

Private Pilot Airplane Single-Engine, Lesson Plan Outline

Lou Dietz, March 2021

Note: "Lessons" will often consist of multiple ground and/or flight sessions.

Stage I: Pre-Solo

Introductory Flight, Preflight, Taxiing and Post-flight Procedures

Four Fundamentals of Flight

Airport Operations (Ground and Tower Communications, Ground Ops, Light Gun Signals)

Performance Maneuvers - Steep Turns

Maneuvering During Slow Flight

Power-On and Power-Off Stalls

Normal and Crosswind Takeoffs and Climbs

Performance Maneuvers – Ground Reference Maneuvers

Flying the Traffic Pattern

Normal and Crosswind Approaches and Landings

Go-Arounds and Rejected Landings

Spin Awareness and Spin Recovery

Forward Slips to Landing

Navigation Charts and National Airspace System

Short- and Soft-Field Takeoffs and Landings, Wheel Landings (tailwheel only)

Non-towered Airport Operations

Emergency Approaches and Landings

(Pre-Solo Quiz and Solo Phase Check; Local Solo Flights)

Stage II: Navigation and Cross-Country Flight

Navigation Systems, including Radar Services

Aircraft Performance including Weight and Balance

Weather Information and Cross-Country Flight Planning

Pilotage and Dead Reckoning

Lost Procedures, and Diversion to Alternates

Emergency Flight by Reference to Instruments: Four Fundamentals

Emergency Flight by Reference to Instruments: Recovery from Unusual Flight Attitudes

(Cross Country Phase Check and Solo Cross Countries)

Stage III: Night Flying and Checkride Preparation

Night Operations and Night Cross Country

Emergency Operations

Review and Checkride Preparation

(Private pilot Quiz and Private Pilot Phase Check)

Appendices:

Appendix A – List of References

Appendix B – Part 61 Training Requirements

Appendix C – Outline of ACS for reference

Appendix D – Minimum Equipment Requirements (FAR Part 91)

Stage I: Pre-Solo

Introductory Flight, Preflight, Taxiing and Post-flight Procedures

Objective: Develop skills associated with preparing for safe flight, including preflight inspection, engine starting, taxiing, before takeoff check, tie-down and securing aircraft.

References: POH, ACS II and XII, WVFC member regulations, AFH Ch. 1-3, PHAK Ch 3-8

Schedule: Ground 1 hour, Flight 1 hour

Lesson Elements:

1. Preflight:
 - a. Preflight the pilot also! - IMSAFE checklist (Illness, Medication, Stress, Alcohol, Fatigue, Emotion)
 - b. Weather and TFRs (temporary flight restrictions)
 - c. Walk-around Inspection, use of checklists
 - d. Fuel sampling and fuel level
 - e. Introduction to Weight and Balance
 - f. Required documents on board – AROW
 - g. Cockpit organization
 - h. Tuning radio, receiving and recording ATIS
 - i. Engine start, including use of primer and propeller safety
2. Taxiing procedure
 - a. Airport and taxiway familiarization (See Lesson 3)
 - b. Stick full aft
 - c. Position of controls relative to wind while taxiing
 - d. Minimum use of brakes
3. Before takeoff check
 - a. CIGARS acronym
 - b. Confirm with checklist
4. Postflight Procedures
 - a. Tie-down technique
 - b. Securing aircraft
 - c. Documenting flight time and squawks/observations
5. Common Errors
 - a. Forgetting checklist items
 - b. Too much use of brakes! Dragging brakes while taxiing.
 - c. While taxiing, not reducing power before braking.
 - d. Taxiing too fast, or carrying too much power while taxiing

- e. Incorrect position of controls relative to wind

Completion Standards: Client must become proficient at preflight inspection, engine start, safe taxiing techniques, before takeoff check, and post-flight procedures.

Four Fundamentals of Flight

Objective: To become proficient at S&L flight, turns, climbs, and descents, controlling the airplane's attitude by visual reference to the horizon.

References: AFH Ch 3, PHAK Ch 1-8

Schedule: Ground 1 hour, flight 1.5 hours

Lesson Elements:

1. Straight and Level
 - a. Scanning for traffic!
 - b. Visual horizon to maintain direction and pitch attitude
 - c. Wingtip reference for level flight
 - d. Periodic cross-check of altimeter (not too often)
 - e. Use of trim
2. Climbs
 - a. To initiate climb: Power – pitch – trim
 - b. Pitch attitudes for climb at V_y and V_x
 - c. Use of trim
3. Descents
 - a. To initiate descent - Pitch – power – trim
 - b. Pitch attitude for cruise descent and pattern descent
 - c. Trim for desired descent rate or speed
4. Turns
 - a. Check for traffic (high wing plane - lift wing slightly before banking)
 - b. Adverse yaw
 - c. Rudder coordination, slips, skids, the ball
 - d. Use of rudder to initiate and exit turn (cancel out adverse yaw)
 - e. Load factor, aft pressure to maintain altitude
5. Common errors
 - a. Forgetting to scan for traffic
 - b. Overcontrolling – use pressure, not movement, of controls
 - c. Chasing the instruments – looking at the instruments too often
 - d. Too firm grip on controls – relax, use fingertip pressure
 - e. Lack of rudder coordination

Completion Standards: Client must demonstrate ability to use external visual references to maintain appropriate pitch and bank attitudes, with occasional cross-check of aircraft instruments. Client must develop habit of visual scanning for traffic, and check for traffic before maneuvers. (ACS standards: +/- 10 knots, +/- 10 degrees, +/- 100 feet)

Airport Operations (Ground and Tower Communications, Ground Ops, Light Gun Signals)

Objective: To understand airport operations, including communications, traffic patterns, and light gun signals

References: ACS Sec III, AFH Ch. 2, PHAK Ch 14, Southwest Chart Supplement, AIM Ch 2, Handouts (following pages) for KPAO taxiways, Chart Supplements page, common radio calls, and light gun signals

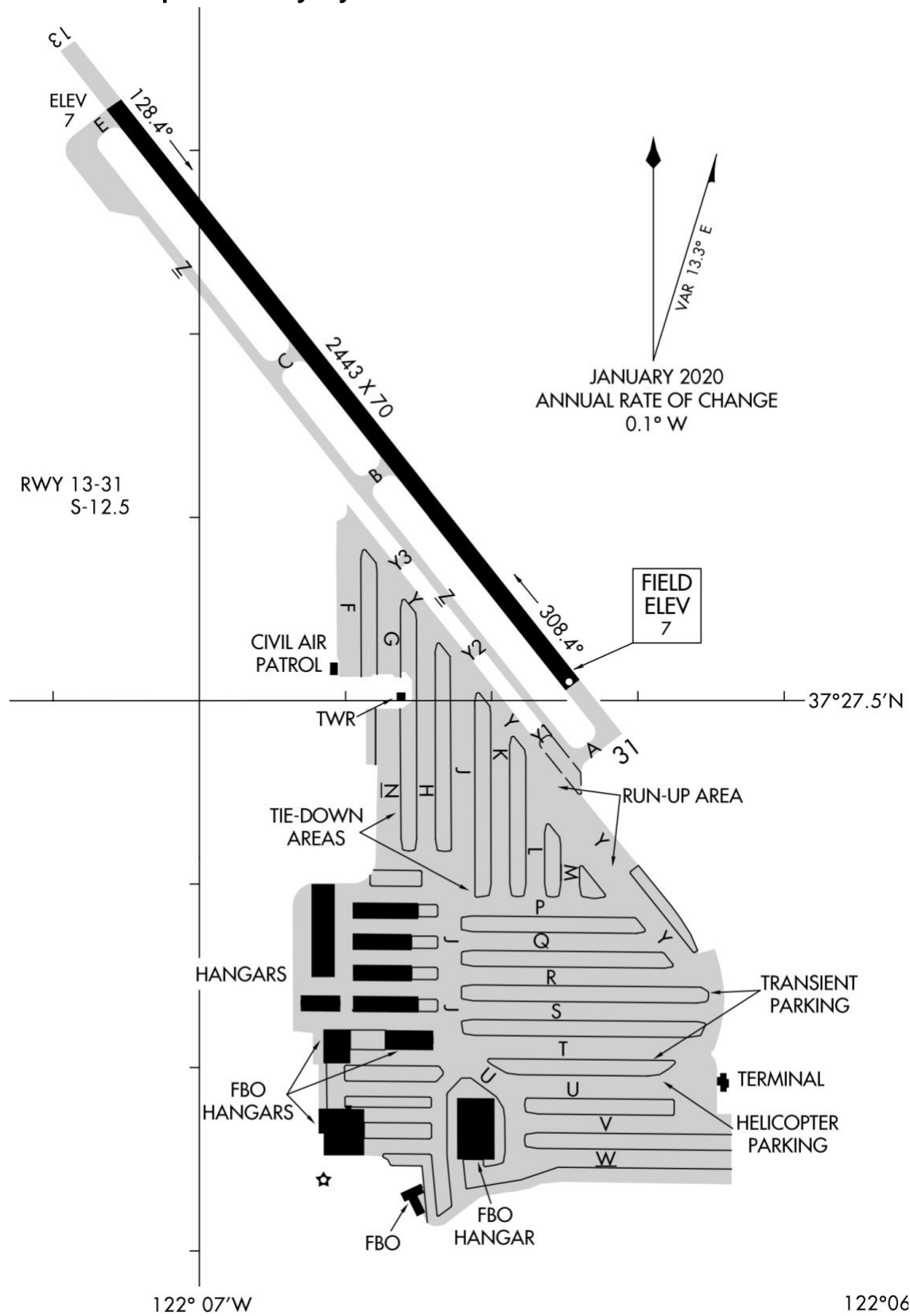
Schedule: Ground 1.5 hours

Lesson Elements:

1. Radio communications
 - a. Frequencies to memorize for Palo Alto: ATIS 135.275, Ground 125.0, Tower 118.6, Emergency 121.5
 - b. Format for all radio calls: WHO you're calling, WHO you are, WHERE you are, WHAT you want
 - c. Required Read-backs: Runway #, taxi instructions, hold short, line-up-and-wait, cleared-for-takeoff, cleared-to-land, etc. If in doubt, re
 - d. After tuning a frequency, PAUSE before talking to make sure you are not stepping on a conversation
 - e. Mentally rehearse what you will say before keying the mic. If in doubt, ask for clarification or request "say again"
 - f. Stuck microphones – how to detect, how to respond
2. Radio communications practice: listen to KPAO tower on handheld radio, or online at www.liveatc.net (KPAO tower or KSQL tower and ground, for example).
3. Phonetic Alphabet
 - a. Memorize them! Alpha thru Zulu
 - b. Special number pronunciations: "Tree" and "Niner"
4. Light Gun Signals
 - a. Debugging common radio issues
 - b. Study and memorize the signals
 - c. Also, put copy onto your kneeboard (people forget in the stress of the moment!)
5. Common Errors
 - a. Poor radio "etiquette", stepping on others, getting tongue-tied
 - b. Not reading back the required information
 - c. Not scanning for traffic, or keeping traffic to follow in sight

Completion Standards: Client must demonstrate good radio communications and etiquette as specified in the AIM, understand the Palo Alto airport ground and pattern environment, and how to use light signals in case of radio/electrical failure.

