cao 1 February 2022

STUDENT PILOT STUDY RESOURCES

There is an overwhelming amount of information to learn in order to become a safe and proficient aviator. As you begin your flight training, strive to have a disciplined study plan to consistently work your way through all the required learning materials. In the beginning, focus on the basics—understanding how pilot training and certification is structured and the required certificates; the rules and regulations that govern your training and flight in U.S. airspace in the Federal Aviation Regulations; and flight procedures and aviation fundamentals in the Airplane Flying Handbook and the Pilot's Handbook of Aeronautical Knowledge. As you progress in your training, dive into the other topics such as aircraft systems and operating limits, weather, charts and navigation, and instruments. The ultimate goal is to be a well-rounded, proficient and safe aviator. The secondary goal is to pass the FAA Private Pilot Knowledge Test that is a prerequisite for taking your practical exam.

Here are some links/references to get you started. Always make sure you have the most up-to-date document posted on the official website, as the FAA regularly revises their regulations, handbooks, Advisory Circulars, etc.

Getting Started as a New Student Pilot—Application, Syllabus, Test Prep, Flight Standards

1. FAA Information on becoming a pilot.

https://www.faa.gov/pilots/become/

2. Airplane Single Engine Land Private Pilot Syllabus (sample syllabi, your instructor will modify as required)

https://www.asa2fly.com/Pilots-Manual-Private-Pilot-Syllabus-PDF-P3805.aspx
https://kingschools.com/pdfs/Private_Syllabus_v1.2_200415.pdf

3. IACRA Registration and Student Pilot Certificate Application.

https://iacra.faa.gov/iacra/HelpAndInfo.aspx?id=5

4. Private Pilot – Airplane: Airman Certification Standards (ACS). What the flight examiner will be looking for on each maneuver or portion of flight.

https://www.faa.gov/training_testing/testing/acs/

5. FAA's testing guides and information.

https://www.faa.gov/training_testing/testing/

6. Knowledge Test Prep – Many online courses/resources available for purchase or free.

https://www.asa2fly.com/Test-Prep-C3.aspx
https://kingschools.com/private-pilot-certificate
https://www.sportys.com/pilotshop/learn-to-fly/faa-private-pilot-test-prep.html

7. FAA website—general information for pilots.

https://www.faa.gov/pilots/

Rules and Regulations

8. Federal Aviation Regulations (FARs). 14 CFR Parts 1, 39, 43, 61, 67, 71, 91.
Begin with the applicable sections of Parts 61 and 91, and fill in the rest as you progress in training.

https://www.ecfr.gov/current/title-14/chapter-I

9. Aeronautical Information Manual (AIM).

https://www.faa.gov/air_traffic/publications/atpubs/aim_html/index.html

FAA Handbooks: https://www.faa.gov/regulations_policies/handbooks_manuals/aviation/

10. Airplane Flying Handbook. FAA Handbook FAA-H-8083-3.

https://www.faa.gov/regulations_policies/handbooks_manuals/aviation/airplane_handbook/

11. Pilot's Handbook of Aeronautical Knowledge. FAA Handbook FAA-H-8083-25.

https://www.faa.gov/regulations_policies/handbooks_manuals/aviation/phak/

12. Risk Management Handbook. FAA Handbook FAA-H-8083-2.

https://www.faa.gov/regulations_policies/handbooks_manuals/aviation/media/risk_management_hb_change_1.pdf

13. Instrument Flying Handbook. FAA Handbook FAA-H-8083-15B.

https://www.faa.gov/regulations_policies/handbooks_manuals/aviation/media/FAA-H-8083-15B.pdf

14. Weight and Balance Handbook. FAA Handbook FAA-H-8083-1B.

https://www.faa.gov/regulations_policies/handbooks_manuals/aviation/media/FAA-H-8083-1.pdf

15. Aeronautical Chart User's Guide

https://www.faa.gov/air_traffic/flight_info/aeronav/digital_products/aero_guide/

FAA Advisory Circulars: https://www.faa.gov/regulations_policies/advisory_circulars/

16. Advisory Circular 00-6, Aviation Weather.

https://www.faa.gov/documentLibrary/media/Advisory_Circular/AC_00-6B.pdf

17. Advisory Circular 00-45, Aviation Weather Services.

https://www.faa.gov/documentLibrary/media/Advisory_Circular/AC_00-45H_CHG_2.pdf

18. Advisory Circular 61-67, Stall and Spin Awareness.

https://www.faa.gov/documentLibrary/media/Advisory_Circular/AC_61-67C_Chg_2.pdf

Videos and Other resources

19. Embry Riddle Aeronautical University / Pilot Training System Tutorials on YouTube.

https://www.youtube.com/user/ERAUSpecialVFR/videos
https://www.youtube.com/watch?v=miXi7EU7msI&list=PLdu8cMWoatm19rjgUl05Y8lSzlOUCTXp1&index=1

Aircraft and Systems Manuals

20. 1967 C-172H Owner's Manual (Pilot Operating Handbook):

www.aeroelectric.com/Reference_Docs/Cessna/cessna-poh/Cessna_172-C172H-1967-OM-bookmarked.pdf

21. Lycoming O-360-A1A Engine Manual:

https://www.lycoming.com/sites/default/files/O-HO-IO-HIO-AIO%20%26%20TIO-360%20Oper%20Manual%2060297-12.pdf

22. Garmin GTN-650 Comm/Nav/GPS Manual:

http://static.garmin.com/pumac/190-01004-03_M.pdf

23. Garmin GTX-345 Transponder (ADS-B In/Out) Manual:

https://static.garmin.com/pumac/190-01499-00_g.pdf

24. Garmin G5 Electronic Flight Instrument (ADI) Manual:

http://static.garmin.com/pumac/190-01112-12_A.pdf

Accident Reporting and Safety Resources

25. NTSB Aircraft Accident Reporting (49 CFR Part 830)

https://www.ecfr.gov/cgi-bin/text-idx?SID=f8b473cd8d9db12de76fbdeddbd6bdaa&mc=true&node=pt49.7.830&rgn=div5
https://www.ntsb.gov/Pages/default.aspx

