Ignite Flight Academy

Flight Training & Operations Manual

Revision 0 | 2/1/2023

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Section 1: Flight Training

1. Ignite Flight Training Philosophy – Confidence and Awareness

The training philosophy of Ignite Flight Academy is to train confident pilots with high situational awareness, not airplane drivers. A confident pilot with high situational awareness is an effective pilot-in-command who manages risk and makes better decisions.

Airplane drivers fly with their head buried in the cockpit watching the instruments while trying to figure out what the plane is doing. They rely on the GPS to provide situational awareness and wait for ATC to tell them where to go. Airplane drivers are primed with rote answers for anticipated questions, ready to handle the most routine situations.

Pilots develop and rely on their own situational awareness. They think and plan well ahead of the plane. They make their own decisions and inform ATC of their intentions. Pilots, primed with knowledge and understanding, are in command of the aircraft and ready to handle any situation.

A confident pilot develops their abilities by training beyond the minimum standards and by flying the aircraft through its full operational range. *Proficiency evolves from a full command of basic fundamentals and simplified flight procedures*. Pilots can't learn precise flying until they learn to fly the airplane near its limits and feel confident in their ability to control it.

An aware pilot has their head outside the cockpit getting the big picture, avoiding terrain and other traffic, while maintaining aircraft control using physical senses. They see aircraft attitude, listen to the airplane, feel the control pressures, and smell (literally) trouble. They know their position and are aware of the wind and how it is affecting them. *This is the very foundation of situational awareness*. A pilot proficient in fundamentals and simplified flight procedures operates with a reduced workload which contributes to increased situational awareness.

2. Flight Training – Fundamentals

Excellent pilots know how to fly the airplane's wing by using specific attitudes and power settings. As an old axiom says, "attitude plus power equals performance". *Proper attitude and power awareness are the secret to flying with a high level of self-confidence*.

Attitude

Attitude refers to the airplane's orientation in relation to the Earth's surface, and is referenced in terms of pitch and bank. Pitch attitude is referred to as nose high, level, or nose low; bank attitude is referred to as left bank, wings level, or right bank.

Power

In most training airplanes, power is referenced in terms of engine speed, or revolutions per minute (RPM). Although power can be fine-tuned to specific RPMs, it is often simpler to refer to approximate power settings as climb power, cruise power, descent power, and approach power.

Senses

The proper level of awareness cannot be achieved when flying unless physical senses are used properly.

<u>Vision for airplane attitude and relative motion</u>.

Evaluate attitude by observing the airplane's wing and nose positions; evaluate relative motion by observing the movement of the windshield's framework in relation to the Earth's surface. *Look outside* to see attitude and evaluate motion.

- Relative Motion – 6 Types
  - Rotational
    - Pitch, Roll, and Yaw
  - Linear
    - Forward, Lateral, and Vertical

Important! All their life people have looked straight ahead while monitoring forward linear motion. When flying in a nose-high attitude, look to the side of the nose cowl to see enough of the Earth's surface to properly evaluate the six types of motion.

<u>Hearing for airspeed and engine speed</u>.

Airflow noise is an indirect indication of aircraft speed. Engine noise is an indirect indication of engine speed. Both tell what the airplane and the engine are doing. *Listen to the airplane*.

<u>Touch for control pressures and attitude response</u>.

Control pressures and the resulting attitude response are an indirect indication of aircraft speed. High speed generates firm control pressure and rapid attitude response to control inputs; low speed generates light control pressures and slow attitude response to control inputs. *Feel control pressures and evaluate attitude response*.

<u>Kinesthesia for movement</u>.

The sensation of movement provides an indication of acceleration or deceleration with respect to the linear and rotational motion that pilots must be aware of during all phases of visual flight. However, ignore these sensations during instrument flight.

<u>Smell for odors</u>.

Odor sounds the alarm for fuel leaks, overheated electrical components, and exhaust leaks.

<u>2b. Pitch and Power as Primary Controls</u>

While pitch and power work together to achieve performance objectives, they each have a primary purpose in determining where the airplane is going and how fast or slow it is getting there.

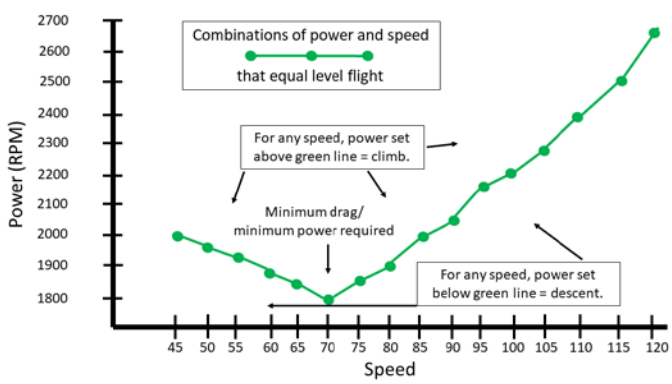
Pitch primarily determines the airplane's airspeed. When the nose is pitched up, the airspeed *always* decreases, and when the nose is pitched down, the airspeed *always* increases. (This assumes the plane is right side up)

Power primarily determines the airplane's vertical flight path (altitude). Flight at a constant altitude (level flight), and the power required to maintain level at any given speed is commonly used as a baseline performance parameter. Power applied in excess of what is required for level flight will *always* result in a climb. A power deficit from what is required for level flight will *always* result in a descent.

Demonstration of "Pitch for Airspeed and Power for Altitude". An instructor and student can "split" the controls. One assumes responsibility for the throttle and the other assumes responsibility for the flight controls. Try to change speed or altitude, but each person should attempt to make the plane do opposite things. For example, one person tries to speed up or slow down while the other person tries to prevent speeding up or slowing down. Or, one person tries to climb or descend while the other person tries to prevent the climb or descent. Trade controls and repeat the experiment. What will be discovered is the person who has the control yoke can *control airspeed through pitch regardless of the throttle setting*, and the person who has the *throttle can control whether the plane climbs, descends, or stays level*.

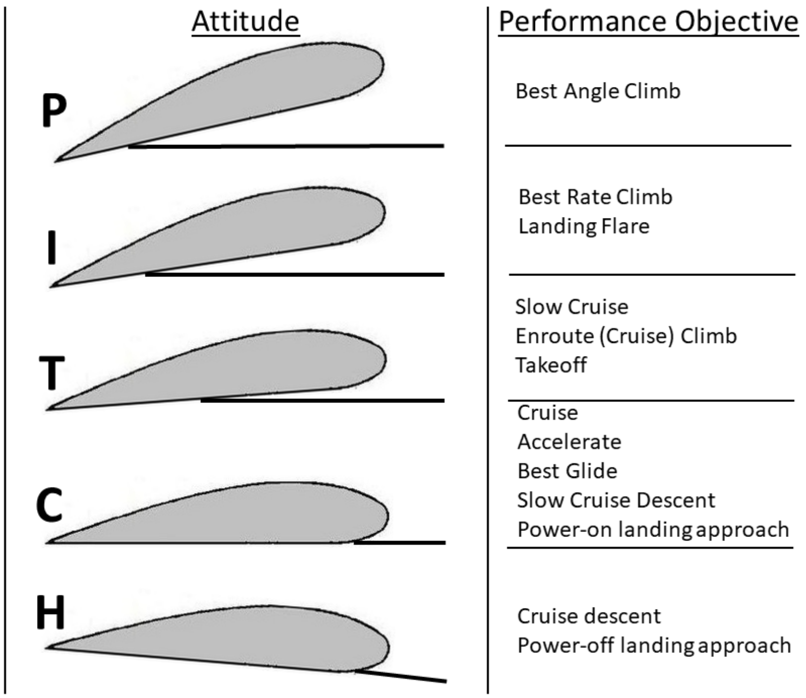
Common misunderstandings of pitch and power inputs.
Most of the time a nose high attitude contributes to a climb and a nose low attitude contributes to a descent, so this can lead to a misunderstanding of how pitch primarily controls airspeed. However, in some situations, a nose high attitude will contribute to a descent and a more level attitude will contribute to a climb (see, "flight on the backside of the power curve"). Some aircraft with enough power can be made to climb with a nose low attitude, but the Skyhawk isn't one of them. Remember, *pitch always affects airspeed* consistently throughout the operational range of the airplane.

Since power requirements change with airspeed, misunderstandings can arise about power primarily determining the vertical flight path and not airspeed. In a car, lower power is associated with less speed. However, in a plane there is a speed (70 knots, for example) that requires a relatively low power setting to maintain level flight. Any speed faster than 70 requires more power to maintain level flight, similar to a car. However, any speed slower than 70 requires more power to maintain level flight, opposite of a car. At any given speed, *an excess of power beyond what is required for level flight will result in a climb, and a deficit of power from what is required for level flight will result in a descent*.



Pitch Performance
Each performance objective requires a specific attitude and power setting. Five pitch attitudes are used for normal flight. To establish pitch attitude, set the correct angle between the wing (chordline) and the horizon. To maintain pitch attitude, use either the chordline/horizon angle or the position of the airplane's nose in relation to the horizon.

To establish power, use muscle memory to adjust the throttle to a familiar position and listen for the familiar engine sound. To fine tune the setting (if necessary), glance at the tachometer and adjust. Don't rely on the tachometer to change power and do become more familiar with throttle position and sound. Developing this skill yields results very close to a specific setting the first time. This keeps head and eyes outside the plane, and situational awareness will increase.



Refer to the table for the five typical attitudes for the most common performance objectives in everyday flight. After mastering flying the wing using attitude, power, and visual reference points, the instructor will introduce instrument reference. This way results can be fine-tuned without staring at the instruments and chasing their indications, which is an extremely serious pilot error.

Trimming

Elevator (pitch) trim relieves control pressures during *stabilized* flight so the "death grip" on the yoke can be relaxed. This has two advantages: it reduces workload and allows the feel of minor control pressure changes (an indicator of airspeed). Trim is directly linked to airspeed, not attitude. *Trim requirements change when airspeed changes*, but once stabilized at a new airspeed, the trim can be re-adjusted to relieve control pressures.

Some pilots are continuously fiddling with the elevator trim thinking they are "fine tuning", but really are attempting to "fly" the plane with the trim control. Those pilots lose control input *awareness,* increase workload, and fall behind the plane. Fly airplanes with the primary controls and use the trim to eliminate control pressures.

Do not rush the trimming process. Give the plane time to respond to inputs and settle down. Once airspeed is stable, trim to relieve control pressures.

Control Pressure vs. Control Movement

Training aircraft are inherently stable and want to return to their previous state when displaced from their flight path. If the plane is properly trimmed and the pilot keeps a light grip on the yoke, these deviations are detected early through changing control pressure felt through the yoke and can be resisted by the pilot with opposite pressure on the yoke. A plane flown by a pilot with a tight grip on the yoke will be out of trim and deviations will not be detected early. As a result, the pilot will be behind the plane and making larger control movements while chasing the desired performance and flight path. Don't fly reactively and get behind the plane while over-controlling trying to catch up. Be proactive by lightening the grip, feeling the control pressures, and flying in proper trim.

2c. Basic Airwork

Remember this: The attitude indicator tells what the airplane is doing, the other five flight instruments tell what the airplane has done, and the outside-the-cockpit visual references tell what the airplane is going to do. This is the secret for maintaining positive airplane control and developing the proper level of awareness and confidence. This is why visual references will be continuously mentioned throughout this manual.

Straight and Level – Cruise

Purpose: To maintain straight and level flight at cruise speed, *hands-on and hands-off*, and develop a critical navigation skill – flying a constant heading and altitude.

Attitude: Establish and maintain the C-pitch attitude.

Power: A value recommended in the POH, usually 75% power (mid to upper green arc on tachometer).

Trim: When airspeed and power *stabilize*, trim the controls.

Vision: Evaluate the wingtip and nose attitude while scanning the surrounding airspace for traffic.

- Use the wingtip and the horizon to establish the pitch attitude and maintain bank attitude. When the wings are level, both wingtips will be an equal distance above the horizon.
- Use the nose and the horizon to establish the bank attitude, maintain pitch attitude, and detect yaw.
- To maintain heading, pick a reference point well ahead on the ground track. Keep that point and the airplane's nose in the same relative position – the angle between the airplane's heading and the ground track is the wind correction angle.
- *Continually referring to the heading indicator makes heading control difficult*.

Straight and Level – Slow Cruise

Purpose: To maintain straight and level flight at reduced airspeed, hands-on and hands-off. Used to enter a traffic pattern and in a practice area.

Attitude: Establish and maintain the T-pitch attitude. T 

Power: A value recommended in the POH, often 55%-65% power (lower to mid green arc on tachometer).

Trim: When airspeed and power *stabilize*, trim the controls.

Vision: Evaluate the wingtip and nose attitude while scanning the surrounding airspace for traffic.

- Use the wingtip and the horizon to establish the pitch attitude and maintain bank attitude.
- Use the nose and the horizon to establish the bank attitude, maintain pitch attitude, and detect yaw.
- To maintain heading, pick a reference point well ahead on the ground track. Keep that point and the airplane's nose in the same relative position – the angle between the airplane's heading and the ground track is the wind correction angle.
- *Continually referring to the heading indicator makes heading control difficult*.

Level Turns

Purpose: To turn using shallow, medium, and steep bank attitudes while maintaining altitude. To stop a turn with the nose on a visual reference point, **not** a compass heading.

Attitude: Establish and maintain the C- or T-pitch attitudes C  (cruise or slow cruise) T  and shallow, medium, or steep bank attitude. Bank attitudes are referenced by the "sight picture" out the window, not by instruments.

Power: Set for cruise or slow cruise.

Trim: Do not retrim the elevator during the turn. Yoke back pressure is tolerated because turns are short duration maneuvers. During a turn entry, drag increases as bank angle increases and this causes airspeed to decrease and elevator back pressure to increase. When the turn is complete, drag, airspeed, and control forces will return to their original values.

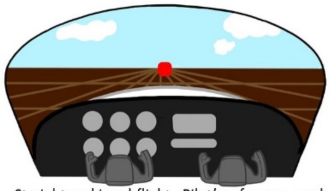
Vision:

- Clear the airspace for traffic before turning.
- To start the turn, look straight ahead and watch the airplane's nose and the horizon.
- Keep the airplane's nose in the same position relative to the horizon during the turn.
- Do not look away from the nose reference until established in the bank attitude and ailerons are neutralized.
- Proper aileron and rudder coordination is indicated by maintaining a reasonable rate of turn for the existing bank angle and airspeed by watching the relative movement between the airplane's nose and the Earth's surface.
- Proper rudder coordination is also indicated when the force of gravity is pushing straight down in the seat. Any feeling of leaning towards the inside or outside of the turn indicates a slipping or skidding turn.

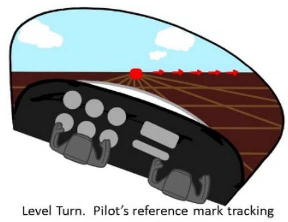
- Proper aileron and rudder coordination during turn entry or rollout is indicated when the nose does *not* yaw to the inside or outside of the turn (refer to the section, “Line-of-Sight Reference Point for Turn Coordination”).
- The inclinometer’s ball reference can be useful, but a person *becomes a much better pilot* when able to evaluate turn coordination by visual and kinesthetic cues.
- To stop a turn, look straight ahead and watch the airplane’s nose and the horizon.
- Keep the airplane’s nose in the same position relative to the horizon.
- Do not look away from the nose reference until the wings are level, ailerons neutral, and any yaw is stopped.

CFI Note:

When teaching turns, elevator and rudder coordination will be established faster and better if a small reference mark is placed on the windshield with a dry-erase marker. To do this, fly straight and level and have the student look straight ahead at the horizon, parallel to the airplane’s longitudinal axis. Place the mark where the student’s line of vision intersects the windshield. Now, have the student keep this mark on the horizon while turning.



Straight and Level flight. Pilot’s reference mark representing the plane’s nose in relation to the horizon.

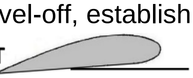


Level Turn. Pilot’s reference mark tracking across the horizon.

Cruise Climb

Purpose: To gain altitude at a reasonable rate while maximizing forward visibility, engine cooling, and forward speed in order to reduce flight time. Establish a cruise climb when reaching a safe altitude after takeoff if flying to the practice area or on a cross-country flight.

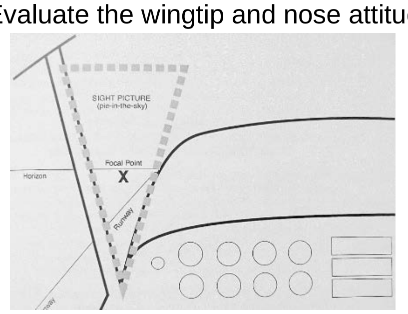
Attitude: *If airspeed is at or above the cruise climb speed*, establish and maintain the T-pitch attitude and any bank attitude. *If airspeed is below the cruise climb speed*, maintain the C-pitch attitude, accelerate to the cruise climb speed, and then establish the T-pitch attitude. At level-off, establish the C-pitch attitude for cruise or establish the T-pitch attitude for slow cruise.

C  T 

Power: Adjust mixture for air density and throttle setting. *If airspeed is above the cruise climb speed*, *do not set climb power until airspeed decreases to the climb speed*. If airspeed is at or below the cruise climb speed, set climb power immediately. At level-off, let the airspeed accelerate to the cruise speed before reducing power.

Trim: Rough trim the elevator as necessary. When airspeed and power *stabilize*, fine tune the trim.

Vision: Evaluate the wingtip and nose attitude while scanning the surrounding airspace for traffic.



- The wingtip and the horizon are used to establish and maintain pitch attitude. With zero bank both wingtips will be an equal distance from the horizon.
- The side of the nose and the horizon are used to establish bank attitude and maintain pitch attitude.
- The Earth’s surface and the horizon, framed by the side of the nose cowl and the windshield post, are used to supplement the first two references and evaluate roll, pitch, and yaw.
- This last reference is critical. Use it whenever in a nose-high attitude, because over the nose visual references become almost non-existent.

CFI Note:

Be firm about establishing good habits. Students will tend to jam the throttle forward as soon as the word, “climb” is heard. If airspeed is above climb speed, set the attitude first and wait for speed to slow to climb speed and then smoothly add power.

The airspeed will almost instantaneously stabilize and be ready to trim. Otherwise, the student will chase speed indications, take a prolonged time to stabilize and trim, and get behind the plane (also see the section, "Elevator-Throttle Coordination Drills").

Best Rate Climb (Vy)

Purpose: To quickly reach a safe altitude after takeoff – gain the most altitude in the least time. A safe altitude is one that gives forced landing options in the event of an engine failure.

Attitude:

Establish and maintain the I-pitch attitude 

and level bank attitude. If present airspeed is at or above Vy, the I-pitch attitude selection is immediate. If present airspeed is below Vy, maintain the C- or T-pitch attitude until the airplane has accelerated to Vy.

Power: Adjust mixture for air density and throttle setting. If airspeed is above Vy, do not increase power until airspeed decreases to Vy. If airspeed is at or below Vy, add power immediately.

Trim: Rough trim the elevator as necessary. When airspeed and power *stabilize*, fine tune the trim.

Vision: Evaluate the wingtip and nose attitude while scanning the surrounding airspace for traffic.

- The wingtip and the horizon are used to establish and maintain pitch attitude. With zero bank both wingtips will be an equal distance from the horizon.
- The side of the nose and the horizon are used to establish bank attitude and maintain pitch attitude.
- The Earth's surface and the horizon, framed by the side of the nose cowl and the windshield post, are used to supplement the first two references and evaluate roll, pitch, and yaw.

CFI Note: The published Vy speed is only valid at max gross weight and goes down as weight goes down. With a lightweight solo pilot and tab fuel it could be as low as 72 kts. Rather than referring to Best Rate Climb as a specific speed, refer to it as a specific attitude (with climb power). Telling a student to "pitch for Vy" draws their eyes inside and encourages them to pitch to make the indicator needle line up with 79. The plane will perform at the maximum rate of climb and the pilot will perform better if they're encouraged to "pitch for a Best Rate Climb attitude".

Cruise Descent

Purpose: To maintain a comfortable rate of descent (for passenger's ears) and maximize forward speed while descending. Use this returning from the practice area or on a cross-country flight.

Attitude: Set and maintain the H-pitch attitude and any bank attitude. 

At level-off, set cruise or slow cruise attitude.

Power: RPM will increase as airspeed increases in fixed pitch propeller airplanes. Reduce power to maintain cruise rpm, to remain within airspeed or tachometer limits, or for turbulence. Adjust mixture for air density and throttle setting.

Trim: When airspeed and power stabilize, fine tune the trim.

Vision: Evaluate the wingtip and nose attitude while scanning the surrounding airspace for traffic.

- The wingtip and the horizon are used to establish pitch attitude and maintain bank attitude.
- The nose and the horizon are used to establish bank attitude and maintain pitch attitude.
- The Earth's surface and the horizon, framed by the nose cowl and the windshield framework, are used to supplement the first two references and evaluate roll, pitch, and yaw.

Slow Cruise Descent
Purpose: To lose altitude while maintaining slow cruise airspeed. Used when maneuvering in the practice area.

Attitude: Establish and maintain the C-pitch attitude and any bank attitude. 

If airspeed is at or below slow cruise descent speed, set the C-pitch attitude immediately. *If airspeed is above the slow cruise descent speed*, *decelerate to this speed while maintaining altitude and then set the C-pitch attitude*. At level-off, set the T-pitch attitude for slow cruise.

Power: Approximately midway between idle and the bottom of the green arc on the tachometer. Depending on the desired flight path, reduce power for a steeper descent and increase power for a shallower descent. Adjust mixture for air density and throttle setting.

Trim: When power and airspeed stabilize, fine tune the trim.

Vision: Evaluate the wingtip and nose attitude while scanning the surrounding airspace for traffic.
- The wingtip and the horizon are used to establish pitch attitude and maintain bank attitude.
- The nose and the horizon are used to establish bank attitude and maintain pitch attitude.
- The Earth's surface and the horizon, framed by the nose cowl and the windshield framework, are used to supplement the first two references and evaluate roll, pitch, and yaw.

CFI Note:
Be firm about establishing good habits. Students will tend to cut power as soon as they hear "descend". If the airspeed is above the desired descent speed, they will struggle with trying to slow down while going downhill, get behind the plane, and be too high too close to the airport. Make sure they slow down while level, then start the descent, and trim (also see the section, "Elevator-Throttle Coordination Drills").

Climbing and Descending Turns
Purpose: To change heading while climbing or descending. To begin and terminate climbs and descents while turning. To rollout on visual reference points, **not** compass headings.

Attitude: Set and maintain the appropriate pitch and bank attitude. Any combination of the five pitch attitudes and the three bank attitudes may be used, but using the P- or I-pitch attitudes and a steep bank attitude could put the angle of attack close to the critical angle of attack.

When an airplane is banked, drag increases in direct proportion to the bank angle, and the increased drag will decrease the airspeed. Therefore, as bank angle increases, decrease pitch attitude to prevent a loss of airspeed. This correction becomes more important if progressing through medium banks to steep banks.

Power: The power used during climbing or descending turns is identical to that used for straight climbs or descents.

Trim: Trim for the climb or descent, but do not retrim the elevator during turns. Back pressure is tolerated during turns.

Vision: Evaluate the wingtip and nose attitude while scanning the surrounding airspace for traffic.
- The wingtip and the horizon are used to establish pitch attitude and maintain bank attitude. In a bank, the wingtips should be an equal distance above/below the horizon.
- The nose and the horizon are used to establish bank attitude and maintain pitch attitude.
- When climbing the Earth's surface and the horizon, framed by the side of the nose cowl and the windshield post, are used to supplement the first two references and evaluate roll, pitch, and yaw.
- When descending the Earth's surface and the horizon, framed by the nose cowl and the windshield framework, are used to supplement the first two references and evaluate roll, pitch, and yaw.

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Flying in the Wind

One of the most important components of situational awareness is knowing where the wind is coming from and how it is affecting the plane. The wind, in part, affects the glide path, fuel status, flight time, taxi, takeoff, approach to landing, and course. A competent pilot is always aware of the wind and evaluating its effect on the flight.

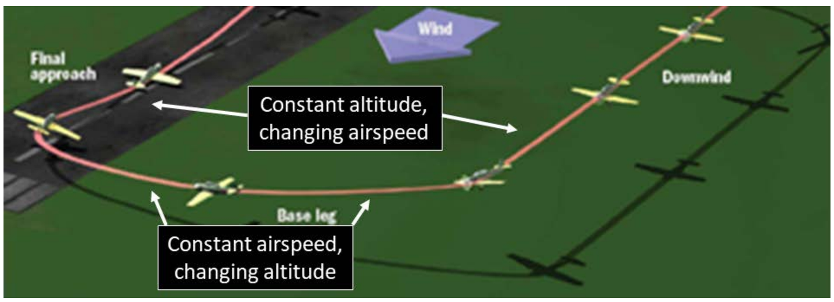
Students should develop their awareness and abilities and always choose to fly a track across the ground or fly to a point on the horizon. When flying between the airport and the local practice areas, don't fly a general direction or heading. When returning to the airport, don't generally fly towards midfield, or downwind, or base. Airplane drivers only fly headings. Pilots, aware of the terrain and structures underneath, determine the best path over the ground while adjusting for wind to put the plane in a specific place. Be intentional about the ground track and verbalize to the instructor what landmarks will be overflown or tracked towards. If wind is only considered during certain maneuvers or when on final, good wind awareness is unlikely to be developed.

2d. Elevator – Throttle Coordination

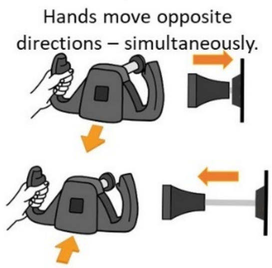
Though the "pitch for airspeed, power for altitude" mantra is a bit simplistic (which isn't bad), the reality is pitch and power must continually work together to achieve performance objectives. There are two basic relationships that form the basis of flight maneuvers and energy management:

- Constant Airspeed, Changing Vertical Flight Path
- Constant Vertical Flight Path, Changing Airspeed

As an example, when descending from pattern altitude to a landing, both of these relationships come into play. On downwind when ready to initiate the descent, the airplane is slowed while maintaining altitude (constant altitude, changing airspeed). In the descent, if too high or too low, airspeed is maintained while adjusting the flight path. On the other hand, if on the correct flight path, but too fast or too slow, a constant flight path is maintained while correcting airspeed. In the roundout and flare, level off above the runway and maintain flight path while changing airspeed. *These two basic relationships between pitch and power are continually utilized as they are the basis of energy management*.

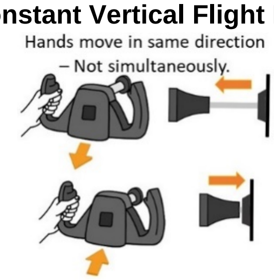


Constant Airspeed – Changing Vertical Flight Path



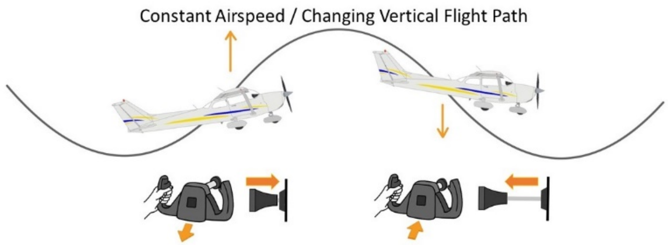
To maintain a constant airspeed when power is reduced, pitch must be reduced. To maintain a constant airspeed when power is increased, pitch must be increased. With one hand on the yoke and another hand on the throttle, *hands move simultaneously in opposite directions*.

