, the effect of torque must be proportionately overcome with right rudder. Accurate rudder coordination must be used to control any tendency the aircraft may have to roll.

4. Because of the drag caused by the extended wheels and flaps, acceleration is relatively slow. Caution must be exercised so that the recovery NOSE ATTITUDE IS MAINTAINED UNTIL DEFINITE FLYING SPEED HAS BEEN REGAINED, and thus the aircraft is prevented from inadvertently entering a progressive stall. This is especially applicable should a stall occur in an actual approach to a landing.

I. **Approach-Turn Wave-Off**
1. The approach-turn wave-off is the proper wave-off technique used to recover from a nose-high, slow landing approach. The maneuver is practiced to ensure that the student will recognize a dangerous approach and wave off before the stall occurs.

2. This maneuver will be done in the slow-flight configuration. Complete the stall check-off list and line up on a section line. Start the clearing turns and when commencing the last 90 degrees of clearing turn, set 20 inches of manifold pressure and establish an 90-knot approach attitude. Complete the clearing turns on a section line in an 90-knot approach attitude. Trim for this approach attitude. Roll smoothly into a 20-degree banked turn. When established with 20-degree angle of bank and an 90-knot descent, smoothly raise the nose to the landing attitude. When the wave off command is given, wave off by adding maximum allowable manifold pressure and simultaneously rolling the wings level, maintaining the nose in the landing attitude. When a positive rate of climb and an increase in airspeed have been established, clean up the aircraft and accelerate to normal climb schedule in accordance with procedures previously described.

3. Since the nose will be trimmed for a descending attitude, the nose will rise sharply and veer to the left unless firm control pressures are maintained. When the throttle is advanced, forward stick pressure must be held to keep the nose in a level-flight attitude; right rudder pressure must be increased to
overcome the effects of torque. Throughout this maneuver, the aircraft will be flown in balanced flight.

J. **Power-Off Stall**

1. This stall might occur while you are descending in an actual or simulated emergency. Recovery is made with power off so that you will become proficient in recovering from a stall without power in the event of an actual engine failure.

2. Complete the stall check-off list, check the cowl flaps closed, and line up on a section line. Perform clearing turns. Upon the completion of the first 90 degrees of clearing turn, close the throttle and retard the propeller control to full decrease rpm simultaneously. Transition to a 130-knot descending attitude. Retrim the aircraft for this descent. Raise the nose 30 degrees above the horizon; maintain balanced flight. Hold this attitude until the aircraft stalls. As airspeed diminishes, it will be necessary to increase the back stick gradually in order to maintain the nose attitude 30 degrees above the horizon. The stick will be at or near the full back position when the stall occurs. Commence the recovery as soon as the aircraft stalls by reducing the angle of attack. This is accomplished by positioning the nose slightly below the 130-knot descending attitude. Maintain this attitude until the airspeed reaches 130 knots. Then resume a 130-knot descent. To complete the maneuver, raise the nose to the level-flight attitude and return to normal cruise.
3. When positioning the nose to the recovery attitude, care must be taken not to lower the nose too rapidly, as another stall could occur when stopping the nose at the recovery attitude. Wings will be maintained level through use of rudders while moving the nose from the stall attitude to the recovery attitude. As airspeed increases, back-stick pressure must be released and a little forward pressure added to maintain the recovery attitude.

4. Enter this stall maneuver smoothly to avoid over-controlling. The entry glide simulates an actual flight condition and also provides a measure for the student pilot to use in establishing the proper recovery attitude. Since the recovery is effected without power, you cannot rely on thrust to "pull" you out of the stalled condition, but must "get the nose over" and utilize the force of gravity to enable the aircraft to regain flying speed.