Palo Alto Airport taxiway layout:



Palo Alto Chart Supplement Page:

PALO ALTO (PAO)(KPAO) 0 E UTC-8(-7DT) N37°27.67' W122°06.90'

7 B TPA—See Remarks NOTAM FILE PAO

RWY 13-31: H2443X70 (ASPH) S-12.5 MIRL

RWY 13: REIL. PAPI(P2L)—GA 4.0° TCH 29'. Berm.

RWY 31: REIL. PAPI(P2L)—GA 4.0° TCH 29'. Berm. Rgt tfc.

SERVICE: S4 **FUEL** 100LL, JET A **OX** 4 **LGT** Arpt lgts opr continuously when twr clsd.

AIRPORT REMARKS: Attended Mon-Sun 1500-0500Z†. Arpt rstd by arpt operator to acft with maximum certificated weight of 12,500 lbs or less. Self-fueling avbl continuously. P-line SE. Birds on and in vicinity of arpt. +100' transmission towers east of arpt. Be alert for pedestrians crossing a dike road 8' high and 300' from end Rwy 13. Continuous pedestrian, vehicle activity on acft taxi lanes not designated as twy movement areas. Noise sensitive area southeast thru west of arpt. Recommend acft ldg at Palo Alto Arpt fly at or above 1500' until crossing the Bayshore Freeway. Recommend acft depart Rwy 31 turn 10° right after tkf until reaching Dumbarton Auto Bridge. On apch to Rwy 31 be alert to possible strong updraft from wind tunnel located on west side of Moffett Federal Airfield. TPA—1007(1000) west, and 807(800) east. Arpt security procedures in effect.

AIRPORT MANAGER: (650) 329-2444

WEATHER DATA SOURCES: LAWRS.

COMMUNICATIONS: CTAF 118.6 ATIS 135.275 650-858-0606 **UNICOM** 122.95

Ⓡ **NORCAL APP CON** 121.3 133.95 134.5

TOWER 118.6 (1500-0500Z†) **GND CON** 125.0

Ⓡ **NORCAL DEP CON** 121.3

AIRSPACE: CLASS D svc 1500-0500Z† other times CLASS G.

RADIO AIDS TO NAVIGATION: NOTAM FILE OAK.

WOODSIDE (H) VOR/DME 113.9 OSI Chan 86 N37°23.55' W122°16.88' 046° 8.9 NM to fld. 2270/17E.

VOR unusable:

225°-305° byd 20 NM blo 9,000'

330°-350° blo 11,000'

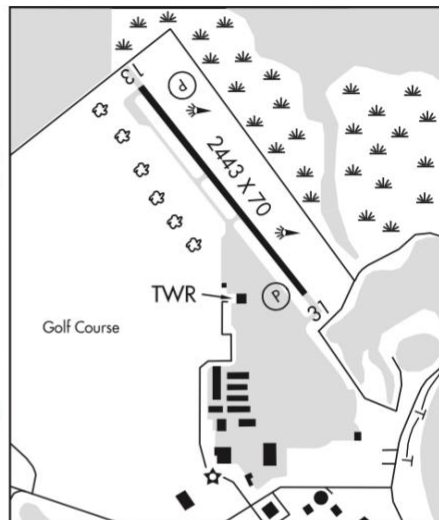
DME unusable:

160°-350° blo 11,000'

190°-230° byd 20 NM blo 13,000'

230°-350° byd 20 NM

COMM/NAV/WEATHER REMARKS: Emerg frequency 121.5 not avbl at tower. For clnc del when twr clsd ctc Norcal apch at 916-361-3748.



SAN FRANCISCO

L-2F, 3B, A







IAP, AD

Example Radio Calls for Palo Alto operations:

1. Don't forget to listen to ATIS prior to first call (before taxi, or before calling tower upon return to airport).
2. Ready to taxi for runway 31 for pattern work:
 - a. "Palo Alto Ground, Citabria Three-Seven-Four-Delta-Mike, parked West Valley, taxi Three-One with November, closed traffic".
 - b. Reply will be similar to: "Citabria Three-Seven-Four-Delta-Mike, taxi Three-One via hangar side, Juliet, Papa, Yankee, Yankee One, Zulu, Advise Ground when runup complete."
 - c. Readback: "Four Delta Mike, runway Three One via Juliet, Papa, Yankee, Yankee One, Zulu".
3. Ready to taxi for runway 13
 - a. "Palo Alto Ground, Citabria Five-Niner-Six-Juliet-Romeo, parked West Valley, taxi One Three with November, Left 270 Overhead departure".
 - b. Reply will be similar to: "Citabria Five-Niner-Six-Juliet-Romeo, taxi runway One-Three via Hangar Side, Juliet, Yankee, Yankee Three, Zulu, hold short Yankee Three".
 - c. Readback: "Six Juliet Romeo, runway runway One-Three via Hangar Side, Juliet, Yankee, Yankee Three, Zulu, hold short Yankee Three".
4. After runup, ready for takeoff:
 - a. "Ground, Citabria Six-Juliet-Romeo, Runup Complete"
 - b. Ground replies: "Citabria Six Juliet Romeo, hold short Yankee One, contact Tower". Readback: "Six Juliet Romeo, hold short Yankee One, contact Tower"
 - c. Contact tower for takeoff clearance: "Palo Alto Tower, Citabria Five-Niner-Six-Juliet-Romeo, Ready for takeoff". Expect to hear: "Citabria Five-Niner-Six-Juliet-Romeo, Palo Alto Tower, hold short Runway Three-One". Readback: "Tower, Citabria Six-Juliet-Romeo, holding short Three-One". And then maybe something like: "Citabria Six-Juliet-Romeo, cleared for takeoff runway Three One, left Dumbarton Departure, follow Cessna on upwind". Readback: "Six-Juliet-Romeo, cleared for takeoff Three-One, left Dumbarton Departure, following Cessna".
5. Initial call when returning for landing:
 - a. "Palo Alto Tower, Citabria Five-Niner-Six-Juliet-Romeo, SLAC, inbound with Bravo"
 - b. Expect reply: "Citabria Five-Niner-Six-Juliet-Romeo, Palo Alto Tower, make left traffic runway Three One, traffic departing Palo Alto to the south climbing through 2000"
 - c. Readback: "Six Juliet Romeo, left traffic Three One, looking for traffic"

6. Arriving on downwind:
 - a. Expect to hear something like: "Citabria Six Juliet Romeo, cleared to land runway Three-One, #2, follow Cessna on 1-mile final".
 - b. Readback: "Six Juliet Romeo, cleared to land Three-One, #2, traffic in sight" (or "looking for traffic" if you don't yet have your traffic in sight).
7. While flying the traffic pattern, if you don't know your landing sequence:
 - a. "Tower, Citabria Six-Juliet-Romeo, what's our sequence?"
 - b. Expect reply such as: "Six-Juliet-Romeo, extend downwind, following Cirrus on Four mile final over Moffat, I'll call your base" (In this case, stay on downwind until Tower asks you to turn base).
8. After landing, taxi clearance back to parking, after switching to ground frequency (or sometimes on tower, if only one controller is working):
 - a. "Palo Alto Ground, Citabria Five-Niner-Six-Juliet-Romeo, on Zulu, taxi West Valley parking."
 - b. Expect reply: "Six Juliet Romeo, PA Ground, taxi to parking via Zulu, Yankee2, suggest Juliet, hangar side".
 - c. Readback: "Six Juliet Romeo, taxi Zulu, Yankee2, Juliet, hangar side".

Light Gun Signals:

ATC Light Signals		
GROUND	SIGNAL	AIR
Cleared for Takeoff		Cleared to Land
Cleared to Taxi		Return for Landing
STOP		Give Way Continue Circling
Taxi Clear of Runway		Airport Unsafe DO NOT LAND
Return to Starting Point on Airport		Not Applicable
Exercise EXTREME CAUTION		Exercise EXTREME CAUTION

Performance Maneuvers - Steep Turns

Objective: Develop knowledge of the aerodynamics of steep turns, including load factor and effect on stall speed. Develop risk management and skills associated with steep turns.

References: ACS Sec V-A, AFH Ch 9

Schedule: Ground 0.5 hours, Flight 1.0 hours

Lesson Elements:

1. Aerodynamics of steep turns
 - a. Adverse yaw and rudder usage to compensate for it.
 - b. Rudder usage during turn entry, steady turn, and turn exit.
 - c. Over-banking tendency – possibly causing crossed controls during turn
 - d. Load factor (g force) varies with bank angle (reciprocal of cosine of bank angle)
 - e. Stall speed varies with square root of load factor
 - f. Most light aircraft designed for 3.8 positive g max (corresponds to 75-

Bank Angle (degrees)	Load factor (g's)	Stall speed (example)
0	1	60
30	1.15	64
45	1.4	71
60	2.0	85
70	2.9	102

degree bank level turn!)

- g. Maneuvering speed V_a – define and discuss entry speed for steep turn
2. Flying the maneuver
 - a. Select area free of traffic and with emergency landing options.
 - b. Clear area and check for traffic (high wing plane - lift wing slightly before banking)
 - c. Configure for speed $\leq V_a$, fast enough to avoid stall at 60 degree bank ($1.4 \cdot V_s$)
 - d. Establish turn with 45 degree bank, add power as necessary to maintain airspeed
 - e. Use of rudder to initiate, maintain, and exit turn (cancel out adverse yaw)
 - f. Use of elevator aft pressure to maintain altitude +/- 100 feet (don't trim during turn)
 - g. Use outside reference of horizon to maintain bank and pitch, with occasional cross-check of altitude and airspeed.
 - h. May notice (subtle) opposite aileron during turn to prevent over-banking tendency.

- i. Roll out of turn on entry heading +/- 10 degrees.
 - j. Release back pressure and reduce power during rollout.
- 3. Common errors
 - a. Forgetting to scan for traffic or locating emergency field
 - b. Using airspeed greater than V_a .
 - c. Letting altitude or bank angle drift during turn
 - d. Lack of rudder coordination
 - e. Not adding power to maintain airspeed.
 - f. Rolling out on wrong heading.

Completion Standards: Client must demonstrate the ability to choose an appropriate location, select a safe entry speed, perform 360-degree turn in either direction with 45-degree bank angle, maintaining altitude and adding power to maintain airspeed. Tolerances: +/- 100 feet, +/- 10 knots, +/- 5 degrees bank, +/- 10 degrees heading on rollout.

Maneuvering During Slow Flight

Objective: Develop knowledge, risk management and skills associated with maneuvers during slow flight. Understand aerodynamics of slow flight, and develop ability to recognize and recover from impending stall.