Constant Vertical Flight Path – Changing Airspeed



Except at low airspeeds, to maintain a constant flight path when power is reduced, pitch must be increased. Except at low airspeeds, to maintain a constant flight path when power is increased, pitch must be decreased. With one hand on the yoke and another hand on the throttle, *hands move in the same direction, but not simultaneously*. When the power is changed, move the yoke slightly to compensate for a power induced pitch change, pause, and then continue to move the yoke as airspeed changes.

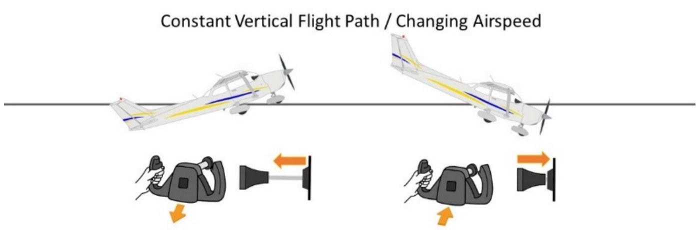
Demonstration and Coordination Exercise of Constant Airspeed



- Set climb power, maintain the best rate climb speed, and use visual references to note the pitch attitude.
- Next, set idle power, maintain the best rate climb speed, and again note the pitch attitude.
- Remember those two attitudes and *cover the airspeed indicator*.
- Continue to alternate between climb and idle power while maintaining the best rate climb speed.

Airspeed will remain constant only if inputs are coordinated so the target power setting and target attitude are reached simultaneously (attitude + power = performance).

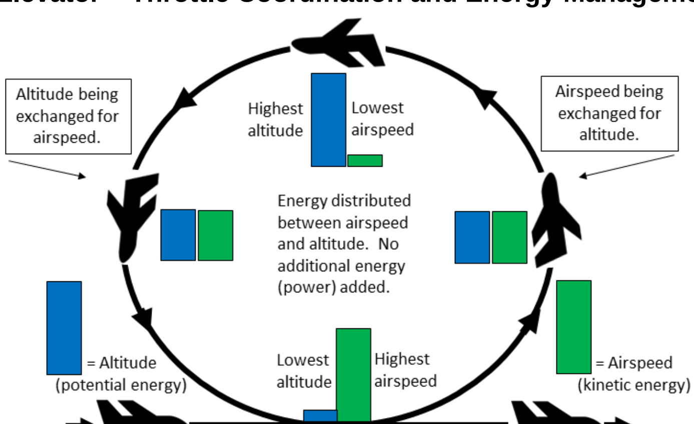
Demonstration and Coordination Exercise of Constant Altitude



- Smoothly set climb power while reducing pitch to increase airspeed to maintain altitude.
- Approaching cruise speed, note the attitude, and smoothly set idle power while increasing pitch to decrease airspeed to maintain altitude.
- Approaching stall warning speed, note the attitude, set climb power, maintain altitude, and repeat the exercise with the *altimeter covered*.
- Continue to alternate between climb and idle power while changing airspeed to maintain altitude.

Altitude will remain constant only if inputs are coordinated so the target power setting and target attitude are reached simultaneously (attitude + power = performance). However, the amount of power change will be greater than the amount of pitch change, so power will need to change at a faster rate than the pitch will need to change to reach the targets at the same time.

Elevator – Throttle Coordination and Energy Management



Energy Management Illustrated by Bob Hoover's Loop Without Power (see on YouTube)

The above exercises also demonstrate energy management (read the Airplane Flying Handbook for more information). The airplane has energy "reservoirs" available as altitude (potential energy) and as airspeed (kinetic energy). Pilots manage energy through elevator and throttle inputs (pitch and power). The throttle adds energy to or removes energy from the airplane, while the elevator controls the distribution between the "reservoirs" of airspeed and altitude.

In the constant airspeed exercise, as the throttle is reduced (energy is removed from the plane) and the plane descends, altitude (potential energy) is exchanged into kinetic energy by pitching to maintain airspeed. As the throttle is increased (energy added to the plane), the plane gains altitude which adds to the potential energy "reservoir" while kinetic energy (airspeed) is maintained with pitch.

In the constant altitude exercise, as throttle is decreased (energy is removed from the plane), airspeed (kinetic energy) is traded for altitude (potential energy) by increasing pitch and slowing down to a speed that requires less power to maintain altitude. Before airspeed is depleted, throttle is increased (energy added to the plane), and what would be a gain in altitude is instead traded back into airspeed by reducing pitch, which builds kinetic energy.

As part of manipulating pitch and power to determine the airplane's vertical flight path and airspeed, it is common to make trades between airspeed and altitude. However, it's important to know that these trades have limits. There is an upper limit where more energy is not available, or if it is, it could overstress the structure of the airframe. There is a lower limit where energy can be depleted to the point where the wing exceeds the critical angle of attack or the plane sinks and/or decelerates excessively. *This is why students at Ignite Flight will learn to fly the airplane to its limits and throughout the entire operating range so they become fully aware and confident pilots*.

Elevator-Throttle Coordination Proficiency Drills (pitch/power, trim)

As stated earlier, pitch and power work together affecting airspeed and flight path to achieve performance objectives, and trades are made between airspeed and altitude as part of achieving those objectives. On any given flight there can be many different performance objectives to be achieved. It may seem like a pilot must master an infinite number of ways to manipulate pitch and power. In fact, that is *not* the case, as there are *three* ways that are used and re-used to achieve various performance objectives. One way to illustrate this is to do so some climbs, descents, and level-offs while either maintaining the same airspeed, or changing airspeed.

<u>Initiate climbs from level flight</u>:

To climb at the same speed:

- Simultaneously change pitch and power to arrive at the target attitude and power setting at the same time.
- Trim.

To climb at a lower speed:

- Lead with increasing pitch to the desired climb attitude, do not change power.
- As airspeed approaches climb speed, follow with climb power. The airspeed will stabilize almost instantly.
- Trim.

To climb at a higher speed:

- Lead with climb power, do not increase pitch attitude.
- As airspeed approaches desired climb speed, follow with increase pitch attitude to maintain airspeed.
- Trim.

<u>Level-off from a climb</u>: (*so altitude and airspeed objectives are achieved simultaneously*)

To level-off at the same speed:

- Simultaneously change pitch and power to arrive at the target attitude and power setting at the same time.
- Trim.

To level-off at a lower speed:

- Lead with decreasing power towards cruise power setting, maintain pitch attitude.
- As airspeed decays, follow with decreasing pitch to maintain new airspeed.
- Trim.

To level-off at a higher speed:

- Lead with slowly decreasing pitch to gain airspeed and decrease climb rate.
- As target altitude approaches, follow with smoothly decreasing power to cruise setting.
- Trim.

<u>Initiate descents from level flight</u>:

To descend at the same airspeed:

- Simultaneously change pitch and power to arrive at the target attitude and power setting at the same time.
- Trim.

To descend at a lower airspeed:

- Lead with a reduction of power, maintain pitch attitude.
- As airspeed decays to the desired value, follow with decreasing pitch to maintain airspeed.
- Trim.

To descend at a higher airspeed:

- Lead with a decrease in pitch to increase airspeed, leave power set.
- As airspeed approaches desired target, follow with a small power reduction to maintain descent.
- Trim.

Level-off from a descent: (*so altitude and airspeed objectives are achieved simultaneously*)

To level-off at the same airspeed:

- Simultaneously change pitch and power to arrive at the target attitude and power setting at the same time.
- Trim.

To level-off at a lower airspeed:

- Lead with an increase in pitch so airspeed and descent rate decay.
- As target altitude approaches, follow with power to stabilize at and maintain altitude.
- Trim.

To level-off at a higher airspeed:

- Lead with an increase in power to cruise setting, maintain pitch attitude to increase airspeed.
- As target altitude approaches, follow with an increase in pitch to maintain the new speed.
- Trim.

Summary:

While this may look like a dozen different ways to manipulate pitch and power, it is really only **three**:

- Simultaneously changing pitch and power.
- Leading with a change in pitch, followed by a change in power.
- Leading with a change in power, followed by a change in pitch.

This isn't limited to climbs, descents, and level-offs. Whenever performance requires changes in pitch and power, such as most of the things done with an airplane, one or more of these fundamentals will be used. A go-around is a good example. It is a rejected landing where the pilot decides to abandon an approach to landing and climb so as to come around for another try. It has three main steps: level-off, accelerate, and climb.

To state it in the terms of the preceding paragraphs, a go-around could be thought of this way:

- From a descent:
    - Level-off at the same airspeed.
- From level flight:
    - Climb at a higher airspeed.

The point isn't to detail how each flight maneuver is broken down into these components. The point is that all, or most, of the things a pilot needs a plane to do can be distilled down to a very few fundamentals of manipulating pitch and power. Understand these fundamentals, practice them to develop "muscle memory", and proficiency will follow.

CFI Note:

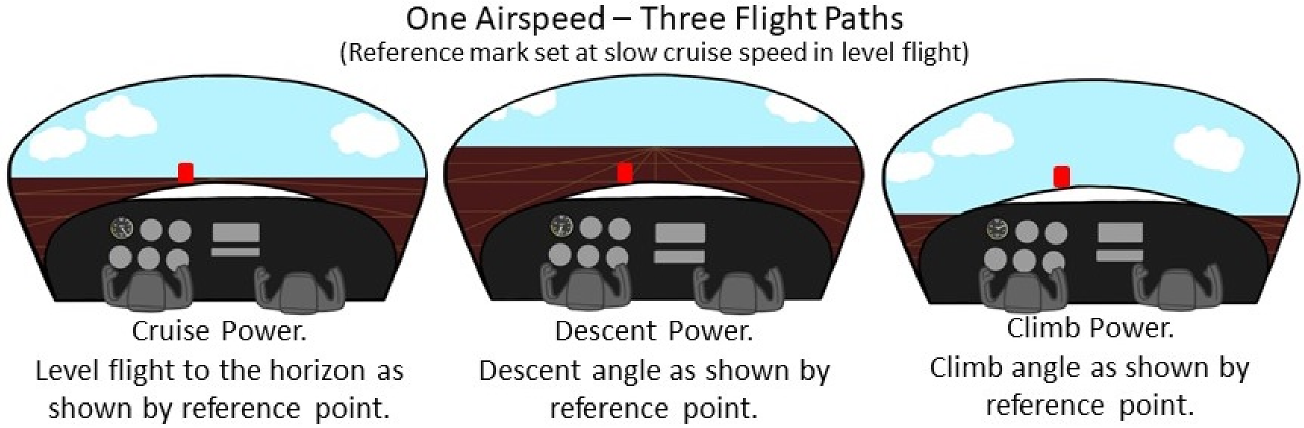
Being intentional about climbs, descents, and level-offs is a good way to help your student improve their fundamental pitch and power coordination and develop muscle memory that they can apply to all flight maneuvers. When climbing, descending, or leveling-off, specify whether to initiate a climb/descent at the current speed, or something higher or lower. Same when it comes time to level-off; same speed, higher speed, or lower speed. Choose speeds (sight pictures) they already know such as, cruise, slow cruise, best rate climb, enroute climb, etc. Drilling them on random speeds is not the purpose. At first, don't be concerned about precision. Being exact about speed will only draw their eyes inside and encourage chasing instrument indications. *Develop proficiency first*. As proficiency develops, then shoot for a range of accuracy, like within 10 knots or within 5 knots. As proficiency develops further, then better accuracy can be expected. The same goes for altitude. *Precision follows proficiency*, *but not the other way around*.

2e. Line-of-Sight Reference Point

A visual reference that can be used to see both flight path and turn coordination is the pilot's line-of-sight reference. In constant airspeed, straight and level flight, with the pilot looking straight ahead at the horizon, the place on the windscreen where the pilot's line of sight meets the horizon can serve as a reference point. This can be used in climbs and descents as well, but straight and level serves as a baseline. See the included graphics.

Line-of-Sight Reference Point as a Flight Path Indicator

In straight and level flight, the airplane's flight path is to the horizon. The reference point will remain on the horizon as long as the plane is in level flight at that airspeed. This is true for turns as well, the reference point will track across the horizon if level. If the plane climbs or descends in a turn, the point will rise above or fall below the horizon.



If the plane climbs or descends at the same airspeed, the reference point will still indicate the airplane's flight path. In a stable descent it will be aimed at the point on the ground where the plane would impact the terrain if it never levelled off. In a stable, constant airspeed, constant flightpath descent, this spot on the ground will appear not to move and will grow larger. However, if power is increased, the descent will be shallower and the reference point will move up closer to the horizon to a spot on the ground further ahead of the plane. Likewise, if power is decreased, the descent will steepen and the reference point will move down further from the horizon to a spot on the ground closer to the plane. The line-of-sight reference is used with an "aim point" on final approach to landing to ensure touchdown at a specific place on the runway. It will also be useful in a forced landing to see where on the ground the glide will end.

In a stable climb it will be aimed above the horizon, and shows how shallow or steep the climb is depending on how far above the horizon the point is. Increasing power will steepen the climb and the point moves further above the horizon. Decreasing power will shallow the climb and the point moves down closer to the horizon. If in a climb, the reference point is aimed at trees or the terrain immediately in front of the plane, the climb angle is not steep enough to clear the terrain at that airspeed. Add power if available, or climb at a slower speed.

Keep in mind, there is not one spot on the windscreen for all airspeeds. At a higher speed the pilot's line-of-sight reference will be further up the windscreen because the pitch is lower, and at a slower speed the pilot's line-of-sight will be lower on the wind-screen because the pitch is higher.

Line-of-Sight Reference Point for Turn Coordination

In coordinated turn entries the longitudinal axis remains stationary while the plane rolls about the axis. During the turn the axis tracks across the horizon (in a level turn). In a coordinated rollout, the axis is again stationary while the plane rolls about the axis. In this case the reference point represents the longitudinal axis from the pilot's point of view.

- Coordinated turn entry – plane rotates around reference point, then reference point tracks in direction of turn.
- Too much rudder entry – reference point yaws in direction of turn as plane rotates, then tracks in direction of turn.
- Too little rudder entry – reference point yaws opposite of turn as plane rotates, then tracks in direction of turn.

- Coordinated rollout – the reference point stops moving and the plane rotates around the point.
- Too much rudder rollout – reference point yaws opposite of turn direction as plane rotates around point.
- Too little rudder rollout – reference point yaws in direction of turn as plane rotates around point.

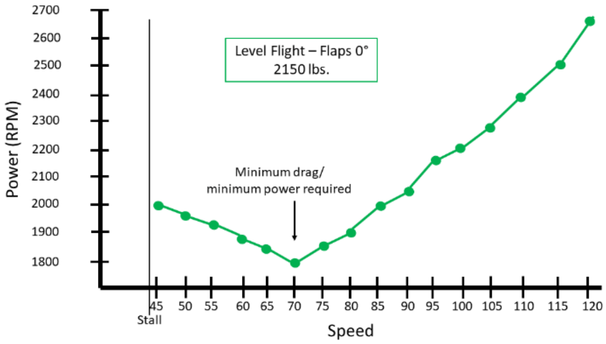
2f. Flight Instruments and the Visual Pilot (or, Don't Get on the "Struggle Bus to Mediocrity")

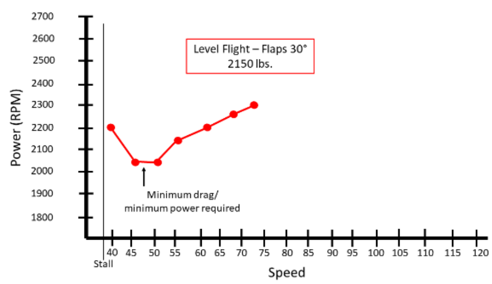
When it comes to proper aircraft control, pilots have to get the priorities straight. The flight instruments are not the first priority, they are the third priority. Attitude and power are the first two priorities. Attitude plus power equals performance. Proper visual references, engine and slipstream sound, and control pressures are *leading indicators* of performance and show unwanted deviations which can be corrected before the instruments register any change. Once the plane is stable following attitude and power changes, the instruments will *confirm the performance objective the pilot is expecting*. This keeps the pilot ahead of the plane. Workload is lower, awareness is higher, performance is better, and confidence grows.

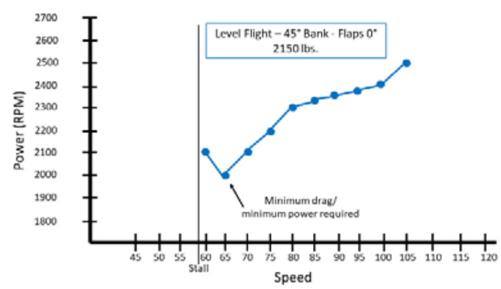
Not flying with attitude and power, and using proper visual references, and not listening to engine and slipstream sound, and not understanding what control pressures are communicating, puts the pilot in the unfortunate situation of relying on flight instruments to tell what the plane has done. The pilot is already behind the airplane and perhaps doesn't realize it. Flight instruments are *lagging indicators* of performance and chasing their indications around trying to get the performance puts the pilot in a high workload, low awareness situation. While doing that attention must be divided to evaluate airplane motion, watch for traffic, and monitor radio communications. Now the pilot is even further behind. Performance and confidence will suffer as the pilot rides the struggle bus to mediocrity. The cruel irony is, more time and money will be spent getting to mediocrity. To get off the bus, cover the instruments and get the priorities straight!

3.Flight on the Backside of the Power Curve

If when in level flight, various combinations of pitch (airspeed) and power (rpm) were recorded and then charted on a graph, the result would resemble a “Nike Swoosh” shaped curve. This is a “power required” curve, which represents the power required for level flight at various airspeeds. The bottom of the curve is the minimum drag or minimum power required speed. When flying slower than the minimum power required speed, the plane is on the back side of the power curve where power must be increased in order to maintain altitude, decrease airspeed, and overcome induced drag. When flying faster than the minimum power required speed, the plane is on the front side of the power curve where power must be increased in order to maintain altitude, increase airspeed, and overcome parasite drag. The power required for level flight is also affected by configuration and load factor as well.







CFI Note:

In the early stages of learning to fly, the goal is not to perform a slow flight maneuver as if on a test. The goal is to learn things and develop skills. Learn aerodynamics. Flight on the backside of the power curve gives the student an opportunity to observe and experience many important aerodynamic characteristics. Develop aircraft control at slower speeds by manipulating power, attitude, and configuration. Flight on the backside of the power curve gives the student an opportunity to build confidence in the airplane and in their abilities. However, if all that is done is to repeat an ACS maneuver, important training opportunities will be missed. Slow flight as the specific ACS maneuver can come later.

In addition to the usual “mushy” controls and left turning tendencies, here are some other things a student should experience:

- Make turns, climbs, and descents at minimum controllable airspeed.
- Demonstrate adverse yaw.
- Demonstrate overbanking tendency.
- Watch turn rate vary with shallow, medium, and steep bank angles.
- Experiment with different flap settings. Do they each give the same amount of balloon when extended? Do they each give the same amount of sink when retracted? Why, or why not?
- Try maintaining a constant airspeed and flight path with 10°, then 20°, and finally 30° of flaps. Do pitch and power requirements change the same with each flap setting? Why, or why not?
- Using the line-of-sight reference as a flight path indicator, visualize the relative wind. See the angle of attack at the first, second, and possibly the third octave of the stall warning. Find the pre-stall buffet and see the angle of attack. Do this with and without flaps and compare results.
- Experience how load factor increases the angle of attack (stall speed) and power decreases stall speed. From just above the stall warning, increase bank until the horn sounds, hold the bank, increase power until horn is silenced. Repeat until throttle is full or the pilot runs out of nerve.
- Take notes on what power settings equal what airspeeds in level flight. Make a power required curve for the clean configuration and another with flaps.
- Try to climb or descend, with power fixed, by changing speed with pitch.

Purpose: To understand airplane control responses, performance, and aerodynamic characteristics when maneuvering at slow airspeed on the back side of the power curve. Most maneuvering at slow speeds occur during takeoff and climb, and approach and landing.

Attitude: Gradually move from the C-pitch attitude to the T-pitch attitude or towards the I-pitch attitude depending on the speed desired. Minimum airspeed can be maintained without using the airspeed indicator; use the prestall buffet as a reference. The stall warning can also be used as a reference if wanting to fly within the 5-10 knot range above stall speed. This maneuver will not be flown well staring at the airspeed indicator. To return to the front side of the curve, gradually move from the T or I-pitch attitude to the C-pitch attitude.

Power: Gradually reduce power from cruise setting to the minimum power required for level flight, then smoothly add power to the setting to maintain level flight at minimum controllable airspeed, or a speed 5-10 knots above stall. Reference the altimeter and tachometer, but do not watch them. Learn to match throttle position and engine sound with pitch attitudes to get the correct power setting.

Configuration: Slow flight can and should be done in various configurations. Start clean. Later, add partial or full flaps. Flaps can be extended on the front side of the power curve, on the backside of the curve, or while transitioning from the front side to the back side. Extending and retracting flaps will require adjustments in attitude and power. Entering and exiting slow flight in multiple ways will increase skill and ability in aircraft control.

Trim: Rough trim the elevator during the transition to the back side of the power curve. Fine tune the trim once attitude and power are stabilized.

Vision: Evaluate the wingtip and nose attitude while scanning the surrounding airspace for traffic.

- The wingtip and the horizon are used to establish pitch attitude and maintain bank attitude.
- The side of the nose and the horizon are used to establish bank attitude and maintain pitch attitude.
- The Earth's surface and the horizon, framed by the side of the nose cowl and the windshield post, are used to supplement the first two references and evaluate roll, pitch, and yaw.

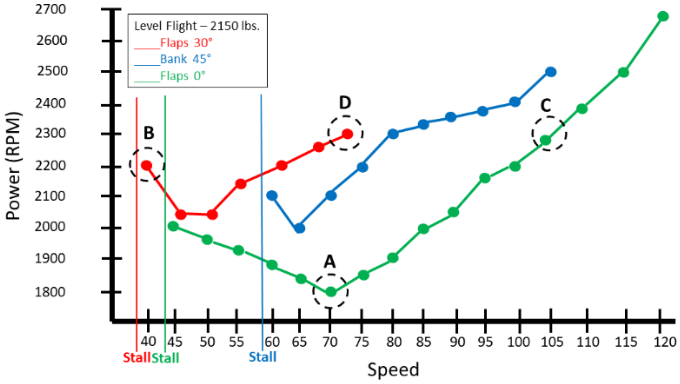
The engine oil temperature gauge must be scanned during this low speed, high power maneuver. If the temperature approaches redline, return to cruise and allow the engine to cool.

Execution: Elevator-throttle coordination must be used to maintain flight path and airspeed. Initially, to get the most out of this maneuver, incrementally slow down the plane to find the minimum power required for level flight (with approximately the T-pitch attitude), and then incrementally slow down to the minimum controllable airspeed (with approximately the I-pitch attitude). To return to the front side of the curve, incrementally adjust pitch and power to the speed requiring the minimum power, and then gradually speed up to cruise speed. As proficiency increases shortcuts can be taken to speed up the process.

Try out different configurations as mentioned above. Climb and descend (with and without power changes), and turn. Vary the flight path by steepening or shallowing the climb or descent. Vary the turns with shallow, medium, and steep bank angles. *The more experimentation with this, the more learning increases about the airplane's capabilities, and the more skill and confidence develops.* The more pilots *use visual references and match them with throttle position and engine sound*, the better they will fly on the backside of the power curve. Those that watch and chase instrument indications will suck at this.

CFI Note:

Keep in mind our philosophy of developing confident pilots with high situational awareness. A part of this is to fly the plane throughout its operational range. Once the student has experimented some as described above and has made power required curves for both clean and approach configurations, further practice should be approached as a problem-solving exercise rather than following directions or following a rote procedure. Ask the student, "how can we move from 'here' to 'here' on the power required curve(s)?" (See below) Both private and commercial students can develop their skills and confidence in this manner.



Some examples:

- From ‘A’ to ‘B’: change in speed, power, and configuration.
- From ‘C’ to ‘D’: power is constant, so drag needs to be kept constant.
- From ‘A’ to ‘D’: airspeed constant.

4.Stalls

Stall recognition and recovery is a prominent feature of flight training, check rides, and flight reviews. Stalls and spins are also a leading cause of accidents. Why? Must be a bunch of dumb pilots out there; it can't be flight training's fault since so much time is spent doing stalls, right?

Although students are informed stalls can happen at any attitude and airspeed, when looking at most depictions of stalls in training materials, and performing stall maneuvers as typically done on check rides and flight reviews, it would seem the plane only stalls at very high pitch attitudes and very low airspeeds. Do accident pilots get into obviously high pitch attitudes and rapidly decaying airspeed situations (like the typical stall training) and fail to notice it? Probably not most of the time. It may be hard to prove (these accident pilots don't tend to survive), but stall/spin accidents probably look different than the typical stall training maneuver.

At Ignite Flight, pilots will learn and experience how power, attitude, configuration, and load factor can contribute to an increase in the Angle of Attack (AoA) and lead to a stall whether the speed and pitch attitude is high, low, or in between. Pilots will also be taught how to relate these factors to real world stall situations such as a high density altitude takeoff or a sloppy approach to landing. Turning stalls will be performed alternately with straight ahead stalls.

<u>Prerequisite</u>: Slow flight with line-of-sight reference as flight path indicator to visualize relative wind and angle of attack. Slow flight climbs, descents, and turns.

<u>Purpose</u>: To understand and recognize the factors that can lead to an increase in the angle of attack. To recognize an impending or imminent stall and take steps to reduce the angle of attack. To recognize and recover from a stall. To build the pilot's confidence in their own abilities, and build the pilot's confidence of the airplane.

<u>Attitude</u>: To enter a stall, *never continuously increase pitch attitude until the stall occurs*. Considering power and configuration, determine and establish a pitch attitude that will result in a stall, or an imminent stall, and maintain that attitude until the stall, or imminent stall, occurs. Do this alternately with the wings level and in a bank. Performing stalls in this manner will *increase attitude awareness*.

<u>Power</u>: Power primarily determines flight path which is opposite the relative wind, so therefore, power influences where the relative wind is coming from as it hits the wing. Power can be set for a climbing, descending, or level flight path. A high power setting reduces the speed at which the plane reaches the critical angle of attack and will require a higher pitch attitude to induce a stall. A low power setting increases the speed at which the plane reaches the critical angle of attack and will require a lower pitch attitude to induce a stall.

<u>Configuration</u>: Flaps lower the speed at which the plane reaches the critical angle of attack. With a fixed pitch attitude, extending flaps will allow an increase in back pressure (increase in AoA) as the plane slows down. With a fixed power setting, flaps will lower a climb angle or steepen a descent angle, affecting the relative wind and increasing the angle of attack (for a given pitch attitude).

<u>Execution</u>: Eventually, student pilots will need the confidence to take the plane to a full stall while the stall warning is blaring, and then recover. However, develop confidence (or at the very least, don't diminish it) by starting with the least anxious and stressful imminent stall (low power, level pitch, wings level, first stall warning) and incrementally progress towards full stalls with increasing pitch and bank attitudes. It's not only the high pitch attitude at the stall that's unnerving, it's the pitch attitude in the recovery as well. *The amount that the nose must be lowered in the recovery is proportional to the pitch-up attitude at the stall*. There is no hurry to get to high pitch attitude stalls. The main requirement in the early stages of training is to recognize and recover from imminent or actual stalls that may realistically be encountered in solo operations.

In order to fly the plane throughout its operational envelope stalls, whether imminent or full, will be performed turning as well as straight ahead. As an ACS standard, turning stalls are performed with a shallow bank on the check ride. However, traffic patterns are typically flown with medium bank turns. If a turning stall were to happen in the takeoff or landing phase, it's reasonable to assume it will be at a medium bank, or possibly more. Turning stalls and recoveries should be practiced with shallow banks to start with and gradually worked up to medium banks. As long as rudder coordination is maintained, a turning stall is no different than a straight-ahead stall. If the plane were to spin due to incoordination during the stall, it won't make any difference whether the plane was originally in a wings level or banked attitude. *Turning stalls develop confidence. Avoiding turning stalls diminishes confidence.*

At a minimum, the regulations require that certain stalls be demonstrated by the instructor, but are not required to be performed by the student. These are the accelerated, secondary, elevator trim, and cross-control stalls. We train beyond minimums and train students to fully operate the aircraft. Pilots should have the experience of recovering from these stall situations so students should perform these stalls. CFI's, be sure to put these stalls in their proper context so students understand how/where they could occur.