K. Precision Spin

1. A spin is an aggravated stall that results in auto-rotation. The aircraft is completely stalled, falling toward the ground, following a corkscrew path through the air, with the nose oscillating below the horizon. In all normal spins, you have control of the lift and drag of both the rudder and the elevator. Manipulation of these controls will permit you to cause, maintain, or remove the conditions of a spin. A spin is very easy to perform, and recovery can be just as easily effected. This maneuver places no excessive loads or stresses on the aircraft when properly executed. A precision spin is one in which recovery is initiated after one and one-half (1-1/2) turns.
2. You will be taught to perform spins so that you will be able to recognize an entry and be able to recover promptly and automatically from intentional and unintentional spins. Being able to perform spins will actually increase your confidence in yourself and the aircraft and improve your orientation in unusual attitudes. In this respect, spins are an excellent introduction to acrobatics. Practice them to the left and right.

3. To perform a spin, complete the stall check-off list, check the cowl flaps closed, and establish the aircraft in straight and balanced flight, lined up with a reference point or line on the ground. Start the spin at an altitude which will ensure that the aircraft can be returned to normal flight, under full control, no lower than 5000 feet above terrain. Trim will remain constant at whatever trim setting was used for the last aircraft configuration prior to the spin entry. KEEP BOTH HANDS ON THE STICK DURING THE ENTRY, THROUGHOUT THE SPIN, AND DURING THE RECOVERY TO PREVENT THE AILERONS FROM WHIPPING.

4. Since considerable altitude will be lost in the spin, be sure that the area below is clear of other aircraft or clouds by making clearing turns. At the start of the last 90 degrees of clearing turn, simultaneously close the throttle and retard the propeller control to full decrease rpm. Roll out of the clearing turn on the desired heading with approximately 120 knots. However, the prime importance at this point is not airspeed, but expediting the stall to avoid flying out of the
cleared area. Regardless of the airspeed at the completion of the clearing
turns, level the wings and smoothly raise the nose to 30 degrees above the
horizon. Maintain this attitude, and as the stall occurs, apply full rudder in the
desired direction of spin and apply full back stick. Do not use aileron in the
entry, during the spin, or before the rotation stops on recovery.

5. To remain oriented during the spin, use ground reference such as roads,
section lines, landmarks, etc. During the initial rotation, notice a point of
reference opposite to the original point of reference. Watch for both these
points as the aircraft rotates. You can count the number of turns as each point
of reference passes the nose. Do not stare directly over the nose, but look out
toward the horizon. Also look in the direction of spin for the approaching
reference points or lines.

6. To recover from a spin, first apply full rudder opposite to the direction of
rotation. Follow immediately with positive forward stick to just slightly forward of
the neutral position. Do not use ailerons at this point. Hold the controls in this
position until rotation stops; this may take 1-3 turns of spin. Then neutralize the
controls and commence a smooth pull-out. Continue this pull-out until the nose
is positioned slightly above the horizon. With the nose in this position, advance
the propeller control and throttle simultaneous to a power setting of 1850 - 23
HG. Check all pressures and temps and then re-set cruise power.
7. Be careful not to apply excessive back-stick pressure immediately after the rotation stops. To do so may cause a secondary stall, resulting in another spin. Recover with a minimum loss of altitude, but with smooth control movements.

8. Spins shall be practiced in the clean configuration. In the event of an unintentional spin with gear and flaps down, they shall be retracted immediately to effect recovery and to prevent possible damage from exceeding their speed limitations. If the unintentional spin was entered with power on, throttle should be closed for recovery.

9. INTENTIONAL INVERTED SPINS IN THIS AIRCRAFT ARE NOT AUTHORIZED. In event of an unintentional inverted spin, the following procedures apply:
   a) Close the throttle to idle and clean up the aircraft.
   b) Recognize the inverted spin by the fact that you will be hanging in your shoulder straps experiencing negative "G's." If your straps are not tight, your head may be pounding against the canopy.
   c) DETERMINE THE DIRECTION OF THE SPIN BY LOOKING AT THE NEEDLE ON THE TURN-AND-BANK INDICATOR. IF THE NEEDLE IS OUT TO THE LEFT, YOU ARE TURNING TO THE LEFT, AND VICE VERSA.
   d) To recover, apply hard full rudder opposite to the direction of rotation and full back stick. When hanging inverted in the straps, it is difficult to hold full back stick. Ensure that you are holding the stick back and not just pulling it straight up by looking at the stick and/or using both hands to pull it back. Allow
time for this recovery to take effect, usually two or more turns before the rotation stops. Double-check correct rudder and full back stick during these turns. After the rotation stops, neutralize the controls and pull out as in the last half of a loop if altitude permits, or roll out from the inverted position.