26. Safety Resources

https://faasafety.gov/
https://asrs.arc.nasa.gov/

Flight Planning Links and Information:

1. Scheduling the Club Airplane on Google Calendar:

   username = club@chiefjosephflyers.info
   password = aviation

https://accounts.google.com/

2. Weather

Telephone (541) 432-0458 – KJSY AWOS-3 airport automated weather observation recording.
https://aviationweather.gov/
https://www.josephoregonweather.com/

3. NOTAMS

(KJSY = Joseph, KLGD = LaGrande, KBKE = Baker City, KLWS = Lewiston, KALW = Walla Walla, KPDT = Pendleton, KMYL = McCall, KGIC = Grangeville, KONO = Ontario, KBOI = Boise, KMAN = Nampa Muni, KEUL = Caldwell)

https://notams.aim.faa.gov/notamSearch/nsapp.html#/

4. Aeronautical Charts & Chart Supplements

https://www.faa.gov/air_traffic/flight_info/aeronav/digital_products/

5. Flight Planning, Filing, and Briefings

https://www.1800wxbrief.com/
https://skyvector.com/

6. Garmin Pilot or Foreflight Mobile/Tablet Apps (subscription required)

https://buy.garmin.com/en-US/US/p/115856
https://www.foreflight.com/

7. Flight calculators

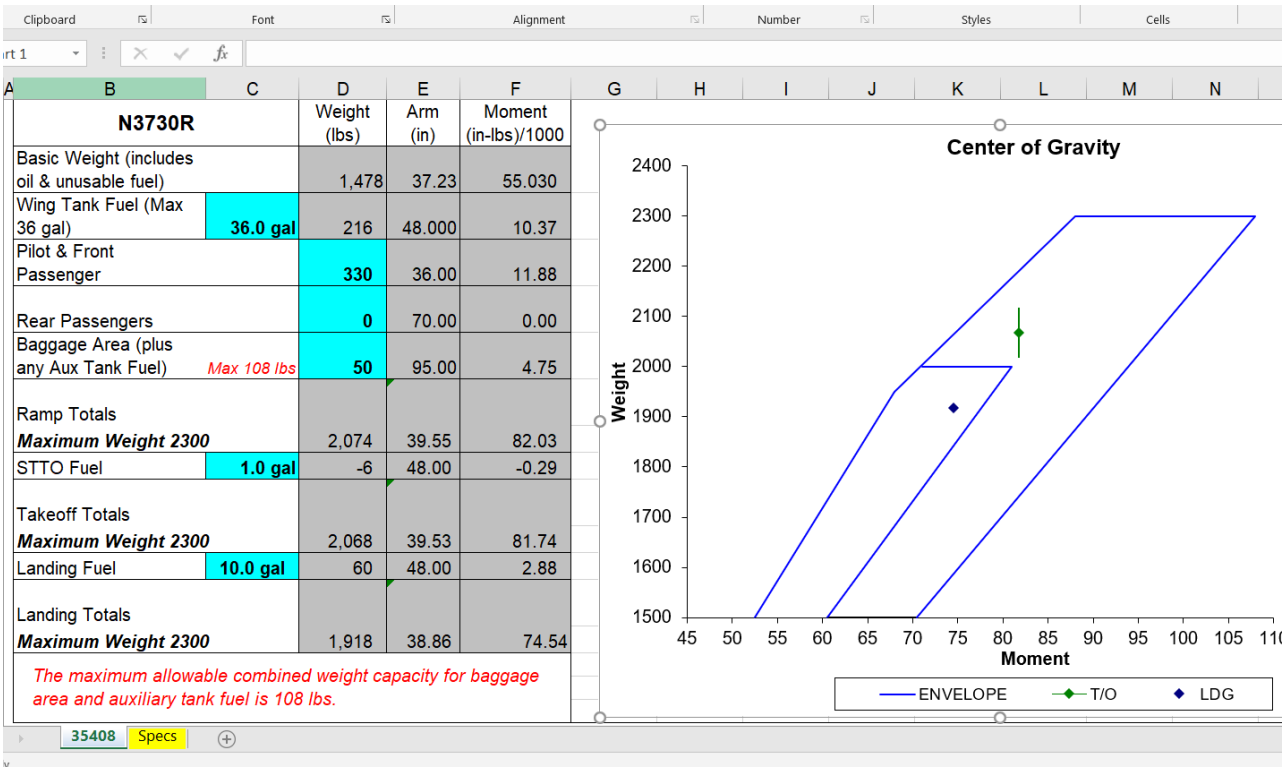
https://e6bx.com/e6b
http://www.csgnetwork.com/e6bcalc.html

8. Weight and Balance

In the weight and balance spreadsheet (separate file), enter values in the blue fields. The Basic Empty Weight and Arm values in the Gray boxes are current as of the official W&B dated 27 Feb 2018 for the Chief Joseph Flyers C172H Tail Number N3730R. Once your passenger & baggage weights and fuel gallons are entered, the takeoff and landing centers of gravity are plotted. If the CG falls within the blue outlined envelope, then your flight configuration is within weight and balance limitations. Here is a sample picture of what the spreadsheet provides.

Formulas

- Weight × Arm = Moment
- Total Moment ÷ Total Weight = CG
- 100 LL (Blue) Fuel Weighs 6 lbs./gal.; Oil Weighs 7.5 lbs./gal.
- 3 Gallons of unusable fuel and oil at full capacity are Included in Basic Empty Weight



C-172H Systems and Operating Limits

Key Figures for C172H 180 HP / Constant Speed Propeller (N3730R)

(All Speeds given in mph)