Factors that increase the AoA and lead to stalls can be better learned in the context of problem solving instead of an exercise in following directions or following a rote procedure. Here are some examples of stall problems a student may be asked to solve:

- Do whatever needed to stall the plane, but with a pitch attitude no higher than the C-pitch attitude.
- Do whatever needed to stall the plane, but with a pitch attitude no higher than the I-pitch attitude and a level or climbing flight path (no sinking).
- Stall the plane with a nose low attitude (H-pitch attitude).
- Stall the plane at or above 80 kts.
- Demonstrate how a plane might stall if it can't climb out of ground effect and is trying to dodge obstacles.
- Demonstrate how a plane might stall if it overshoots the turn from base to final.
- Demonstrate how a plane might stall on final if it is sinking below the desired flight path and the pilot attempts to correct with pitch alone.
- Demonstrate how a plane might stall on climb-out if a pilot attempts to increase climb angle (to miss a tree) with pitch alone.

<u>No Power Recovery</u>: Establish the H-pitch attitude and level bank attitude. This recovery shows that reducing the AoA alone restores the stalled wing to its normal condition. It is also the only way to recover from a stall in a power-off glide. During one recovery, abruptly increase pitch to experience a secondary stall. Note the small effort that is required to make this happen.

<u>Power Recovery</u>: Establish the C-pitch attitude, level bank attitude, and full power. If flaps were extended, retract partial flaps. Maintain this acceleration attitude until control pressures increase and then establish the I-pitch attitude and climb. Retract remaining flaps. During one recovery, abruptly increase pitch and notice how easily a secondary stall can be induced.

<u>Rudder Usage</u>: If the airplane rolls during a stall recovery, **do not** use aileron inputs. *Stop the roll with rudder input*. To improve rudder coordination and confidence, the instructor will use the continuous stall exercise (sometimes called a "falling leaf" stall), a coordination maneuver where the instructor holds the airplane in a power-off stall and the student uses the rudder to practice roll control. *Any time an unsolicited roll occurs, rudder input must be the first reaction to prevent a spin from developing*.

<u>Vision</u>: Evaluate the wingtip and nose attitude while scanning the surrounding airspace for traffic.

- The wingtip and the horizon are used to establish pitch attitude and maintain bank attitude.
- The nose and the horizon are used to establish bank attitude and maintain pitch attitude.
- Stall entry: The Earth's surface and the horizon, framed by the side of the nose cowl and the windshield post, are used to supplement the first two references and evaluate roll, pitch, and yaw.
- Stall recovery: The Earth's surface and the horizon, framed by the nose cowl and the windshield's framework, are used to supplement the first two references and evaluate roll, pitch, and yaw.

CFI Note:

The *proper visual references are critical*, because pilots who watch the instruments during a stall are an accident waiting to happen. Cover the flight instruments. Make students aware of pre-stall control feel, airflow noise, and airframe buffet. The resulting increase in situational awareness promotes safety and will make it easier to teach landings.

5.Takeoff and Landing

Normal Takeoff

Purpose: To reach a safe altitude as fast as possible. Safe altitude is based on pilot judgment and it represents the lowest altitude that provides a suitable emergency landing site in the event of an engine failure.

Attitude: C-pitch attitude to initiate the takeoff roll. As control pressure increases and the elevator becomes effective, set the T-pitch attitude. 

The plane will liftoff when lift equals weight. At liftoff maintain the T-pitch attitude by moving the yoke slightly forward and the plane will accelerate. As the plane accelerates, smoothly set the I-pitch attitude.

At the safe altitude, set the T-pitch attitude for enroute climb.

Power: Set full throttle. If at or below 3000' density altitude, this will result in full power. If above 3000' density altitude, full throttle may not be full power. Above 3000' density altitude, set full throttle and lean the mixture until the first increase in RPM, which will be maximum power. Do not lean past that "bump" up in RPM. Use that setting for takeoff.

Trim: Set for takeoff or, if not specified, set neutral trim.

Vision: Proper vision starts while taxiing to the runway. Look for a windsock or other wind indicator. A student who ignores wind indicators before takeoff has a serious, disqualifying awareness problem. During the takeoff roll, look straight down the runway. At liftoff, shift eyes to the side of the cowling.

CFI Note:

Do **not** teach students to hold an airplane on the ground and "rotate it" into the air at a specific airspeed. When light airplanes are flown in this manner, weight transfers onto the nose gear while accelerating, a grossly incorrect procedure that causes wheelbarrowing and transmits stress through the nose gear to the firewall. Teach students attitude awareness and to establish the T-pitch attitude when the elevator becomes effective. With this attitude, weight distribution is correct, and the airplane will fly itself off the runway when the wing is ready to fly.

Crosswind Takeoff

Purpose: To compensate for a crosswind during takeoff.

Execution: Similar to the Normal Takeoff, but with different control inputs to produce an initial sideslip. The initial sideslip, required until a positive climb occurs, protects the airplane if it settles back onto the runway due to wind gusts. Touchdown in a sideslip is normal and easy to control; touchdown in a crab is dangerous and can easily cause a loss of control.

When a positive climb occurs, simultaneously level the wings and apply enough right rudder to compensate for left turning tendencies. Establish a wind correction angle. Adjust that angle in order to track the runway's extended centerline.

The term, positive climb, **does not** mean a positive rate of climb. Identify a positive climb visually by evaluating airplane movement in relation to the ground. Do not maintain the sideslip longer than necessary. A sideslip produces drag which is detrimental to climb performance.

Elevator Control: For the crosswind takeoff, do not establish the T-pitch attitude as soon as the elevator becomes effective. Wait until elevator pressure is firm and control response is positive. This prevents a liftoff at minimum speed and minimizes the chance of settling back onto the runway during gusty conditions.

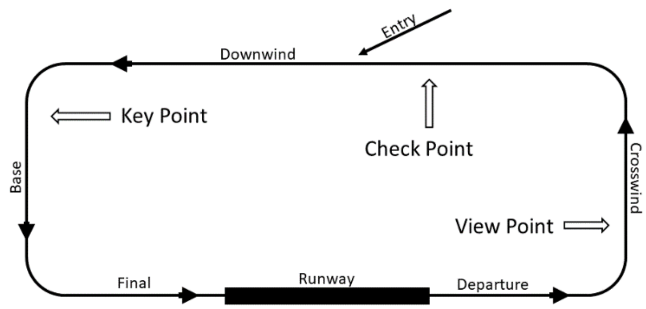
Rudder Control: Use it to keep the airplane parallel with the runway centerline until a positive climb occurs.

Aileron Control: Use it to *keep the airplane's weight on the upwind wheel* during the takeoff roll and to maintain the liftoff bank attitude until a positive climb occurs. Start with full aileron deflection and gradually reduce some deflection as speed increases and control effectiveness increases. The downwind wing rises slightly during the takeoff roll, the nose rises when the T-pitch attitude is selected, and *the upwind main wheel is the last to leave the ground*.

Flying the Traffic Pattern

After takeoff, track the extended runway centerline until 300' below traffic pattern altitude (TPA). Before turning onto the cross-wind leg, choose a reference point directly off the side and visualize a line to that point to track towards. Keep the airplane on the selected ground track, and fly a rectangular traffic pattern.

The **view point** depicted in the illustration is where the plane will be after turning crosswind and levelling the wings. Carefully check the entry and downwind legs for traffic, choose a point to track towards, and turn onto the downwind leg. While parallel to the runway, note its position in relation to the wing or wing strut to gauge the appropriate distance of the downwind leg from the runway. However, to track straight, especially as the plane passes the other end of the runway, points along the ground track should be overflown.



At the **check point**, located abeam the departure end of the runway, perform the before landing flow and mental check, look for traffic that may be ahead, and call tower if applicable (always the last priority). If number three (or more) for landing, or extending downwind, consider slowing down so as not to get as far from the runway. The starting point for the descent to the runway will depend on one of two traffic situations:

Number one to land. Start the descent when opposite the intended touchdown point on the runway. Turn onto the base leg when the touchdown point is 45° behind the wing, but start earlier in strong winds. Do not become dependent on a certain landmark to determine when to turn to the base leg unless the landmark can be taken to other airports. Do pick a point and/or visualize a ground track to follow prior to turning onto the base leg. Upon completion of this turn is where the **key point** is located, the point where the landing evaluation process begins. Visually extend the runway's centerline on the ground for reference and plan the turn to final so that the line is intercepted.

Following other traffic. Remain at pattern altitude (consider higher if over town or on extended downwind) until in a position for a normal descent to the runway. Descending too early eliminates forced landing options. The amount of traffic and the distance from the runway will dictate whether to start the descent on base leg or on final approach. Wait to start the base leg turn after the airplane being followed is on final approach and passes abeam.

Constant Attitude and Power, Variable Airspeed Approach

When ready to initiate the descent from TPA, set approach power, extend the first increment of flaps, and set the approach sight picture (C-pitch attitude). *Ideally, control flap extension and ground track so that attitude and power changes are minimal until the landing flare*. If using the proper attitude and power, airspeed will decrease to the appropriate approach speed as flaps are extended (variable airspeed). *Reducing the dependence on power adjustments*, and the corresponding pitch changes, to control glidepath results in a stable approach and develops and increases the skills necessary to survive a forced landing.

While the goal is to reach the round-out at the correct airspeed without changing attitude or power, no one can do this on every approach.

If high:

- extend ground track (widen the pattern)
- extend flaps early (to increase descent angle),
- perform a forward slip,
- or reduce power.

If low:

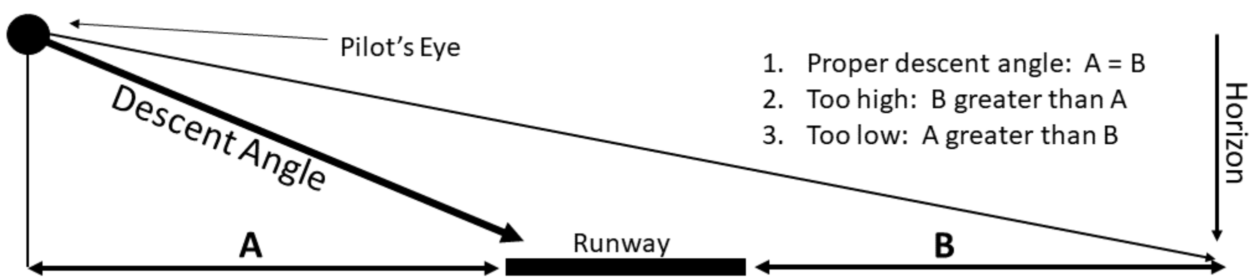
- shorten ground track (tighten the pattern),
- delay additional flap extension,
- add power.

Base leg orientation, flap selection, and bank angle are tools for modifying the ground track and descent angle.

CFI Note:

A goal of this approach is to maintain a constant (fixed) power setting and control descent angle with flaps and ground track. It requires good thinking, planning, and airmanship. The importance of developing this skill will become apparent if the pilot has to make a forced landing due to engine failure when power is also fixed (at zero), or when performing the power-off 180 landing for the commercial check ride. It is not the expectation for student pilots to master this prior to solo, so pitch and power corrections can be made. However, the more this skill is developed the more the pilot's awareness, confidence, and safety is improved.

Evaluating the descent angle. Do this continually while on the base leg and on final until establishing an aim point. In the illustration, A is the distance from aircraft position to the runway threshold, and B is the distance from the departure end of the runway to the horizon. At the **key point**, A will be shorter than B, but as the descent continues, equalization will occur.



- If A continues to equal B, the glidepath is correct.
- A greater than B = low. Correct by shortening the ground track to the runway and/or delaying flap extension.
- A less than B = high. Correct by lengthening the ground track to the runway and/or extending flaps early. Maintain the approach pitch attitude. If decreasing pitch and diving toward the runway, airspeed will increase and the plane will float during the landing.

Use good judgment with respect to the wind gradient and updrafts or downdrafts. This will be discussed in a following section.

CFI Note:

Visual glide slope indicators are a vital tool at night and in lower visibility conditions, but in ideal conditions can become a crutch if allowed. Not all runways are equipped with these lights, and not a single off-airport landing site in the entire country is equipped with them either. Pilots *must* develop their own judgment. With a visual reference that can be used in most circumstances to evaluate descent angle, performance will become consistent and proficiency will increase.

Base leg orientation. Normally, the base leg is flown perpendicular to the final approach, but if high or low, turn more towards or slightly away from the runway in order to decrease or increase the ground track.

Flap selection. Lift and drag increase as flaps are extended, and the increased drag decreases airspeed and steepens the descent angle. While it is customary to extend the second and third increment of flaps on base and final respectively, it is not a rigid rule. Flap extension must be based on judgment of descent angle, ground track, wind, updrafts and downdrafts.

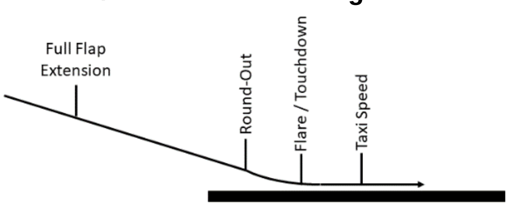
It is important to *anticipate the need for flap extension*, because when on the proper glidepath with a normal wind gradient, the plane is about to go high. So, when everything looks correct, extend the next increment of flaps. Delaying flap extension until too high will require a power reduction, which may require further adjustments of power.

The turn onto final approach. Make a medium bank turn, but if too high or too low, adjust the descent rate and ground track with bank angle. Ground track and descent rate will both increase with a steeper turn onto final; they will both decrease if a shallower turn is made.

Anticipating wind gradient changes. As the airplane descends toward the surface, wind direction *typically* backs (moves counter-clockwise) and velocity decreases. As the headwind component decreases, groundspeed increases, and the plane will go above the desired glidepath if a correction is not made.

Anticipating updrafts and downdrafts. Look at the ground track ahead of the plane and watch for surfaces where heat will rise (updrafts or thermals) and surfaces where air will rise less or even sink. Smooth, dark, or dry surfaces like asphalt roads and brown fields tend to have updrafts, while trees, green fields, and water tend to have downdrafts. Anticipate extending flaps before updrafts, and anticipate delaying flap extension until after downdrafts. In the updrafts and downdrafts if the altitude displacement becomes significant, apply elevator-throttle coordination and use power to restore the proper descent angle and simultaneously use pitch to maintain airspeed.

Normal / Crosswind Landing

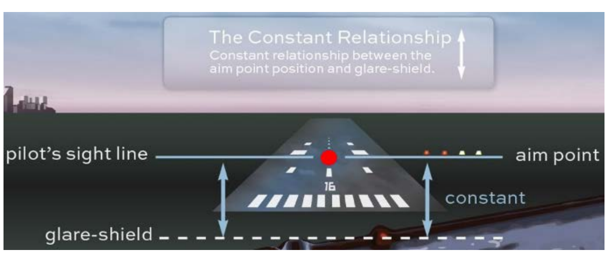


- Stage 1 – From full flap extension to the round-out point.
- Stage 2 – From the round-out point to the flare.
- Stage 3 – From touchdown until reaching taxi speed.

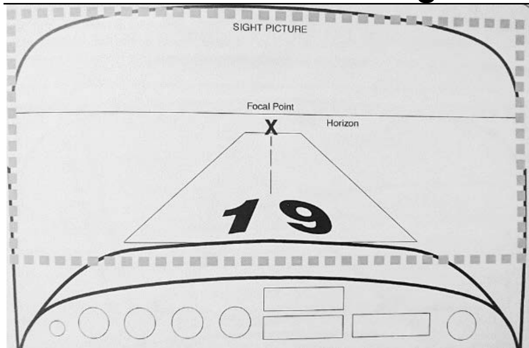
Stage 1 – From full flap extension to the round-out point
Object:

- Descent angle.
- Airspeed control.
- Runway centerline track.
- Round-out point.

Full flaps are extended and the current descent angle, attitude, and power setting will maintain airspeed and take the plane to the round-out point. As the runway gets closer, the primary reference shifts from the descent angle to the planned aim point on the runway. This is the line-of-sight reference (flight path indicator) learned earlier. The aim point's relative position on the windshield should align with the pilot's line-of-sight reference and stay there. That is where the plane is going if the descent is stable. This is easy to do if a constant attitude approach is flown, but becomes more difficult when making pitch changes. If the aim point (red dot in the illustration) moves up on the windshield the plane is too low; if the aim point moves down the plane is too high.



Runway centerline control means drift control. Unless wind conditions are known for certain, rollout on final approach with the airplane parallel to and on the extended runway centerline. Watch for drift. If drift occurs, crab into the wind to control ground track and remain on centerline. The wind correction tells the actual winds on the approach, which may be different than reported surface winds. As the plane gets lower and the runway gets closer, transition from the crab into a sideslip.



Sight Picture On Short Final

Vision:

- The aim point.
- The sight picture.

Once the plane is definitely stabilized on a path to the aim point look up at, but don't fixate on, the focal point shown in the illustration, and maintain the existing pitch attitude.

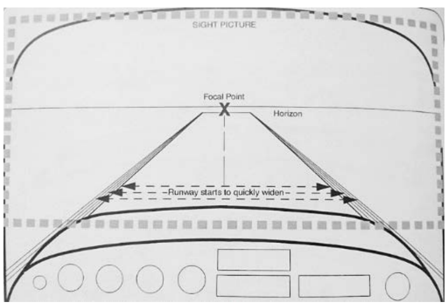
CFI Note:

The old saying, "a good landing starts with a good approach" does not register with students. *They are obsessed with the landing, not the approach*. Do not allow students to attempt to practice, or salvage, a landing from a lousy approach. This will lead to bad habits and bad decisions later on. Execute a go-around. A landing attempt should be earned with a good approach.

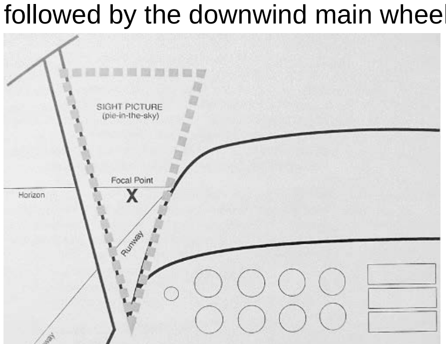
Stage 2 – From the round-out point to the flare and touchdown.

Object:

- Recognize the round-out point.
- Proper use of the forward and side of the nose cowl sight pictures to evaluate sink rate, attitude, and drift.
- Recognize ground effect.
- The flare and touchdown.



Approximately 20' above the runway, an optical illusion happens as the runway appears to quickly widen. This is the round-out point. Smoothly close the throttle and shift the sight picture to between the nose cowling and the windshield post on the left. Smoothly increase pitch to the nose-high landing (flare) attitude, which blocks forward vision. As airspeed slows and the elevator becomes less effective, increase the back pressure to maintain the flare attitude. Ideally, the stall horn will activate just prior to touchdown. If in a side slip, increase aileron deflection as airspeed slows and the ailerons become less effective. Maintain parallel with centerline using rudder as needed. If landing with a side slip, it is perfectly normal and desirable for the upwind main wheel to touch down first, followed by the downwind main wheel, with the nose wheel touching down last as in any other landing.



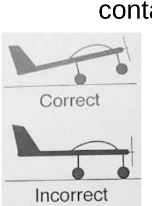
Sight Picture After You Start The Landing Flare

Vision:

- The focal point should move closer to the airplane as speed decreases.
- The focal point will move down toward the edge of the runway in the nose-high landing attitude just prior to touchdown.

At touchdown two critical actions <u>must</u> occur:

- The airplane must be in a nose-high attitude (I-pitch attitude) so the nose wheel is well clear of the runway.
- The yoke must be quickly moved slightly aft in order to counteract the pitch-down that occurs when the main wheels contact the runway.



The nose wheel will settle onto the runway automatically as airspeed decreases, and the aerodynamic drag from the nose-high attitude will help slow down the plane without using the brakes.

A tricycle gear airplane's center of gravity is located just forward of the main wheels. If the airplane lands on its nose wheel, or with too much weight on its nose wheel, that wheel becomes a pivot point for the center of gravity which can generate unrecoverable yaw and an accident. This is called a “wheelbarrow”. If the nose wheel touches the runway first it can also start an oscillation where the nose wheel bounces, then the main wheels bounce, then the nose, and back and forth. This is called a “porpoise” and can be dangerous because the oscillations tend to get worse and aircraft control can easily be lost.

Flat or nose-wheel first landings are also damaging to the plane, even if it is not involved in an accident. Main wheels are designed to support most of the weight of the aircraft while on the ground and can also easily absorb the force from a hard landing. Nose wheels are not robust. In a Cessna, the nose gear is attached to the firewall which is important to structural integrity. Forces from flat or nose-wheel first landings are transmitted to the firewall and can warp it which compromises its integrity. It is very important to keep weight off of the nose gear.

CFI Note:

Flat landings are unacceptable. Do not tolerate flat landings. If the plane won’t be landed in a nose-high attitude (T-pitch attitude at a minimum), then execute a go-around. Never solo a student who has a tendency to move the yoke forward and force the airplane onto the runway.

<u>Stage 3 – From touchdown until reaching taxi speed</u>

Object:

- Keep the airplane’s weight on the main wheels during deceleration in order to prevent wheelbarrowing.
- Stay on the runway centerline until reaching taxi speed and the runway’s exit point.
- Maintain wind correction inputs.

The airplane lands and the yoke is immediately moved back slightly in order to keep the nose from pitching down. The nose wheel will automatically settle to the runway when airspeed and elevator effectiveness decrease. Maintain directional control with the rudder and position the ailerons for the existing wind condition. Never relax control input until taxi speed has been reached.

Keep the yoke back and stay off the wheel brakes when moving at high speed on the ground. This maximizes the weight on the main wheels and minimizes weight on the nose wheel. The tires will skid if brakes are applied immediately after touchdown because the wings still support much of the airplane’s weight.

Vision:

- The side of the cowl sight picture until the nose wheel touches down.
- Straight ahead after nose wheel touchdown. Do not look at or do anything inside the cockpit until clear of the runway.

CFI Note:

When the wheels touch the pavement, students have a tendency to stop flying the plane and start driving their car. The ailerons are neutralized as the tires are scrubbed sideways, the yoke is relaxed as the nose gear slams down, and the brakes are applied as the prop dips towards the ground. Granted, they’re task saturated and relieved to have landed, however, do not let this go unchallenged. Insist they fly the plane throughout the touchdown and rollout. They can relax once they’ve come to a stop.

Go-Around (rejected landing)

Landing approaches sometimes don’t go as planned for various reasons, so the landing needs to be rejected and a go-around needs to be executed. As soon as it is apparent a go-around (rejected landing) is required, take decisive action. The go-around is fairly simple, but at low altitude and low airspeed, it can easily be botched. The key is to keep the priorities straight:

- Stop the descent. Full power.
- Accelerate. C-pitch attitude, reduce flaps from full to partial.
- Climb. I-pitch attitude (P-pitch if obstacles), incrementally retract remaining flaps.
- Track. If an aircraft is on the runway, offset to right side of runway, otherwise track over the runway.
- Communicate, if necessary (it often isn’t), after the above steps are done. Shut up and fly the plane.

6.Instrument Flight Training

The skills developed during visual flight still apply and will reduce workload and keep the pilot ahead of the plane when flying on instruments.

- Attitude + power = performance.
  - Add configuration to the formula and memorize seven settings used for IFR flight.
- Well-developed feel of control pressure.
  - Smooth application of pressure to effect change in attitude is the secret to instrument flight.
  - Deviations are signaled through control pressure prior to showing on instruments.
- Good use of trim.
  - It is immensely important to be in proper trim at all times.
  - Workload is too high to be fiddling with trim. Learn to get it right the first time.
- Listening to engine and slipstream sound.
  - These cues communicate what is happening with the aircraft and supplement situational awareness.

6a. Power + Attitude + Configuration = Performance

In visual flight 5 pitch attitudes are used with associated power settings to make the plane do whatever is wanted. For instrument flight in most training aircraft, seven Power, Attitude, and Configuration (PAC) settings are used to accomplish everything needed for IFR flight. Figure out the first four in stage one; the final three can wait until stage two.

	Power	**Attitude**	**Configuration**	**Airspeed**	**Vertical Speed**
Best Rate Climb	Full		Flaps 0	74-79	
Enroute Climb	Full		Flaps 0	80-85	
Cruise			Flaps 0		0
Slow Cruise			Flaps 0	90	0
Precision Descent			Flaps 10	80	-450*****
Non-Precision Descent			Flaps 10	80	-700-1000*****
Level at the MDA			Flaps 10	80	0

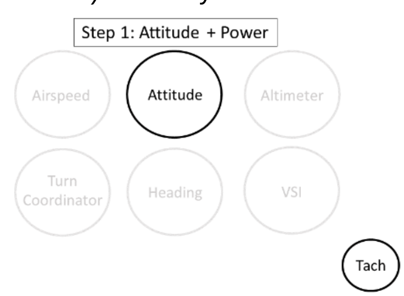
*****Based on a groundspeed with no wind. Significant differences in groundspeed will require an adjusted rate.

6b. Instrument Scan

This instrument scan will focus attention on priorities, reduce workload, and stay ahead of the plane.

Step 1: Attitude + Power.

Any time a change in flight path or performance is needed (e.g., from straight and level to a descent) look only at the attitude indicator while establishing the new power, attitude, and configuration (PAC) setting.

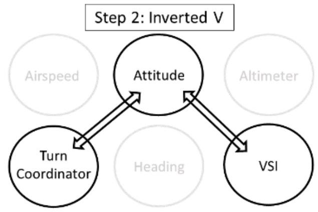


- Utilizing sense of control pressure, smoothly set and hold the required attitude.
- Use muscle memory of throttle position and listen for the familiar engine sound to set power.
- Set flaps if necessary and anticipate a change in control pressure.
- Give the tachometer a quick glance if needed. Set an approximate trim.

All of this is done while lingering on the attitude indicator. A common mistake is to look at other instruments too soon.

Step 2: Verify and Validate.

This is an important step which verifies PAC settings, and most importantly, validates the attitude gyro and vacuum system.

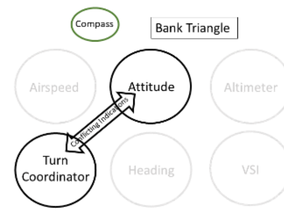


Verify: Power, attitude, and configuration will equal performance, but not right away. However, performance should be trending the right way. Use the inverted V scan to check the trend instruments and verify performance is trending the correct way. Be careful to interpret the VSI correctly. When the needle moves, the direction it indicates is correct, but the rate will not be correct until a number of seconds after the aircraft has stabilized in the new flight path.

Validate: The attitude indicator is central to the instrument scan, and any problems with the indicator or the vacuum system threaten a pilot's survival if not identified early. The inverted V scan shows any problems with the attitude indicator because it includes other bank and pitch instruments from completely different systems. If there is a conflict between the attitude indicator and either the turn coordinator or VSI, use the bank triangle or pitch triangle as appropriate.

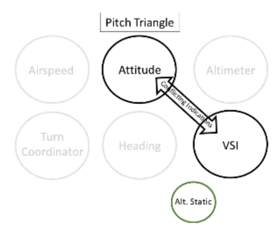
Bank Triangle – conflict between attitude indicator and turn coordinator.