e) If the aircraft refuses to recover, bail out at a safe altitude. Disconnect the radio cords and oxygen hose, open the canopy, and unbuckle your seat belt. Be sure to open the canopy prior to unbuckling the seat belts; otherwise, you will be forced against the canopy.

L. **Standard Field Entry and Departure Procedures**

1. The standard field entry and standard field departure are a series of uniform procedures which are used because of the number of aircraft which may be operating from the same field. It is absolutely necessary that each conform to some systematic pattern and standard procedure. If properly executed, this procedure will combine a maximum of safety with a minimum of confusion in that all necessary procedural checks will be given prior to the landing and there will be less possibility of a mid-air collision with other aircraft because of confusion over the right-of-way. This procedure will be in accordance with current FAR procedures described in the A.I.M. or local course rules.

2. There are five items of major importance which must be considered in order to make a standard field entry.
a) **Intended point of landing**: This is the point on the runway where you intend to "touch down." It should be the middle of the first third of the runway, or in the "box" if practicing precision landings.

b) **Landing line**: This is an imaginary line extending through the intended point of landing and parallel to the course over which the aircraft will actually pass in the final straight-away and landing.

c) **Wing line**: This is an imaginary line extending through the intended point of landing which parallels the direction of the wind. It may or may not coincide with the landing line. It represents your position in the "cone of descent" at which point you intercept the glide slope and begin descent regardless of aircraft position or heading.

d) **Landing pattern**: The landing pattern is a geometric race-track course flown at 1500 feet of AGL altitude, so that a landing approach may be executed in a systematic sequence. The landing line, the upwind leg, and the parallel downwind leg form the sides of the race-track pattern. These lines are joined together by the upwind turn and by the approach turn at the downwind end of the pattern. Downwind is flown at a wing tip distance in wings level flight.

e) **Traffic Pattern Operations**: From normal cruise speed 180 knots:
   
   1. Deploy speed brake.
   3. Airspeed - slow to 140 knots
(4) Cowl flaps - normally closed (note in extended slow flight, high drag configurations may be necessary to open cowl flaps to maintain proper CHT - 180-200- degrees.

(5) Upon reaching **140 knots** (in the traffic pattern you would be mid-field down wind) lower the landing gear and check, "Three down and locked light out in handle," airspeed to **120 knots** level flight. (MAP 23 inches, RPM 1850, Mix rich).

(6) Upon reaching **120 knots** (in the traffic pattern you would be abeam the touchdown point) lower full flaps. (MAP 23 inches, RPM 1850, Mix rich). If the exercise is (1) slow flight you would continue to let the speed decrease to the assigned slow-flight speed in level flight to, for example, 95 knots, or as assigned and maintain airspeed and altitude with power as necessary. If the exercise is (2) simulated or actual traffic pattern you would lower the nose to maintain **120 knots** and begin your descent and base leg turn simultaneously. (MAP 23 inches, RPM 1850, Mix rich). The **key** in the traffic pattern is not to lower the flaps and hence begin the descent until you are ready. The ideal point to descend from a 1200-1500' traffic pattern is abeam the touchdown point. If, however, you must extend your downwind to follow other traffic, **delay** your flap extension. If you attempt to maintain level flight (i.e., traffic pattern altitude at 120 knots with gear, flaps, and speed brake extended) you will find that you will need in excess of climb power! Remember the key is not to extend a drag device and then to have to add power. If in the traffic
pattern an extended downwind situation is expected, retract the speed brake and/or perform a 360 degree on downwind if traffic and conditions permit and no safety hazard is introduced. CAUTION!!!!