V_S / V_{SO} – Stall	Level flight:	**57** flaps up / **49** flaps full down
	20° bank:	59 flaps up / 51 flaps full down
	40° bank:	65 flaps up / 56 flaps full down
	60° bank:	81 flaps up / 69 flaps full down
V_{NE} – Never Exceed		174
V_{NO} – Max Structural Cruising		140
V_{FE} – Max with Flaps Extended		100
V_A – Maneuvering		122 @ max gross weight (2300 lbs)
V_R – Rotate		60
V_Y – Best Rate of Climb		80 at Sea Level; 77 at 10,000 ft. MSL (79 mph at Joseph)
V_X – Best Angle of Climb		66 at Sea Level; 71 at 10,000 ft. MSL (68 mph at Joseph)
Normal Approach		65-75 (flaps down); 70-80 (flaps up)
Best Glide (flaps up, wind-milling)		80 (glide distance ≈ 1.5nm per 1000' altitude…e.g. 3000' AGL ≈ 4.5 nm glide)
Stall Warning		5-10 mph prior to stall speed
Wing Span		36'
Max Gross Weight (Normal Cat.)		2300 lbs
Acceleration (Normal Category)		+3.8 TO -1.52 G (Flaps Up) +3.5 TO 0 G (Flaps Down)
Max Gross Weight (Utility Cat.)		2000 lbs
Acceleration (Utility Category)		+4.4 TO -1.76 G (Flaps Up) +3.5 TO 0 G (Flaps Down)
Engine Rated Power		180 HP @ 2700 RPM
Max RPM		2700
Prohibited RPM Range		Avoid continuous operation between 2000-2250 RPM
Cruise Power (Std Day, 7K'MSL)		2400 RPM/20" MP = 60% rated power, 109 hp, 110 KTAS, 8.5 gal/hr 2350 RPM/21" MP = 65% rated power, 117 hp, 115 KTAS, 9.5 gal/hr 2450 RPM/23" MP = 75% rated power, 135 hp, 125 KTAS, 10.5 gal/hr
Fuel Quantity – 100/100LL		36 gal useable in wing tanks (18 gal/side); 18-gal aux tank (not normally used)
Fuel Burn Rate		8.5-10.5 gallons/hour in cruise flight (budget for 9)
Fuel Pressure		3-5 psi normal, 0.5 psi min, 8 psi max
Oil Quantity		8 quarts max (6 quarts min)
Oil Pressure		60-90 psi normal, 25 psi min, 100 psi max
Oil Temperature		100-240°F
Oil Burn Rate		< 0.8 quarts/hour (typically 0.4 quarts/hour in cruise flight)

Magneto Check (1700 RPM)	Max Drop - 125 RPM (for either mag); comparison: +/- 50 RPM (between mags)
Vacuum Check (1700 RPM)	Allowable Range 4.5 TO 5.4 psi
Absolute Max Cylinder Head Temp	500°F/260°C

Dos and Don'ts:

--Maneuvers allowed when operating in the normal category are any maneuvers incidental to normal flying, stalls (except whip stalls), and turns in which the angle of bank is not more than 60°.

--Maneuvers allowed when operating in the utility category include normal category maneuvers plus chandelles, lazy eights, steep turns, stalls (except whip stalls) and spins. HOWEVER, for the Chief Joseph Flyers, the club aircraft is placarded "INTENTIONAL SPINS PROHIBITED".

--The baggage compartment and rear seat must not be occupied for maneuvers using utility category limits.

--Avoid abrupt full-range control surface deflections at/above V_A to preclude damage to flight surfaces.

--Slips are prohibited during full flap approaches down due to a downward pitch encountered at certain airspeeds/sideslip angles.

--Be aware of your crosswind limits. The pilot operating handbook states a demonstrated 15 knot crosswind capability for takeoff and landing. Use 10 knots or less max crosswind for student pilot considerations.

--When pulling aircraft or pushing-back, avoid steering the nosewheel greater than 30° either side of center to preclude damage to the main wheels.

--Reduce RPM to min required prior to taxiing over gravel or loose debris to preclude pitting/damage to propeller.

--Avoid snap full-range throttle movements to preclude counterweights damaging crank shaft. Full-range throttle movements should be accomplished in no less than 2-3 seconds.

--Warm-up to approximately 1000-1200 RPM. Avoid prolonged idling and do not exceed 2200 RPM on the ground.

--Any ground check that requires full throttle operation must be limited to three minutes, or less if the cylinder head temperature should exceed the maximum as stated.

--Minimize use of carb heat on ground. Avoid use of partial carb heat: set knob full in or full out. Use only when required and then return to off.

--Set fuel selector switch to 'Both' for takeoff, climb, and landing. Set to either 'Left' or 'Right' above 5000' MSL to preclude accumulation of fuel vapor in the fuel line and loss of power.

--Maintain mixture control in "Full Rich" position during takeoff and climb. Routinely and carefully observe temperature instruments to ensure the limits specified in Lycoming Operator's Manual are never exceeded.

--At 5,000 feet density altitude and above, or high ambient temperatures, roughness or reduction of power may occur at full rich mixture. The mixture may be adjusted to obtain smooth engine operation. Set throttle at full power and lean mixture at maximum RPM with smooth operation of the engine as a deciding factor.

--During cruise flight, lean for performance. Lean slowly in small increments and monitor cylinder head temperature as well as EGT. For Maximum Power Cruise (most mph for a given power setting) – lean to 100°F on rich side of peak EGT. For Best Economy Cruise (most mpg for given power setting) – Operate at peak EGT. If roughness is encountered, enrich the mixture slightly for smooth engine operation.

--For maximum service life, cylinder head temperatures should be maintained below 435°F (224°C) during max performance cruise operation and below 400°F (205°C) for economy cruise powers. Never exceed red line temperature 500°F (260°C).

Aircraft Systems:

Engine: The Chief Joseph Flyers 1967 Cessna 172H is equipped with a Lycoming, 4-cylinder, normally aspirated, float carbureted, 360-cubic inch, horizontally opposed, air cooled, direct drive O-360-A1A engine. This engine produces 180 HP @ 2700 RPM. Ignition is provided by 2 magnetos on the back of engine which provide spark to 8 spark plugs (2 per cylinder). The engine has an 8-quart oil sump. Minimum oil quantity for takeoff is 6 quarts. Engine power is controlled in flight by the throttle knob and measured in inches of Manifold Pressure.