References: ACS Sec VII, AFH Ch. 4, PHAK Ch. 5

Schedule: 1-hour ground, 1.5 hours flight

Lesson Elements:

1. What is slow flight? Why do we practice this?
 - a. Flight at high AOA, close to the stall, or stall warning
 - b. We experience this during takeoffs, landings, go-arounds
2. Aerodynamics of slow flight
 - a. Angle-of-Attack (AOA), airspeed, load factor, aircraft configuration, weight, and attitude.
 - b. The drag curve and power curve. Flying “behind the power curve”.
 - c. Stall warning devices
 - d. Difference between attitude and AOA
 - e. Environmental elements affecting aircraft performance
3. Slow flight maneuvering
 - a. Altitude limits (ACS calls for 1500’ minimum after recovery – too low!)
 - b. Select practice area, perform clearing turns
 - c. Reduce power, maintaining altitude while aircraft slows down, extend gear and flaps at appropriate speeds.
 - d. Reduce speed to ~5 knots above stall or stall-warning.
 - e. Add power as necessary to maintain altitude.
 - f. Maintain rudder coordination, adjust trim as necessary
 - g. S&L, turns, climbs, descents at various configurations (flaps and power).
 - h. Emphasize rudder coordination, and divide attention between aircraft control, traffic avoidance, and orientation.
 - i. Reestablish cruise flight: Full power, reduce pitch, hold altitude as plane accelerates, Set cruise power, trim.
4. Common Errors:
 - a. Poor rudder coordination, drifting off altitude, heading, etc.
 - b. Using excessive bank angle
 - c. Unintentional stall
 - d. Improper use of trim

Completion Standards: Client should be proficient at entering slow flight, maneuvering, and recovering. During slow flight maneuvers, maintain altitude ± 100 feet, heading ± 10 degrees, airspeed $+10/-0$ knots, bank angle ± 10 degrees.

Power-On and Power-Off Stalls

Objective: Develop knowledge, risk management and skills associated with power-on and power-off stalls.

References: ACS Sec VII-B and -C, AFH Ch 4, PHAK Ch 5, POH

Schedule: 0.5-hour ground, 1.0-hour flight, with practice on multiple flights

Lesson Elements:

1. Aerodynamics of stalls:
 - a. Stall occurs at critical angle of attack
 - b. Stall can occur at ANY airspeed, attitude, or power setting!
 - c. Discuss effect of gear, flaps, weight, CG, load factor, bank angle.
2. Situations where risk of stalls increase
 - a. Landing approach, especially skidding base to final turn
 - b. Climb-out, trying to clear an obstacle, especially at high density altitude
 - c. Emergency landing, power-off glide, trying to stretch the glide
 - d. Exceeding mass gross, CG out of limits
 - e. Ice or frost accumulation on wings
3. Stall recognition
 - a. Sight – high pitch attitude (not always)
 - b. Sound – reduced airflow, less wind noise
 - c. Feel - Mushy controls, less effective
4. Power-off stall procedure
 - a. Select practice area, check traffic, altitude 3000' AGL minimum
 - b. Establish stable descent in landing configuration at 1.3 V_{so} (gear, flaps, power, carb heat, etc.), straight or turning as requested
 - c. Use rudder to maintain coordinated flight (ball in center)
 - d. Gradual pitch up until stall occurs
 - e. Recovery:
 - i. Pitch down
 - ii. Full power
 - iii. Level wings (primarily rudder, ailerons also as airspeed increases)
 - iv. pitch up to establish climb at V_x
5. Power-on stall procedure
 - a. Select practice area, check traffic, altitude 3000' AGL minimum
 - b. Reduce power to slow down, maintaining altitude
 - c. Configure aircraft for take-off/climb configuration, straight or turning as requested
 - d. At V_x, add full power and pitch up for climb
 - e. Use rudder to maintain coordinated flight (ball in center)
 - f. Gradual pitch up until stall occurs

- g. Recovery:
 - i. Pitch down to break stall
 - ii. Level wings (aileron/rudder)
 - iii. pitch up to establish climb at V_x
- 6. Common Errors:
 - a. Not maintaining rudder coordination, causing wing to drop during stall, entering spin!
 - b. Delay in stall recovery, causing excessive altitude loss or spin entry
 - c. Secondary stall due to aggressive pitch up during recovery

Completion Standards: Client must be able to demonstrate power-off and power-on stalls, to ACS standards. Recovery no lower than 1500' AGL, maintain heading ± 10 degrees before stall, or specified bank angle ± 10 degrees, recognize stall and recover promptly with proper procedure.

Normal and Crosswind Takeoffs and Climbs

Objective: To understand and become proficient at the procedures used for normal takeoffs and climbs.

References: ACS Sec IV, AFH Ch 5, PHAK Ch 11, POH

Schedule: Ground 0.5 hour; airplane ~ 1 hour, practice every flight

Lesson Elements:

1. Takeoffs (no flaps used in most trainers)
 - a. Effect of wind and density altitude
 - b. Weather minimums
 - c. Takeoff distance from aircraft performance charts
 - d. Pre-takeoff checks, and traffic checks
 - e. Go/No-go location picked out ahead of time. Call out rotate and climb speeds. Recite emergency landing options.
 - f. Takeoff clearances: hold short, line-up-and-wait, cleared for takeoff
 - g. Taking the runway – Check for traffic, and “Lights, Camera, Action”
 - h. Setting controls for cross-wind
 - i. Feet off brakes, gentle power application, last check of instruments
 - j. Dancing on the rudder pedals to maintain directional control, right rudder as necessary to offset left-turning tendency (P-factor).
 - k. (Taildragger – may need aggressive stick/yoke forward to level pitch attitude, to keep airplane from lifting off too early)
 - l. Crosswind: transition from slide-slip to wings-level crab for climb
2. Normal Climbs
 - a. Climb out at V_y , set trim, correct for wind to maintain runway center line
 - b. No turns below 400' typically
 - c. Awareness of noise abatement rules/recommendations (at Palo Alto, turn right 10 degrees for climb out.)
3. Emergency Considerations
 - a. Plans for rejected takeoff. Reasons to reject: tailwheel or nosewheel shimmy, engine RPM, something “doesn’t feel right”, etc.
 - b. Emergency plans must be in mind BEFORE TAKEOFF.
 - c. Engine failure on upwind climb – LAND STRAIGHT AHEAD
4. Common Errors:
 - a. Ignoring crosswind
 - b. Drifting from centerline during takeoff roll
 - c. Drifting from centerline during climb out

Completion Standards: Client must demonstrate proficiency and safety for normal takeoffs and climbs, including pre-takeoff checks, traffic awareness, and emergency options.

Performance Maneuvers – Ground Reference Maneuvers

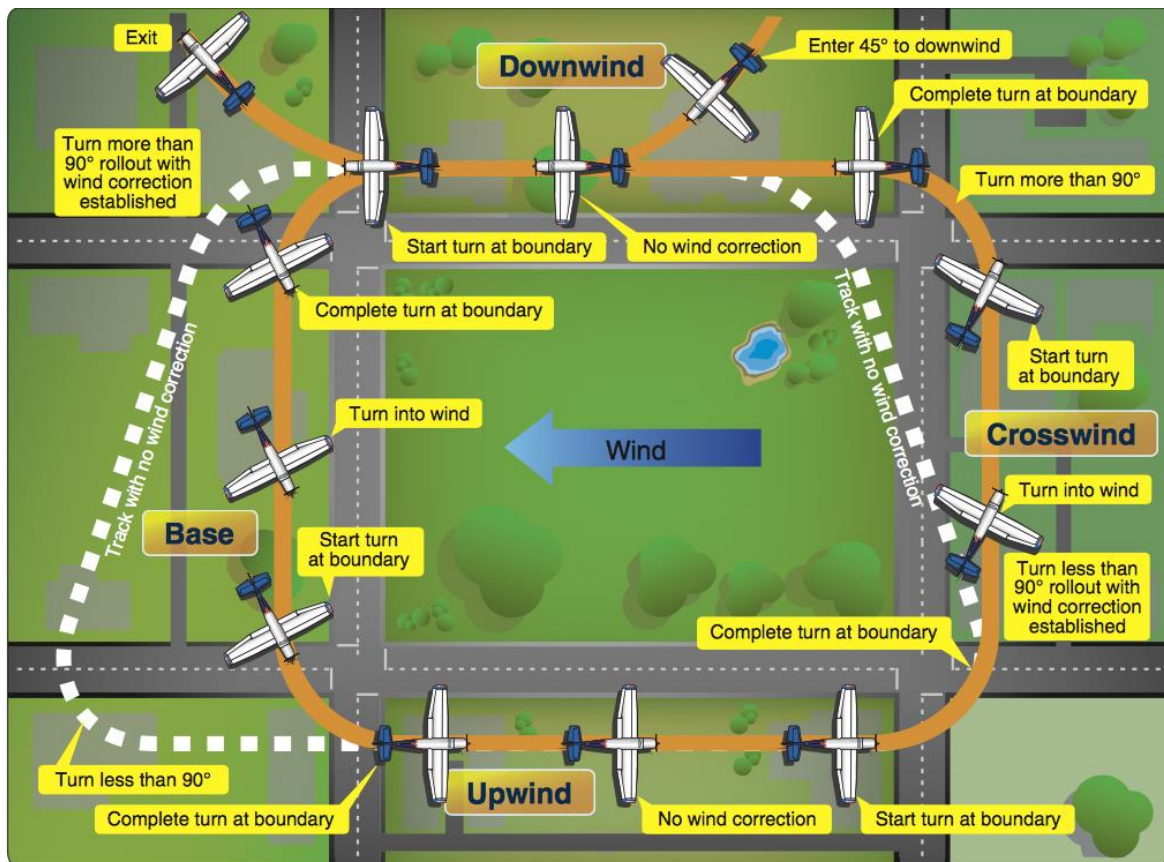
Objective: Develop risk management and skills associated with ground reference maneuvers, including rectangular patterns, S-turns and turns around a point.