- Compare the attitude indicator, turn coordinator, and compass.
- The compass determines which instrument is correct.



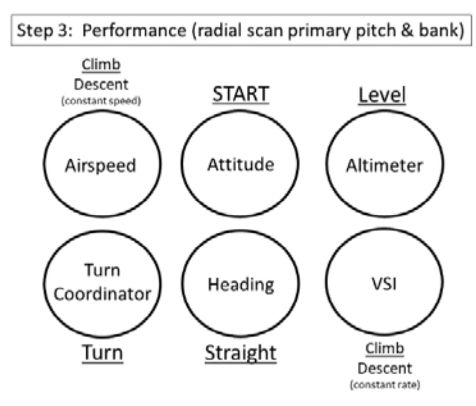
Pitch Triangle – conflict between attitude indicator and VSI.

- Engage the alternate static air and compare the attitude indicator, VSI, and altimeter. If all the instruments now agree, there was a problem with the static system. If the static instruments agree but not the attitude, then there is a problem with its gyro or the vacuum system.



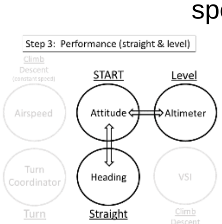
Step 3: Performance.

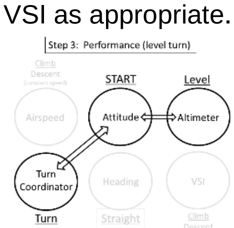
This checks if the performance is as expected. Radial scan the attitude indicator and the primary pitch and primary bank instrument for the flight maneuver. A common mistake is to include lower priority instruments which increases workload for no additional benefit while losing situational awareness.

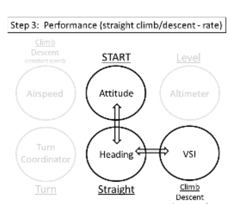


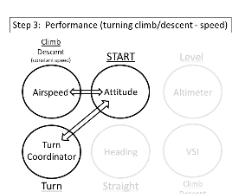
Primary pitch and bank instruments:

- Straight and level – heading and altimeter.
- Level turn – altimeter and turn coordinator.
- Straight, constant airspeed climb/descent – heading and airspeed.
- Straight, constant rate climb/descent – heading and VSI.
- Turning climb or descent – turn coordinator and either airspeed or VSI as appropriate.





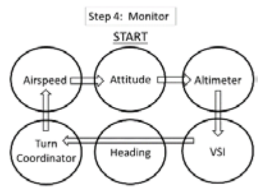




Common radial scan mistakes:

- Straight and level – watching airspeed.
    - If PAC settings are correct and the plane is straight and level, airspeed is fine.
- Turns – watching heading too much.
    - Set bug before turn, after established occasionally check for bug to roll up top, then go back to attitude indicator and roll out.
- Climbs and descents – watching altimeter too much.
    - The plane won't get there right away, so only occasionally glance at altimeter to keep track.

Step 4: Monitor.
When in long periods of stabilized flight, use the rectangular scan to monitor the flight instruments.



No-Gyro Scan – Loss of Attitude Indicator.
Combine Step 1 and Step 2 to set attitude and power. Without the attitude indicator the turn coordinator can be used to set bank, but the pilot must rely on muscle memory of control pressure and the PAC settings for pitch attitude.

- Ease into pitch changes to get a familiar control pressure feel.
- See the VSI initially point in the correct direction.
- Don't chase the needle as the value won't be correct initially.
- Rough trim as control pressure and engine/slipstream sound seems "about right".

Step 3 – Performance.

- As trend instruments stabilize, check performance against PAC settings.
- Each PAC has expected airspeed and vertical speed.
- If power, airspeed, and vertical speed are correct then pitch attitude is correct.
- Fine tune the trim.

No-Gyro Scan – Loss of Heading Indicator.
Step 1 and Step 2 remain unchanged.

Step 3: Without the heading indicator to serve as the primary bank instrument for straight flight, the turn coordinator now becomes the primary bank instrument to verify the aircraft is straight.

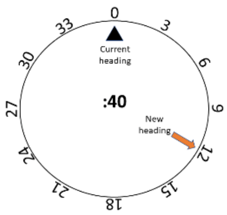
Timing turns are the primary, and preferred, method of rolling out onto new headings. Compass turns are part of the syllabus and need to be learned, but *timed turns shall be the primary method* taught to turn to headings without a heading indicator. With compass turns, pilots tend to do one of two things with a higher potential for disorientation in real IMC:

- Stare at the compass while turn rate and pitch attitude go awry.
- Make multiple head movements constantly checking the compass.

Timed turns keep head movements to a minimum, and keep attention on the remaining flight instruments better than compass turns.

No Mental Math Method for Timed Turns: (see illustration below)

- Manually set current heading at the top of an unused VOR or ADF indicator.
- Count the number of cardinal directions displayed (every 30°) between current heading and new heading.
- Each of the cardinal directions equals 10 seconds of turn.
- If current or new heading is between cardinal directions, add 5 seconds to turn.
- After turn is complete, manually set new heading at the top of the VOR/ADF indicator.



6c. Instrument Flight Maneuvers / Patterns

Stage 1 Instrument Flight Maneuvers/Patterns

These maneuvers/patterns are not in the syllabus, but are a way to practice what is in the syllabus once basic flight maneuvers have been introduced. In addition to providing practice for basic attitude instrument flight, these maneuvers and patterns provide the opportunity to develop the orientation, situational awareness, planning, and the ability to manage a higher workload that's needed for instrument procedures.

Steep Turns: These are no longer on the practical test for the instrument rating, but there's nothing like the ability to handle the airplane in a steep turn to build confidence. Start with enough bank to push the turn indicator a little past the standard rate mark, and as skill builds, keep it going until confidently and smoothly flying in a medium to steep bank, rolling out right on the desired headings. Roll into and out of the turns at a slow, deliberate rate.

Pattern A: Before starting, "calibrate" the turn coordinator. To calibrate the turn coordinator, execute left and right standard rate 360° turns and time them. They should take two minutes. All timing is done with reference to cardinal times on the clock, regardless of the bank attitude of the airplane. If getting behind, check the rate of turn, and the rate at which rolling into and out of turns. The whole pattern is based on precise three-degree-per-second turns. The pattern as depicted is at a constant airspeed and constant altitude. This can and should be modified to incorporate changes in airspeed, configuration, and altitude at various airspeeds and rates of climb/descent. It should also be done partial panel.

Vertical S: This is a coordination builder, and requires constantly changing thought patterns; start planning ahead. Like flying into a funnel without touching the sides, the Vertical S gets more demanding the further it goes. Before starting, "calibrate" the VSI. To calibrate the VSI, start a constant rate climb and/or descent. Once the rate is stabilized, time how long it takes to change a specific amount of altitude. The Vertical S is a series of constant airspeed, constant heading climbs and descents. It starts with a 500' altitude change, next time it's only 400', then down to 300' and finally 200'. When level-off time comes, don't! The objective is to touch the top and bottom altitudes and enter a climb or descent without any change in airspeed. The smoothness of the transition and the ability to maintain airspeed are more important than being at the transition point's exact altitude. It can also be repeated at a constant rate and also at a constant airspeed with variable rates.

Here are the variations:

- Constant airspeed.
- Constant rate.
- Constant airspeed / variable rates with each climb and descent equaling one minute.
    - 500' change in altitude at 500 fpm, 400' change at 400 fpm, etc.
- Can start with climbs or descents (depicted as starting with climb).
- Can do altitude changes greater than 500' (depicted as 500' and less).
- Full and partial panel.

Vertical S1: The Vertical S1 is a Vertical S but with constant turns. The standard method is to change the direction of turn each time the plane reaches the starting altitude. Don't be concerned about how many degrees are turned during the exercise; the objective is to accomplish smooth, positive, and coordinated changes in aircraft attitude.

In addition to the Vertical S variations, add these to the Vertical S1:

- Direction of turn reversed at the start of each climb.
- Direction of turn reversed at the start of each descent.
- Direction of turn reversed simultaneously with each change in vertical direction.

Oscar Pattern: The graduation maneuver for basic instrument flying. For this constant airspeed maneuver, all turns are at standard rate; all 1000' climbs and descents, designated by the vertical arrows, are at 500 fpm. However, the *airplane must keep pace with the clock* as it controls the Oscar Pattern. If the plane gets ahead of or behind the clock, the airplane's trend (turn rate or vertical speed) must be adjusted so that the airplane will catch the clock within a reasonable period of time. The chosen speed should be capable of producing a 500 fpm climb in a turn with less than climb power, and a 500 fpm descent using more than idle power. The entire maneuver is 12 minutes. This should be done both full and partial panel.
Highlights:

- Constant airspeed – allow 500 fpm climb w/o full power, 500 fpm descent with more than idle
- Maneuver controlled by clock – 12 minutes long
- Target 500 fpm climbs/descents
- Target standard rate turns
- Adjust trends (turn rate or vertical speed) to stay on time

Stage 2 Instrument Flight Patterns
These patterns can be introduced in the ATD, but are primarily intended as a way to complete lessons in the airplane. The next section will outline the ATD portion of instrument lessons. These patterns maximize navigational practice opportunity in the airplane in the local practice area. They serve as the bridge to the next stage of training by further developing the orientation, situational awareness, planning, and the ability to manage a higher workload that's needed for the instrument procedures coming in the next stage.

In the practice area, create a temporary waypoint in the GPS. Put the GPS in OBS mode to track to/from the waypoint as if it were a VOR. These patterns use the seven power, attitude, and configuration (PAC) settings. Vertical guidance won't be available to/from the GPS waypoint, but fly the precision descent PAC setting as if it were. The key to flying a glideslope is flying a precise rate of descent for the ground speed.

The patterns don't specify courses, altitudes, or distances as those can be designated based on the conditions and any ATC restrictions. Holds are not depicted, but can be assigned by the instructor.

Stage 2 Patterns:

- Pattern A with GPS Waypoint
- 80/260 PT and Precision Descent Profile with Hold
- Arc and Non-Precision Descent Profile with Time and Hold
- Arc and Precision Descent Profile with Hold
- Hold in Lieu of PT, Non-Precision Descent with Hold as Published

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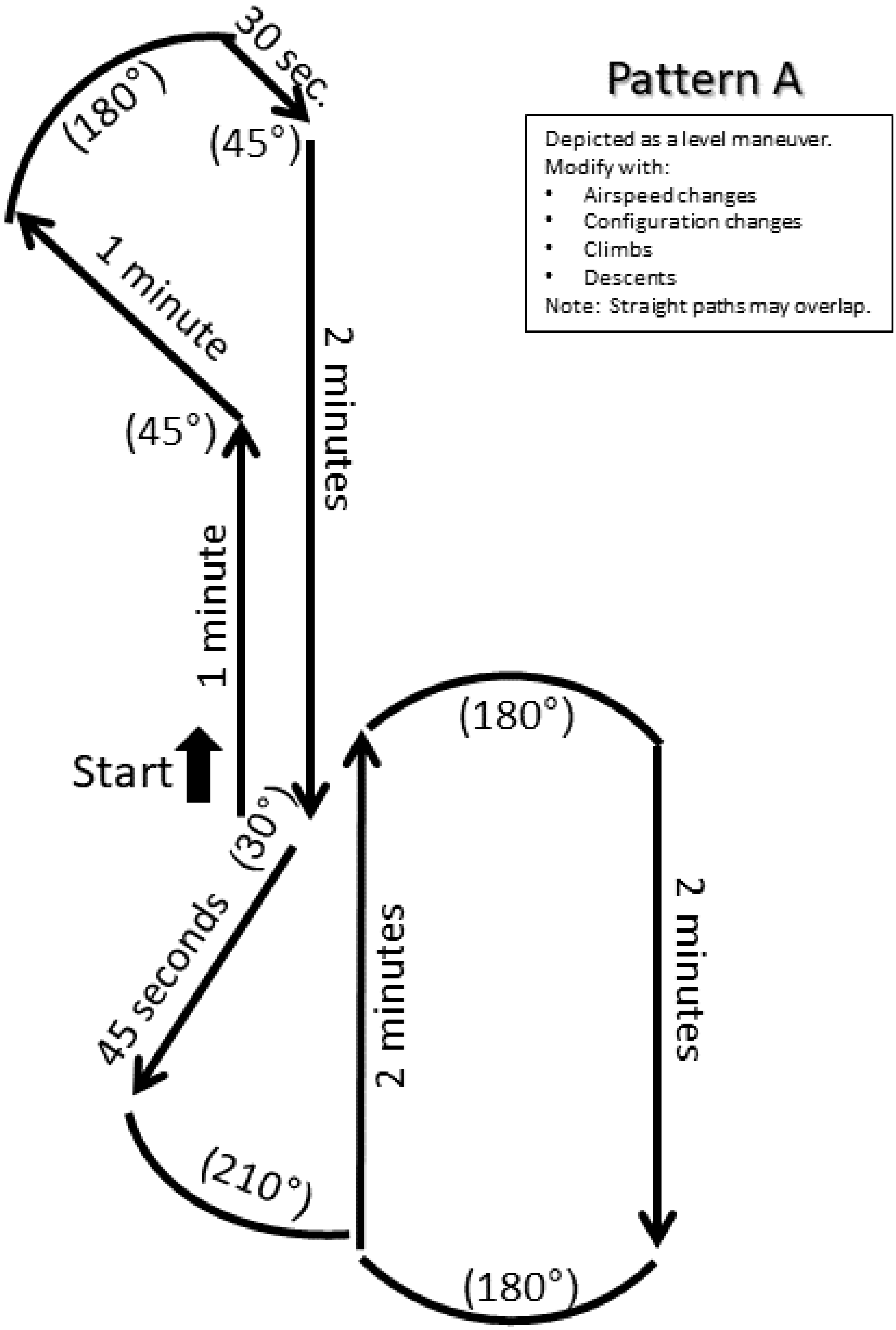
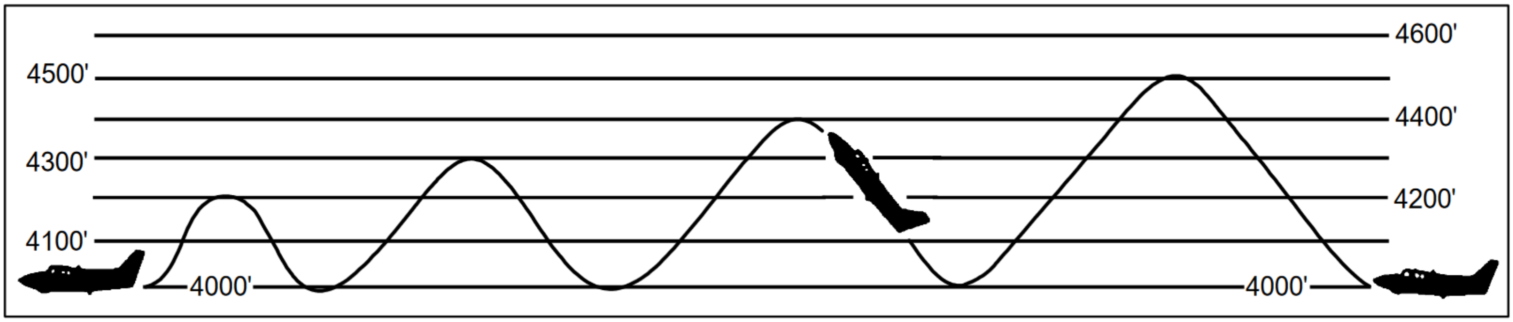
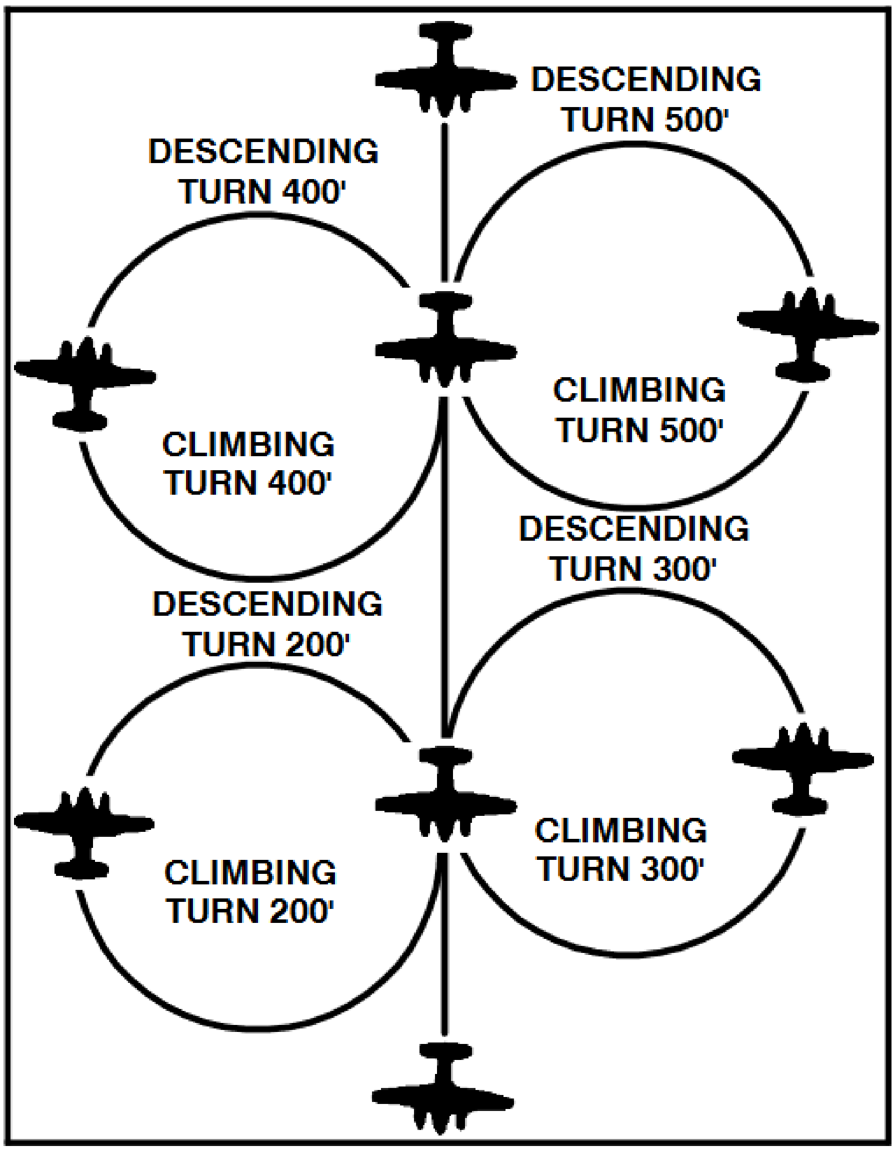


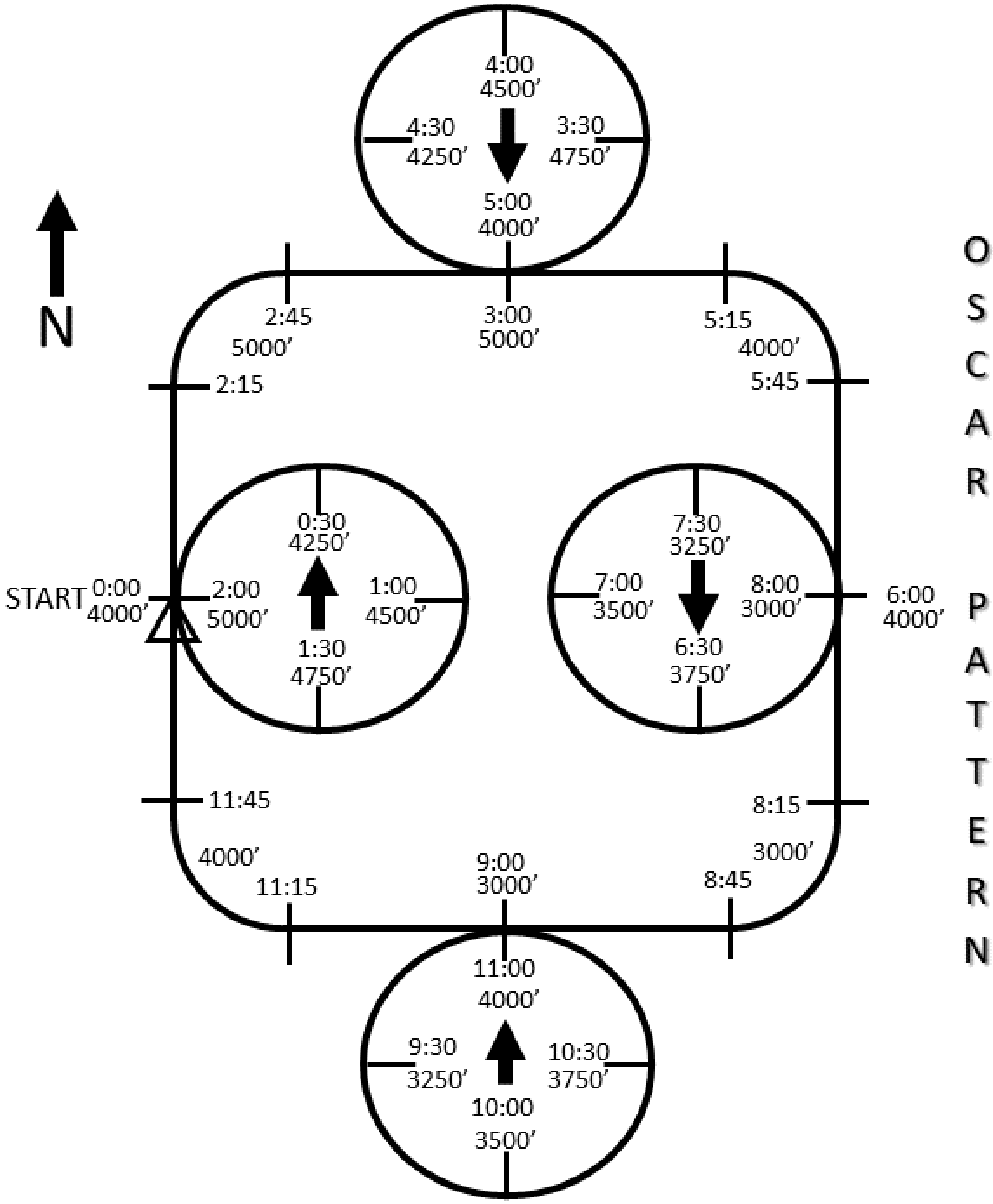
Pattern A
Depicted as a level maneuver.
Modify with:
• Airspeed changes
• Configuration changes
• Climbs
• Descents
Note: Straight paths may overlap.
30 sec.
(180°)
(45°)
1 minute
2 minutes
(45°)
1 minute
Start
(30°)
45 seconds
(180°)
2 minutes
2 minutes
(210°)
(180°)