Retracting the landing gear on downwind due to traffic conflict or re-sequencing will disrupt your normal check list rhythm. Always scan and comply with items on the instrument panel "Landing" checklist before landing.

If you are Number 1, when abeam the point of intended landing. Turn base dependent on wind. Lower the nose to the 120-knot approach attitude. Expect to decelerate to 110 knots at approximately the 90-degree position. You should have approximately 600 feet of actual altitude at the 90-degree position. Vary the angle of bank and adjust the power as necessary to fly a pattern over the ground to intercept the landing line with approximately 1200 feet of straight-away and 300 feet of actual altitude, slowing to 95 knots. Level the wings, then assume the final approach attitude. The nose attitude change is very slight. A gradual deceleration toward 95 knots will be due primarily to power reduction and advancing the propeller to full increase, not change in nose attitude. Do not slow below 90 knots until commencing the landing transition. Do not reduce power below 20” HG until in the flare. Maintain direction straight down the runway.
3. When approaching the point of intended landing, start a transition to the landing attitude by using smooth, continuous back pressure on the stick, smoothly adjusting the throttle to control the rate of descent. Adjust the nose attitude as necessary to cushion the landing. Touchdown should be made on the main wheels in a nose-high attitude. Hold the nose wheel off the runway. As speed decreases, ease off the back pressure and smoothly lower the nose wheel to the runway.

M. No-Flap Landing

A no-flap landing involves a 180-degree approach, started from a position abeam the intended point of landing, to a landing without the use of flaps. This type of approach further develops the student’s judgment and ability to control airspeed with nose attitude and rate of descent with power while following a prescribed pattern over the ground. A no-flap approach would be necessary in event of hydraulic failure where flaps would not be available, or under certain conditions, such as high or gusty winds, that might require that an approach and landing be made without flaps. The speed brake is not used.

1. Following the standard field entry, the downwind leg is flown at 1500 feet actual altitude, at a "wing tip" distance from the landing line, 120 knots, 25 to 27 inches of manifold pressure, 2000 rpm, gear down, and flaps up. When abeam the upwind end of the runway, check and report, "Landing gear down and locked, brakes firm, speed brake up." Just prior to reaching a position abeam of the intended point of landing, retard the throttle to 18 inches of manifold pressure and begin descent. When visual glide path dictates turn base leg, and assume 115 knot approach attitude. The nose attitude in the
115 knot approach turn is approximately the same as the nose attitude in the downwind leg; the deceleration to 115 knots is due to power reduction and the nose attitude change. Do not lower the nose at the 180. Apply up elevator trim to maintain the 115 knot approach attitude. Adjust the angle of bank and reduce power as necessary during the approach turn to intercept the landing line with approximately 1200 feet of straight-away and 200 to 300 feet of actual altitude. Level the wings and assume the 105-110 knot approach attitude. Maintain direction straight down the runway. Advance propeller control on short final to full increase.

2. Maintain the approach attitude until approaching the point of intended landing, then close the throttle and start a transition to the landing attitude by using smooth, continuous back pressure on the stick. Change the attitude slowly and evenly, attempting to touch down on the main wheels in a nose-high attitude. Hold the nose wheel off the runway. As the speed decreases, ease off the back pressure and smoothly lower the nose wheel to the runway.

3. In planning the approach, take into consideration the shallow glide angle and the increased gliding ratio due to the absence of drag from extended flaps. Throttle reduction will be sooner in this type of approach, as compared to the full-flap approach, because of the tendency of the aircraft to glide farther in the no-flap configuration.

N. Wind Conditions
1. The power setting and angle of bank used at the start of the approach are compatible with an "average" condition. This "average" condition is a day when the wind is 5-10 knots and nearly parallel to the landing line. Under these conditions, provided a proper abeam position is set up, the approach turn will utilize 15-20 degrees of bank and the throttle setting will be reduced in small increments in order to maintain the prescribed glide slope. However, as wind conditions vary, it will be necessary during the approach to vary the angle of bank, throttle setting, or both in order to arrive at the landing line with 1200 feet of straight-away and 200-300 feet of actual altitude.