References: ACS Sec V-B, AFH Ch 6

Schedule: Ground 1.0 hours, Flight 1.0 hours

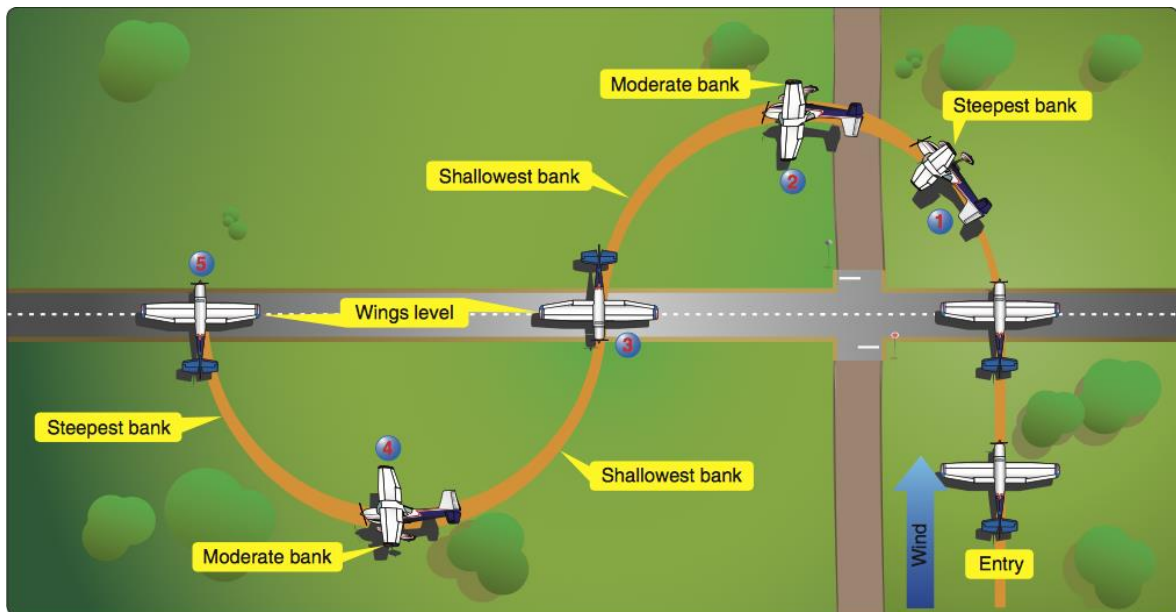
Lesson Elements:

1. Effects of wind during ground reference maneuvers
 - a. Effects of wind on ground track and crab angle
 - b. Effect of bank angle and groundspeed on rate and radius of turn (relative to ground)
2. Flying all the maneuvers:
 - a. Select location without excessive traffic, and with suitable emergency landing fields
 - b. Select safe altitude and appropriate airspeed for maneuver
 - c. Check for traffic in area before and between each maneuver
 - d. Divide attention between airplane control, traffic, and ground references
3. Rectangular course
 - a. Similarity to landing pattern
 - b. Enter on 45 degree to downwind (as with traffic pattern) at 600-1000 AGL



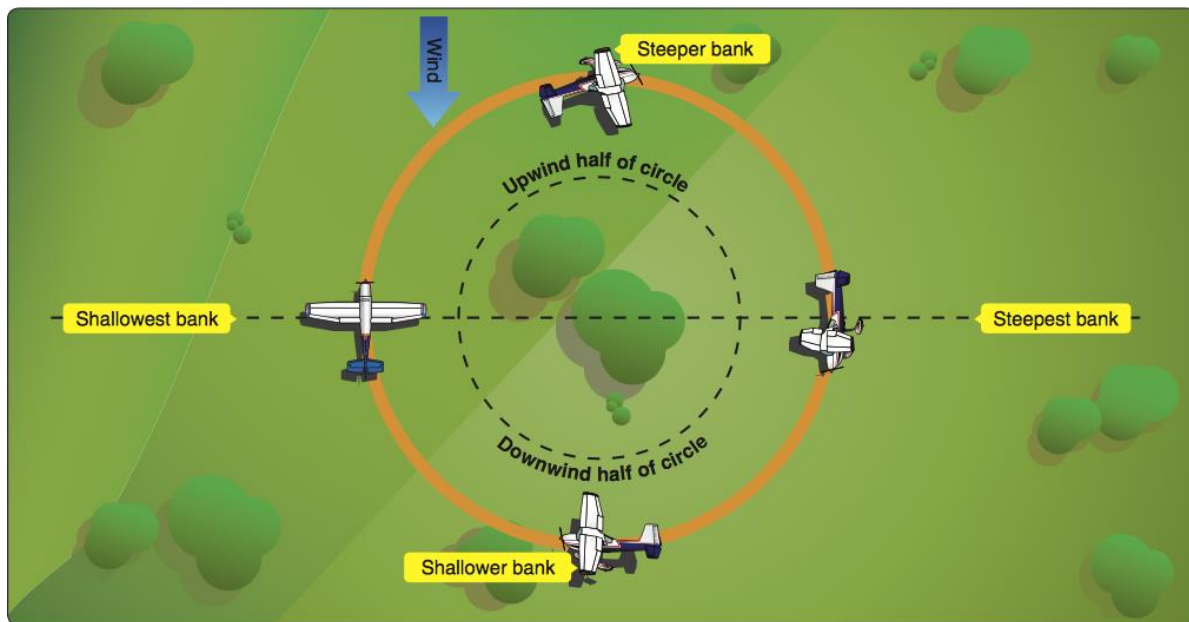
4. S-Turns

- a. Enter downwind, perpendicular to the selected reference line, 600-1000'



5. Turns around a point:

- a. Enter on the downwind, at an appropriate spacing from the reference point



6. Common errors

- a. Forgetting to check for traffic or to locate emergency field
- b. Failure to divide attention aircraft control, instrument check, ground references, traffic and situational awareness
- c. Improper correction for wind drift
- d. Lack of rudder coordination
- e. Failure to maintain altitude or airspeed throughout the maneuver

Completion Standards: Client must demonstrate the ability to choose an appropriate location, select a safe entry speed, and perform the maneuvers to ACS standards. Tolerances: +/- 100 feet, +/- 10 knots, +/- 5 degrees bank, +/- 10 degrees heading on rollout.

Flying the Traffic Pattern

Objective: Develop knowledge of airport traffic patterns (towered and non-towered), skill and judgment in approaching and departing various types of patterns, and good procedures while flying the pattern and approach to landing

References: ACS Sec III, AFH Ch 7, AIM 4-3

Schedule: 1-hour ground, 1.5 hours flight

Lesson Elements:

1. Review charted information on Sectionals, Chart Supplements, other information sources
2. Palo Alto traffic procedures (as example of airport with Control Tower)
 - a. Pattern altitude: 800' on east side, 1000' on west side
 - b. Approaching from west: maintain 1500' until crossing 101 freeway.
 - c. Standard Right Traffic for runway 31, turn right 10 degrees after departure for noise abatement
 - d. Common departures: Left and Right Dumbarton, 270 overhead
 - e. Visual Reporting points for calling in to PAO: SLAC, Woodside VOR, Windy Hill, Leslie Salt, Coyote Hills, Sunol Pass, etc....
 - f. Flying the pattern – memorize power settings/airspeeds, use wind correction angle
3. Non-towered airports
 - a. CTAF and Unicom frequencies, radio usage at non-towered airports
 - b. Planning pattern entry (and use of tools like Foreflight)
 - c. Standard traffic patterns to the left, unless charts indicate Right traffic (See "RP 31" for KPAO on sectional.
 - d. Overhead entries, and standard 45-degree entry to traffic patterns
4. Other safety concerns:
 - a. Right of Way rules
 - b. Wake turbulence from helicopters, and heavy aircraft
 - c. Awareness of other operations, such as parachuting
5. Common Errors:
 - a. Lack of planning ahead, staying ahead of the airplane
 - b. Lack of situational awareness or awareness of other traffic
 - c. Improper radio usage, forgetting radio calls at non-tower airports

Completion Standards: Client must demonstrate proficiency at planning and flying traffic pattern approaches and departures, at towered and non-towered airports, complying with AIM recommended procedures, maintaining awareness of and proper spacing from other aircraft. Maintain traffic pattern altitude +/- 100 feet, and airspeed +/- 10 knots (or mph).

Normal and Crosswind Approaches and Landings

Objective: Develop knowledge, risk management and skills associated with normal approach and landing.

References: ACS Sec IV-B, AFH Ch. 8, POH

Schedule: 0.5 hours ground, multiple flights to practice as necessary

Lesson Elements:

1. Determining landing performance and limitations
2. Awareness of traffic, obstructions, hazards, wake turbulence
3. Importance of Stabilized Approach to landing
4. Downwind leg
 - a. Awareness of traffic
 - b. Power setting, configuration, airspeed for downwind
 - c. Complete pre-landing checklist
 - d. Cross-wind correction if necessary
 - e. Downwind abeam-the-numbers, start descent (traffic permitting)
5. Base leg
 - a. When to turn base?
 - b. Adjust configuration (flaps, speed, trim)
 - c. Evaluate altitude, distance, wind. Correct as necessary
6. Final approach
 - a. Coordinate turn to roll-out on runway centerline, establish cross-wind correction as needed
 - b. Set flaps, trim for final approach speed
 - c. Pitch for airspeed, power for altitude (use glidepath indicator if available). One hand on stick/yoke, other on throttle.
 - d. Maintain runway centerline
7. Roundout/Flare
 - a. Judge speed and altitude on short final
 - b. Use ailerons to maintain centerline, rudder to keep nose pointing down the runway, parallel to centerline (this is a "Side-Slip").
 - c. Usually start flare about one wing-span above runway
8. Touchdown
 - a. Smooth power reduction and pitch increase to level off just above runway at idle power
 - b. Hold off with increasing back pressure to touch down in full-stall attitude
9. Rollout
 - a. Maintain centerline with rudder
 - b. Deflect ailerons into the wind, gradually increasing to full deflection at taxi speed

- c. Gentle braking, especially with tailwheel!

10. Taxi

- a. Exit runway, completely beyond hold-short lines
- b. stop and complete after-landing checklist
- c. Contact ground frequency (unless staying with tower)

11. Common Errors:

- a. Getting “behind the airplane”, missing radio calls, missing traffic, etc.
- b. Forgetting checklists
- c. Non-stabilized approach
- d. Flaring too high or too low, bouncing, ballooning
- e. Poor directional control or drifting off centerline
- f. Excessive braking!

Completion Standards: Client must become proficient at flying stabilized approaches to landing, with smooth control application and safe touchdown and rollout in first third of runway length, with proper control application relative to crosswind.

Go-Arounds and Rejected Landings

Objective: Develop knowledge, risk management, and skills associated with go-around or rejected landing, with emphasis on landing conditions that may require a go-around.

References: ACS Sec IV N, AFH Ch 8, POH

Schedule: Ground 0.5, multiple flights to practice this maneuver frequently

Lesson Elements:

1. Situations requiring a go-around.
 - a. Be prepared constantly for go-around. Every landing is a potential go-around! Go-around sooner, rather than later. Don't let things get out of hand!
 - b. Too high to land in first third of runway
 - c. Traffic on runway, or instruction from tower to go-around
 - d. Unstable final approach
 - e. Possibility of wake turbulence
 - f. Wind-shear or gusty crosswind
 - g. Bounced landing, or balloon during flare.
2. Go-around procedure:
 - a. Full power (throttle and prop), smooth but rapid, carb heat off
 - b. Pitch to Vx or Vy climb attitude by visual reference to horizon
 - c. Immediately retract flaps to climb setting
 - d. Accelerate to Vx or Vy
 - e. Trim for Vx or Vy
 - f. Verify positive rate of climb, then retract gear
 - g. Set flaps for normal climb
 - h. Check cowl flaps open
 - i. Report go-around to tower (Aviate, Navigate, then Communicate)
 - j. Use take-off check-list
3. Common Errors:
 - a. Initiating go-around too late
 - b. Too slow power application, leaving carb heat on
 - c. Improper pitch attitude, causing touch down or porpoise
 - d. Lack of rudder usage to correct for P-factor and torque
 - e. Drifting from runway centerline (unless offsetting for conflicting traffic)
 - f. Forgetting checklist items (flaps, carb heat, cowl flaps)

Completion Standards: Client must demonstrate judgment about when to initiate go-around, and meet ACS skill standards. Maintain takeoff power and proper climb configuration at Vx or Vy, +10kt, -0 knots.

Spin Awareness and Spin Recovery

Objective: Develop knowledge, risk management and skills associated with spins, flight situations where unintentional spins may occur, and procedures for recovery from unintentional spins.