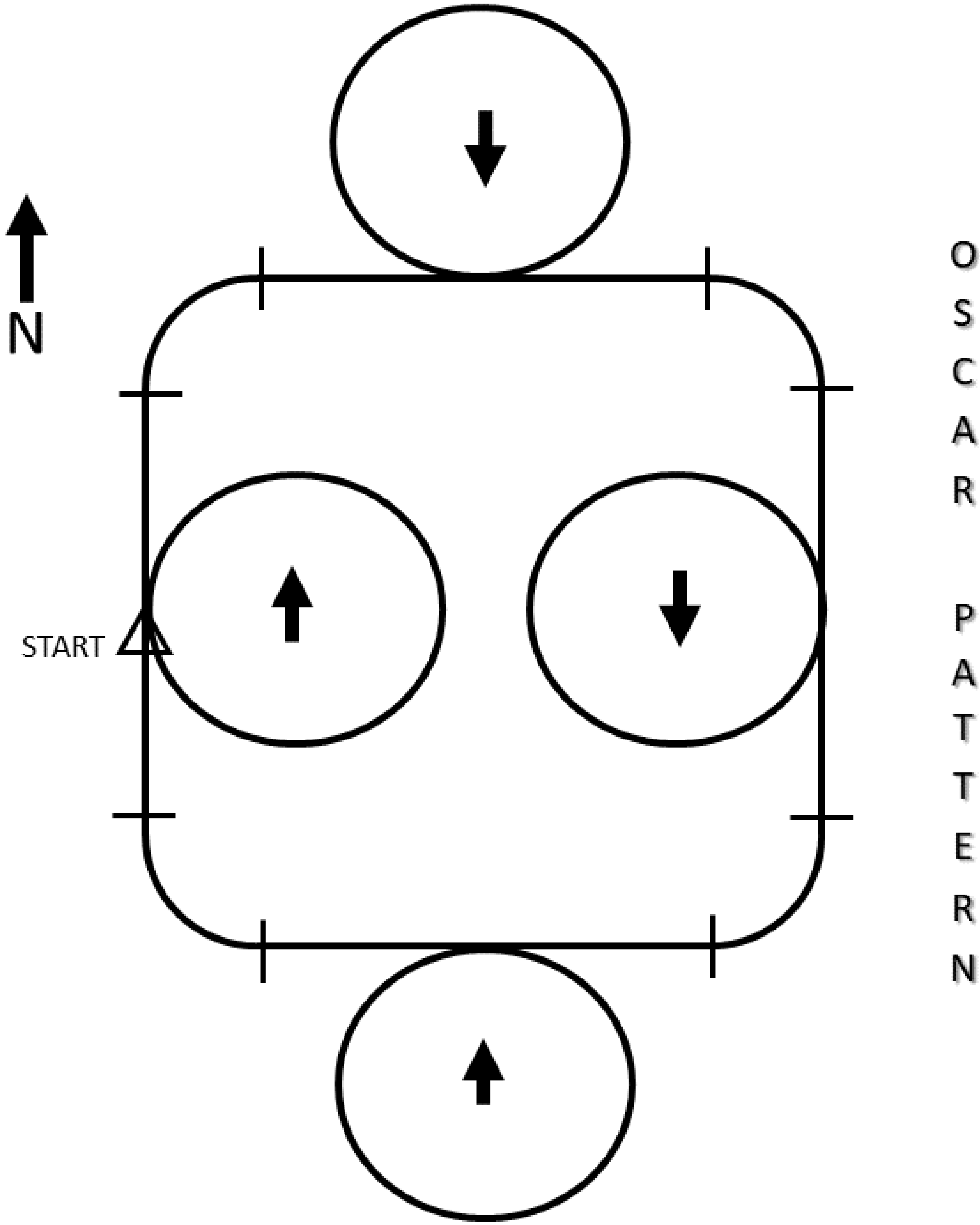
Vertical S

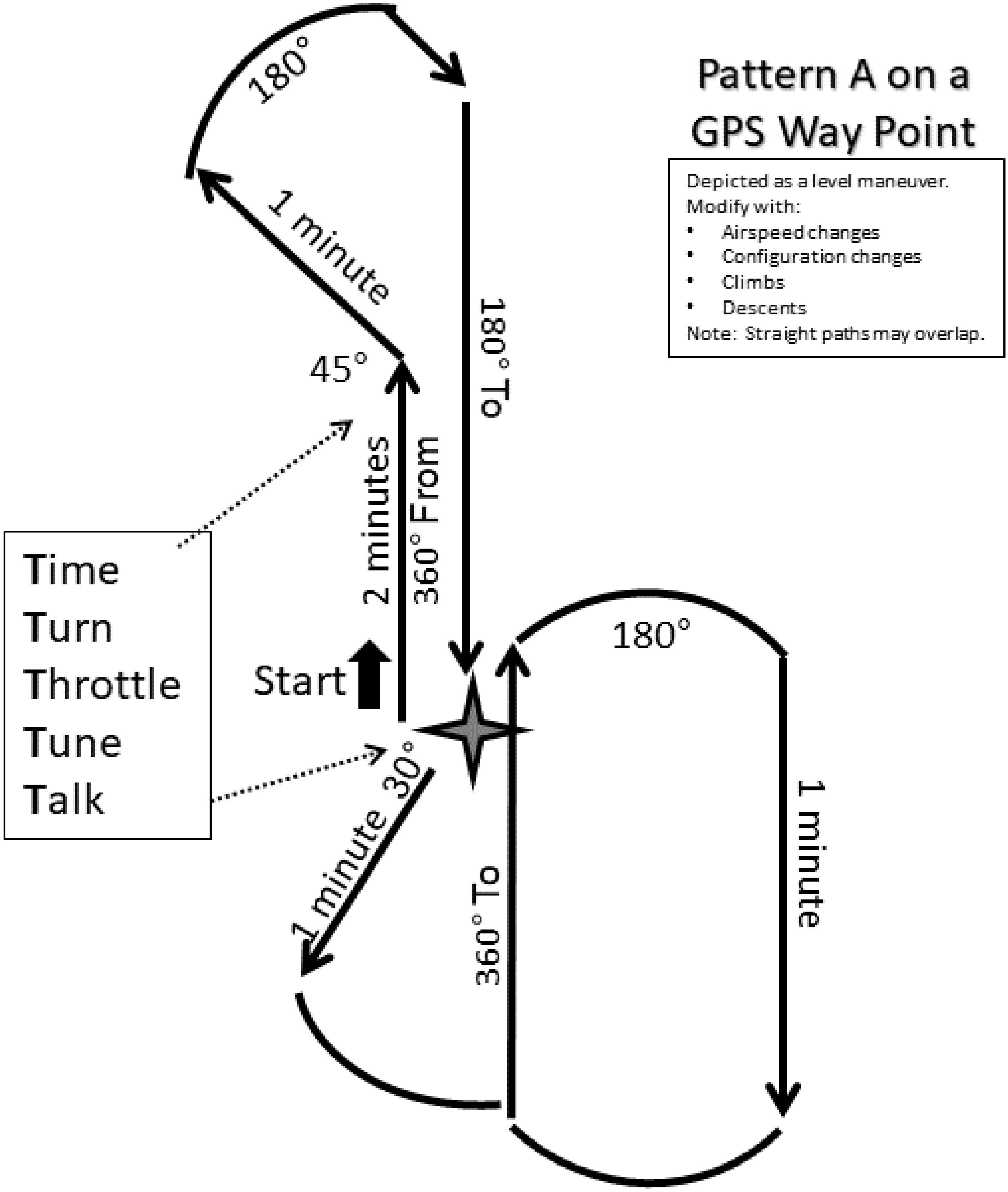


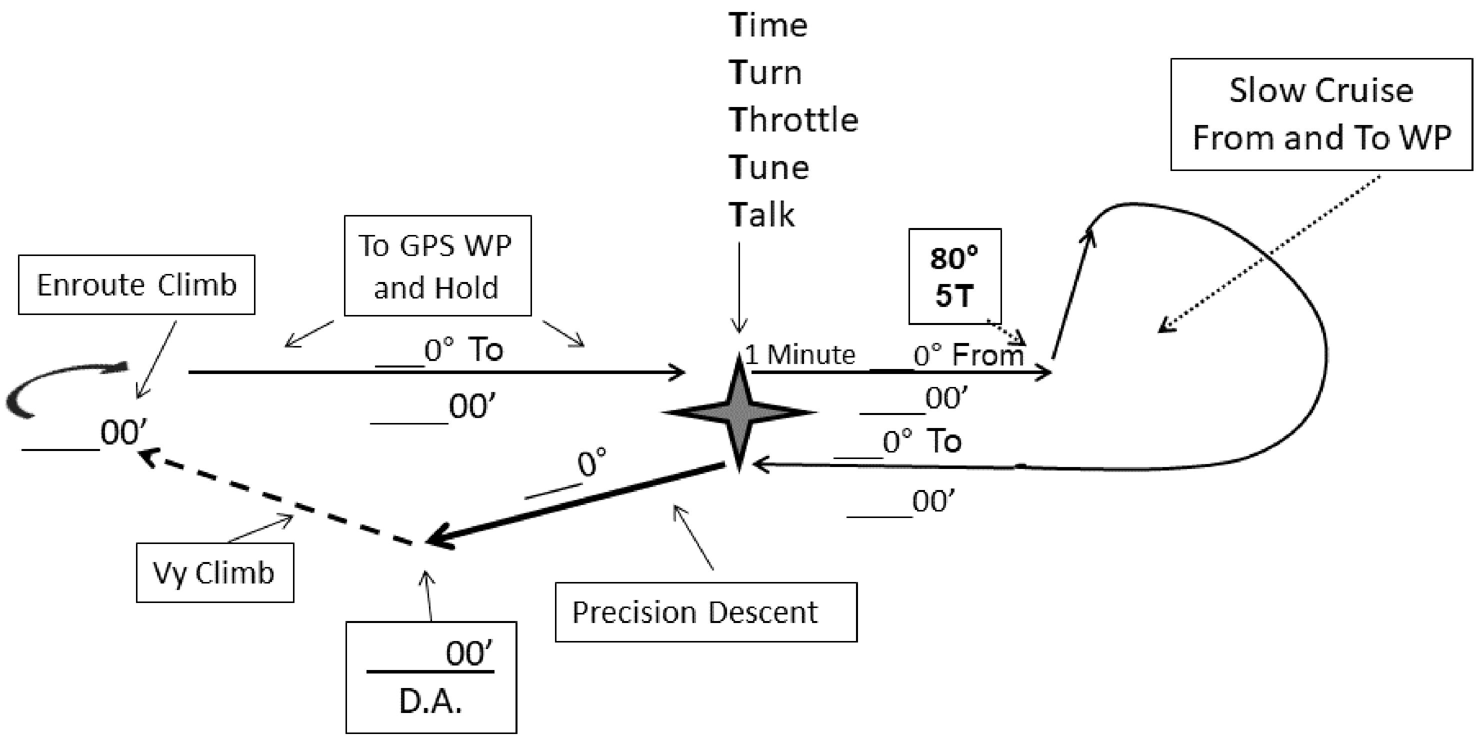
Vertical S1



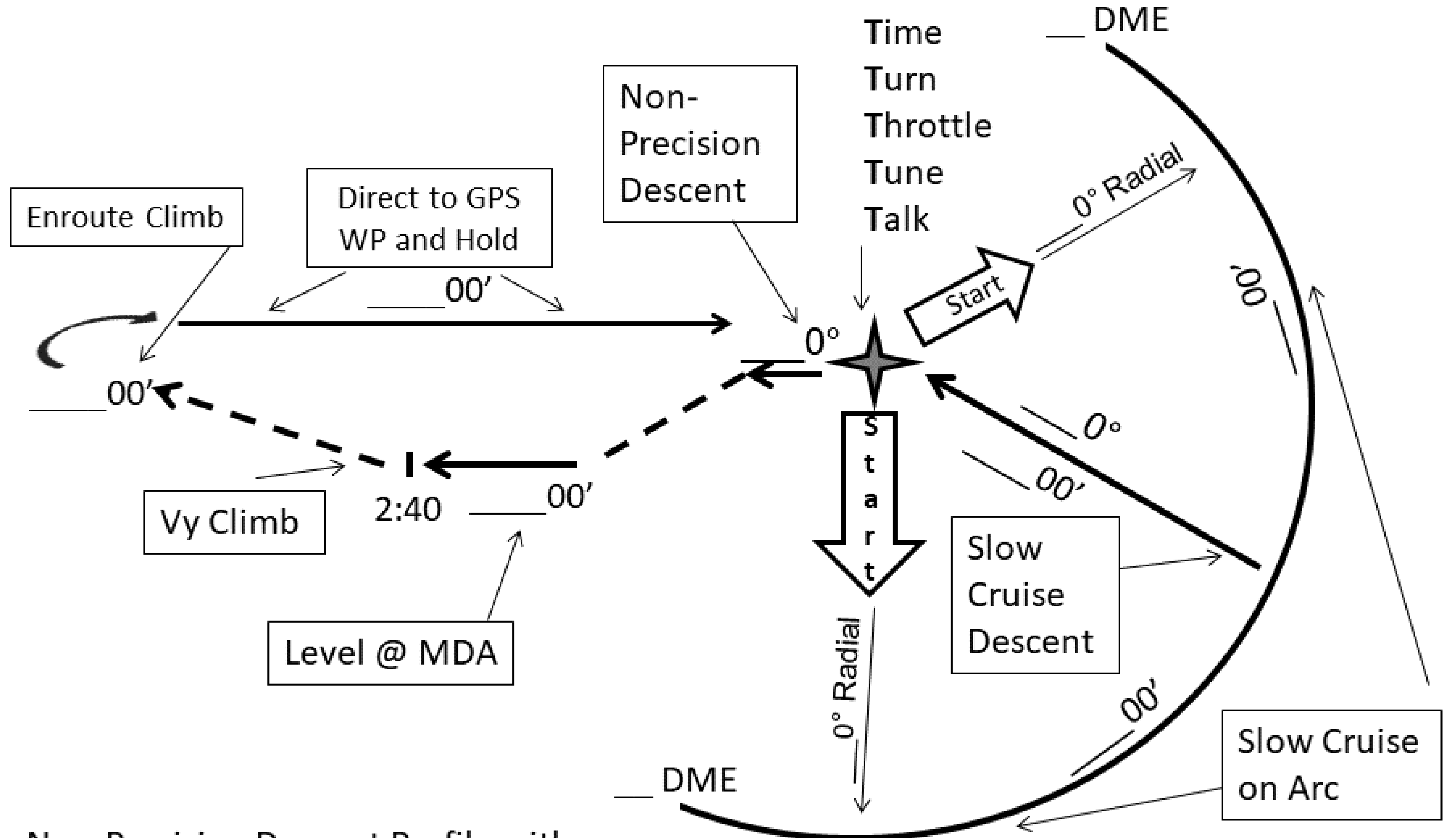

N
4:00
4500′
4:30
4250′
3:30
4750′
5:00
4000′
2:45
5000′
3:00
5000′
5:15
4000′
2:15
5:45
0:30
4250′
START
0:00
4000′
2:00
5000′
1:00
4500′
1:30
4750′
7:30
3250′
7:00
3500′
8:00
3000′
6:30
3750′
6:00
4000′
11:45
8:15
4000′
11:15
9:00
3000′
3000′
8:45
11:00
4000′
9:30
3250′
10:30
3750′
10:00
3500′
OSCAR PATTERN


N
START
OSCAR PATTERN


Pattern A on a GPS Way Point
Depicted as a level maneuver.
Modify with:
• Airspeed changes
• Configuration changes
• Climbs
• Descents
Note: Straight paths may overlap.
180°
1 minute
45°
180° To
2 minutes
360° From
Time
Turn
Throttle
Tune
Talk
Start
30°
1 minute
360° To
180°
1 minute

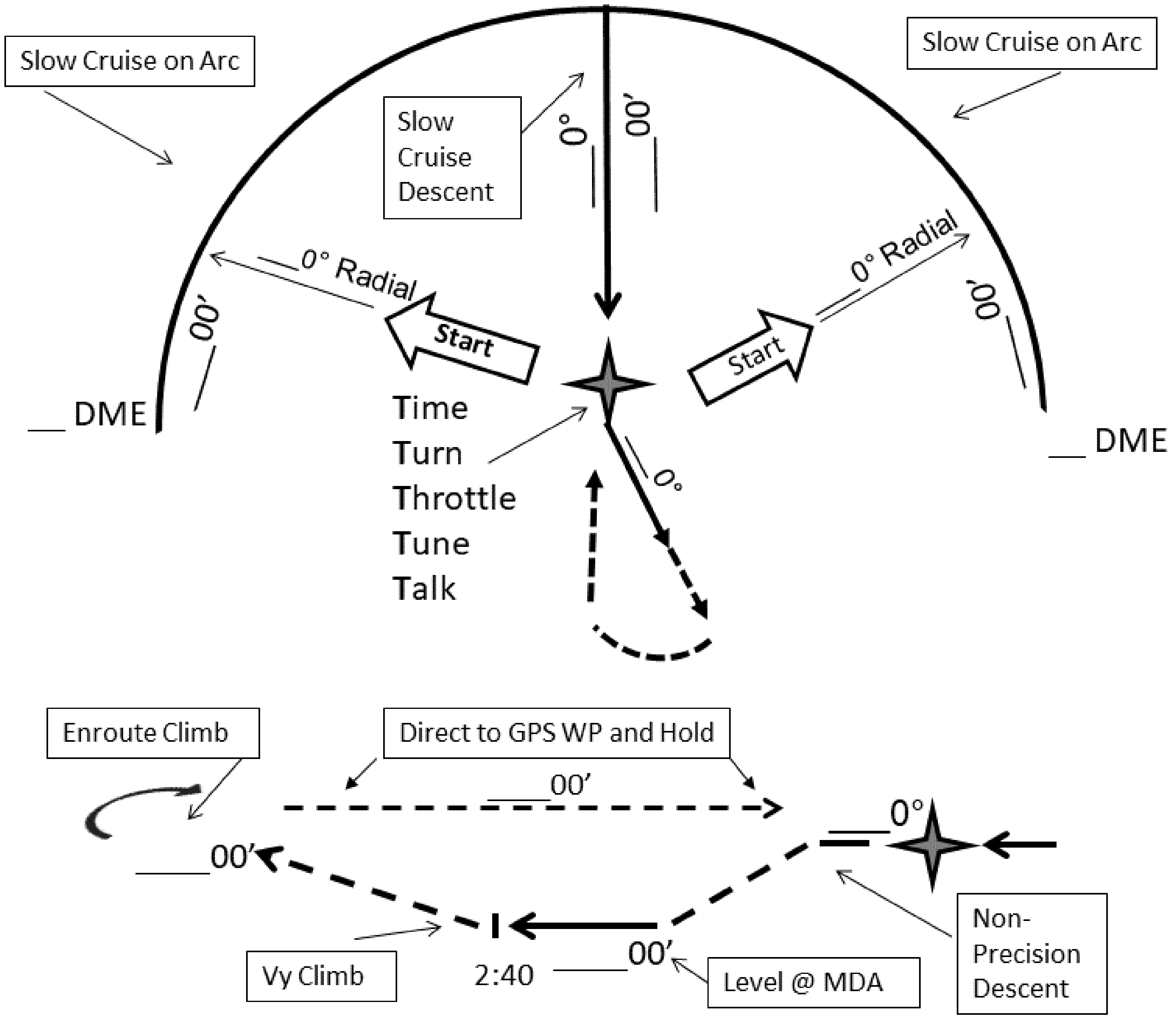


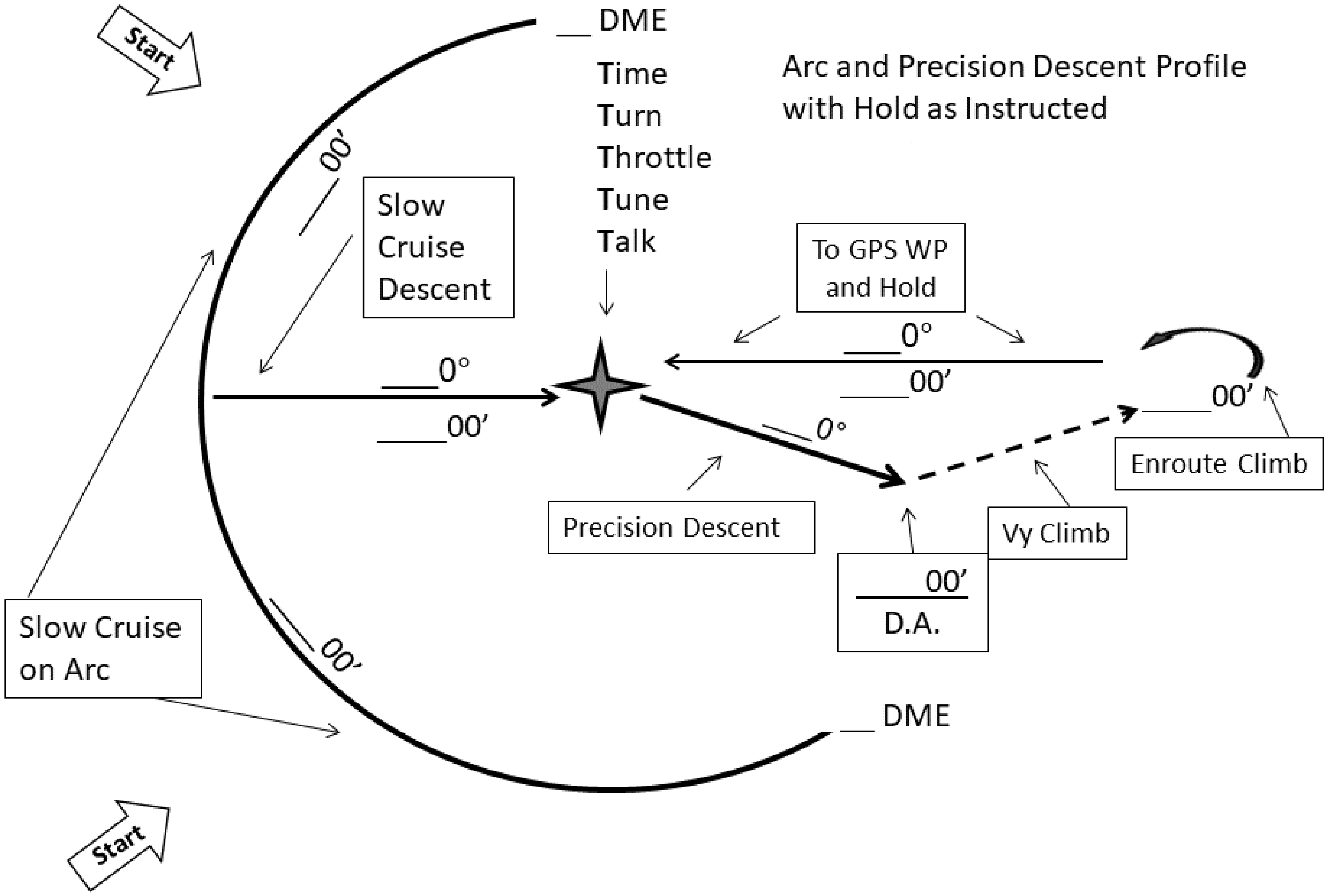
80/260 Procedure Turn and
Precision Descent Profile with
Hold as Instructed



Non-Precision Descent Profile with
Time and Hold as Instructed

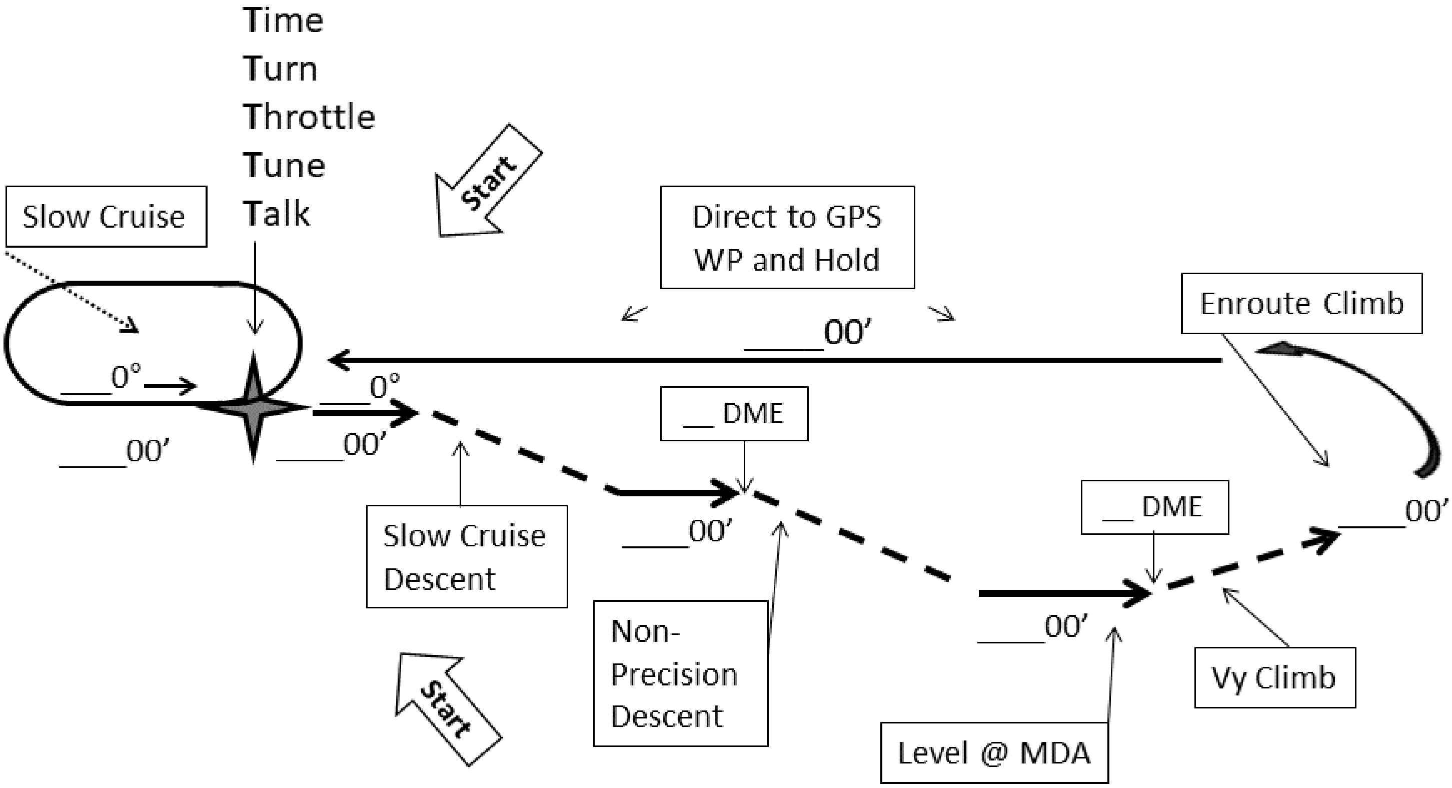
Non-Precision Descent Profile with Time and Hold as Instructed





Start
__ DME
Time
Turn
Throttle
Tune
Talk
Arc and Precision Descent Profile with Hold as Instructed
00'
Slow Cruise Descent
To GPS WP and Hold
___0°
___00'
___0°
___00'
___0°
___00'
Enroute Climb
Precision Descent
Vy Climb
___00'
D.A.
Slow Cruise on Arc
00'
__ DME
Start

Hold in Lieu of Procedure Turn, Non-Precision Descent with Hold as Published.



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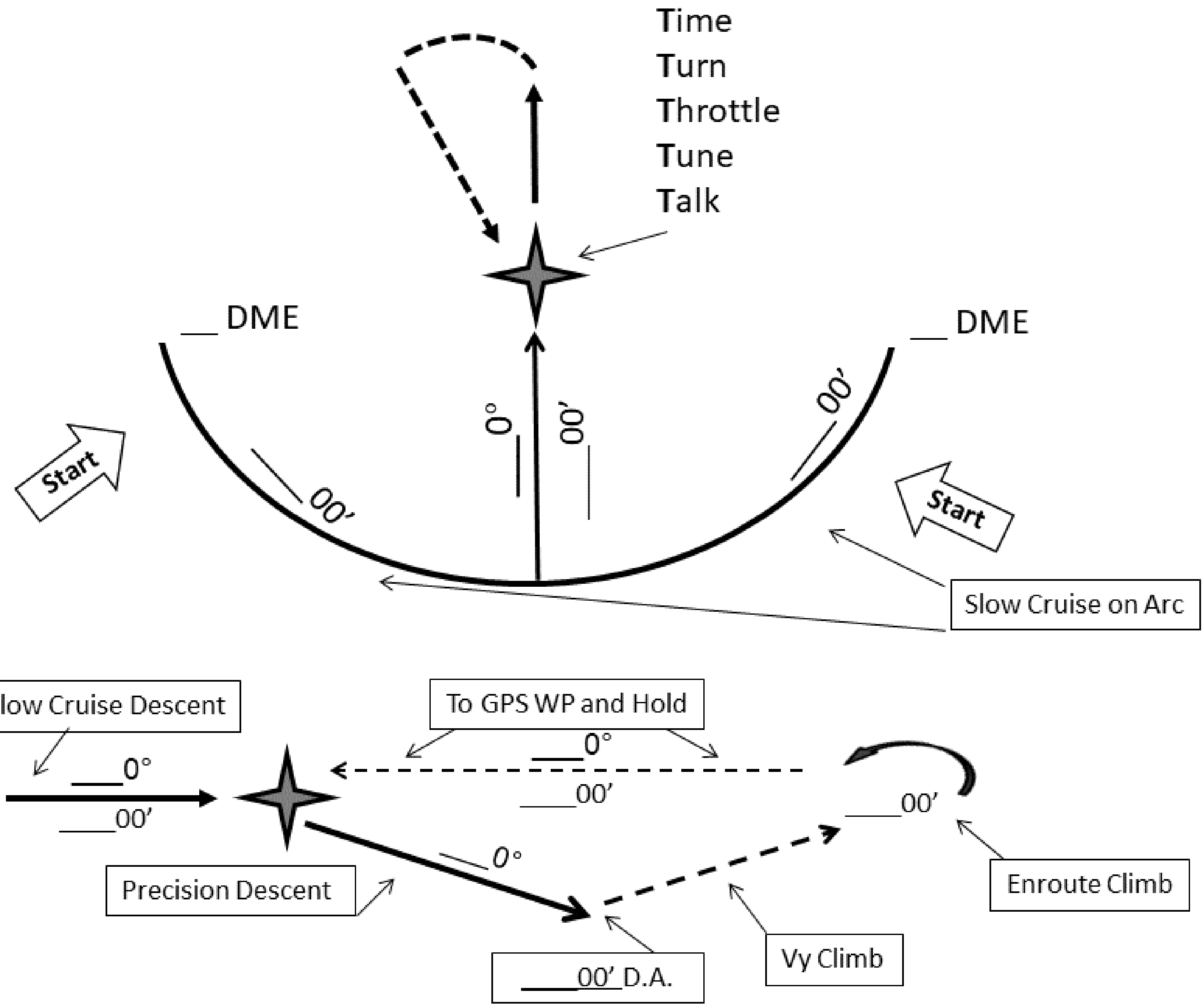
Arc and Precision Descent Profile with Hold as Instructed



6d. ATD Lessons

The AATD shall be used for 40% of the required hours in the instrument course and the Pilot Edge ATC service will be used for the majority of the ATD lessons. The ATD will be used in conjunction with the airplane for designated lessons in the syllabus. These lessons are listed below with procedures that will accomplish all or part of the lesson elements.