2. With stronger winds prevailing, it may be necessary to increase the angle of bank from abeam position to avoid being blown too far away at the 90-degree position and the throttle will be reduced less, if at all. If the wind is nearly calm, it may require less angle of bank from the abeam position so the 90-degree position will not be too close to the point of intended landing and requiring the throttle to be reduced more rapidly. If the wind is an overshooting cross-wind condition, it will be necessary to make a shallow turn from the 180-degree position and steepen the angle of bank as you approach the 90-degree position, holding this steeper bank to the straight-away to avoid overshooting. The throttle will be reduced accordingly to achieve the proper rate of descent relative to the wind conditions. For an undershooting cross wind, the approach turn from the 180-degree position to the 90-degree position will be steeper than the last 90 degrees of turn in order to maintain the desired track to the landing line. It will be necessary to make a slower reduction of power to achieve the
proper rate of descent, since the relative rate of closure toward the landing line is less.

3. For either a left or right cross wind, when the aircraft is lined up in the straight-away, on very short final it will be necessary to lower the upwind wing to counteract the drift and apply (top) rudder to keep the aircraft straight down the landing line. Maintain this slipping cross-wind correction to touchdown. The stall speed is higher and characteristics are different when you are performing a slip to accomplish a crosswind landing.

O. Wave-Off/Go-Around

1. Frequently, during your landing practice, you will have to discontinue an approach for reasons of safety and execute a wave-off. Specific wave-off and field departure patterns are applicable to certain fields, depending upon the field's utilization. For example, although basically the same in procedure and purpose, regardless of the wave-off pattern prescribed, there are certain procedures common to all wave-offs. This section will be directed to pilot technique and the sequence in which these procedures are accomplished.

2. Although a landing approach may be aborted at any point in the pattern, a wave-off will usually be executed during the approach turn, in the straight-away, or during the landing transition. The sooner a poor landing condition is recognized and the wave-off executed, the safer it will be. If at any time your approach does not feel comfortable or you are too close to the aircraft in front
of you, wave off. Interval as established downwind which will normally afford sufficient separation during the landing approach; however, the following guidelines should be followed: There should always be at least 90 degrees of approach turn between you and the aircraft ahead, and if you roll out in the straight-away before the aircraft ahead has landed, an immediate wave-off shall be initiated; do not delay your wave-off with the hope that the situation will correct itself or that you can "salvage" the approach. Occasionally, poor judgment or technique during the landing transition may require a wave-off. Regardless of the height above the ground, a safe wave-off may be executed if properly flown.

3. The correct procedure for executing a wave-off is as follows: Place propeller control full forward, advance the throttle smoothly and firmly as required, up to 48 inches, speed brake up, simultaneously rolling the wings toward the level position. When positive rate of climb is established - raise gear. When safe to do so, retard the throttle to 36 inches, reduce rpm to 2400, and fly a course outboard but parallel with the traffic pattern. Do not exceed 140 knots. The flaps will be raised at 300 feet actual altitude. Climb to traffic pattern altitude and re-enter pattern, making sure not to conflict with traffic established in the pattern.

P. **Simulated High-altitude Engine Failure**

1. A simulated high-altitude engine failure, for instructional purposes, will be initiated by your instructor between 2000 and 5000 feet A.G.L.
2. It is conceivable that, during any flight, engine failure may occur. The failure may fall into two main categories: those occurring instantly and those giving ample warning. The instant failure is rare and usually occurs only if ignition or fuel flow completely fails. Most engine failures are gradual and afford the alert pilot ample indication that he may expect a failure. An extremely rough-running engine, loss of oil pressure, excessive cylinder-head temperature, loss of manifold pressure, fluctuating rpm, or a sump-plug warning light are some indications that an engine failure may occur. It is the purpose of this section to show the action that should be taken in the event a failure does occur.