Propeller: The engine drives a Hartzell, 74-inch, 2-blade, all metal, constant speed propeller with pitch settings between 14 (max RPM) and 20 degrees. A central hub connects the individual blades. Inside the hub, oil is used to provide pressure against a cylinder and spring mechanism that either increases or decreases the pitch of each blade. For a given RPM setting, as other flight parameters such as throttle position or pitch change, inducing a change in airspeed, the governor mechanism automatically adjusts the pitch of the blades within its pitch settings to maintain a constant RPM. If parameters change beyond the point that the blades are either at their maximum or minimum pitch setting, you will get a corresponding increase or decrease in RPM. There is a blue propeller control knob to the right of the mixture knob to adjust the RPM setting indicated on the tachometer.

Vacuum System: A single engine-driven vacuum pump is located on the back of engine, providing suction to the directional gyro (heading indicator), and has a normal operating range 4.5-5.4 inches of mercury.

Landing Gear: The landing gear is a fixed, tricycle type gear consisting of tubular spring steel providing shock absorption for the main wheels, and an oleo (air/oil) strut providing shock absorption on the nose wheel. The nose strut extends in flight, locking it in place. The nose wheel contains a shimmy damper which damps nose wheel vibrations during ground operations at high speeds. The nose wheel is linked to the rudder pedals by a spring-loaded steering bungee, which turns the nose up to 10° each side of center. Differential braking allows for up to 30° of steering either side of center. Tire pressure should be 24 psi in the mains and 26 psi in the nose.

Brakes: Brakes are hydraulically actuated, main wheel single-disc brakes controlled by master cylinders attached to both pilots' rudder pedals. When the airplane is parked, the main wheel brakes may be set by the parking brake handle beneath the left side instrument panel. To apply the parking brake, set the brakes with the rudder pedals, pull the handle aft and rotate it 90° down.

Flaps: The 172 has single slot type flaps driven electrically by a motor in the right wing. A flap position selector on the instrument panel is connected to an electric flap position indicator. Flaps can be set between 0 and 40 deg.

Pitot Static: The Pitot Static system consists of a pitot tube on left wing providing ram air pressure to the Airspeed Indicator, and a static port on the left side of the fuselage providing static pressure to the Altimeter, Vertical Speed Indicator and Airspeed Indicator. The pitot tube is electrically heated. There is an alternate static source is located under the instrument panel.

Fuel System: The fuel system consists of 2 tanks in the wings with a total capacity of 39 gallons, of which 36 is useable, and an auxiliary 18-gallon fuel tank in the fuselage. Total useable fuel quantity is 54 gallons, although for normal day to day operations the aux tank is not used. Fuel flows by gravity from the wing tanks through a four-way selector valve (labeled Left, Right, Both, and Off) and a fuel strainer to the carburetor. There are 3 fuel sumps (1 under each wing and 1 under fuselage aft of passenger door) and 3 fuel vents (1 under left wing and 1 in each fuel cap). An electric fuel boost pump has also been installed to provide fuel under pressure to the carburetor for takeoff, landing and certain emergencies.

Electrical System: The airplane is equipped with a 14-volt DC electrical system and a 12-volt lead-acid battery. Electrical energy is supplied by a 50-amp alternator located on the front of the engine. Electrical power is distributed through a single electrical bus and circuit breakers. If an electrical problem arises, always check circuit breakers. “Essential” circuit breakers should be reset in flight only once, and only if there is no smoke or “burning smell”, and only if the affected system and equipment is NECESSARY for the operational environment. Do not reset any non-essential circuit breakers in flight. The ammeter will indicate a slight positive charge when the

engine is running and indicates output of the alternator to the battery. A discharge indicates either an alternator malfunction or a load that exceeds the capacity of the alternator to recharge the battery.

Carburetor Heat: Under certain moist atmospheric conditions at temperatures of 20° to 70° F (-5° to 20° C), it is possible for ice to form in the induction system, even in summer weather. This is due to the high air velocity through the carburetor venturi and the absorption of heat from this air by vaporization of the fuel. To avoid this, the carburetor heat is provided to replace the heat lost by vaporization. The initial signs of carburetor ice can include engine roughness and a drop in engine Manifold Pressure. Carburetor heat should be selected on if carburetor ice is expected or encountered. Adjust mixture for maximum smoothness.

Exterior Lighting: Exterior lighting consists of navigation lights on the wing tips and top of the rudder, a dual position landing/taxi light on the leading edge of the left wing, and a flashing beacon on the top of the vertical fin.

Environmental: Cabin heat is provided by air ducted through the exhaust shroud and into the cabin and is controlled by a knob on the instrument panel. Air flow is controlled by a Cabin Air knob on the instrument panel and additionally by ventilators near the top corners of both left and right windshields.

Stall Warning: A pneumatic type stall warning system consists of an inlet on the left wing's leading edge, which is ducted to a horn near the top left of the windshield. As the aircraft approaches a stall, the lower pressure on top of the wing shifts forward drawing air through horn resulting in an audible warning at 5 to 10 knots above the stall.

Communication/Navigation: The aircraft is equipped with a Garmin GTN-650 Comm/Nav/GPS system providing dual VHF communication radios, dual navigation radios capable of receiving VOR and Localizer signals, and a WAAS GPS navigation system. The GTN provides GPS or VOR/Localizer course guidance signals to the stand-alone Course Deviation Indicator (CDI). The GTN is integrated with the GTX-345 Transponder (Mode A/C and ADS-B In/Out) allowing transponder changes to be made via the GTN controls, and for ADS-B traffic information to be graphically displayed. The GTN also provides a moving map display, terrain and obstacle warning, flight plan management, flight timers, datalink weather display and other utilities. The GTN does not receive any heading information from a magnetometer nor any barometric information from the aircraft pitot-static system; therefore, all altitudes, speeds and tracks displayed on the GTN are derived exclusively from the GPS signal, and no baro-aided VNAV functionality is available (for instrument approaches).