References: ACS Sec VII-D, AFH Ch 4, PHAK Ch 5, POH, AC 61-67C

Schedule: 0.5-hour ground, 1.0-hour flight

Lesson Elements:

1. Aerodynamics of spins
 - a. Spins are stalls, but with one wing “more stalled” than the other, causing rapid autorotation and descent. The nose may be pointing near the ground, but angle of attack is high, airspeed is slow, and descent rate is moderate.
 - b. At spin entry, trying to lift the down wing with aileron deepens the stall and accelerates the spin entry!
 - c. Relationship to CG – If CG is too far aft (e.g. aft of utility category limits) spin may not be recoverable!
2. What aircraft are approved for spins?
 - a. Check POH. Some airplanes are approved for spins in utility category (e.g. C152, C172, Citabria) but many are not.
 - b. Normal category airplanes are tested to recover from 1-turn spin only. Any spin further than 1 turn may not be recoverable!
 - c. Note: Parachutes are NOT required for spin training. See Fitzpatrick-Spartan College interpretation from FAA Chief Counsel in Feb 2018.
3. Situations where unintentional spins may occur
 - a. The classic: Skidding base-to-final turn
 - b. Trying to stretch a power-off glide
 - c. Climb-out stall that develops into spin (lots of P-factor during takeoff climb)
 - d. Iced up airframe
4. Spin Recovery Procedure:
 - a. PARE - Power Off – Ailerons neutral – Rudder opposite rotation – Elevator stick/yoke forward briskly. Then, neutralize rudder and recover from dive.
5. Practicing Spins and Recoveries:
 - a. Before departure
 - i. Confirm aircraft W&B in utility/acrobatic category approved for spins
 - ii. Secure interior – no loose objects

- b. Discuss nervousness/anxiety about spins. They can be anxiety-inducing, but are very safe and controlled if procedure is followed!
 - c. Select altitude to recover above 3000', typically 4500' or above
 - d. Check traffic with clearing turns
 - e. Configure and perform power-off stall (no flaps), stick full aft
 - f. As stall breaks, add full rudder in desired direction of spin
 - g. Hold full aft elevator and full rudder for desired number of turns in spin
 - h. Recover with PARE procedure described above
 - i. Pull up from dive and add power to regain altitude as necessary.
6. Common Errors:
- a. Failure to configure aircraft properly (e.g. spinning with flaps down, since recover may exceed flap limit speed)
 - b. Failure to hold full stall, resulting in steep spiral and high airspeed
 - c. Improper use of controls during recovery, especially neutral ailerons (instinct is to lift the low wing with ailerons)
 - d. Disorientation, and "freezing" during the spin
 - e. Recovering from dive too abruptly, causing secondary stall
 - f. Spinning an airplane not approved for spins, or out of utility limits. This could be fatal!

Completion Standards: The client must have the ability to assess and avoid situations where intentional spins may occur, and must be able to explain (and optionally demonstrate) procedures to recover from unintentional spins.

Forward Slips to Landing

Objective: Develop knowledge, risk management, and skills associated with forward slips to landing.

References: ACS Sec IV-M, AFH Ch 8, POH

Schedule: Ground 0.5, multiple flights to practice this maneuver frequently

Lesson Elements:

1. Overview of Forward Slips
 - a. Purpose – lose altitude quickly, without gaining airspeed. Allows for steeper gliding descent for short-field or emergency landing
 - b. Forward Slips vs Slide Slips? Slide slips are the usual technique for cross-wind landing, with heading parallel to runway. Forward slips are steeper than side-slips, with exaggerated bank (into the wind) and opposite rudder, with heading significantly different than runway heading, but ground track aligned with runway centerline.
 - c. Adjust “steepness” of slip as necessary for intended landing spot
 - d. Airspeed errors – what is effect of slip on indicated airspeed? Depends on number and location of static ports
 - e. Check POH – are slips allowed with full flaps? Will fuel ports uncover?
2. Flying the forward slip:
 - a. Reduce power to idle.
 - b. Bank into wind (if any), and apply opposite rudder to prevent turn.
 - c. Adjust bank angle to control glide path as necessary. Adjust bank and rudder to maintain runway centerline.
 - d. Maintain normal final approach indicated airspeed, depending on static port locations
 - e. Transition from forward slip to side slip (or no slip) before the landing flare.
 - f. Beware of excessive sink rate due to forward slip. Keep enough airspeed to round out and flare.
3. Common Errors:
 - a. Speed control during the slip
 - b. High sink rate in the flare
 - c. Failure to maintain stable forward slip, allowing bank and heading to wander
 - d. Failure to go around if the approach becomes unstable

Completion Standards: Client must demonstrate smooth entry into a forward slip, with upwind wing down, maintaining runway centerline and safe airspeed, and smooth

recovery from slip prior to round out. Touch down within 400 feet beyond a specified landing point with no sideways drift and with airplane's longitudinal axis parallel to and over runway centerline.

Navigation Charts and National Airspace System

Objective: Develop pre-solo knowledge of required preflight planning, VFR navigation charts, airspace and weather minimums, weather briefings, and flight plans

References: ACS Sec I Task C-E; PHAK Ch 12-13, 15-16; AIM Ch 3

Schedule: Ground 2.0 hours

Lesson Elements:

1. Required Preflight Action (FAR 91.103)
 - a. Weather reports and forecasts
 - b. Fuel requirements and available alternatives, traffic delays
 - c. Runway lengths, takeoff and landing distance, aircraft performance vs airport elevation, gross weight, wind and temperatures
2. Terminal and Sectional charts, chart symbology
3. Chart Supplements (formerly Airports/Facility Directory, still called A/FD in Foreflight)
4. Types of airspace – Class A, B, C, D, E, G
5. VFR weather minimums (see memory aid documents)
6. Altitudes for cruise flight, minimum altitudes

Completion Standards: Client should demonstrate knowledge, to a level appropriate for local solo flights, of required preflight planning, navigation charts, the national airspace system, weather briefings, and flight plans.

Short- and Soft-Field Takeoffs and Landings, Wheel Landings (tailwheel only)

Objective: Develop knowledge and skills for soft-field (unpaved) takeoffs and landings, short-field takeoffs and landings, and wheel-landings for tailwheel aircraft.

References: ACS Sec IV Task E-F; AFH Ch 5, 8; Wheel landing references: AFH Ch 13; Stick and Rudder page 305-309; WVFC Tailwheel Operations Guide (on WVFC website)

Schedule: Ground 1.0; Flight – multiple flights, with frequent practice

Lesson Elements:

1. Overview of short- and soft-field operations and wheel landings
2. Takeoffs and Climb Procedures:
 - a. Set flaps according to POH/AFM
 - b. Position flight controls for existing wind conditions
 - c. Soft-field takeoff:
 - i. Taxi into takeoff position without stopping, with smooth power application for takeoff
 - ii. Establish pitch attitude to rapidly transfer weight from wheels to wings
 - iii. Lift off at lowest possible airspeed, accelerate to V_x or V_y in ground effect.
 - iv. Establish pitch attitude and airspeed for V_x or V_y climb.
 - v. Retract gear/flaps after positive rate of climb, and in accordance with POH/AFM.
 - d. Short-Field takeoff:
 - i. Taxi into takeoff position using maximum available runway length, and align on runway centerline.
 - ii. Apply brakes and hold while applying takeoff power, check gauges.
 - iii. Release breaks, accelerate with POH recommended pitch technique, rotate at recommended A/S, and accelerate to and climb at V_x .
 - iv. Retract gear/flaps after positive rate of climb, and in accordance with POH/AFM.
 - v. Maintain V_x until obstacle is cleared (or 50' AGL), then accelerate to V_y .
3. Approach and Landing Procedures:
 - a. Complete pre-landing checklist
 - b. Establish POH-recommended approach and landing configuration (flaps) and airspeed.
 - c. Soft-Field landing:

- i. Maintain stabilized approach and recommended airspeed (not more than $1.3V_{so}$), applying gust factor (add half of gust difference) $+10/-5$ knots.
 - ii. Make smooth roundout and flare, with minimum sink rate. Use power as necessary to cushion descent and touchdown.
 - iii. Maintain full up elevator during rollout, and exit the runway without stopping and safe taxi speed, using proper control deflections for existing wind conditions.
 - d. Short-Field landing:
 - i. Establish POH-recommended approach configuration and airspeed, adjust pitch and power as required.
 - ii. Maintain stabilized approach and recommended airspeed (not more than $1.3V_{so}$), applying gust factor (add half of gust difference) $+10/-5$ knots.
 - iii. Touch down smoothly, with minimal float, at or within 200 feet beyond the specified touchdown point.
 - iv. Apply brakes as necessary to stop in the shortest distance consistent with safety, using proper control deflections for existing wind conditions.
- 4. Wheel landings (Tailwheel only):
 - a. Technique varies by aircraft type.
 - b. Heels on the floor! Don't use brakes until tail is down at very low speed.
 - c. Generally, use slightly higher than normal approach speed (10 knots extra).
 - d. Generally carry ~200 RPM extra power, into the flare to give more time to establish near level pitch attitude, inches above the runway, with zero descent rate.
 - e. As main wheels touch, reduce power to idle, and simultaneously move stick forward slightly to keep tail high and pin the mains onto the runway.
 - f. As speed bleeds off, continue stick forward motion to hold tail off, and gradually apply full ailerons into any crosswind. Use rudder as necessary for directional control.
 - g. When tail feels ready to fall, smoothly pull stick full aft to pin the tail on the ground.
 - h. Apply brakes only after tail is on the ground.
 - i. Botched wheel landing recovery: Do NOT try to salvage wheel landing after a bounce! Instead, go-around, or transition to a 3-point landing.

Completion Standards: Client should demonstrate ability to perform short- and soft-field takeoffs and landing (and wheel landings, for tailwheel aircraft) to ACS standards.

Non-towered Airport Operations

Objective: Develop knowledge of operations and traffic patterns at non-towered airports

References: ACS Section III Task B; PHAK Ch 14; AIM Ch 4, Section 3, AC 90-66B

Schedule: Ground 1.0

Lesson Elements:

1. Sources for airport information and data (chart supplements, EFB), NOTAMS
2. Non-towered airport frequencies: Unicom, CTAF
3. Tower airports become non-towered when tower is closed.
4. Weather sources: AWOS/ASOS, 1800wxbrief.com, telephone
5. Airport markings
 - a. Segmented circle, pattern indicators
 - b. Wind indicators: sock, Tees, Tetrahedrons
 - c. Runway and taxiway markings
6. Airport lighting
 - a. Airport beacons
 - b. Pilot controlled lighting
 - c. Glidepath systems
7. Non-towered airport operations
 - a. Pattern entries and departures
 - b. Parallel runway operations
 - c. Radio communication procedures (see examples in Appendix)
 - d. Right of way rules
 - e. Wake turbulence avoidance
 - f. Parachute operations, ultralights, gliders, etc....
8. Common errors
 - a. Forgetting radio calls
 - b. Selecting wrong runway or inappropriate entry procedure to pattern
 - c. Lack of awareness of other aircraft

Completion Standards: Client should demonstrate knowledge of non-towered airport operations, including obtaining pre-flight information, airport markings, traffic pattern procedures, radio communications, and awareness of other aircraft.