a) The simulated high-altitude engine failure procedure will simulate, insofar as possible, the actual characteristics of the aircraft with a "dead" engine. A glide ratio and rate of descent similar to those encountered with an actual engine failure will be simulated. It may not simulate the proper nose attitude needed to maintain best power-off glide speed of 130 knots with a failed engine and no oil pressure to control the prop.

b) With an actual engine failure, the best glide ratio is obtained by placing the propeller in the full decrease rpm position. The nose attitude necessary to maintain 130 knots is very flat. Glide ratio is approximately 9 miles over the ground for every 5000 feet of altitude lost, under no-wind conditions.

c) An alert pilot is constantly on the lookout for suitable landing fields, one of which he would have to select in the event of any actual emergency.
Naturally, the perfect forced-landing field is an established airfield. This should be your first consideration during any emergency.

d) There are many factors to consider in determining the length of a field needed to land an aircraft. When you are landing into a strong wind on a level field, the distance needed for landing may be only a small fraction of the distance which would be required if you were landing downwind. This is due to the difference in ground speed. If you are landing in a freshly plowed field, the aircraft will require a shorter distance to come to a stop than on a hard-packed surface.

e) Always be aware of the direction, and if possible, the velocity of the wind. Wind direction can be determined in several different ways. Other than the wind socks at an established field, the best indication of wind direction is blowing smoke. If the smoke rises for a short distance and then abruptly flares out close to the earth in a straight line parallel to the ground, the wind velocity on the surface will be fairly high. Blowing dust is another excellent wind indicator. If you are unable to determine wind direction and velocity, use your last known wind. In some instance, this will be the duty runway heading at home field.

3. The high-altitude engine failure uses two check points, the high key and the low key. The high key is at least 2500 feet actual altitude directly over the intended point of landing, and low key is 1600 feet to 1800 feet actual altitude, headed downwind at a wing-tip distance. The point of intended landing is located one-third the way down the landing area from the approach end.
4. To initiate a simulated high-altitude engine failure, the instructor will reduce the throttle to 20 inches MAP, simultaneously set rpm at 1600, set aircraft configuration, and inform the student, "You have a simulated high-altitude engine failure." The following procedure will be utilized, keeping the aircraft trimmed throughout:

a) Commence transition to 130-knot descent. If fast, maintain altitude until airspeed dissipates; if slow, lower nose.

b) Check gear, flaps, and speed brake up, cowls closed. (After steps a. and b., the instructor will take electrical control, extend the speed brake and one-half flaps as the airspeed approaches 130 knots. Lowering of the nose is necessary to compensate for the additional drag. Retrim.)

c) Look around slowly and select the best available field for your altitude and airspeed. Then turn, as necessary, to arrive at high key.

d) Mixture rich.

e) Make systematic check of the cockpit to determine the cause of the emergency.

f) Report, "Simulated air start."

g) When the aircraft is established in a trimmed, 130-knot descent, make a voice report to the instructor including the following information:

   (1) Identification.
   (2) Type of emergency (simulated or actual).
   (3) Position.
   (4) Altitude.
(5) Cause of emergency; i.e., engine failure, fuel exhaustion, etc.
(6) Selected landing field.
(7) Wind direction.
(8) Landing direction

5. Judgment should be used to dissipate excess altitude so as to arrive at high key in a 130-knot descent. When at the high key, transition to a 120-knot approach attitude (the instructor will clear the engine) and start a turn in either direction. Report each item on the check-off list, as follows:

a) Harness -- Locked.
b) Blower -- Low.
c) Mixture -- Rich.
d) Hook -- Up. (If installed)
e) Canopy -- To go.
f) Gear -- Up and will remain up (if approach is made to an unprepared surface) or Gear -- To go (if field is paved).
g) Prop -- Simulated full decrease. (It will be at 1600 rpm and instructor will place it to full increase rpm at low key).
h) Flaps -- Adjust as required.