Aircraft Instruments:

Pitot-Static Driven Instruments: Airspeed Indicator (ASI), Altimeter, Vertical Speed Indicator (VSI)

Vacuum Driven Instruments: Directional Gyro (heading indicator), Suction Gauge

Engine Driven Instruments: Engine Tachometer (RPM), Manifold Pressure (MP) Gauge, Oil Pressure Gauge, Exhaust Gas Temperature (EGT) Gauge, Cylinder Head Temperature (CHT) Gauge

Electric Driven Instruments: Garmin G5 Primary Flight Display (attitude indicator), Turn and Slip Indicator (electric gyro), Course Deviation Indicator (CDI), Fuel Quantity Indicators, Oil Temperature, Fuel Pressure, Ammeter

Flight Instruments requiring no power source: Vertical Card Compass (magnetic)

NOTE: The Directional Gyro (DG) must be manually slaved to match the vertical card compass. It is subject to drift, and should be re-caged to the mag compass before takeoff and approx every 15 min during straight/level flight.

NOTE: The G5 functions as the primary attitude indicator (ADI) and derives pitch and bank information from its internal electric gyros. It also receives pressure from the aircraft pitot-static system and is useable as a secondary altimeter, airspeed indicator (mph), and vertical speed indicator. It does not receive heading input from a magnetometer, but it receives and displays ground track and ground speed (knots) from the external GPS (GTN-650)—therefore it can be used to fly a desired course but not a magnetic heading (use the directional gyro to fly ATC assigned headings). It receives no other navigation course info from the GTN-650, so the CDI, Glide Path, Horizontal Situation Indicator (HSI) and Radio Magnetic Indicator (RMI) functionality is disabled.

C-172 Traffic Pattern Guide

Taxi Operations (Airplane Flying Handbook Chapter 2)

1. A taxi clearance must be obtained from ground control prior to moving an airplane onto the airport movement area when an air traffic control tower is in operation.
2. At an airport without a control tower or when the tower is closed, the pilot should announce his or her intentions to taxi on the appropriate frequency (CTAF).
3. When first beginning to taxi, the brakes should be tested for operation as soon as the airplane is put in motion. If braking action is unsatisfactory, the engine should be shut down immediately.
4. Steering the airplane is accomplished with the rudder pedals and minimal usage of brakes. Turns should be made at a slow, safe speed, generally no faster than a brisk walk.
5. The taxi speed should be slow enough so that when throttle is closed the airplane can be stopped promptly.
6. When yellow taxiway centerline stripes are provided, the airplane's nose wheel should remain on the line unless necessary to clear other airplane, vehicles, or obstructions.
7. In no-wind, the ailerons and elevator controls should be held in a neutral condition.
8. In windy conditions:
    a. Headwind: Deflect ailerons into the wind, neutral elevator.
    b. Tailwind: Deflect ailerons away from the wind, elevator full forward.
9. While taxiing, clear all taxiway and runway intersections visually and verbally, i.e. "Clear left, clear center, clear right". Also, when taxiing onto an active runway CLEAR THE FINAL APPROACH IN BOTH DIRECTIONS.
10. Although ATC issues a taxi clearance, it is the PILOT'S RESPONSIBILITY to avoid collisions with other aircraft, vehicles, and objects on the ground.

Traffic Pattern Operations (Airplane Flying Handbook Chapter 7)

1. Prior to entering controlled airspace at a field with a control tower, determine the active runway, establish pattern altitude, and report your position and intentions to tower. Be prepared to adjust your pattern entry as directed by the tower controller.
2. When approaching to land at a non-towered airport, monitor the appropriate radio frequencies no later than 10 NM from the airport, (i.e. CTAF, UNICOM, ASOS, AWOS) in order to determine the active runway, airport conditions, and other traffic in the pattern. In the absence of any other information, determine the most suitable runway by the use of visual wind indicators, (segmented circle, wind sock, flag, smoke).
3. Complete the before landing checklist (BCGUMPS – Boost Pump: on, Carb Heat: on, Gas: Fuel Selector Both, Undercarriage: gear check, Mixture: full rich, Prop: check, Switches: Set…landing light).
4. **Pattern Entry:** Enter the pattern in level flight, on a 45-degree intercept heading to the downwind leg, abeam the midpoint of the runway, at pattern altitude. 1,000 feet AGL is the recommended pattern altitude with left hand turns unless established otherwise. Slow to 90-100 mph with a throttle setting of ≈16-17 inches of Manifold Pressure (MP) and turn to downwind.
5. **Abeam Touchdown Point:** Abeam the point of intended landing, reduce power to 1500 - 1700 RPM, and set flaps to 10 degrees. Maintain altitude while decelerating to 80 mph, then begin a gradual descent by setting pitch attitude for 80 mph and re-trim the aircraft.
6. **Turn to Base:** At a point approximately 45 degrees past the approach end of the runway, begin a standard to medium bank turn onto the base leg. Set flaps to 20 degrees, slow to 70 mph, and trim. While on the base leg, visually clear the final approach area.

7. **Turn to Final**: At approximately 20 degrees to the touchdown point, begin a standard to medium bank turn onto the final leg to roll out about ½ to 1 nm from touchdown and 300-400' AGL. Set desired landing configuration flaps and final approach airspeed, typically 20-30 degrees of flaps and 65 mph. Refer to the appropriate landing procedure for runway surface, length, and crosswind conditions as per below.
8. When stabilized on final and approaching the overrun, set prop control to full forward (max RPM) and carb heat off in case a go-around is required.

Closed Pattern (if remaining in the pattern for touch and go landings)

9. **Touch and Go:** Retract flaps, double check prop full forward and carb heat off, advance throttle smoothly to full power, apply rudder to maintain centerline, accelerate to rotation speed, and execute takeoff.
10. **Turn to Crosswind:** Maintain straight ahead climb at V_Y (80 mph) with max continuous power until within 300 feet below pattern altitude, then make a standard to medium banked turn to crosswind. Adjust propeller to 2400 RPM passing 500' AGL.
11. **Turn to Downwind:** Make the turn to downwind to achieve the desired lateral spacing ½ - 1 NM from runway (place runway halfway up wing strut). Level off at pattern altitude, reduce power to approximately 16-17 inches MP to maintain 90-100 mph. Accomplish before landing checklist and analyze previous pattern to apply corrections for winds, etc.