From AOPA's "Operations at Nontowered Airports": <https://www.aopa.org/-/media/files/aopa/home/pilot-resources/asi/safety-advisors/sa08.pdf>

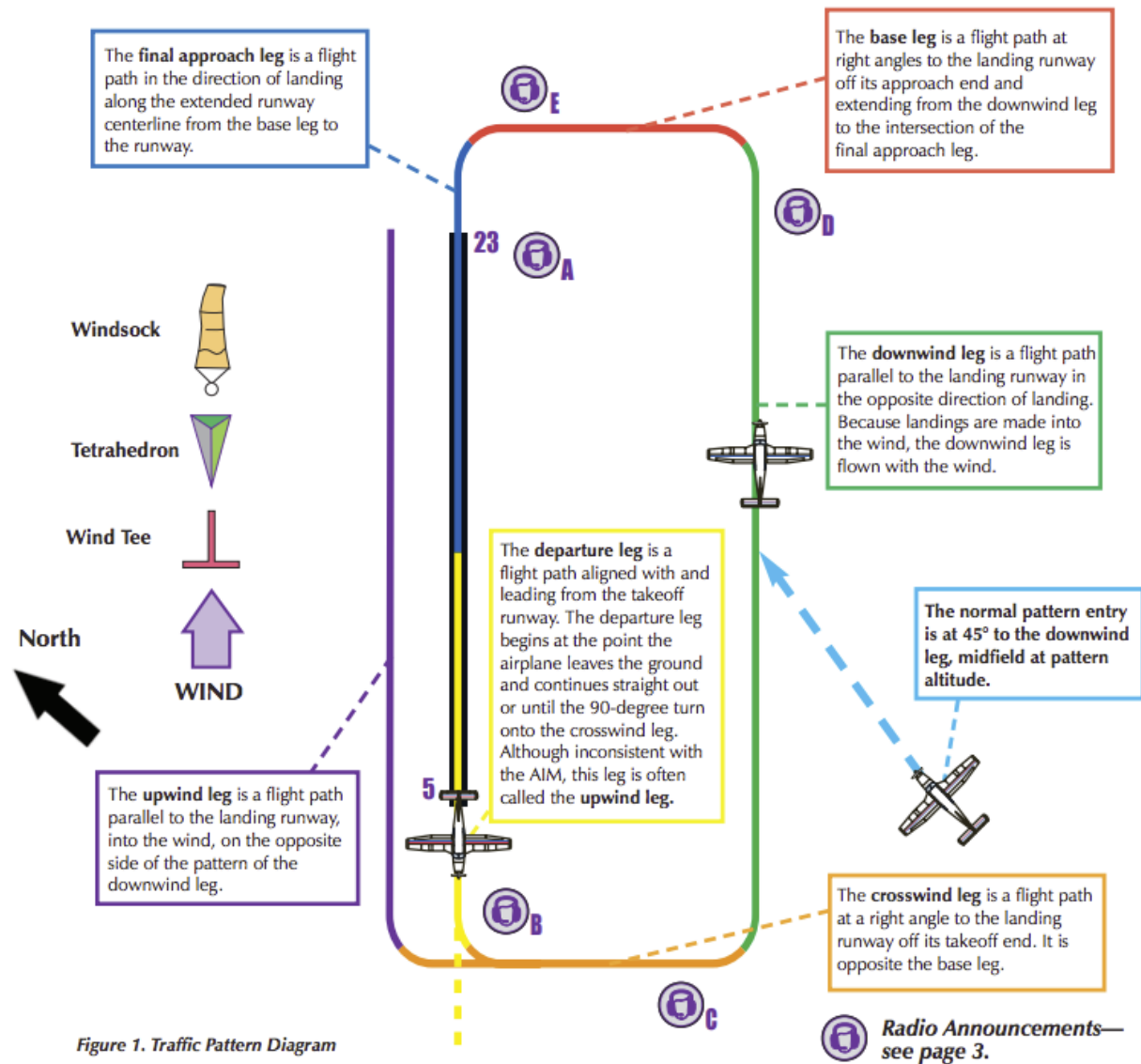
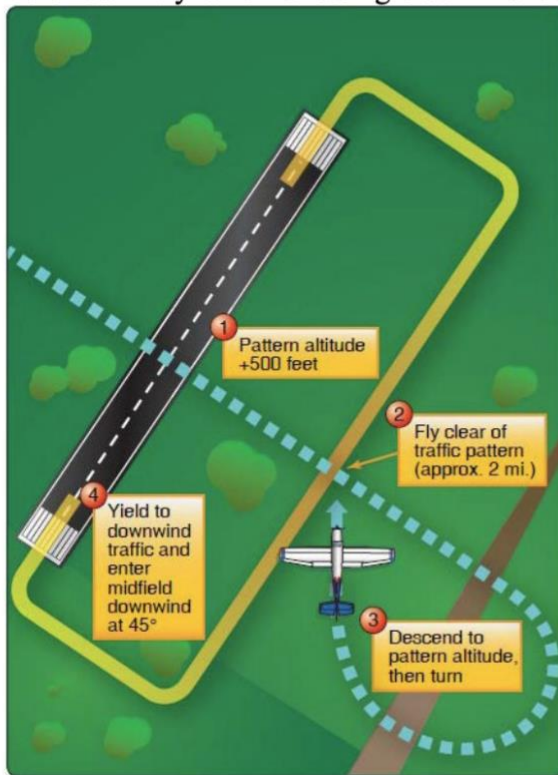


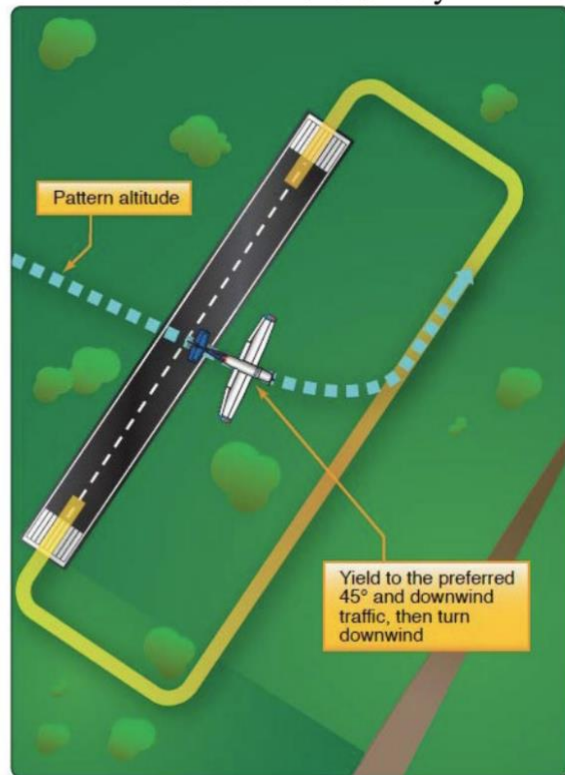
Figure 1. Traffic Pattern Diagram

Figure 1. Preferred and Alternate Entry When Crossing Midfield (From the PHAK)

Preferred Entry When Crossing Over Midfield



Alternate Midfield Entry



Non-Tower Radio Communications Examples:

These are example radio calls for an arrival and departure at a non-tower airport. The exact calls will vary depending on the circumstances. Each call should include your location and altitude, and what you are doing next. If you are on the 45 or downwind, you are assumed to be at pattern altitude, unless you call out something different.

When things are confusing or non-standard, it's OK to get "conversational" on the frequency to make your intentions clear, but try to keep the calls concise.

1. Initial call, inbound for landing: *"Watsonville traffic, Cessna six Charlie Sierra, ten miles north east, 3000 feet, inbound for landing, Watsonville"*

2. Next call, closer in, when you have determined what runway other traffic is using: *“Watsonville traffic, Cessna six Charlie Sierra, five miles north east, three thousand feet, will overfly the airport and enter left forty five runway two zero, Watsonville”*.
3. Crossing overhead: *“Watsonville traffic, Cessna six Charlie Sierra, overhead at two thousand two hundred feet, turning southbound will enter left forty five runway two zero, Watsonville”*.
4. After flying outbound for about 2 miles, and descending to pattern altitude, on the 45 entry: *“Watsonville traffic, Cessna six Charlie Sierra, left forty five runway two zero, Watsonville”*.
5. On the downwind: *“Watsonville traffic, Cessna six Charlie Sierra, left downwind runway two zero, Watsonville”*.
6. On base leg: *“Watsonville traffic, Cessna six Charlie Sierra, left base runway two zero, Watsonville”*.
7. On final: *“Watsonville traffic, Cessna six Charlie Sierra, final approach, two zero, full-stop landing, Watsonville”*.
8. After landing: *“Watsonville traffic, Cessna six Charlie Sierra, exiting runway two zero at Delta, taxiing transient parking, Watsonville”*. (Note: The taxiway callout is optional.)
9. Taxiing for departure: *“Watsonville traffic, Cessna six Charlie Sierra, transient parking, taxiing runway two zero via Alpha for departure, Watsonville”*. (Note: It's nice to include the taxiway if there are multiple ways to get there.)
10. If you need to cross an intersecting runway: *“Watsonville traffic, Cessna six Charlie Sierra, taxiing across runway two seven at Alpha, Watsonville.”*
11. Before taking the runway for departure: *“Watsonville traffic, Cessna six Charlie Sierra, taking runway two zero, then right crosswind departure”, Watsonville”*.
12. During the upwind climb: *“Watsonville traffic, Cessna six Charlie Sierra, departure leg runway two zero, then right crosswind departure, Watsonville”*.
13. On the crosswind: *“Watsonville traffic, Cessna six Charlie Sierra, departing right crosswind from two zero, one thousand three hundred feet, climbing, Watsonville”*.

14. Last call during the departure: *“Watsonville traffic, Cessna six Charlie Sierra, three miles west, two thousand seven hundred feet, climbing, departing to the west, Watsonville”.*

Emergency Approaches and Landings

Objective: Develop knowledge and skills associated with emergency approaches and landings, and ability to handle various system and equipment failures.

References: AFM/POH; ACS section IX; AFH Ch. 17 (Emergency Procedures)

Schedule: Ground 1.0, Flight 1.0, frequent practice on multiple flights

Lesson Elements:

1. Types of Emergency Landings: Forced landing, Precautionary landing, Ditching
2. Aviate, Navigate, Communicate:
 - a. Establish best glide
 - b. Maneuver to (hopefully) preselected landing area
 - c. If altitude allows: GPS NRST – what is the closest airport?
 - d. Emergency field selection
 - e. Squawk 7700, Mayday call with Approach or Center, or nearby tower, or 121.5 (last resort)
3. Flying the approach:
 - a. Effect of headwinds/tailwinds
 - b. Aircraft configuration, such as gear and flaps
 - c. Debug the problem with flow pattern followed by checklist (if time permits)
 - d. Spiral descent, and rectangular pattern if altitude permits.
 - e. Land INTO the wind!
 - f. Keep altitude, and plan to use steep slip to control touchdown location
 - g. Securing engine and electrical system before landing
 - h. Unlatch doors before touchdown
4. Other emergencies (including all POH abnormal and emergency procedures)
 - a. Engine failure after takeoff: Land straight ahead!
 - b. Electrical malfunctions or complete failure
 - c. Minimum fuel
 - d. Engine fire
 - e. Retractable gear malfunction
 - f. VFR into IMC
 - g. Icing
5. Common Errors:
 - a. Aviate first! Don't let distractions lead to loss of control.
 - b. Route of flight with few or no landing options
 - c. Lack of situational awareness. Be aware of position and options.
 - d. Failure to use checklist

Completion Standards: Client should develop knowledge of emergency situations and procedures, and demonstrate ability to maneuver and land the airplane, while following checklist procedures including emergency communications.