Upon completion of this 180-degree turn, the aircraft should be at low key. Start the landing approach, flying the aircraft deep enough at the 90-degree position to give a straight-away of 1800-2000 feet. Use half-flaps as needed in the approach (approximately at the 90-degree position). When ready for half-flaps, the student will
report, "Half-flaps," and the instructor will close the throttle. If the landing is to be made on a prepared surface field, lower the gear in the straight-away when sure that the aircraft will land in the desired area. If the landing is to be made on other than a prepared surface field, the gear will remain up. Lower full flaps in the straight-away as necessary to hit the point of intended landing. Maintain a minimum of 100-105 knots on final. This will require a lowering of the nose when full flaps are lowered.

6. On final, report, "Canopy SIMULATED blown open, battery, gas, and mixture SIMULATED off."

7. The wave-off will be taken by the instructor and must be completed by 300 feet actual altitude at an airport or 2500 feet above an outlying field or at any time it is evident that a safe landing could not be made.
   a) Check propeller at full increase rpm.
   b) Add power smoothly to a maximum of 48 inches MAP (normally 36 inches is sufficient) and simultaneously roll the wings level and retract the speed brake.
   c) Establish and maintain a 95-knot climbing attitude and raise the gear if down.
   d) Raise the flaps as soon as possible and climb straight ahead while the flaps are coming up. (No lower than 300 feet actual.)
   e) Set 36 inches MAP and 2400 rpm when safe.
   f) Accelerate to, and maintain, 120 knots until reaching 1000 feet of actual altitude. (Then assume normal climb schedule.)
g) Climb out in the direction which affords the best possible selection of landing areas should the engine fail. You may want to consider turning to a low-key position for the field to which the simulated engine failure was intended.

Q. **Practice Precautionary Emergency Landing (PPEL)**

1. For many of the emergency situations that may develop in the T-28, the procedures include a precautionary emergency landing to the nearest paved field. Sump lights, rough-running engines, oil leaks, low oil pressure, streaming fuel, and fluctuating rpm, etc., are emergency situations where we have power available, and this power can be used to arrive at a high-key position over a paved field. This section prescribes procedures for a practice precautionary emergency landing at a field designated for that purpose.

2. The practice precautionary emergency landing pattern is the same as the pattern for the actual PEL. The pattern uses two check points: High Key, which is at 2500 feet actual altitude over the point of intended landing headed into the wind, and Low Key, which is 1600-1800 feet actual altitude 3/4 to one wing tip distance abeam the point of intended landing heading downwind. The point of intended landing is a point one-third the way down the runway from the approach end.

3. The procedures for the practice precautionary emergency landing are basically the same as for the actual PEL. However, becoming proficient in the
procedures outlined below is only the beginning. In order to be sufficiently prepared, you must also know the procedures for the specific situations as discussed in Chapter V of this publication (sump light, streaming fuel, etc.).

4. The practice PEL will be initiated by the instructor informing the student that he has a simulated situation requiring that a PEL be performed. (Ex. "You have a simulated sump warning light.") At this time, the student will perform the necessary procedures required by the specific situation and proceed to the nearest outlying field designated for practice PEL’s.

a) Approaching the practice PEL field, transition to 130 knots if the situation simulated by the instructor has not already called for this configuration. This is accomplished by placing the mixture rich, rpm to 2000, 20-21 MAP, extend the speed brake, and decelerate to 130 knots and trim. As the airspeed approaches 130 knots, adjust the MAP to maintain 130 knots, and retrim. Note: This configuration has the engine operating at power settings which will conserve the engine as well as afford the proper configuration for high key.

b) Just prior to reaching High Key, report, "Landing and taxi light circuit breakers simulated in, external master switch simulated on."