Departing the Pattern

12. If departing the traffic pattern, continue straight out, or exit with a 45-degree turn (to the left when in a left-hand traffic pattern; to the right when in a right-hand traffic pattern) beyond the departure end of the runway, after reaching pattern altitude.

Normal / Crosswind Takeoff (Airplane Flying Handbook Chapter 5)

1. Accomplish the before takeoff checklist.
2. Align aircraft with runway centerline with ailerons fully deflected into the wind if crosswind is present.
3. Smoothly apply full power and check instruments.
4. As the aircraft accelerates, reduce aileron deflection as necessary and maintain runway alignment with rudder.
5. At 60 mph, apply backpressure to establish V_Y climb attitude (80 mph).

NOTE: If a significant crosswind exists, increase the rotation speed by one half the gust factor, not to exceed 10 knots. This holds the aircraft on the ground a little longer so that a smooth and definite liftoff can be made.

6. As the aircraft lifts off, establish a crab into the wind; then level the wings.
7. Maintain takeoff power, V_Y, and a ground track along the extended runway centerline during climb out.
8. Above 500' AGL, reduce prop to 2400 RPM and turn Boost Pump off at 1000' AGL.
9. Once clear of the pattern, establish a cruise climb speed of 80-90 mph.

Normal / Crosswind Approach and Landing (Airplane Flying Handbook Chapter 8)

1. Accomplish the before landing checklist.
2. While flying the traffic pattern, assess the wind by noting the required drift correction angles on downwind and base, and by the surface wind indicators. *With crosswinds present, consider the use of reduced flap settings on final (20 degrees max).*

3. Prior to 300 feet AGL on final approach, stabilize the aircraft with the final flap setting and a final approach airspeed of 65 mph (flaps down) or 70 mph (flaps up). *If gusty conditions are present, increase final approach speed by one half the gust factor, not to exceed 10 knots*.
4. With crosswinds present, initially establish a crab angle to maintain the proper ground track on final, then transition to the wing low side-slip technique prior to the flare (aileron into the wind to counter drift and opposite rudder to keep the aircraft's longitudinal axis aligned with the runway centerline). Pilots with less experience should transition to the wing low side-slip earlier on final (normally >= 200' AGL).

NOTE: Regardless of reported winds, if the required bank to maintain drift control is such that full opposite rudder is required to prevent a turn toward the bank, the wind is too strong to safely land the airplane. Go-around and select another runway or airport any time the outcome of an approach or landing becomes uncertain.

5. When stabilized on final, return prop control lever to full forward and carb heat to off in case a go-around is required.
6. At the appropriate flare altitude (10-20 feet above the ground), smoothly reduce power towards idle and slow the descent by increasing pitch attitude. Strive to maintain airplane 1-2 feet above the ground by slowly increasing back pressure on the yoke until the aircraft settles onto the runway. As the aircraft decelerates with crosswinds present, increase aileron and rudder deflection to maintain the necessary side-slip. Allow the aircraft to touch down on the upwind main wheel first, followed by the downwind main wheel, then the nose wheel.
7. Maintain backpressure on the yoke throughout the landing roll and continue to increase aileron deflection fully into the wind as the aircraft slows to taxi speed.

<u>Soft Field Takeoff and Climb</u> (Airplane Flying Handbook Chapter 5)

1. Accomplish the before takeoff checklist.
2. Prior to taxiing onto the takeoff surface, set the flaps to 10 degrees and apply full elevator backpressure.
3. Taxi onto the takeoff surface at a speed consistent with safety. Avoid stopping on a soft surface.
4. Smoothly apply full power and check instruments while adjusting the elevator to maintain minimum nose wheel pressure on takeoff surface.
5. Lift off at the lowest possible airspeed in ground effect, then reduce back pressure to lower the pitch attitude to remain in ground effect (one wingspan length) while the aircraft accelerates to V_X (68 mph). Maintain takeoff power and a ground track along the extended runway centerline.
6. After reaching V_X (68 mph), establish a positive rate of climb. Maintain V_X until well clear of obstacles. Once clear of obstacles, retract flaps and accelerate to continue climbing at V_Y (80 mph).
7. Above 500' AGL, reduce prop to 2400 RPM and turn Boost Pump off at 1000' AGL.
8. Once clear of the pattern, establish a cruise climb speed of 80-90 mph.

NOTE: If a crosswind exists, apply the appropriate crosswind procedures.

<u>Soft Field Approach and Landing</u> (Airplane Flying Handbook Chapter 8)

1. Accomplish the before landing checklist.
2. Select the desired touchdown point and complete the appropriate traffic pattern. Consider extending downwind to allow sufficient time on final for establishing the desired descent profile.
3. Stabilize the airplane on final approach at 65 mph (1.3 V_{SO}) with 30 to 40 degrees of flaps.
4. When the intended landing area is assured, smoothly reduce power toward idle and hold the airplane off the runway in ground effect while slowing to minimum controllable airspeed. Add an audible amount of power (50-100 RPM) in the flare just prior to touchdown in order to soften the landing.

5. As the main wheels touch, hold back pressure on the yoke to prevent the nose wheel from touching. Once the aircraft is stabilized with the main wheels on the ground, smoothly reduce power as required while maintaining sufficient backpressure to hold the nose off the runway as long as possible. Adjust power according to the surface conditions.
6. When the nose wheel settles to runway, maintain full elevator back pressure to minimize the weight on the nose wheel.

NOTE: If a crosswind exists, apply the appropriate crosswind procedures.

<u>Maximum Performance (Short Field) Takeoff and Climb</u> (Airplane Flying Handbook Chapter 5)

1. Accomplish the before takeoff checklist. POH recommended flap setting is no flaps (full up).
2. Taxi into position at the end of the runway so that maximum runway is available for takeoff.
3. On the runway, hold the brakes so that the airplane remains static while smoothly advancing the throttle to full power and check engine instruments.
4. Rotate as normal at 60 mph, accelerate to V_X (68 mph) and maintain V_X for the climb out to clear obstacles. Your pitch reference looking out the front of the airplane will be a couple inches higher than for a normal V_Y picture.
5. An alternate technique is to release brakes, accelerate, and delay rotation until approximately V_X (68 mph). The aircraft will smoothly and firmly liftoff and tend to accelerate more rapidly than normal. After liftoff, establish and maintain V_X until well clear of real or simulated obstacles.
6. With either technique, once all obstacles are cleared, set pitch attitude for V_Y (80 mph) and continue the climb.