(Pre-Solo Quiz and Solo Phase Check; Local Solo Flights)

Stage II: Navigation and Cross-Country Flight

Navigation Systems, including Radar Services

Objective: Develop knowledge and ability to use onboard navigation equipment to enter and follow flight plans, and knowledge of ATC capabilities and ability to use ATC assistance with radar vectors

References: ACS Section VI; PHAK Ch. 15 (Navigation), Manuals for all installed equipment in the plane.

Schedule: Ground 1.0

Lesson Elements:

1. Compass and compass errors
2. Radio navigation equipment
 - a. VOR
 - b. ILS
 - c. DME
 - d. ADF
 - e. GPS – using and entering flight plans
3. Transponders, and altitude reporting equipment
4. ADS-B In and Out
5. Autopilot
6. ATC services and assistance available
 - a. Flight Following
 - b. ASR (airport surveillance radar) and PAR (precision approach radar) capabilities

Completion Standards: Client should develop knowledge of navigation equipment on board their training aircraft, and ability to recover from lost situations, including planning diversion to alternate destinations. Client should be familiar with services available from ATC, and know how and when to request assistance.

Aircraft Performance including Weight and Balance

Objective: Develop understanding of aircraft performance and limitations, and ability to safely and conservatively plan cross-country flights.

References: POH/AFM; PHAK Ch 9 (flight manuals), Ch 9 (Weight and Balance), Ch 10 (aircraft performance)

Schedule: Ground 2.0

Lesson Elements:

1. Organization of POH
2. Weight and Balance calculations
 - a. Effect of CG location on stability and performance
 - b. Effect of gross weight on performance
3. Performance calculations
 - a. Takeoff and landing distances for ground roll and obstacle clearance
 - b. Rate of climb and time to climb
 - c. Power settings for cruise, airspeed and fuel burn
4. Flight planning for cross-country flights

Completion Standards: Client should develop knowledge of POH/AFM organization, and ability to use POH to safely and conservatively plan cross country flights, including weight and balance calculations.

Weather Information and Cross-Country Flight Planning

Objective: Develop ability to obtain, process and understand pre-flight weather briefings, and use weather data for flight planning.

References: PHAK, Ch 12 (weather theory); ACS I-C (Weather Information), Aviation Weather (AC 00-6B), and Aviation Weather Services (AC 00-45H), “Pilot’s Guide to a Preflight Briefing” (AC 91-92)

Schedule: Ground 1.0, frequent practice on multiple flights

Lesson Elements:

1. Weather theory – sources of information for study
2. Sources of weather information
 - a. Flight Service: 1-800-WXBrief
 - b. Flight service online: 1800wxbrief.com
 - i. Student should make an account, and use for flight planning
 - c. Foreflight and other EFBs
3. Weather briefings
 - a. Structure of weather briefings
 - b. Adverse Conditions: TFRs, NOTAMS, SIGMETS, AIRMETS, etc.
 - c. Current weather:
 - i. ATIS/METARS (towered airports)
 - ii. AWOS and ASOS (non-towered)
 - iii. PIREPS
 - d. Forecasts: Area, TAFS, Winds aloft
4. Types of weather briefings from Flight Service
 - a. Outlook
 - b. Standard
 - c. Abbreviated
5. VFR Flight plans for search and rescue:
 - a. When to use them
 - b. How to file
 - c. How to activate and close

Completion Standards: Client should develop working knowledge of weather theory, and understand sources of weather information for pre-flight planning

Pilotage and Dead Reckoning

Objective: Develop knowledge and skills associated with pilotage navigation by reference to charts, and dead-reckoning navigation with reference to clock and compass, including expected wind correction

References: PHAK Ch 16 (Navigation)

Schedule: Ground 1.0, Flight – multiple during dual cross-country flights

Lesson Elements:

1. Pilotage
 - a. Reading charts, and navigating by visual landmarks
 - b. Following flight plans
2. Dead reckoning
 - a. Navigation by direction, airspeed, distance and time
 - b. Flight log forms, and updating during flight
 - c. Mental arithmetic – time, speed, distance

Completion Standards: Client should be able to fly a cross country route, using dead reckoning and pilotage, visually identifying each waypoint, and recording actual time of arrival. Client should be able to update the navigation plan in-flight to account for variations in heading and groundspeed due to unforecast winds.

Lost Procedures, and Diversion to Alternates

Objective: Develop skills and procedures to identify aircraft location, with on-board charts or equipment or with ATC help, and plan diversion to an appropriate alternate airport.

References: PHAK Ch. 16; ACS VI-C (diversion) and VI-D (lost procedures);

Schedule: Ground 1.0, Flight 1.0, frequent practice on multiple flights

Lesson Elements:

1. Lost procedures
 - a. Might be appropriate to circle and/or gain altitude for better view of landmarks. Some use the 5 C's: Climb, Circle, Conserve (fuel), Communicate, Comply
 - b. Use of charts and pilotage to find location
 - c. Use of GPS nearest airport feature, or VORs
 - d. How to get ATC assistance
2. Plan diversion to alternate airport
 - a. Use of GPS direct-to feature
 - b. Use of VOR navigation, such as crossing VOR radials
 - c. Use of charts (paper or electronic) to estimate distance and heading to alternate
 - d. Estimate distance, heading, time enroute, and fuel burn to alternate airport
3. In-flight practice
 - a. CFI will get student "lost", typically after maneuvering with the hood during simulated instrument flight
 - b. Student will demonstrate ability to find location, plan route to an alternate airport, and fly to and land at the alternate.

Completion Standards: Client should be able to use multiple means to identify location, and to plan route to an alternate airport, including estimate of distance, time and fuel usage to the alternate.

Emergency Flight by Reference to Instruments: Four Fundamentals

Objective: Develop knowledge and skills associated with emergency approaches and landings, and ability to handle various system and equipment failures.

References: Instrument Flying Handbook Ch 6-7; AFH Ch 17; ACS section VIII

Schedule: Ground 1.0, Flight 1.0, frequent practice on multiple flights

Lesson Elements:

1. Introduction to Instrument Scan (ground portion)
 - a. Primary and supporting instruments
 - b. Instrument Scan
 - i. Control and performance instruments
 - ii. Instrument cross check, types of scans
 - iii. 4-step scan procedure (Butcher) to initiate any maneuver:
 1. Set approximate attitude and power
 2. Inverted V-scan to check trends
 3. Scan primary instruments
 4. Scan all instruments
2. Attitude Instrument Flight Basics (simulator and/or airplane)
 - a. Power-Pitch-Trim sequence to initiate climb, Pitch-Power-Trim for descent.
 - b. Straight and Level flight (IFH 7-2)
 - c. Straight climbs and descents (IFH 7-14)
 - d. Turns (IFH 7-19)
3. Common Errors:
 - a. Spatial disorientation
 - b. Distraction
 - c. Fixation or omission
 - d. While turning – watch the turn, and do nothing else until complete
 - e. Heavy touch, over-controlling
 - f. Improper trim control

Completion Standards: Client must demonstrate basic attitude instrument flying skills, to ACS standards (+-200 feet, heading +-20 degrees, airspeed +-10 knots). Maneuvers will include straight-and-level, turn to headings, and perform constant airspeed climbs and descents, by reference to flight instruments only.

Emergency Flight by Reference to Instruments: Recovery from Unusual Flight Attitudes

Objective: To develop student knowledge and skill in recognition of and recovery from unusual attitudes, with full- and partial-panel operations.

References: IFH Ch 7

Schedule: Ground 1.5 hour, simulator and/or airplane, 1.5 hours

Lesson Elements:

1. Causes of unusual flight attitudes
 - a. Failure to properly trim the controls
 - b. Distraction, or fixation
 - c. Turbulence and Wake Turbulence
2. Unusual Attitude Recoveries (IFH 7-26)
 - a. Unusual attitudes are those not normally required during instrument flight.
Recovery includes prompt return to straight-and-level flight
 - b. Full panel recoveries
 - c. Partial panel recoveries
3. Recognize nose-high unusual attitude:
 - a. ASI slow or decreasing rapidly
 - b. VSI shows climb, altimeter shows climb
 - c. TC shows turn
 - d. Recovery:
 - i. Power-Pitch-Bank (must become 2nd nature!)
 - ii. **Full-power - Pitch Down - Level Wings**
4. Recognize nose-low unusual attitude:
 - a. ASI fast or increasing rapidly
 - b. VSI negative rate, altimeter shows descent
 - c. TC shows turn
 - d. Recovery:
 - i. Power-Bank-Pitch (must become 2nd nature!)
 - ii. **Reduce power - Level Wings - Pitch Up**
5. Common errors
 - a. Failure to recognize unusual attitude
 - b. Dependence on senses other than instrument indications
 - c. Failure to use proper recovery sequence, i.e. power-pitch-bank for nose-high, and power-bank-pitch for nose low

Completion Standards: Student demonstrates the ability to recognize, confirm, and recover from unusual attitudes, applying the appropriate pitch, bank, and power

corrections in the correct sequence to return the aircraft to a stabilized level flight attitude.

(Cross Country Phase Check and Solo Cross Countries)

Stage III: Night Flying and Checkride Preparation

Night Operations and Night Cross Country

Objective: To develop student knowledge and skill pertaining to night flight.

References: ACS section XI; AFH Ch. 10 (night operations), PHAK Ch. 14 (airport lighting), Ch. 17 (night vision)

Schedule: Ground 1.5 hour, flight 3 hours

Lesson Elements:

1. Regulations pertaining to night flight
 - a. Navigation lights required sunset – sunrise
 - b. Logging night flight – after civil twilight
 - c. Night currency for carrying passengers – 3 takeoffs and landing within 90 days, >1 hour after sunset
2. Aircraft lighting
 - a. Anti-collision lights – strobes and/or beacon
 - b. Navigation lights
 - c. Interior and panel lighting
3. Airport lighting
 - a. Beacons, runway and taxiway lighting, VASI, PAPI, REIL
 - b. Pilot controlled lighting and how to operate
4. Navigation at night
 - a. Pilotage and chart-reading techniques
 - b. Approaches at night – black hole illusion
 - c. Importance of VASI or PAPI lights
5. Pilot considerations
 - a. Physiology of night flight with respect to vision
 - b. Personal lighting equipment
 - c. Illusions affecting night approaches, e.g. “black hole approach”
6. Night flight experience – 3 hours required:
 - a. Dual cross country flight of > 100 nm
 - b. 10 takeoffs and landings in pattern, full stop
7. Common errors

- a. Navigational disorientation
- b. Loss of situational awareness, due to loss of visual horizon
- c. Getting low on final approach, due to black hole illusion
- d. Inadvertent flight into clouds is possible

Completion Standards: Student demonstrates the ability to knowledge and skills to safely fly and navigate at night.