c) Over High Key, report, "High Key." After making this report to you instructor, adjust the throttle and place the propeller control to 2000. Start a turn toward Low Key (conform to the pattern direction required by course rules), transition to 110 knots, and trim. Perform the landing check list and report
each item over the ICS to the instructor. Use power if necessary to reach Low Key.

d) At Low Key, recheck prop full, mixture rich, and clear the engine by smoothly advancing the MAP to 25 inches and then to 18-20 inches. Report, "Landing check list complete except for wheels and flaps." Commence a turn toward the runway. Prior to reaching the 90-degree position, report, "Simulate landing lights extended."

e) Lower one-half flaps at approximately the 90-degree position and maintain 110 knots. Roll out on final with 1800-2000 feet of straight-away from the point of intended landing. When the runway is made, lower the wheels and full flaps and report, "Gear indicate down and locked." Maintain a minimum of 100-105 knots on final with gear and full flaps down. **DO NOT** turn battery, gas, and mixture off on final.

f) **Power is available.** Use power as necessary to reach High Key and Low Key.

   (1) If high in the approach, lower full flaps early, and if necessary, lower the gear early. Also, you may open the canopy to increase your rate of descent.

   (2) If low, add power to reach the runway.

g) Touchdown is made on the main gear as in a normal landing. Then lower the nose gear to the runway, check the prop and mixture full forward, and take off from a normal touch-and-go, **adding power smoothly.** Depart the pattern via local course rules or make a wide climbing turn to re-enter the PPEL pattern.
R. **Simulated Low-Altitude Engine Failure**

1. A simulated low-altitude engine failure will be initiated by your instructor below 2000 feet of altitude. It is understood that many different situations arise but the one encountered most frequently is engine failure on take-off or soon thereafter.

2. Practicing low-altitude engine failures develops the judgment, accuracy, coolness, and planning technique required to accomplish a successful landing in any available area, should an actual emergency occur. This maneuver will be initiated by the instructor’s closing the throttle and will not be given unless you have 500 feet actual altitude and 120 knots with the flaps in the up position. The aircraft will not be permitted to descend below 300 feet of actual altitude on any simulated low-altitude engine failure.

3. The basic consideration in the event of an engine failure at low altitude is to maintain flying speed. Therefore, when your instructor closes the throttle at low altitude, execute the following procedure:
   a) Immediately assume a safe flying attitude and retract the landing gear. Remember, you will probably be in a climbing attitude when the low-altitude engine failure occurs, so you must immediately lower the nose of the aircraft to establish a safe gliding attitude. Any delay in lowering the nose will result in a dangerously rapid rate of deceleration; consequently, the aircraft will very rapidly approach its critical angle of attack.
b) Look for an available landing site. Your selection of a landing site will depend upon your altitude, geographic location, and knowledge of the surrounding terrain. Your decision must be expeditious and final. In any event, if an actual emergency should occur immediately following take-off, DO NOT attempt to turn back into the field you just left. If sufficient altitude is available, make coordinate, shallow-banked turns to line up into the wind, if possible, and/or fly to a selected landing area.

c) Place mixture in full rich.

d) Place prop full increase rpm (full decrease if actual).

e) Time permitting, make a brief voice report to your instructor. Include as many items listed in the voice report for the simulated high-altitude engine failure as possible.

f) Lower the flaps. The flaps are important for two basic reasons:

   (1) They increase the glide angle, thus increasing the rate of descent without increasing the airspeed.

   (2) They permit the aircraft to land at as slow an airspeed as possible, thereby reducing the force of impact on landing. However, the flaps should not be lowered until it is apparent that the selected landing area will be made.

   (3) Maintain a minimum of 100-105 knots on final. This will require a lowering of the nose when full flaps are lowered.

g) Report canopy SIMULATED blown open, battery, gas, and mixture SIMULATED off.
h) Your instructor is responsible for the wave-off at the completion of the emergency. The wave-off procedures are identical with those listed for the simulated high-altitude engine failure.

Note: Simulated emergencies that the student can normally expect in the transition, precision/acrobatic stages are not restricted to the two types previously described in this chapter.