Stage 1 ATD Lessons

ATD Pre-Loaded Scenario	Phase / Scenario	Main Task	Pilot Edge?
N/A	P1 / S2	Scan, Basic Instrument Maneuver	No
N/A	P2 / S1	Scan, Basic Instrument Maneuver	No
N/A	P2 / S3	Partial Panel	No
N/A	P2 / S6	Review	No

Stage 2 ATD Lessons

ATD Scenario	Phase / Scenario	Main Task	Pilot Edge?	Procedures
IR-1	P3 / S1	GPS (DP or STAR)	Yes	KLGB: HAWWC3 DP
IR-2	P3 / S2	VOR Nav.	Yes	KSNA - KBUR CSTP1 (Coast One) TEC route w/ visual approach
IR-3a IR-3b	P3 / S3	DP's	Yes	KPSP: Cathedral 1 KVNY: Canoga 3, Fillmore Trans.
N/A	P4 / S1	Holding	No	
IR-4	P4 /S2	DME Arc, Holding	Yes	KYKM: Gromo 4 DP

Stage 3 ATD Lessons

ATD Scenario	Phase / Scenario	Main Task	Pilot Edge?	Procedures
IR-5	P5 / S1	ILS	Yes	KONT: ILS 8 or 26
IR-6a IR-6b	P5 / S2	GPS Apr. w/ vertical guid-ance	Yes	KOXR: GPS 7 or 25 KRAL: GPS 9 or 27
IR-7a IR-7b IR-7c	P5 / S3	GPS Apr. w/o vertical gui-dance	Yes	KPOC: GPS-A KIZA: GPS-A KIZA: GPS 8 KEMT: GPS-B
IR-8a IR-8b IR-8c IR-8d IR-8e	P5 / S4	Localizer Approach	Yes	KFUL: LOC/DME 24 KSBP: LOC 11 KHHR: LOC 25 KVNY: LDA-C KYKM: LOC/DME BC-B
IR-9a IR-9b IR-9c IR-9d IR-9e	P6 / S1	VOR Approach	Yes	KCCB: VOR-A KTRM: VOR-A KPSP: VOR-B KSMO: VOR-A KVNY: VOR-A / VOR-B
IR-10a IR-10b	P6 / S3	DP's, Approaches, Hold	Yes	KOAK – KSJC – KMRY KSNA – KONT - KBUR

Stage 4 ATD Lessons

ATD Scenario	Phase / Scenario	Main Tasks	Pilot Edge?	Procedures
IR-11	P7 / S2	Partial Panel Approach	Yes	KSDM - KCRQ

6e. IFR Communications in VFR Conditions (airplane)

In the early stages of the instrument course, much of the flight training (not in ATD) is done in VFR conditions, and sometimes this proves confusing to students as they try to distinguish between their simulated IFR operation and the actual VFR operations going on around them. This is probably most evident with radio communications when some of what is said on the radio does relate to IFR operations, but some is only due to the actual VFR operations going on around them, and wouldn't apply if in real IFR.

The CFII and the student should discuss the scenario of the simulated conditions (IFR, MVFR) and how that would relate to the airspace and airport operations if the simulated conditions were real. Once entering simulated IMC (foggles on), the student should only handle radio communications as they relate to IFR operations. The CFII should handle the rest of the radio communications. Some IFR-style radio communications will still need to be simulated within the cockpit with the CFII acting as ATC, and the student can act accordingly. Lessons for the instrument rating course in the AATD will use the Pilot Edge ATC service to the maximum extent possible giving the student an immersive IFR experience with radio communications as it would be in actual IFR flight.

6f. Instrument Training for the Private Pilot

Visual flight into Instrument Meteorological Conditions (IMC) is an emergency situation. The lifespan of a non-rated pilot in IMC is shockingly short (see AOPA's video, "178 Seconds to Live"). Before maneuvering in IMC, some steps should be taken so the situation doesn't get worse.

- **H**ands Free – trim for straight and level
- **H**eading – set heading indicator to compass
- **H**eat – turn on pitot heat (carburetor heat if applicable)
- **H**elp – declare an emergency with ATC

ATC will offer information and assistance, but the pilot is in charge of the flight and makes the decisions. ATC does not assume responsibility nor will they issue IFR-style clearances. Examples of help ATC may be able to provide:

- Direction/distance to nearest airports reporting visual conditions
- Vectors to areas of reported visual conditions if requested
- Vectors away from terrain
- Reports of cloud bases and tops (so the pilot can decide whether to climb or descend)

VFR pilots will be taught the same scan and aircraft control techniques as an instrument pilot. Instructors can act as ATC however, they shouldn't take command of the flight and issue IFR-style instructions and clearances. CFI's acting as ATC should offer information which the pilot can act upon, and give vectors or other assistance as requested.

7. Expanded Envelope Exercises (E^3)

Maneuvers to increase precision, coordination, and confidence.

Taxi Exercise

More useful for less experienced pilots. Teaches aircraft command and divided attention.

Purpose: judgment of aircraft position in relation to centerline and precision aircraft placement.

Required: wide taxiway with a painted stripe and/or concrete expansion joints.

Exercises:

- Taxi at normal speed with the nose wheel on the centerline, then the left main wheel, and then the right main wheel.
- Taxi with the nose wheel on a seam or marking not in the center of the taxiway.
- Designate the centerline, a seam, or marking as the "edge" of the taxiway. Taxi close to, but not over the "edge".

Slow Dutch Roll

The slow rate is extremely challenging, especially on recovery, even for experienced pilots. This is a good rudder exercise, also known as a "constant heading sideslip".

Purpose: precise aircraft control in multiple dimensions.

Exercises: perform these at a speed near maneuvering speed, where there is surplus thrust, with a point identified on the horizon.

- Roll the plane to the left or right at a constant rate of 1 degree per second, but no faster, keeping the plane pointed at the reference point until full rudder is required to keep the airplane pointed at the reference.
- Using the same glacial roll rate, recover to level flight and then do the same bank in the other direction until full rudder is required.
- Recover to level flight at the same roll rate.
- Repeat while holding altitude.

Fast Dutch Roll

Rapid bank changes can be more disorienting.

Purpose: teaches full aileron deflection that many may not have seen.

Exercises: perform these at less than maneuvering speed, with a point identified on the horizon.

- Using full aileron and appropriate rudder in the same direction, roll the plane to 45 degrees.
- Immediately reverse controls and roll to 45 degrees in the other direction with full aileron.
- Repeat without interruption until two banks in each direction.

Variants:

- Repeat while holding altitude.
- Repeat at final approach speed while holding speed and altitude.

Stall and Recovery in Turn

A challenge for pilots who've never tried it, but turning stalls should be a normal part of training at Ignite Flight.

Purpose: teaches that reduction in AoA is more important than wings level and builds confidence.

Exercise:

- With banks between 30° and 45°, initiate stalls and recoveries while continuously in a turn.

Variant:

- With banks between 30° and 45°, initiate a stall, reduce AoA, and recover in a turn of the opposite direction.

Low Speed 60/90 Turns

Done with caution, this can be a confidence building exercise.

Purpose: combines full control deflection, high roll rate, divided attention, precision, flight near or in the stall buffet, and high sensory input.

Exercise:

- Start at a lower speed, like flaps up approach speed.
- Using full aileron deflection, roll to a 60° bank and turn 90°.
- Immediately roll to a 60° bank in the opposite direction and turn 90°.
- Repeat the alternating 90° turns with 60° of bank.
- Accept altitude loss in turns, however, do not allow a high speed, high descent rate spiral.
- In an airplane with benign stall characteristics, allow the maneuver to continue even into the stall buffet without recovering.

Note: This exercise has an obvious risk of spin in some airplanes if poorly flown. Be judicious.

Low Speed Turns, S-Turns on Final

Purpose: demonstrate the aircraft's turning ability on final, as might be required for traffic or large bird avoidance.

Exercise:

- Perform at altitude, configured as on final approach, with representative speed, power, and descent.
- Using 30° of bank, alternately turn 30° left and right of heading.
- Do not stall, but observe any pre-stall indications.

Slow Flight with Maximum Bank

Some pilots will be uncomfortable with this although the plane remains 5-10 kts above stall speed the entire time.

Purpose: Demonstrate how load factor and power affect stall speed. Build confidence.

Exercise:

- Start in slow flight just above the stall warning.
- Bank until the stall warning sounds; hold that bank attitude.
- Add enough power so the stall warning shuts off.
- Repeat the previous two steps until full throttle is applied. Note the final bank angle.

Vertical S – Turning

More useful with less experienced pilots. Similar to the instrument exercise, but not standard rate.

Purpose: Throttle/elevator/rudder coordination.

Exercise:

- Note starting altitude. Enter a 30° bank climbing turn at a constant airspeed.
- Approaching a specified altitude, transition to a descending turn at same airspeed and bank. Do not level off.
- Approaching starting altitude, start a climbing turn in the opposite direction at same airspeed and bank. Do not level off.
- Repeat this with progressively lower target altitudes. (example: 400', 300', 200', then 100')
- Repeat this with 45° bank.

Variant: Change direction of turn at top of climb instead of bottom of descent.

8.Checklist Usage

8a. Flow Patterns, Mental Checks, Checklists and Phases of Flight

Pilots who do not use written checklists make mistakes.

- They may have a high level of cockpit familiarity which is a real advantage when a timely assessment of cockpit status is needed.
- They also occasionally forget or miss critical items.

Pilots who only use written checklists make mistakes.

- They tend to have a low level of cockpit familiarity which is a serious disadvantage when a timely assessment of cockpit status is needed.
- They spend more time heads down reading and occasionally run out of time to finish a checklist.

Competent pilots use flow patterns, mental check lists, and written check lists to prevent error.

- They're more familiar with their aircraft and can configure it in a timely manner.
- They have better situational awareness and perform better in high workload situations.
- They more often correctly configure the aircraft in less time with fewer mistakes.

Flow Patterns

A flow pattern is a logical path followed in order to configure the cockpit for a desired task. Initially, it requires understanding of the aircraft and its systems, and some thought about what items need to be re-configured.

Mental Checks

These unwritten check lists are used to remember routine procedures that occur at specific points on every flight. Often, mental checks take the form of an acronym.

Written Checklists

These are not a read-and-do list, they check previous actions (the flows and mental checks) to ensure compliance. Written checklists are to be used in conjunction with flows and mental checks, but serve as the final authority of the three methods.

Phases of Flight

Preflight Inspection

Use a flow pattern for conducting the preflight inspection. Upon completion, review the written checklist to ensure compliance.

Before Engine Start

Use a flow to prepare the cockpit for engine start. Before yelling, "clear" and starting the engine, review the written before start checklist.

Before Takeoff

Use a flow and/or a mental checklist to conduct the runup and configure the plane for takeoff. Upon completion, review the written before takeoff checklist.

Climb/Cruise/Descent

Use a flow to configure the cockpit (there are only a few items). Upon completion, review the written checklist.

Practice Area Pre-Maneuver Check

Prior to practicing maneuvers, do these four things:

- Clear the area for traffic and birds

- Check for obstacles and landing sites
- Note the wind
- Set mixture according to air density (altitude) and throttle setting
    - o Full rich is not likely to be required at altitudes above 3000'.

Before Landing

Use a flow and/or a mental checklist to configure the cockpit. Upon completion, review the written checklist.

Centerline Check

On final verbalize one last mental check. There won't be time for a written checklist.

- Mixture – As Required (set according to density altitude in case of a go-around)
- Heels - on the floor (off the brakes)
- Windsock – Check (what's the wind at the runway really doing?)
- Landing Gear – Green light, visually check (in retractable gear airplanes)

After Landing

When stopped clear of the runway, use a flow and/or mental checklist. Do not configure the cockpit or call ground control until the plane is stopped. Follow up with the written checklist.

Shutdown

Once in the parking spot, ensure the avionics are OFF and shut down the engine. Follow up with a flow pattern and the written checklist.

8b. Cessna 172r Leaning Procedure

The following are the Ignite Flight guidelines from the Cessna 172R POH on mixture control during each phase of flight and how we should teach our students. Generally, set mixture for altitude (air density) and throttle setting (volume of air).

After Start/Taxi

- Set Throttle to 1200 RPM.
- Lean the mixture for maximum RPM.
- Set throttle back to 1000 RPM for ground ops.

Before Takeoff

- Above 3000 feet density altitude the mixture should be leaned until the RPM increases in a full throttle, static run up prior to takeoff. Do not lean beyond the increase in RPM.
- Below 3000 feet density altitude the mixture should be set to full Rich.

Climb

- Through 3000 feet lean mixture for smoother operation and max RPM.
- Periodically lean for smooth operation and max RPM in prolonged climbs.

Cruise

- Below 75%-80% power use the EGT Gauge to lean the mixture to 50 degrees rich of peak, or
- Lean for the planned fuel flow, or
- Lean until engine runs rough and then enrichen for smooth operation.

Practice Area (pre-maneuver)

- Set mixture for altitude (air density) and throttle setting (volume of air) for maneuver being performed.

Descent

- Adjust for smooth operation. Slightly enrichen the mixture periodically during the descent.

Landing
- Full Rich at or below 3000' density altitude.
- Above 3000' density altitude, set as it was for the takeoff.

The following is from the Lycoming IO 360 engine manual**.**

On engines with manual mixture control, maintain mixture control in "Full Rich" position for rated take- off, climb, and maximum cruise powers (above approximately 75%). However, during take-off from high elevation airport or during climb, roughness or loss of power may result from over-richness. In such a case adjust mixture control only enough to obtain smooth operation – not for economy. Observe instruments for temperature rise. Rough operation due to over-rich fuel/air mixture is most likely to be encountered in carbureted engines at altitude above 5,000 feet.
Always return the mixture to full rich before increasing power settings.

Notes

Set full rich on takeoff below 3000 feet density altitude because the need for more fuel for combustion and cooling on an engine operating over 75%-80% power is greater than the small amount of additional performance.

Leaning the mixture can be accomplished at any altitude as long as engine percentage of power is below 75%-80%. The engine designers and engineers have concluded that takeoffs below 3000 feet density altitude are at a higher percentage of power and the bigger benefit falls with a full rich mixture.

Do however teach students high altitude airport/aircraft operations and the need to lean the mixture at airports above 3000 feet to get max RPM.

8c. Abnormal or Emergency Situations

Priority #1 is to maintain positive aircraft control.

- Exercise good judgement to assess the situation.
- Take action when a solution is obvious.
- Use flows and mental checks.
- Then, if time and altitude permit, use the appropriate written checklist to ensure compliance.

An emergency requires both immediate and reference actions; an abnormality requires timely reference actions.

- Immediate action items are performed from memory.
- Immediate action items related to aircraft configuration are listed in bold type in the POH checklists.
- Reference items are performed using a written checklist, if one is available.

Not all abnormal situations have a checklist; this is where understanding of the aircraft and its systems is advantageous.

9. Ground Operations

Proper ground operational procedures can be found in the POH and Airplane Flying Handbook. Here are a few additional things specific to Ignite Flight.

Fueling

When ordering fuel, *avoid asking for a "top-off"*. Instead, ask for the number of gallons required to have the maximum usable fuel. For example, if adding 10 gallons a side gets up to 53 usable gallons, ask for that. The line personnel tend to overfill the tanks which causes additional wear on the fuel sender units and leads to intermittent readings on the fuel gauge.

When sampling fuel, always start with the highest drain and work down to the lowest. Draining the low points first could allow contaminated fuel in the tanks to descend into the fuel line before sampling the tanks.

Engine Starting

Avoid overheating the starter. Starters are lightweight and can easily overheat and even melt internally. Only crank over the starter for 10 seconds and stop cranking if it doesn't start. After the 10 seconds of cranking, allow 20 seconds to cool. This cycle can be repeated two more times followed by a 10 minute cool down period. The cycle of three 10 second cranks with 20 second cool downs can be repeated one more time, but no more.

After Engine Start

After engine start, do not linger in the parking spot. Conduct a brake check and pull out of the parking spot towards the west end of the parking area, or in another location not blocking traffic on the east ramp. Get a clearance and make taxi preparations there. This avoids extended periods of prop blast for the people pre-flighting behind and places the spinning prop in a place without pedestrians.

Taxi

Do not use brakes to control speed while power is applied. If taxiing too fast, set idle power to control speed before using the brakes. Never drag (ride) the brakes. Use spot braking instead. To spot brake, apply the brakes smoothly and slow the airplane below taxi speed and release the brakes. Repeat as necessary. When stopping, reduce power to idle before braking. Once stopped, set power to 1000 rpm.

Avoid fiddling with avionics, tablets, configuring the plane, or any other heads-down activity while taxiing. *Come to a stop first.* When off runway 17/35 and having received a taxi clearance, it is usually acceptable to taxi across taxiway Alpha to the east ramp and stop to finish after-landing checks.

Shutdown / Postflight

When in the parking spot, stop the spinning meat cleaver (propeller) as soon as practical. When shutting down the engine, the order in which equipment is turned off isn't too important, with one exception. *The avionics need to be shut off before shutting down the engine*. Electrical spikes are rare, but if one were to occur a vulnerable time is as the engine starts up and shuts down. A spike could damage the avionics. So, shut the avionics off, pull the mixture to idle cutoff, and then get the rest of the items completed.

After the flight, conduct a post flight walkaround. Note the fuel quantity and record it on the whiteboard at the front desk.

10. Communications

General information on radio communications, phraseology, and techniques can be found in the AIM. To communicate in a concise, professional manner, follow the operational practices below.

ATC Acknowledgements / Readbacks

- Always acknowledge receipt of ATC clearance or instruction.
- Do **not** readback non-critical instructions or advisories that are understood.

Items that must be read back to ATC:

- Clearances
    - Examples - taxi to runway, hold short of runway, cross a runway, takeoff or land on a runway, approach clearance, maintain VFR, cleared to enter class Bravo.
- Assigned altitudes
- Assigned headings

To acknowledge other instructions or advisories:

- “Roger” (I understand)
- “Wilco” (I will comply)
- “Unable” (I cannot comply with that instruction)
- “Affirmative” (Yes)
- “Negative” (No)
- “Say Again” (Huh? What was that?)

Do Not acknowledge an ATC transmission with a double click of the mic.
If uncertain the transmission was heard correctly, do read it back.

One example of “Roger”:
ATC: “3VU, no traffic observed between you and the airport, squawk VFR, frequency change approved.”
Pilot: “Roger, 3VU.”

One example of “Wilco”:
ATC: “3VU, extend downwind, I’ll call your base, your number two behind a King-Air on 5 mile final, report traffic in sight.”
Pilot: “3VU, Wilco.”

One example for instrument pilots reading back only what is necessary:
ATC: “3VU, you’re 3 miles from Potts, turn left to heading 030°, maintain 3000’ until established on the localizer, cleared for the ILS approach to runway 36.”
Pilot: “030, 3000, cleared ILS 36, 3VU.” (heading, altitude, clearance)

One example of a long-winded, frequency congesting radio call:
Pilot: “Lincoln tower, N133VU is 10.4 miles west at 3500’, and we’re looking to land on runway 17, uh, 3VU.”
ATC: “3VU, do you have information Charlie, and are you full stop or are you requesting the option?”
Pilot: “Yes, we have information Charlie, and we’re looking for a full stop, 3VU.”
ATC: “3VU, enter a right base for runway 17, you’re number two behind a citation on 5 mile final, wind is 190 at 10, cleared to land runway 17.”
Pilot: “Roger, we’re cleared to land on 17, number two, and we’ll be looking for that traffic, 3VU.”

How the above example could be concise and uncluttered:
Pilot: “Lincoln tower, 133VU, 10 west, 3500, full stop, information Charlie.”
ATC: “3VU, enter a right base for runway 17, you’re number two behind a Citation on 5 mile final, wind is 190 at 10, cleared to land runway 17.”
Pilot: “3VU cleared to land 17.”

Less is More. Sometimes ATC sounds long-winded, but there are things they are required to say. Reading back instructions or advisories that are understood creates congestion on the frequency and delays ATC moving on to the next pilot. In a busy environment unnecessary readbacks become annoying and can be problematic. Professional pilots keep radio communication concise and uncluttered, but concise radio calls benefit all pilots by reducing mental workload when they don’t have to formulate long-winded sentences.

11.Abnormal and Emergency Procedures

11a. Methodology

As much as we prepare for normal operations as pilots, we should also discipline ourselves to practice abnormal and emergency operations as well. The following is a foundation to consider when training for such events or having been dealt an abnormal or emergency situation. Take the time to build the muscle memory and understand the aircraft.

For the most part in the flight training environment, we operate as one single crewmember and build on our experience each lesson to strengthen our Single Pilot Resource Management (SRM). When a CFI and student are onboard and faced with an abnormal operation, we must utilize Crew Resource Management (CRM). Examples and a sequence of procedures are listed below for both SRM and CRM.

Single Pilot Resource Management (SRM).
SRM is the art of managing all onboard and outside resources available to a pilot. The definition is vague, however during normal operations we do just that. We manage all onboard and outside resources before, during, and after the flight for a successful outcome. This essentially is following the process to stay one step ahead of the airplane in terms of checklists, weather, navigation, power setting, communications, etc. During training and building on our SRM the PIC is responsible for all aeronautical decision making. The PIC is also responsible to make safe and conservative decisions during abnormal and emergency ops.

Crew Resource Management (CRM).
CRM is also the art of managing all onboard and outside resources available to the pilot before, during, and after a flight for a successful outcome. However, one major difference is now we are part of a team effort and must utilize each other to complete the flight safely. We are interdependent on each other to complete the mission. In training your aeronautical decision making will be challenged as if you were the Pilot in Command (PIC). If you advance your aviation career and operate in a multi crew flight deck you will start to integrate CRM. Crew resource management differs from single pilot resource management in the following ways.

1. Aeronautical decision making is a 2-way street and both pilots will consider the options and make a safe decision.
2. CRM will utilize split job duties (procedure below). Generally, one crewmember flying and the other working on the issue at hand.

11b. Abnormal and Emergency Sequence of Procedures.

In any situation, but more so in emergency or abnormal situations, a pilot must have priorities straight.

1. Aviate
2. Navigate
3. Troubleshoot
    a. Immediate action items (memory items)
    b. Reference items - Checklists (time and altitude permitting)
4. Communicate

Aviate
As pilots our one job is to take a moving object airborne and then bring it back safely to the ground. It is human nature and many studies have shown that if our attention is directed off course, such as an emergency we omit our primary objective of flying the aircraft. The following term has been used in aviation for many years at all levels. Fly the airplane first! Maintain aircraft control of altitude, configuration, and safe flying before attempting to solve the problem.

Navigate
Ensure the aircraft is navigating where it needs to be. Whether that is a heading issued from ATC, radio and GPS navigation, or a forced landing site.

With the plane under control and going where it needs to be, continue to deal with the immediate problem.

Dealing with the Abnormal or Emergency.
When dealing with abnormal ops follow the procedure in order listed below.

1. Memory Items
2. Abnormal or Emergency Checklists

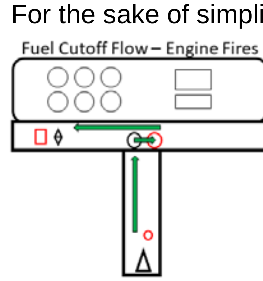
Memory Items
Memory items are quick acting actions in an aircraft during an emergency. They are listed with some emergency checklists as the first several items and generally are **BOLD** in our aircraft POH. These are memory items and should be committed to memory so that they can be completed during an emergency in a timely manner.

Checklists
Once memory items are complete and there is sufficient time and altitude, find and complete the appropriate checklist in the aircraft checklist or aircraft POH.

Communicate
Communicate the situation to local air traffic control, or on the CTAF. The two things to consider are **declaring an emergency or an advisory**. Do not hesitate to declare an emergency if the situation requires it. This tells ATC that priority assistance is requested. An advisory communicates to controllers or other aircraft that the situation is not favorable but the safety of the flight is not affected. Generally, communicating is the lowest priority, but in some cases contact ATC prior to finishing checklists (for example, an engine failure shortly after takeoff with a turn toward a runway). Use good judgment, but do not prioritize communication above flying the plane.

<u>11c. Fire and Engine Failure Emergencies</u>
Refer to POH for the full listing of emergency procedures.

Engine Fires
After maintaining aircraft control, the first priority is to cut off the fuel (gas) to the fire by executing the immediate action items from memory. Memory items for all engine fires are similar, but listed in various orders in the POH. For the sake of simplicity, when cutting off the fuel, one flow will be used for all engine fires that covers the immediate action items.



<u>Fuel Cutoff Flow for Engine Fires</u>:

- Fuel Shutoff valve – Pull off
- Throttle –Forward (allow time to draw fire into engine and use up fuel)
- Mixture – Idle/Cutoff
- Fuel pump – Off
- Master switch – Off *

*This is only an immediate action item in flight. Consider electrical items (flaps, radio, transponder) may be desired in the event of a forced landing.

<u>Engine Fire in Flight Reference Items</u>
Cutting off gas to the engine should extinguish the fire. However, if it does not, then a high airspeed emergency descent can be used to put out the fire or, if it still doesn't extinguish the fire, the emergency descent will get the plane on the ground quickly. Note that the emergency descent is not an immediate action item.

- If cutting off fuel puts fire out: conserve altitude to glide to a landing site.
- If cutting off fuel does not put fire out: give away altitude to extinguish fire.

Electrical or Cabin Fire

Immediate action items should extinguish the fire. If so, land at an airport as soon as possible.

- Master switch – Off
- Vents, Cabin Air, Heat – Off
- Fire extinguisher – Activate

However, if the fire continues, execute an emergency descent and get on the ground and out of the plane immediately.

Halon Extinguisher

The fire extinguisher uses Halon, which works by displacing oxygen rather than covering and smothering a fire. This means the fire could be put out even though it may not be possible to aim the extinguisher straight at the fire. Halon is a liquefied gas, so when released into the air it will not obscure vision, although it can be an eye irritant.

Electrical Fire Reference Items

Once the fire is out, the first reference item to be completed should be:

- Ventilate the cabin

The rest of the items will reconfigure the cockpit if the pilot wants to try restoring electrical power. Otherwise, with the master switch off there is no urgency to turn other switches off.

Engine Failure in Flight / Forced Landing

The engine failure immediate action items from the POH are mostly geared towards configuring the cockpit to possibly restart the engine and don't take into account all actions that should be done from memory. Pilots should be able to execute the following items from memory before consulting the written checklist:

- **Attitude** – Best glide, trim (Aviate)
- **Best landing site** – fly towards (Navigate)
- **Configure** – restart procedure (Troubleshoot)
  - **Fuel shutoff valve** – On (In)
  - **Fuel selector valve** – Both
  - **Mixture** – Rich
  - **Fuel pump** – On
  - Ignition switch – Both (or start if prop stopped)
  - Fuel pump – Off (if start was successful)
- **Distress** – mayday, 7700 (Communicate)
- **Exit** – survive the landing
  - **Seatbelts** - tighten
  - **Doors** – unlatch
  - When committed to a forced landing:
    - Fuel shutoff valve – Off (Out)
    - Mixture – Idle/cutoff
    - Master switch – Off
    - Ignition – Off
    - Fuel pump - Off

11d. Management of Abnormal or Emergency Operation Procedures.

SRM

The student in solo operations is the PIC of the aircraft and has the responsibility and the authority to choose the safest course of action. When following this **sequence of procedures** listed below, the key is not to go too fast and not too slow. However, a smooth, steady, quick response should be expected to be in the best position.

1. Aviate
2. Navigate
3. Troubleshoot (abnormal or emergency situations)
    a. Memory items
    b. POH Checklists
4. Communicate

CRM

When flying with an instructor and faced with an abnormal situation (not training) the student will act as a crew and utilize crew resource management to share tasks and safely complete the flight. In the event of an actual abnormal or emergency situation, the CFI and the student will do the following:

CFI

The CFI will take control of the aircraft and complete the following tasks.

1. Aviate.
2. Navigate.
3. Direct student to memory items and checklists.
4. Consider all options from both crew members.
5. Communicate.

Student

The student will give aircraft control to the CFI.

1. Assist with memory items and abnormal checklists.
2. Consider all options from both crew members.
3. Help with communication as directed by the CFI.

12. Takeoffs

12a. Standard Takeoff Brief

Prior to takeoff the pilot will consider and brief abnormal situations associated with these scenarios. Have a plan and verbalize the plan.

The briefing should go beyond generalities and take into account the environment of the departure airport. If departing an airport other than KLNK, the pilot should get the "lay of the land" as he/she arrives at the airport to see what options exist for a forced landing after takeoff.

Example:
"This will be a normal/short/soft field off of runway (X). I expect to lift off in ____ feet at ____ knots (takeoff ground roll) and climb out at (Best Rate / Best Angle) on (heading / course) to (altitude)". **Then brief the each of the following.**

I will abort the takeoff if:

- Airspeed does not equal ___ knots at ____ feet of ground roll (Decision Point).
- There is any abnormality.