NOTE: If crosswind exists, apply the appropriate crosswind procedures.

<u>Maximum Performance (Short Field) Approach and Landing</u> (Airplane Flying Handbook Chapter 8)

1. Accomplish the before landing checklist.
2. Select the desired touchdown point and complete the appropriate traffic pattern.
3. Stabilize the airplane on final approach. The pilot operating handbook for our C-172H states to use an approach speed of 69 mph (1.3 V_{S0}) with flaps full down (40 degrees). If there are obstacles to clear on the approach to a short field, use of full flaps allows a steeper descent on final for a given airspeed.
4. Select an appropriate aim point situated approximately 100-200 feet short of the specified touchdown point and adjust power as necessary to avoid over- or undershooting that aim point. Precise airspeed control is essential for judging the descent profile.
5. In the flare, reduce power slowly to touch down on the intended point with little or no floating. Touch down at minimum control airspeed with no side drift, minimum float, and with the airplane's longitudinal axis aligned with and over the runway center/landing path.
6. Lower the nosewheel and begin smoothly applying brakes immediately after touchdown. Retract the flaps while holding positive back pressure on the elevator. Continue applying full elevator backpressure and maximum braking (without skidding the tires) until the aircraft has slowed to normal taxi speed. For practice approaches, announce "Maximum Braking" to simulate this portion of the procedure.

NOTE: If crosswind exists, apply the appropriate crosswind procedures.

<u>Balked Landing (Go-Around)</u> (Airplane Flying Handbook Chapter 8)

1. Smoothly apply full power while confirming carb heat is off and the prop is full forward. Retract the flaps immediately to 20 degrees (if greater than 20 degrees used). You will likely need to add nose-down trim to relieve pressure on the yoke and prevent pitch attitude from becoming too high.

WARNING: Jamming the throttle forward can cause the engine to falter or quit.

2. Control pitch to gain a safe flying airspeed (60 mph) before establishing a nose-high climb pitch attitude.
3. Establish and confirm a positive rate of climb (positive VSI, altitude increasing) as soon as possible after ensuring a safe flying airspeed (60 mph). Set a pitch attitude equivalent to your desired climb airspeed. If obstacles are present, establish a V_X pitch attitude (68 mph) and maintain V_X until clear of obstacles.
4. As the aircraft accelerates, retract remaining flaps passing V_X (68 mph) while maintaining a positive rate of climb. Continue acceleration to V_Y (80 mph) and climb to pattern/desired altitude.
5. Side step to the right to keep conflicting runway traffic in sight.
6. Announce the go-around on CTAF or to the Tower.

NOTE: The decision to execute a go around is no reason for embarrassment, but rather the manifestation of sound judgment. Welcome any opportunity to practice this vital maneuver!

TRAFFIC PATTERN ONE-PAGER

NORMAL PATTERN: (NO WIND, STANDARD DAY, 1000' AGL, LEFT TURNS)

PATTERN ENTRY – Enter 45-degrees to downwind; 1000' AGL; 2400 RPM; ~16-17" MP; 90-100 MPH; Trim!

BEFORE LANDING CHECKLIST (BCGUMPS) – **B**oost Pump ON; **C**arb Heat ON; **G**as BOTH; **U**ndercarriage Check Gear; **M**ixture RICH; **P**rop CHECK; **S**witches SET (Landing Light as required)

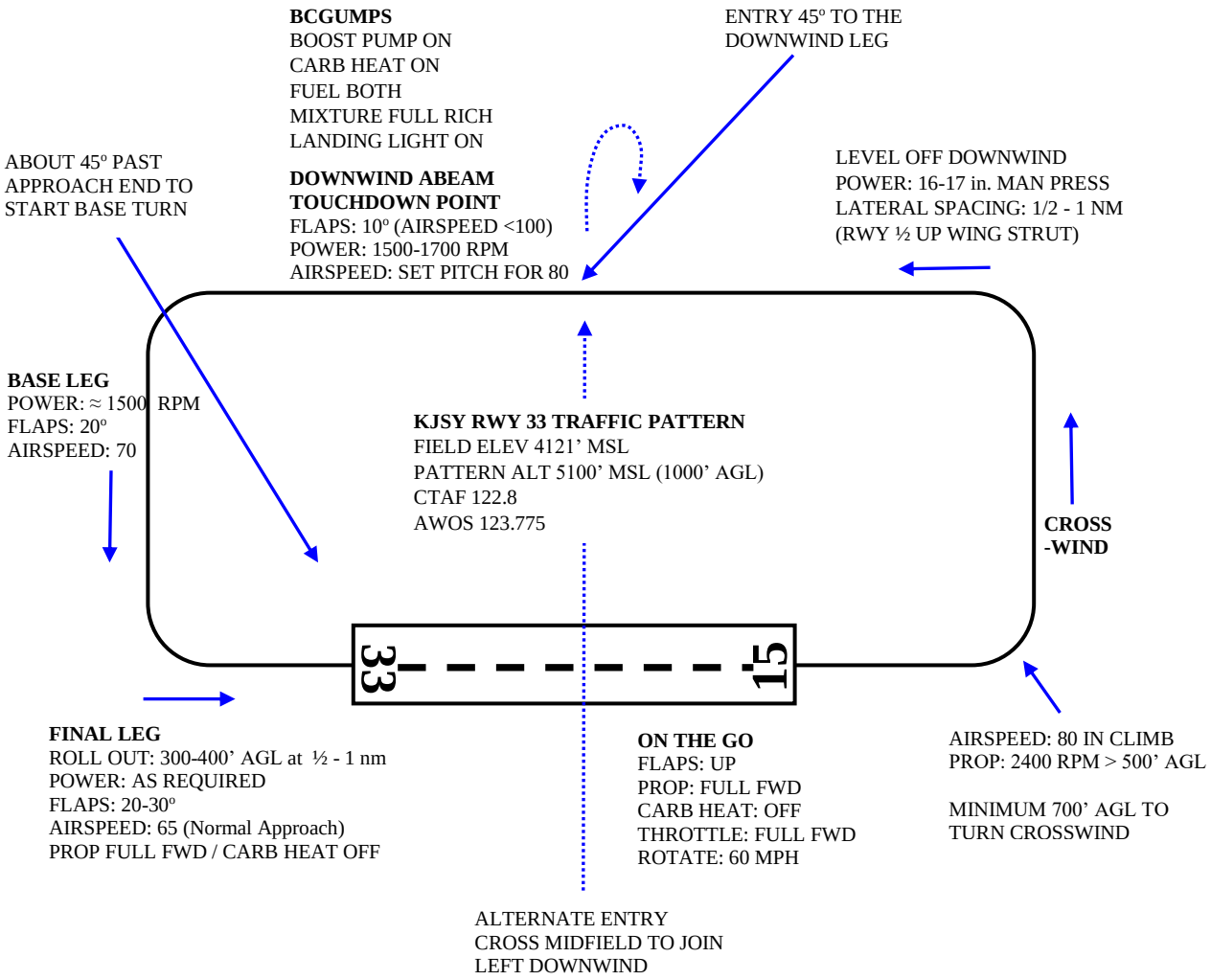
TURN TO DOWNWIND – Set lateral spacing ½ - 1 NM from runway (place runway halfway up wing strut)