Emergency Operations

Objective: To develop knowledge of all abnormal and emergency procedures for the training aircraft in use, including all ACS risk management and skill tasks.

References: AFM/POH; ACS section IX; AFH Ch. 17 (Emergency Procedures)

Schedule: Ground 1.5 hour, flight practice as necessary

Lesson Elements:

1. Emergency Descents (rapid descent procedure, e.g. engine fire)
2. Emergency approach and landing (covered pre-solo)
3. Systems and Equipment Malfunctions
4. Emergency Equipment and Survival Gear
5. Common errors
 - a. Failure to use flow patterns or memory items
 - b. Failure to use checklists, or improper use

Completion Standards: Student demonstrates appropriate knowledge of aircraft systems, abnormal and emergency procedures, and the ability to perform emergency procedures to ACS standards.

Review and Checkride Preparation

Objective: Prepare for Practical Test oral and flight portions

References: ACS – all sections, AFH (descriptions of maneuvers), POH/AFM, FAR parts 91 and 61, AIM, Chart Supplements

Schedule: Ground 3 hours, Flight as necessary

Lesson Elements:

1. Thorough review of ACS
2. Choice of DPE and location of checkride
 - a. May require DPE to be scheduled months in advance!
3. Practice for Oral portion of practical test
 - a. Good video, showing DPE's expectations for checkride, especially oral portion (Andy Munnis, DPE): <https://www.youtube.com/watch?v=zVE-gleZUpk>
 - b. Books available for preparation
 - c. Practice oral exams with other students and instructors
4. Practical test maneuvers to practice and polish
 - a. Takeoffs, Landings, Go-arounds, including short- and soft-field techniques, and forward slips to landing
 - b. Steep turns and ground reference maneuvers: rectangular patterns, turns-around-a-point, and S-turns-across-a-road
 - c. Cross-country – diversion and lost procedures
 - d. Maneuvering during slow flight, power-off and power-on stalls
 - e. Spin Awareness (optional spin training in-flight)
 - f. Basic instrument flight maneuvers (S&L, climbs, descents, turns) and recovery from unusual flight attitudes
 - g. Emergency Operations
 - i. Emergency Descent (simulated engine fire)
 - ii. Emergency approach and landing
5. Simulated practical test (optional) with senior CFI

Completion Standards: The student should be able to answer oral questions on all topics listed in the ACS, and be able to fly all the flight maneuvers consistently meeting ACS standards.

Appendices:

Appendix A – List of References

All of these reference are free downloads from the FAA or other websites, though some can be purchased in book form from ASA and other publishers.

- “PHAK” – Pilots Handbook of Aeronautical Knowledge
- “AFH” – Airplane Flying Handbook
- “IFH” – Instrument Flying Handbook
 - Refer to this for instrument flying basics, and unusual attitude recoveries, both of which are tested on the check ride.
- POH/AFM
 - This is the Pilot’s Operating Handbook and/or Approved Flight Manual for the training aircraft. All aircraft built after 1996 have AFMs that are specific to the exact aircraft, with serial number and signature of FAA inspector. The AFM includes the POH, relevant supplements, and weight-and-balance info, and must be on-board. Prior to 1996, aircraft had a generic “POH”, which must be onboard the aircraft, along with any required supplements and weight and balance info.
- “ACS” – Airman Certification Standards, Private Pilot Airplane
 - This is the document detailing how the check ride will be conducted, and how the maneuvers are evaluated. This should be reviewed for each maneuver that you study, so that you learn it the “ACS” way right from the beginning.
- FAR/AIM
 - This refers to the “Federal Aviation Regulations” and the “Airman’s Information Manual”.
- WVFC Member Regulations – Find these on the West Valley Website. You will need to read them carefully and answer a quiz about them, before you can solo. You will also need to fill out the ground review form and pre-solo quiz (both from WVFC website) before you can solo.
- Advisory Circulars
 - These are like FAA “memos” covering various topics. Two are referenced in the syllabus: AC 61-67C about stall/spin awareness training, and AC90-66B, about non-tower airport operations and pattern procedures.

- Aviation Weather (AC-00-6B) and Aviation Weather Services (AC00-45H). These are actually nice books, but for some reason the FAA calls them an advisory circular, and they get updated fairly often.
- Foreflight website: <https://foreflight.com/>
 - Most pilots are using Foreflight running on an iPad and/or iPhone for aviation charting and flight plan. The Foreflight website is a great resource for learning to use all the features.

Appendix B – Part 61 Training Requirements

Solo Requirements for Student Pilots:

FAR 61.87(d) *Maneuvers and procedures for pre-solo flight training in a single-engine airplane.*

A student pilot who is receiving training for a single-engine airplane rating or privileges must receive and log flight training for the following maneuvers and procedures:

- ☐ Proper flight preparation procedures, including preflight planning and preparation, powerplant operation, and aircraft systems;
- ☐ Taxiing or surface operations, including runups;
- ☐ Takeoffs and landings, including normal and crosswind;
- ☐ Straight and level flight, and turns in both directions;
- ☐ Climbs and climbing turns;
- ☐ Airport traffic patterns, including entry and departure procedures;
- ☐ Collision avoidance, wind shear avoidance, and wake turbulence avoidance;
- ☐ Descents, with and without turns, using high and low drag configurations;
- ☐ Flight at various airspeeds from cruise to slow flight;
- ☐ Stall entries from various flight attitudes and power combinations with recovery initiated at the first indication of a stall, and recovery from a full stall;
- ☐ Emergency procedures and equipment malfunctions;
- ☐ Ground reference maneuvers;
- ☐ Approaches to a landing area with simulated engine malfunctions;
- ☐ Slips to a landing; and
- ☐ Go-arounds.

Solo Cross-Country Requirements for Student Pilots:

FAR 61.93 (e) *Maneuvers and procedures for cross-country flight training in a single-engine airplane.*

A student pilot who is receiving training for cross-country flight in a single-engine airplane must receive and log flight training in the following maneuvers and procedures:

- ☐ Use of aeronautical charts for VFR navigation using pilotage and dead reckoning with the aid of a magnetic compass;
- ☐ Use of aircraft performance charts pertaining to cross-country flight;
- ☐ Procurement and analysis of aeronautical weather reports and forecasts, including recognition of critical weather situations and estimating visibility while in flight;
- ☐ Emergency procedures;
- ☐ Traffic pattern procedures that include area departure, area arrival, entry into the traffic pattern, and approach;
- ☐ Procedures and operating practices for collision avoidance, wake turbulence precautions, and wind shear avoidance;
- ☐ Recognition, avoidance, and operational restrictions of hazardous terrain features in the geographical area where the cross-country flight will be flown;
- ☐ Procedures for operating the instruments and equipment installed in the aircraft to be flown, including recognition and use of the proper operational procedures and indications;
- ☐ Use of radios for VFR navigation and two-way communication, except that a student pilot seeking a sport pilot certificate must only receive and log flight training on the use of radios installed in the aircraft to be flown;
- ☐ Takeoff, approach, and landing procedures, including short-field, soft-field, and crosswind takeoffs, approaches, and landings;
- ☐ Climbs at best angle and best rate; and
- ☐ Control and maneuvering solely by reference to flight instruments, including straight and level flight, turns, descents, climbs, use of radio aids, and ATC directives. For student pilots seeking a sport pilot certificate, the provisions of this paragraph only apply when receiving training for cross-country flight in an airplane that has a V_H greater than 87 knots CAS.

Private Pilot Aeronautical Experience (prior to checkride)

From FAR 61.109:

- ☐ 40 hours of flight time (any CC) (*) 61.109(a)
- ☐ 20 hours of flight training (dual) (any CC) (*) 61.109(a)
- ☐ 10 hours of solo flight time (any CC) (*) 61.109(a)
- ☐ 3 hours cross-country dual 61.109(a)(1)
- ☐ 3 hours night dual (including as follows:) (*) 61.109(a)(2)
 - Dual XC of >100 NM total 61.109(a)(2)(i)
 - 10 night dual full stop TO/LDG in pattern 61.109(a)(2)(ii)
- ☐ 3 hours dual by ref to instruments (see details) 61.109(a)(3)
- ☐ 3 hours dual in prep for practical in 2 month prior to test 61.109(a)(4)
- ☐ 10 hours solo (including as follows:) 61.109(a)(5)
 - 5 hours solo XC 61.109(a)(5)(i)
 - 1 solo XC 150 NM distance, 50+NM leg, 3 points FS 61.109(a)(5)(ii)
 - 3 solo TO/LDG full-stop at airport with operating control tower 61.109(a)(5)(iii)

Appendix C – Outline of ACS for reference

- I. Preflight Preparation
 - a. Pilot Qualifications
 - b. Airworthiness Requirements
 - c. Weather Information
 - d. Cross-country Flight Planning
 - e. National Airspace System
 - f. Performance and Limitations
 - g. Operation of Systems
 - h. Human Factors
- II. Preflight Procedures
 - a. Preflight Assessment
 - b. Cockpit Management
 - c. Engine Starting
 - d. Taxiing
 - e. Before Takeoff check
- III. Airport Operations
 - a. Communications
 - b. Traffic Patterns
- IV. Takeoffs, Landings, Go-arounds
 - a. Normal takeoff and climb
 - b. Normal approach and landing
 - c. Short-field takeoffs and landings
 - d. Soft-field takeoffs and landing
 - e. Forward slip to landing
 - f. Go-arounds, Rejected Landings
- V. Performance Maneuvers
 - a. Steep turns
 - b. Ground reference maneuvers
- VI. Navigation and Cross-Country Flight
 - a. Pilotage and Dead Reckoning
 - b. Navigation Systems and Radar Services
 - c. Diversion
 - d. Lost Procedures
- VII. Slow Flight and Stalls
 - a. Maneuvering During Slow Flight
 - b. Power-Off Stalls
 - c. Power-On Stalls
 - d. Spin awareness and Spin Recovery

- VIII. Basic Instrument Maneuvers
 - a. Straight-and-Level Flight
 - b. Constant Airspeed Climbs
 - c. Constant Airspeed Descents
 - d. Turns to Headings
 - e. Recovery from Unusual Flight Attitudes
 - f. Radio Communications, Navigation Systems/Facilities, Radar Services
- IX. Emergency Operations
 - a. Emergency Descent
 - b. Emergency Approach and Landing
 - c. Systems and Equipment Malfunction
 - d. Emergency Equipment and Survival Gear
- X. (Multiengine Operations)
- XI. Night Operations
- XII. Postflight Procedures

Appendix D – Minimum Equipment Requirements (FAR Part 91)

Minimum Equipment Requirements under FAR Part 91:
(From Advisory Circular 91-67)