If the engine fails after liftoff but BELOW _____feet (1000 feet AGL). Brief specifically for the airport of departure.

- I will land on the remaining runway or straight ahead if able, or
- I will turn (left/right) and land (in a spot specific to the runway environment).
-

If the engine fails after takeoff ABOVE ______ feet (1000 Feet AGL). Brief specifically for the airport of departure.

- I will turn (left/right) and land on runway ___ or turn (left/right) and land on runway ___.
- Or I will land (in a place specific to the airport environment).

12b. Abnormal Takeoff Procedures (Memory Items).

Items in **bold are MEMORY ITEMS**. After memory items are complete finish appropriate checklist as time permits.

Engine abnormality, or lack of performance, or failure on runway (Sufficient Runway Remaining)

- **Throttle** – Idle
- **Brakes** – As required
- Taxi off runway if able
- Communicate situation to ATC or CTAF
- Flaps – Retract
- Engine – Shutdown if necessary

Engine failure immediately after takeoff (below TPA)

- **Attitude** – Push nose down
- **Best landing site** – Straight ahead or off to side (look for obstacles & clearings) "DO NOT TURN BACK"
- **Configure** – prepare for immediate landing
  - Flaps – As required
  - Doors – Unlatch
- **Distress** – Mayday
- **Exit** – shut off fuel and electrical

12c. Takeoff Speeds and Configuration

Type	Power	Flap	Liftoff (Vr)*	Best Angle (Vx)*	Best Rate (Vy)*
Normal	Full	0	50-55	54-60	72-79
Short Field	Full	10	46-51	52-57	72-79 (flaps 0°)
Soft Field	Full	10	Slowest Possible	52-57	72-79 (flaps 0°)
Crosswind	Full	Min Necessary for Field Length	50-55**	54-60	72-79

*These speeds are based on a weight range of 2000lb to max gross weight. Flying with the correct power, attitude (sight picture), and configuration will result in the correct weight adjusted speed. Set T-pitch attitude for takeoff when elevator is effective. Never hold the plane on the runway and "rotate" it at liftoff speed.
**This speed does not include a gust factor. Add ½ the gust speed to the lift-off speed.

12d. Normal Takeoff

1. Before takeoff checklist and takeoff brief complete.
2. Verify runway alignment with heading indicator/compass and runway is clear.
3. Add Crosswind Input.
4. Full Power.
5. Verbalize, "Airspeed Alive" and "Engine Instruments Green".
6. As elevator becomes effective, set T-pitch attitude.
7. At decision point check if airspeed is at the calculated liftoff speed.
   a. Speed as calculated or higher – continue takeoff.
   b. Speed lower than calculated – abort takeoff.
8. After liftoff as plane accelerates and climbs out of ground effect, set the I-pitch attitude.
9. Add rudder and aileron inputs for coordination and wind correction.
10. Climb to 300' below TPA prior to turning.
11. Through 1000' set T-pitch attitude for remainder of climb.
12. Complete climb checklist.

12e. Short Field Takeoff

1. Before takeoff checklist and takeoff brief complete.
2. Use all available runway.
3. Verify runway alignment with heading indicator/compass and runway is clear.
4. Hold Brakes
5. Full Power
6. Release Brakes
7. Verbalize "Airspeed Alive", and "Engine Instruments Green".
8. As elevator becomes effective, set T-pitch attitude.
9. At decision point check if airspeed is at the calculated liftoff speed.
   a. Speed as calculated or higher – continue takeoff.
   b. Speed lower than calculated – abort takeoff.
10. After liftoff as plane accelerates and climbs out of ground effect, set the P-pitch attitude.
11. Add rudder and aileron inputs for coordination and wind correction.
12. When clear of obstacle, set the I-pitch attitude.
13. Retract flaps.
14. Climb to 300' below TPA prior to turning.
15. Through 1000ft set T-pitch attitude for remainder of climb.
16. Complete climb checklist.

12f. Soft Field Takeoff

1. Before takeoff checklist and takeoff brief complete.
2. Elevator control full Aft. To maintain nose wheel up.
3. Taxi on runway and verify runway alignment with heading indicator/compass and runway is clear.
4. Do Not Stop
5. Full Power
6. Reduce elevator pressure as necessary, however keep the nose wheel off the runway.
7. Verbalize, “Airspeed Alive”, and “Engine Instruments Green”.
8. Liftoff when the aircraft can fly at the slowest possible airspeed.
9. Smoothly apply elevator pressure to remain in ground effect and accelerate to 50-60kts (approximately liftoff or Vx speed).
10. Set I-pitch attitude.
11. Retract flaps when out of ground effect and stabilized in a climb.
12. Add rudder and aileron inputs for coordination and wind correction.
13. Climb to 300’ below TPA prior to turning.
14. Through 1000ft set T-pitch attitude for remainder of climb.
15. Complete climb checklist.

13. Traffic Pattern and Approach Profiles

13a. Good Planning = Good Landing

A good landing is a result of good planning. When planning an approach and landing, decide on the type of approach and landing (visual or instrument, short-field, soft-field, etc.). Decide on the flap setting and the final approach speed, the aiming point, and where the airplane will touch down on the runway surface.

Approach Briefing – Verbalize the Plan

During the Approach Checklist, conduct an approach briefing. This organizes the plan and ensures effective communication between pilots. The briefing should be specific to each approach and landing, but presented in a standard format that makes sense to other pilots and instructors.

Planning considerations:

1. Field Elevation
2. Traffic Pattern Altitude
3. Landing Runway
4. Winds (left or right crosswind? tailwind on downwind or base?)
5. Type of Approach & Landing (visual, instrument, short-field, soft-field)
6. Flap Setting and Final Approach Speed
7. Aiming Point
8. Touchdown Point

13b. Ideal Traffic Pattern (Normal Landing)

LEG	POWER SETTING	FLAP SETTING	AIRSPEED	ALTITUDE TARGET*
Prior to Pattern	Approx 1800-2000 RPM	0	90	Traffic Pattern Altitude (1000 AGL)
Downwind	Approx 1800-2000 RPM	0	90	Traffic Pattern Altitude (1000 AGL)
Abeam Point	Approx 1500 RPM*	10	Approx 80 **	Initiate Descent
Base	Approx 1500 RPM*	20	Approx 70 **	TPA minus 200' at base turn
Final	Approx 1500 RPM*	30	60-65 **	TPA minus 600' at final turn
Over The Numbers	Reducing to Idle	30	Slowing	Flare

***The approach power setting and altitude targets work best with a standard ground track. If downwind and/or base legs are closer to the runway, the plane will likely be high. If downwind and/or base legs are further from the runway, the plane will likely be low. See section 5 on evaluating descent angle.

****Approach speed is dependent on weight. Flying with the correct power, attitude (sight picture), and configuration will result in the correct weight adjusted speed.

Aiming Point

The Airplane Flying Handbook defines aiming point as "the point on the ground at which, if the airplane maintains a constant glidepath, and was not flared for landing, it would contact the ground." The pilot will round-out and flare in the vicinity of the aim point so as to float slightly and touchdown at the desired point on the runway.

An aim point should always be used, even in the presence of visual glide slope indicators, to develop precision for all landings and to develop judgement of the glide path when visual glide slope indicators are not available.

Managing Energy

Managing energy means the pilot controls the airplane's glidepath, speed, and power setting so that altitude and airspeed are depleted simultaneously on the intended touchdown point.

Power

Adjust ground track, select flaps, and use a forward slip if needed to establish the glidepath. Maintain a constant angle glidepath to the aiming point by making *minimal power adjustments* (see "Constant Attitude and Power, Variable Airspeed Approach") to keep the aim point stationary in the windshield while maintaining the desired approach speed with pitch. If the aiming point moves lower in the windshield, take steps to get down to the glidepath until the aiming point is back in the correct, stationary position. If the aiming point moves toward the top of the windshield, take steps to get up to the glidepath until the aiming point is back in the correct, stationary position.

Pitch

During a stabilized approach and landing, use pitch to control deviations from the desired approach speed while maintaining a constant angle glidepath to the aiming point. If the airspeed is fast, increase pitch while maintaining the constant angle glidepath. If the airspeed is slow, reduce pitch while maintaining the constant angle glidepath.

Gust Factor

Slightly higher approach speeds should be used under turbulent or gusty wind conditions. Add 1⁄2 the gust factor to the normal approach speed. For example, it the wind is reported 8 gusting to 18 knots, the gust factor is 10 knots. Add 1⁄2 the gust factor, 5 knots in this example, to the normal approach speed. A slightly lower pitch attitude (1/4-1/2 inch) can add 5 knots.

Flap Setting

The C172 Operations Manual states: "Normal landing approaches can be made with power on or power off with any flap setting desired. Surface winds and air turbulence are usually the primary factors in determining the most comfortable approach speeds."

Students must be able to determine the best flap configuration and approach speed given the landing conditions.

13c. Stabilized Approach Policy

Definition: A stabilized approach is one in which the pilot establishes and maintains a constant angle glidepath towards a predetermined point on the landing runway. It is based on the pilot's judgment of certain visual cues, and depends on a constant final descent airspeed and configuration (FAA-H-8083- 3A, p.8-7).
A stabilized approach is required during visual and instrument approaches in all Ignite Flight airplanes.

Whether the flight is IFR, or VFR, all four of these criteria shall be met at the target altitude on each approach.

IFR Target Altitude: 500' above MDA/DA

VFR (and visual portion of IAP) Target Altitude: 200 AGL

1. **On a vertical path of some kind.** For visual flight this can be VASI, PAPI, or visual aim point. For instrument flight this can be a glide slope indication from an ILS or LPV approach.
2. **Speed stabilized at V Ref.** Determine what the target speed is going to be prior to being on final. This will always vary according to aircraft weight and configuration, weather, runway length and possibly more criteria. The point is to determine what speed is going to be the REF speed for the approach and honor it.

3. **On Centerline.** Uncommanded lateral drifts off the centerline are obvious to the pilot and cannot be accepted. Slight variances may be tolerable depending on conditions and runway width, this consideration should be acknowledged prior to commencing the approach.
4. **Touchdown in the touchdown zone.** Some runways are marked with white blocks that indicates a touch down zone (TDZ). In absence of any TDZ markings, use the first third of the runway as a target.

The solution is to know the targets and be ready and willing to **Go Around** when not all four criteria are met by the target altitude.

13d. Instrument Approaches

Approach Preparation: ABBCA

ATIS
Build the Approach
Brief the Approach
Configure the Airplane
Activate Approach (GPS)

Sometimes, this mental checklist may have to be done in a different order than depicted. The GPS approach may have to be activated before it's been briefed or well before the plane needs to be reconfigured. Occasionally, there may not be enough time to thoroughly brief and get everything else done. Briefing is a good operational practice, but keep the priorities straight, and don't sacrifice aviating and navigating. Learn to be concise and cover the most important points; reading the entire plate should've already happened on the ground.

Precision Approach (ILS Approach / RNAV GPS LPV)

1. Set Slow Cruise PAC on vectors or when final approach course inbound
2. Announce *"Localizer Alive"* when localizer begins moving toward center.
3. Announce *"Glideslope Alive"* when glideslope begins moving and complete Before Landing Checklist.
4. Verify no flags at glideslope intercept altitude and marker (ILS). Verify LPV within 2nm of FAF (GPS).
5. 1/2 dot below glideslope intercept: set Precision Descent PAC.
6. At glideslope intercept descend at a rate to maintain glideslope (400-500 fpm) at 80 KIAS.
7. Run through the 5T mental checklist.
8. Periodically callout altitude during the descent (e.g., "3000 for 1400")
9. 500' above DA approach should meet stabilized criteria.
10. At DA announce: *"Minimums".*
11. Runway in sight: *maintain stabilized approach*, *remain on glide path* (no config change), and land.
12. Runway not in sight: execute missed approach.

Non-Precision Approach (GPS, VOR, LOC Approach)

1. Load the approach into the GPS, and select appropriate nav source, and frequency if required.
2. Set the desired course on the Nav 1 OBS.
3. Set Slow Cruise PAC when on a published segment of the approach or if on vectors.
4. Prior to FAF complete the before landing checklist.
5. At FAF, set Non-Precision Descent PAC. Run through 5T mental checklist.
6. Descend at 500-1000 FPM at 80 KIAS (Non-Precision Descent PAC).
7. Periodically callout altitude during descent (e.g., "3000 for 1500")
8. Set Level@MDA PAC 50'-100' prior to reaching MDA.
9. Level at MDA announce, *"Minimums."*

10. Maintain MDA (plus 50', minus 0').
11. Runway in sight: descend after VDP or maintain MDA until ready to descend.
12. Do not leave MDA until landing is assured.
13. When descending from MDA *consider* flaps 20° - approximately 70 KIAS (C-pitch attitude).
14. On short final, *consider* flaps 30° - 60-65 KIAS (C-pitch attitude).

Circling Approach

When conducting a circling approach, fly the non-precision approach profile to the published circling minimums. Maintain circling minimums at 80 KIAS until in a position from which a normal landing can be made. When descending from MDA (circling minimums), *consider* selecting flaps 20˚and slowing to approximately 70 KIAS (C-pitch attitude). On short final, *consider* selecting flaps 30° slowing to 60-65 KIAS (C-pitch attitude).

In deciding whether or not to attempt a circling approach, there are some factors to be evaluated:

- How low is the weather?
- How strong is the wind?
- Are the circling MDA's different from standard? (300' obstacle clearance) Why?
- Where are the obstacles?
- Are there restrictions to circling?
- Is there a VASI or PAPI?
- What's the specific plan for going missed?

Spend a considerable amount of time studying the approach plate and the sectional chart.

14. Landing

14a. Landing Profile.

Type	Flap	Approach speed (Vref)*
Normal Landing	Flaps Full (Flaps Up)	60-65* (65-75*)
Short Field Landing	Flaps Full	57-62*
Soft Field Landing	Flaps Full	60-65*
Crosswind Landing	Min Necessary for Field Length	60-65* Flaps Full, or 65-75* Flaps Up

*****Approach speed is dependent on weight. Speed range based on 2100 lbs. to 2450 lbs. Flying with the correct power, attitude (sight picture), and configuration will result in the correct weight adjusted speed. Apply gust factor as needed.

14b. Cessna 172R Landing Sequence

1. Plan and brief each landing carefully.
2. Enter the traffic pattern at Traffic Pattern Altitude (TPA) trimmed for 90 KIAS in level flight. Complete before landing checklist.
3. Whenever possible, fly the traffic pattern at a distance from the airport that allows for a power off landing on a safe landing surface in the event of an engine failure.
4. Adjust ground track, select flaps, and adjust power, if necessary, to maintain glidepath. Complete the centerline check on final.
5. Maintain stable approach until round out (flare) at approx. 10' to 20' above the runway.
6. Manage the airplane's energy so touchdown occurs at the designated touchdown point.
7. Reduce throttle to touch down with the engine idling and the airplane at minimum controllable airspeed.
8. Touch down on the main gear only, with the wheels straddling the centerline. Do not stop flying the plane when the wheels touch down.
9. Maintain a pitch attitude at touchdown that prevents the nose wheel from touching down by increasing aft elevator. Continue increasing aft elevator as the airplane slows until yoke is full aft. Avoid braking immediately after touchdown and use as little braking as possible.
10. Maintain centerline until taxi speed is reached and increase crosswind control inputs as airplane slows.
11. Adjust crosswind control inputs as necessary during taxi after leaving the runway.

14c. Rejected Landing (Go Around).

The decision to execute a go-around is both prudent and encouraged anytime the outcome of an approach or landing becomes uncertain. Ignite Flight considers the use of a go-around under such conditions as an indication of good judgement and cockpit discipline on the part of the pilot.

1. Full power and C-pitch attitude.
2. Reduce to flaps 20°.
3. Set I-pitch attitude (or P-pitch attitude if an obstacle).
4. Look outside to confirm the plane is in a positive climb;***** reduce flaps to 10°.
5. If obstacle present: when over obstacle set I-pitch attitude and retract flaps.
6. If no obstacle present: retract remaining flaps.
7. If going around due to another aircraft on the runway, sidestep to the left.
8. Never, absolutely never, report the go-around on the radio until the climb is established and the flaps are retracted.

*****CFI Note: Positive climb **does not** mean positive rate of climb. Instrument rated pilots use the VSI to confirm a positive rate of climb during instrument takeoffs in low visibility conditions. Keep eyes outside and evaluate climb performance visually.

14d. Cessna 172r Forward Slip Procedure with Flaps Extended.

The Cessna 172R aircraft have a placard below the flap handle that states "AVOID SLIPS WITH FLAPS EXTENDED". This placard may lead pilots to believe that forward slips cannot be conducted when flaps are extended.

However, in the Cessna 172R pilot operating handbook the placard is not listed within the limitations section. The only place it is referenced within the POH is in the normal procedures section under normal landings. It states "steep slips *should* be avoided with flap settings greater than 20 degrees due to a slight tendency for the elevator to oscillate under certain combinations of airspeed, sideslip angle, and center of gravity loadings".

While this is not a limitation and is not expressly forbidden, *the preferred method for conducting and or demonstrating a forward slip should be with flap settings 0°, 10°, or 20° and not when configured with full flaps (30°)*. In an actual emergency the pilot should take whatever steps are needed for a successful outcome, but be aware of and ready for, the possible oscillations if slipping with full flaps.

15. Practical Test Preparation - Flight Maneuvers

Flight maneuvers are the foundation of airmanship and what each pilot is tested on for a practical test. It is important to discuss, demonstrate, practice, and perform these maneuvers in order to gain this foundation and be in control of the aircraft. These maneuvers are broken down into Performance based maneuvers and Ground Reference maneuvers.

- Performance Based Maneuvers done above 1500 AGL.
- Ground Reference Based Maneuvers done from 600-1000 AGL.

In addition, there is a difference in testing standards based on the private and commercial applicant. Be familiar with the ACS and what standards apply.

Prior to any maneuver in the practice area and at cruise altitude, complete the following memory items.

1. Clearing Turns.
2. Mixture – Set as Required (for throttle setting and air density)
3. Choose a visual reference point outside of the aircraft (road, grain elevator, downtown, lake, etc.). This ensures the use of outside references to maintain a lateral course during the maneuver. This also allows for picking a place to land in the event of an emergency especially at low altitudes.

15a. Slow Flight

Slow Flight is a performance based maneuver and done above 1500 AGL.

Private ACS Standards
- Altitude +/- 100 feet.
- Heading +/- 10 degrees.
- Airspeed +/- 10 knots.
- Specified Bank +10/-0 degrees.
- Slow to 5-10 knots above 1G stall speed (just above stall warning).

Commercial ACS Standards
- Altitude +/- 50 feet.
- Heading +/- 10 degrees.
- Airspeed +5/-0 knots.
- Specified Bank +/- 5 degrees.
- Establish and maintain an airspeed at which any further increase in angle of attack, increase in load factor, or reduction in power, would result in stall warning.

Setup
- Perform two 90° clearing turns
- Landing configuration flow
- Visual Reference Point

Execution
- Smoothly retard throttle to approximately approach power while slowly pitching up to approximately the I-pitch attitude.
- Trade airspeed to maintain altitude and extend flaps as required.
- As aircraft transitions to back side of power curve, add power as required to maintain altitude. Maintain visual reference point.
- Slow to 5-10 knots above 1G stall speed (just above the stall warning horn).
- Accomplish level flight, climbs, turns, and descents as required.

Recovery
- While maintaining visual reference point, set full power, maintain altitude, reduce flaps.
- Return to cruise.
- “Cruise Checklist.”

15b. Power Off Stall

Power Off Stall is performance based maneuver and done above 1500 AGL.

Private ACS Standards
- Heading +/- 10 degrees.
- Specified Bank +/- 10 degrees not to exceed 20 degrees.

Commercial ACS Standards
- Heading +/- 10 degrees.
- Specified Bank +/- 5 degrees not to exceed 20 degrees.

Set up
- Perform two 90* clearing turns
- Landing configuration flow
- Visual Reference Point

Execution
- Reduce throttle to approach power.
- Maintain altitude while slowing to approach speed.
- Set flaps to full.
- Establish a normal approach attitude and approach descent.
- Keep wings level (straight-ahead stall) or set shallow bank (turning stall) as specified.
- Reduce power to idle and set C-pitch or T-pitch attitude until: horn, buffet, or full stall as specified by instructor.
- Verbally announce each stall indication.

Recovery
- Simultaneously reduce AoA and set full power. Level wings after reducing AoA.
- Set C-pitch attitude and retract flaps to 20°
- As control pressures increase, set I-pitch attitude and retract flaps to 10°
- Retract flaps to 0° and establish Vy climb.
- Return to cruise.
- *“Cruise Checklist.”*

15c. Power On Stall

Power On Stall is a performance based maneuver and done above 1500 AGL.

Private ACS Standards
- Heading +/- 10 degrees.
- Specified Bank +/- 10 degrees not to exceed 20 degrees.

Commercial ACS Standards
- Heading +/- 10 degrees.
- Specified Bank +/- 10 degrees not to exceed 20 degrees.

Setup
- Perform two 90° clearing turns
- Takeoff configuration flow
- Visual Reference Point

Execution
- Reduce throttle and maintain altitude while slowing to a speed just above liftoff (approximately 60 Kts).

- Set flaps for takeoff (0° or 10°) as specified.
- Smoothly increase pitch to the P-pitch attitude and smoothly apply full power.
- Keep wings level (straight-ahead stall) or set shallow bank (turning stall) as specified.
- Slightly increase pitch attitude if needed to induce stall (full or imminent stall as specified).
- Verbally announce stall horn, pre-stall buffet, and the stall.

Recovery
- Simultaneously reduce AoA (C-pitch attitude, but no lower than H-pitch attitude), max power, and level wings.
- As control pressure increases, set I-pitch attitude. Retract flaps if applicable.
- Return to cruise.
- *Cruise Checklist".*

15d. Steep Turns

Steep turns are a performance based maneuver and done above 1500 AGL

Private ACS Standards
- Altitude +/- 100 feet.
- Heading +/- 10 degrees.
- Airspeed +/- 10 knots.
- Bank 45 degrees +/- 5 degrees.

Commercial ACS Standards
- Altitude +/- 100 feet.
- Heading +/- 10 degrees.
- Airspeed +/- 10 knots.
- Bank 50 degrees +/- 5 degrees.

Setup
- Perform two 90° clearing turns
- 90 KIAS (1900 RPM) maintain altitude
- Cruise configuration flow
- Visual Reference Point

Execution
- Perform a 360 turn with 45° of bank (50° commercial)
- Maintain altitude and airspeed (+ load factor, + audible increase in RPM)
- Roll out on visual reference point.
- Clear traffic and perform a 360° turn with 45° of bank in the opposite direction
- Roll out on visual reference point.
- *"Cruise Checklist"*

15e. Rectangular Course

Rectangular Course is a ground reference maneuver and done between 600-1000 ft AGL.

Private ACS Standards
- Altitude +/- 100 feet.
- Airspeed +/- 10 knots.

Setup

- Pick an altitude between 600-1000ft AGL
- Perform two 90° clearing turns
- 90 KIAS (1900 RPM) maintain altitude
- Cruise configuration
- Visual Reference Point

Execution

- Pick a square area that is one mile in length and width
    - Use fields or roads
- Set up so as that the aircraft is flown ¼ to ½ mile left or right of the selected area
- Enter at a 45° to the downwind as if entering a traffic pattern
- Maintain wind correction so as to parallel the road or field
- When abeam the boundary line, start the turn to the next leg

Recovery

- Exit the maneuver on the downwind at a 45° angle
- Advance power back towards cruse power
- Cruse Checklist

15f. S-Turns across a road

S Turns across a road is a ground reference maneuver and done between 600-1000 ft AGL.

Private ACS Standards

- Altitude +/- 100 feet.
- Airspeed +/- 10 knots.

Setup

- Pick an altitude between 600-1000ft AGL
- Perform two 90° clearing turns
- 90 KIAS (1900 RPM) maintain altitude
- Cruise configuration
- Visual Reference Point

Execution

- Pick a long straight road (that is clear of obstacles) perpendicular to the wind
    - Enter with a tailwind (downwind)
- Pick points ½ miles apart crossing the road and also points ½ mile on either side of the road
- Complete a series of 180° turns across the road to these points
- Recommended radius of the turns should be about a half mile
- Adjust power as required to maintain 90 KIAS

Recovery

- Exit the maneuver on the downwind
- Advance power back towards cruse power
- Cruse Checklist

15g. Turns around a point

Turns around a point is a ground reference maneuver and done between 600-1000 ft AGL.

Private ACS Standards
- Altitude +/- 100 feet.
- Airspeed +/- 10 knots.

Setup
- Pick an altitude between 600-1000ft AGL
- Perform two 90° clearing turns
- 90 KIAS (1900 RPM) maintain altitude
- Cruise configuration
- Visual Reference Point

Execution
- Pick a square field or area that is 1 mile in length and width with an object in the center
    - Field intersections work well
- Pick 4 object that are ½ mile on either side of the object
- Enter the orbit on the downwind side
- Use wind correction to maintain an orbit around the object
    - Reference the 4 points on either side of the object to maintain spacing and wind correction

Recovery
- Exit the maneuver on the downwind
- Advance power back towards cruse power
- Cruse Checklist

15h. Chandelles (Commercial Maneuver)

Chandelles are to be accomplished at an entry altitude that will allow completion no lower than 1,500' AGL, and consist of one maximum performance climbing turn beginning from straight-and-level flight, and ending at the completion of a precise 180° turn in a wings-level, nose-high attitude at the minimum controllable airspeed.

Commercial ACS Standards
- Heading +/- 10 degrees.
- Airspeed Just above stall speed momentarily and avoid the stall.
- Bank Approx 30 degrees.

Setup
- Perform two 90° clearing turns
- 105 KIAS (2200 RPM) maintain altitude
- Clean configuration flow
- Visual Reference Point

Execution
- Choose a reference point off wing
- Establish / maintain medium bank.
- Full Throttle - Increase pitch to attain P-pitch attitude at 90° point.
  1st 90° of turn, Bank = constant medium bank, Pitch = increasing to approximately P-pitch attitude.

- 90° point - maintain pitch - reduce bank angle to attain level flight at 180° point
  2nd 90° of turn, Pitch = constant attitude, Bank = decreasing to level flight
- 180° point - wings level - Minimum Controllable Airspeed (MCA).
- Maintain level flight while returning to cruise.
- *"Cruise Checklist"*

15i. Lazy Eights (Commercial Maneuver)

Lazy Eights are to be accomplished at an entry altitude that will allow the task to be completed no lower than 1,500' AGL. The applicant is required to maintain coordinated flight throughout the maneuver, with a constant change of pitch and roll rate.

Commercial ACS Standards
- Altitude +/- 100 feet from entry altitude at completion.
- Heading +/- 10 degrees at completion.
- Airspeed +/- 10 knots from entry airspeed at completion.
- Bank approx. 30 degrees at steepest point.

Setup
- Perform two 90° clearing turns
- 105 KIAS (2200 RPM) maintain altitude – ***Power remains constant for the whole maneuver***
- Clean configuration flow
- Visual Reference Point

Execution
- Choose a reference point off of the wing
- Simultaneously increase pitch and bank (slowly)
- 45° point – P-pitch attitude and shallow bank
- Reduce pitch / increase bank
- 90° point – C-pitch attitude – medium bank - min. speed (just at stall warning)
- Continue reducing pitch and reduce bank
- 135° point – H-pitch attitude - shallow bank
- Increase pitch / reduce bank
- 180° point – level flight – entry airspeed and altitude
- Repeat in opposite direction
- *"Cruise Checklist"*

15j. Eights on Pylons (Commercial Maneuver)

Eights on Pylons are to be accomplished at the appropriate pivotal altitude (groundspeed^2/11.3 + field elevation), governed by the aircraft's groundspeed. The applicant is required to maintain coordinated flight while flying a figure eight pattern which holds the selected pylons using the appropriate pivotal altitude. At the steepest point, the angle of bank should be approximately medium to steep, but not exceeding 40°.

Commercial ACS Standards
- Bank not to exceed 40 degrees.

Setup
- Enter on pivotal altitude – ***Power remains fixed***
- Perform two 90° clearing turns

- Clean configuration flow
- Visual Reference Point

Execution

- Select two pylons to allow for minimal time spent wings level between the two
- Enter maneuver on a 45° midpoint downwind
- Anticipate changes in groundspeed and apply appropriate pitch inputs to:
- Maintain line of sight reference with the pylon (pitch forward if point moves toward nose and pitch back if point moves toward tail)
- Begin rollout to allow the airplane to proceed diagonally between the pylons at a 45° angle
- Begin second turn in the opposite direction of the first
- Exit maneuver on entry reference point
- *"Cruise Checklist"*

15k. Steep Spirals (Commercial Maneuver)

Steep Spirals are a constant gliding turn, during which a constant radius around a point on the ground is maintained similar to the maneuver, turns around a point. Sufficient altitude must be obtained before starting this maneuver so that the spiral may be continued through a series of at least (3) 360° turns. The objective of this maneuver is to improve pilot techniques for airspeed control, wind drift control, planning, orientation, and division of attention. The steep spiral is not only a valuable flight training maneuver, but it has practical application in providing a procedure for dissipating altitude while remaining over a selected spot in preparation for landing, especially for emergency forced landings.

Commercial ACS Standards

- Heading +/- 10 degrees.
- Airspeed +/- 10 knots.
- Bank not to exceed 60 degrees.
- Complete the maneuver no lower than 1500 AGL.

Setup

- Altitude – at least 3,000' AGL
- Perform two 90° clearing turns
- Speed 80 KIAS.
- Clean configuration flow
- Visual Reference Point

Execution

- Choose visual reference point.
- Enter maneuver on downwind leg.
- Reduce throttle to idle
- Track at least three constant radius circles around reference point
- Airspeed – constant
- Bank angle – steep bank up to 60° - adjust for winds
- Clear engine once every 360° turn
- Recover – roll out on visual reference point
- Return to cruise
- *"Cruise Checklist"*

15l. Accelerated Stall (Commercial Maneuver)

Accelerated Stall is a demonstration stall and should be also be introduced to Private students early in their training.

Accelerated stalls are accomplished at an altitude that allows completion no lower than 3,000 feet AGL. A smooth transition should be made from cruise attitude to a bank angle of 45°, maintaining coordinated turning flight, while increasing elevator back pressure steadily to induce the stall.

Setup
- Perform two 90° clearing turns
- Slow to approximately 80 KIAS (during clearing turns)
- Clean configuration flow
- Visual Reference Point

Execution
- Establish a coordinated 45° bank turn
- Slowly reduce power to idle
- Maintain altitude to induce stall

Recovery
- Recover at the first indication of the stall.
- Simultaneously reduce AoA, max power, and level wings
- *"Cruise Checklist"*

15m. Secondary Stall Power On (CFI Maneuver)

Secondary stall is a demonstration stall and should be also be introduced to Private students early in their training.

Secondary Stalls are to be accomplished above 3,000 AGL. The purpose is to demonstrate the effect of attempting to hasten the completion of a stall recovery before the airplane has regained sufficient flying speed. Demonstrate and simultaneously explain secondary stalls from an instructional standpoint.

Setup
- Perform two 90 clearing turns
- 1500 RPM (maintain altitude)
- Clean configuration flow
- Visual Reference Point

Execution
- At 60 KIAS, smoothly set the P-pitch attitude and apply full power
- Slightly increase pitch attitude just enough to induce stall
- At stall, recover – simultaneously reduce AoA, max power, and level wings
- When stall horn silences, increase pitch to induce a secondary stall
- At stall, recover – simultaneously reduce AoA, max power, and level wings
- *"Cruise Checklist"*

15n. Secondary Stall Power Off (CFI Maneuver)

Secondary Stall is a demonstration stall and should be also be introduced to Private students early in their training.

Secondary Stalls are to be accomplished above 3,000 AGL. The purpose is to demonstrate the effect of attempting to hasten the completion of a stall recovery before the airplane has regained sufficient flying speed. Demonstrate and simultaneously explain secondary stalls from an instructional standpoint.

Setup
- Perform two 90 clearing turns
- 1500 RPM (maintain altitude)
- Landing configuration flow
- Visual Reference Point

Execution
- Stabilized approach descent (approach power, attitude, configuration).
- Throttle idle (slowly)
- Maintain altitude to induce stall
- At stall, recover – simultaneously reduce AOA and level wings (do not add power)
- When stall horn silences, increase pitch to induce a secondary stall
- At stall, recover – simultaneously reduce AOA, max power, and level wings
- Set C-pitch attitude, retract flaps to 20˚
- As control pressure increases, set I-pitch attitude and retract flaps to 10°
- Maintain I-pitch attitude and retract flaps to 0˚
- Return to cruise.
- *“Cruise Checklist”*

15o. Elevator Trim Stall (CFI Maneuver)

Elevator Trim Stall is a demonstration stall and should be also be introduced to Private students early in their training.

Elevator Trim Stalls are to be accomplished above 3,000 AGL. The purpose is to demonstrate what can happen when full power is applied for a go-around and positive control of the airplane is not maintained. Demonstrate and simultaneously explain elevator trim stalls from an instructional standpoint.

Setup
- Perform two 90 clearing turns
- 1500 RPM (maintain altitude)
- Landing configuration flow
- Visual Reference Point

Execution
- Trim for stabilized descent (approach power, attitude, and configuration).
- Apply full power (slowly)
- Allow the nose to rise and turn left
- When stall is approaching (high AOA) recover – simultaneously reduce AOA, max power, and level wings
- Retract flaps in increments and adjust trim as plane accelerates
- *“Cruise Checklist”*

15p. Cross Control Stall (CFI Maneuver)

Cross Control Stall is a demonstration stall and should be also be introduced to Private students early in their training.

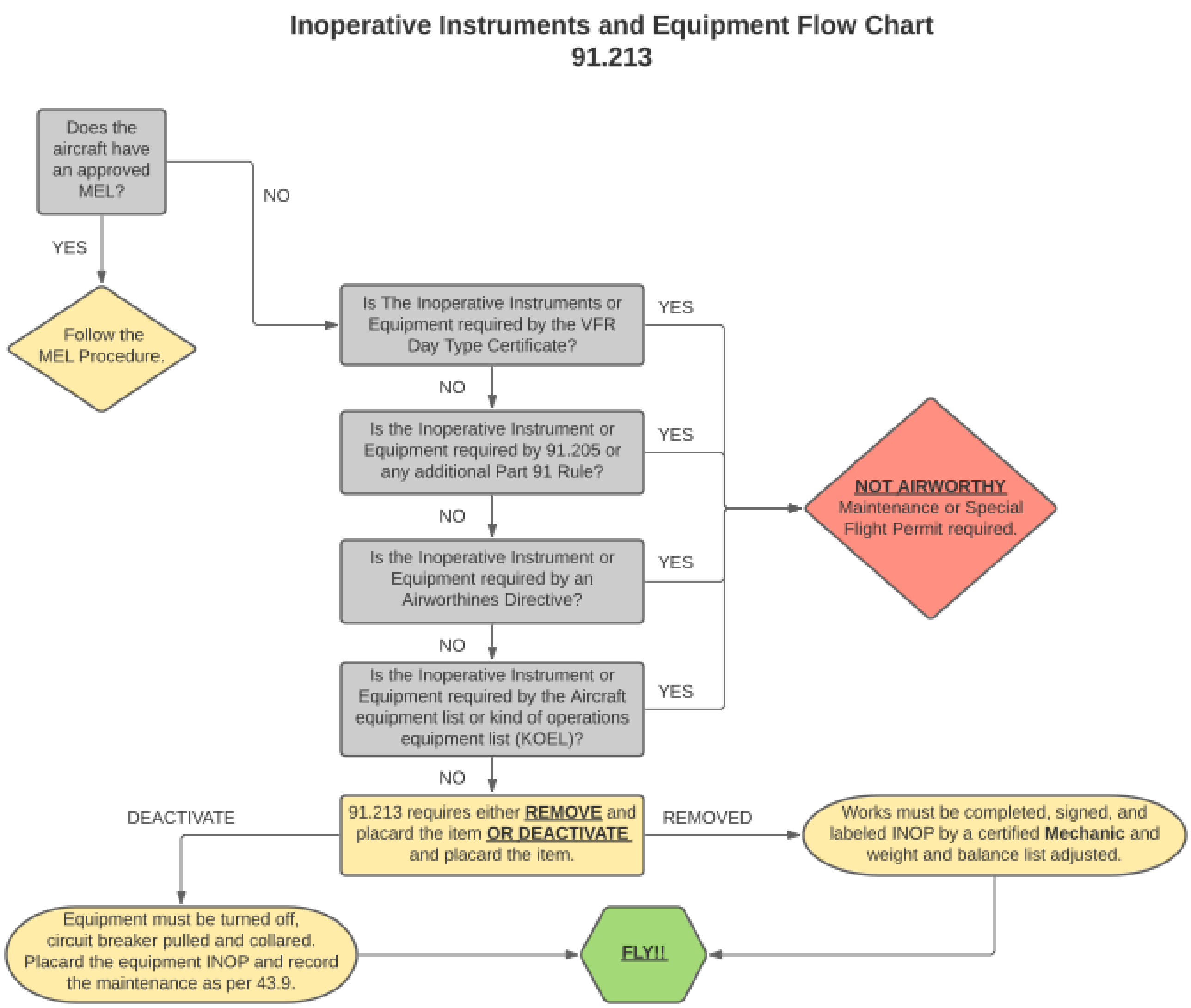
Cross-Control Stalls are to be accomplished above 3,000 AGL. The purpose is to demonstrate the effect of improper control technique and to emphasize the importance of using coordinated control pressures whenever making turns. This demonstration shows what can happen during poorly executed base-to-final turn where too much rudder is applied in the direction of the turn. Demonstrate and simultaneously explain cross-control stalls from an instructional standpoint.

Setup
- Perform two 90 clearing turns
- 1500 RPM (maintain altitude)
- Clean configuration flow
- Visual Reference Point

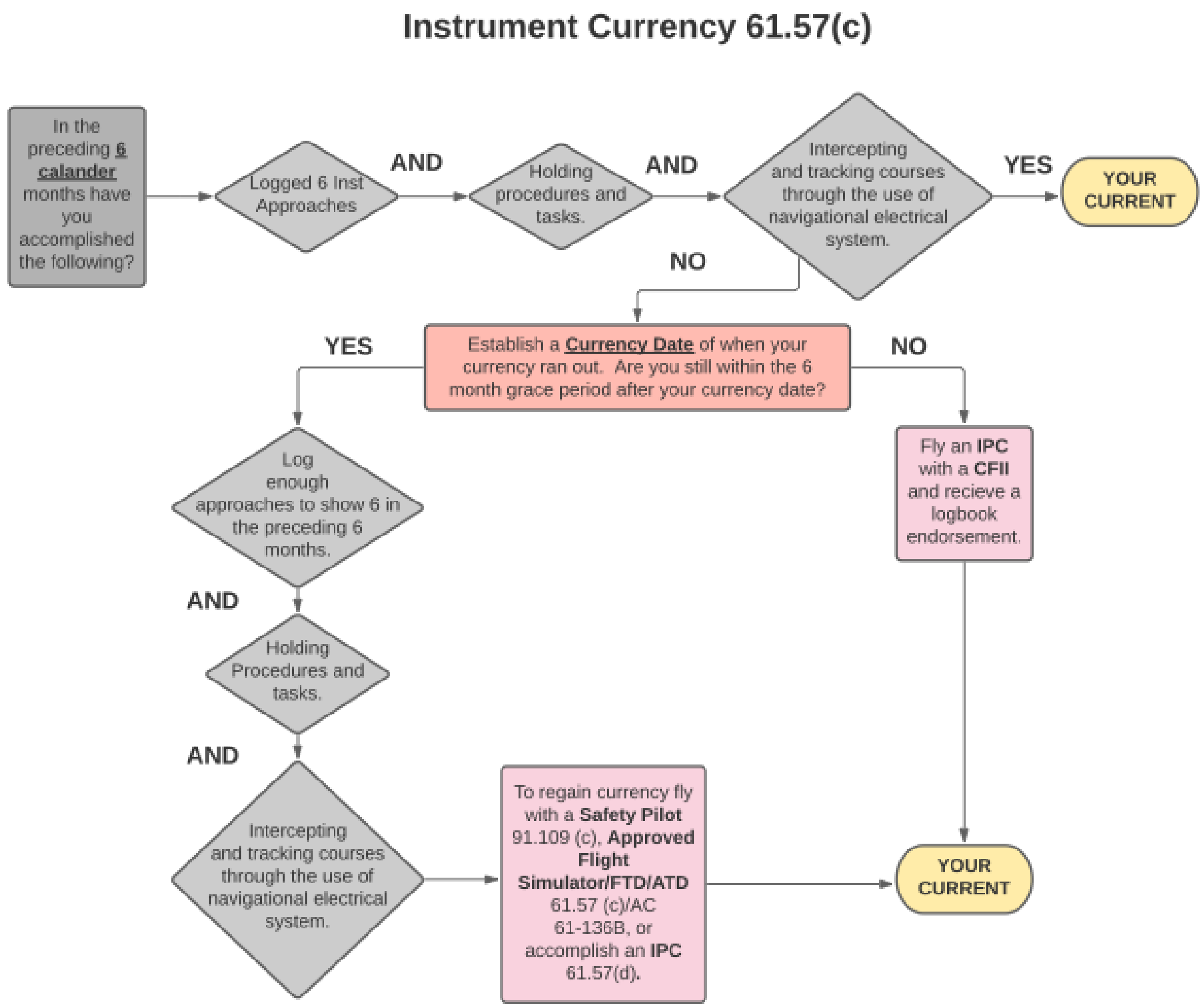
Execution
- Stabilized approach descent (flaps 0°).
- Establish a medium banked turn.
- Smoothly apply excessive rudder pressure in the direction of the turn.
- As rudder pressure increases, opposite aileron will be necessary to correct for over-banking tendency.
- As rudder pressure increases, the nose slices down. Increase aft elevator pressure.
- At first indication of stall, recover – simultaneously reduce AOA, max power, and level wings
- *“Cruise Checklist”*

16. Flight Training Supplements

16a. Inoperative Equipment Flow Chart.



16b. Instrument Currency Flow Chart



16c. Prog Check Planning.

Use the following guidance below to best prepare for a private, instrument, or commercial 141 progress check with the check instructor.

1. Study the King Schools syllabus to understand what will be covered during the check flight and the standards that must be met in order to move to the next phase of training. This will cover both the ground and flight activities.
2. Have the online ground content completed through the phases leading up to the check.
3. Come prepared with the weather, flight planning, landing and takeoff performance, and weight and balance for the progress check flight.

Private Pilot

Phase 2 Progress Check

1 hour approx. Flight

Amplified flight items from syllabus*:

- Flight by visual references
- Understanding of pitch/power relationship
  - Changing airspeed in level flight
  - Constant airspeed / changing flight path descent
  - Constant flight path / changing airspeed descent
- Understanding of factors increasing angle of attack
- Wind awareness / tracking
- Glide and field selection

*Not expected to be able to land or handle all radio comm.

Phase 5 Progress Check

1.0 hours approx. Ground

1.0 hours approx. Flight

Knowledge Items (if Pre-Solo exam done):

- Emergency Procedures (perfect from memory)
  - Fires
  - Engine Failure
  - Spin Recovery
- Aerodynamics
  - Stalls
  - Spin recovery
- Takeoff performance / abort point
- Mixture operation for performance
- Ignition or other system(s)
- Anything from Pre-Solo exam if not done

Amplified flight items from syllabus:

- Flight on backside of power curve
  - Airspeed – stall warn to MCA
  - Turns at various bank angles
  - Climbs/descents with/without power
- Realistic stall situations and recoveries (minimum 2)
  - Approach / Departure
  - Without excessive nose-high attitudes
  - Straight and turning
  - Accelerated
  - Nose-low attitude
- Emergency / Abnormal (minimum 1)
  - Engine fail
  - Fire
  - Partial power loss

Phase 7 Progress Check.

1.5-2.0 hours approx. Ground

1.5 hours approx. Flight

Flight Plan and Navlog for **KLNK to KGRI.**

Knowledge Items:

- ADM / Risk Management
  - Identify Issues, Risks, Hazards
  - Mitigate risks, hazards
- Flight planning
- Weather
- Airspace
- VFR Sectional
- Airport diagrams
- Airport lighting, signs, and markings
- Runway incursion avoidance
- 91.213
- Lost Comms
- Lost procedures

Flight items as stated in syllabus

Phase 10 Final Progress Check.

2 hours approx. Ground

1.5-2.0 hours approx. Flight

Flight plan and Navlog for **KLNK to KFSD with stop in KODX.** Pick up a passenger and bags in KODX.

Knowledge Items:

- See syllabus / ACS

Flight Items:

- See syllabus / ACS

Instrument Rating

Phase 2 Progress Check.

½-1 hour approx. Ground

1 hour approx. Flight

Knowledge Items:

- Pitot-Static Instruments

- How they work
- Blockages / indications
- Inspections
- Gyroscopic Instruments
  - How they work
  - Problems / indications
- Compass errors

Flight items:

- Oscar Pattern used to accomplish most syllabus items

Phase 4 Progress Check.
½-1 hour approx. Ground
1 hour approx. Flight
Knowledge Items:

- Required equipment
- VOR checks
- VOR service volumes
- GPS RAIM / WAAS
- Hold entries / procedures

Flight Items:

- Arc, Precision or Non-Precision Descent Profile with Hold used to accomplish most syllabus items

Phase 6 Progress Check.
1 hour approx. Ground
1.5 hour approx. Flight
Knowledge Items:

- Takeoff minimums
- SID, ODP, STAR
- Approach plates
- Types of approaches MDA vs. DA
- Descent below DA, MDA – 91.175
- Circle to land procedure, distances, speeds
- Missed approach procedures
- Approach/runway lighting
- VOR/DME/ILS/GPS operations
- IFR currency requirements

Flight Items:

- Local approaches used to accomplish syllabus items.
- Circling approach with missed approach if able

Phase 8 Final Progress Check.
2 hours approx. Ground
2 hours approx. Flight
Flight plan and navlog for **KLNK to KANW.**
Knowledge Items:

- Low altitude enroute charts
- Alternate requirements / minimums
- Flight planning / preferred IFR routes
- Weather briefing
- Weather hazards
- Obtaining a clearance
- ATC required reports
- Lost Communications
- Equipment/system malfunctions

Flight Items in addition to syllabus:

- Depart on planned X-C flight
- Amended clearance
- Diversion
  - System/equipment malfunction
  - Weather hazard
- Approach and landing at diversion airport
- Receive new clearance to return to Lincoln

Commercial Pilot

Phase 2 Progress Check.
1.5 hours approx. Flight (ATD)
Flight plan and nav log for KAPV to KBUR.
Knowledge Items: N/A
Flight Items:

- As in syllabus
- Takeoffs and Landings – N/A in ATD

Phase 3 Progress Check.
2 hours approx. Ground
1.5 hours approx. Flight (ATD)
Flight plan and navlog for KSNA to L35 and KPSP
1 Passenger with bags to L35
1 Passenger with bags to KPSP
Knowledge Items:

- Identify, assess, and mitigate risks encompassing:
  - PAVE (or something similar)
  - Limitations of ATC services
  - Improper fuel planning
- Cross Country flight planning
  - Route planning, altitude selection, navigation
  - NOTAM
  - Special Use Airspace
  - TFR
  - Performance, Weight and Balance
    - Possible differences between calculated performance and actual performance
    - Density altitude considerations
  - Weather information including in-flight weather resources

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        - Factors involved in making the go/no-go and continue/divert decisions
        - Personal weather minimums
        - Limitations of onboard or inflight weather resources
    - Meteorology applicable to the departure, enroute, alternate, and destination
        - Fronts, stability, precipitation, clouds, turbulence, weather hazards, etc.
    - Procedures for activating and closing a VFR flight plan
    - Lost procedures
- Airspace
    - Symbology
    - Basic VFR weather minimums
    - Communication and equipment requirements
    - Special VFR
- Unfamiliar airports and runway incursion avoidance
    - Chart supplement, airport diagram
    - Airport, runway, and taxiway signs, markings, and lighting
    - Radio communications, clearances, and loss of communication

<u>Phase 5 Progress Check</u>
1 hour approx. Ground
1.5 hours approx. Flight
Knowledge Items:

- Airworthiness Requirements (part 1)
    - Certificate location and expiration dates
    - Required inspections and airplane logbook documentation
    - Equipment requirements for day and night VFR
    - Kinds of Operation Equipment List (KOEL)
    - Flying with inoperative equipment
    - Identify, assess, and mitigate risks associated with inoperative equipment
- Performance and limitations
    - Explain the use of charts, tables, and data to determine performance
    - Factors affecting performance
        - Atmospheric conditions, technique, configuration, loading, etc.
    - Risks of exceeding airplane limitations
    - Possible differences between calculated performance and actual performance
- Operation of systems including, but not limited to:
    - Landing gear
    - Propeller
    - Auto pilot
    - Electrical
    - Avionics
    - Any other system specific to the airplane
- System and equipment malfunctions
    - Partial or complete power loss
    - Indications of and procedures for managing system abnormalities or failures
    - Risks of failing to detect malfunctions and/or improper management of a system failure
    - Risks associated with distraction or loss of situational awareness
    - Risks of failing to monitor and manage automated systems
- Emergency procedures
    - Situations that require an emergency descent
        - Immediate action items and procedures
        - Airspeed, to include airspeed limitations
    - Engine failure
        - Immediate action items and procedures
        - Best glide and its relationship to weight
        - Best glide and its relationship to distance
        - Difference between best glide speed and minimum sink speed
        - Effects of wind on glide distance
    - Fires
- Aerodynamics associated with steep turns, chandelles, lazy 8's, 8's on Pylons, stalls/spins

<u>Phase 8 Final Progress Check</u>
2 hours approx. Ground
1.5-2 hours approx. Flight
Flight plan and nav log KLNK to KPUB with stop in KHUT to pick up passenger and bags
Knowledge Items:

- Airworthiness Requirements (part 2)
    - Airworthiness Directives
    - Special Airworthiness Information Bulletin
    - Type Certificate and Supplemental Type Certificate
    - Special Flight Permit

    - Using an approved Minimum Equipment List
    - Required discrepancy records or placards
    - Pilot performed preventative maintenance
- Certificates and Documents (Pilot Qualifications)
    - Requirements for certification
    - Recent flight experience and record keeping
    - Medical certificates: class, expiration, privileges, temporary disqualifications, Basic Med
    - Documents required to exercise commercial pilot privileges
    - Identify, assess, and mitigate risks of flying unfamiliar aircraft or avionics
- Commercial pilot privileges / limitations (FAR 61, 91, 119.1, AC120-12)
    - Privileges and limitations
    - Common carriage and "holding out'
- Human factors
    - Symptoms, recognition, causes, effects, and corrective actions
        - Hyperventilation, middle ear and sinus problems, motion sickness
        - Carbon monoxide, stress, fatigue, dehydration, hypothermia, dissolved nitrogen in blood
    - Optical illusions
    - Spatial disorientation
    - Alcohol, drugs, and over the counter meds – regulations and effects
    - Identify, assess, and mitigate risks associated with hazardous attitudes
- High altitude operations
    - Regulatory requirements for supplemental oxygen use
    - Physiological factors to include impairment, hypoxia, and time of useful consciousness
    - Fundamental concepts of airplane pressurization system, including failures

17. CFI

17a. Flight Review, Annual Checkout, Initial Checkout, 90 Day currency Overview

There are 5 major “check” flights that we provide for Ignite Flight customers. **The flight review and IPC are required by the FAA and further guidance can be found in Advisory Circular 61-98d.** The Initial aircraft checkout, annual aircraft checkout, and 90 day currency are Ignite Flight requirements. Again, the 5 “check” flights are:

- Flight Review
- Initial Aircraft Checkout
- Annual Aircraft Checkout
- 90 Day Currency
- IPC

Ignite Flight Checkout Guide

This guide on the following pages will cover everything that must be accomplished for ALL flight checks. In addition, this guide will have ground discussions that flow from the personal minimums checklist or PAVE, and suggested flight activities come from the areas of operation from the ACS/PTS.

All **BOLD** faced items are mandatory topics to be covered for each flight check, with the exception of the 90 day currency check (only 3 takeoffs and landings).

17b. Flight Review

The flight review per 61.56 consists of a **minimum** of 1 hour of flight training and 1 hour of ground training. It also consists of a review of Part 91 flight rules and a review of maneuvers that are necessary for the CFI to determine the safe exercise of the privileges of his/her pilot certificate.

Again, the flight review is a minimum of 1 hour of flight training and a minimum of 1 hour ground training. There will be reviews that a customer/student will not fly to PTS/ACS standards. In this case it is not a failure of a flight review. It can be logged as a normal flight and an invitation to return for an additional flight to clean up deficiencies or weak areas. For some customers who have not flown in many years there should be multiple flights before the final flight review endorsement is given.

Good practice for a flight review is understand the pilots past flying history and what knowledge and experience they have. In addition, ask them what they would like to accomplish on the review. This should help ease the customer and help them try and reach out of their comfort zone.

The Ignite Flight Checkout Guide will assist the CFI in building a plan of action to complete the flight review both for ground and through suggested flight activities. Not all items must be completed to finish a flight review.

CFI Flight Review Flow

- Oral discussion over the Ignite Flight Checkout Worksheet and make sure it’s complete.
- Oral discussion of ground Bold faced items and test the customer on selected other topics.
- Integrate the customers’ requests in the Plan of Action for flight.
- Fly at a minimum the Bold-faced flight activities and add more as necessary.

17c. Initial/Annual Aircraft Checkout

The CFI can use the checkout guide as guidance for both the initial and annual aircraft checkout. This is a Ignite Flight requirement not a FAA requirement.

CFI Initial/Annual Aircraft Checkout Flow

- Oral discussion over the Ignite Flight Checkout Worksheet and make sure it's complete.
- Oral discussion of ground Bold Faced items.
- Fly at a minimum the Bold faced items from the guide.

17d. 90 Day Currency

Once a customer has passed 90 days without flying they will complete a 90 day currency checkout. This will ensure their landing currency and give them more exposure/experience in the aircraft.

90 Day Currency Flow

- Oral discussion over the Ignite Flight Checkout Worksheet and make sure it's complete.
- Oral discussion of ground Bold faced items.
- 3 Takeoff and Landings at KLNK.

17e. Instrument Proficiency Check

The IPC will need to be accomplished once the customer has lapsed on their instrument currency or anytime at their request. The guide can also direct the CFI what activities are required to complete the IPC. There are specific Bold faced IPC requirements listed at the bottom of the form in the suggested flight activities.

CFI IPC Flow

- Oral discussion over the Ignite Flight Checkout Worksheet and make sure it's complete.
- Oral Discussion of ground Bold faced items. Although not required additional ground may be covered.
- Complete the IPC Bold flight activities.

17f. Cross Country VFR Flight Plans

Cross-country training flights, solo and dual, conducted under VFR and greater than 25nm from Lincoln will have a flight plan filed and opened whether or not flight following is used. An exception would be a flight to an airport greater than 25nm, but still within the sector of the Omaha Approach control designated for the Lincoln Class C airspace (124.00).

18. Revision Page

Original 2/1/2023