ABEAM TOUCHDOWN – 1500-1700 RPM; FLAPS 10; Slow in level flight to 80 MPH then pitch to descend at 80 MPH; Trim!

TURN TO BASE – At 45° angle-off from touchdown point; ~700' AGL; FLAPS 20; set pitch for 70 MPH; Trim!

TURN TO FINAL – Roll out ½ to 1 NM from touchdown; 300-400' AGL; FLAPS 20-30; Stabilize at 65 MPH; Trim!

DESCENT ON FINAL – Set Aimpoint; control airspeed & glide path w/ pitch and power; Airspeed 65 MPH (Normal) 70 MPH (No Flap); Set Prop Full FWD (Max RPM) & Carb Heat OFF when stabilized on final and approaching the overrun prior to go-around or touchdown.



C-172H STANDARDIZED MANEUVER GUIDE

PURPOSE

Standardizing the way maneuvers are performed establishes a solid foundation of basic procedural skills and knowledge. This, coupled with experience gained over time, will enable any pilot to handle most unusual situations and emergencies in a more predictable fashion with a greater chance of a successful outcome.

Student pilots seeking a private pilot's license are only required to accomplish slow flight, stalls, steep turns, and ground reference maneuvers (rectangular course, S-turns, and turns around a point). Chandelles, lazy eights, steep spirals, eights-on-pylons, and power-off 180-degree accuracy approach and landings are only required for commercial pilot applicants.

The specific airspeeds, power settings, and flap settings used in this guide are for a C172H with a 180 hp engine and a constant speed propeller. They may differ slightly from other models of the C-172. Stalls, slow flight, chandelles, lazy 8's, steep turns, and unusual attitudes shall be performed at an altitude which allows for recovery no lower than 1500 feet AGL. Steep spirals and emergency procedures will be terminated at 500 feet AGL unless the aircraft is in a position to land.

BACK TO BASICS

1. Every maneuver begins and ends the same way: **SLUF** (Strait and Level Unaccelerated Flight – i.e.; cruise power, trimmed, on altitude and heading, and stabilized). That way, you know exactly when you are beginning the maneuver, and exactly when you are done.

2. The recovery altitude is the altitude you are at when you are finished with the maneuver (i.e.; SLUF). It will probably be different than the altitude from which you started the maneuver. That being said, your instructor may want you to return to your original altitude after recovering from a power off stall.

3. There is no requirement to establish a positive rate of climb when recovering from a stall in a fixed gear aircraft (the ACS only requires a positive rate of climb prior to retracting the landing gear). However, the aircraft should be in a pitch attitude that will result in a positive rate of climb at the end of the maneuver.

4. To consistently raise or lower the flaps "incrementally," use airspeeds that equate to something useful. Pattern airspeeds work well for extending the flaps and V-speeds work well for retracting them during a stall recovery or a go-around.

5. Clearing turns will be accomplished by two 90-degree turns in each direction.

6. The importance of proper trim techniques cannot be over emphasized. Trim constantly changes throughout the flight. Any change in power, pitch, bank, airspeed or weight/CG (fuel burn) requires a corresponding trim change. You should constantly strive to keep the aircraft trimmed "hands off." A properly trimmed aircraft will allow you to do other things with your eyes and hands (e.g. looking for other air traffic, taking notes, inserting coordinates in the GPS) without having to constantly monitor altitude, airspeed and heading.

7. The following maneuver descriptions are designed to produce standardized performance. By performing each maneuver as described, you will consistently fly the aircraft (and think through the maneuver) the same way every time. This will develop a sound knowledge and flying skills base and allow you to handle any emergency or unusual flight situation in a predictable fashion based on a solid foundation of the basics.

Slow Flight (Airplane Flying Handbook Chapter 4)

1. Clear the area using clearing turns.
2. Fuel: BOTH / Mixture: RICH
3. Power: 1500-1700 RPM
4. Establish and announce altitude, heading and target airspeed.
5. Airspeed in flap operating range, extend flaps in 10-degree increments to desired setting. (85 mph – flaps 10; 75 mph – flaps 20; 65 mph – flaps 30).
6. As airspeed diminishes, adjust power and pitch attitude to maintain level flight.
7. Establish and maintain an airspeed at which any further increase in pitch, load factor, and/or reduction in power would result in an immediate stall, about 5-10 mph above 1G stalling speed (~60 mph flaps down, 65-70 mph flaps up). You will need to add power when reaching desired airspeed (set ~18-19 inches MP).
8. Recognize and announce the first aerodynamic indications of an oncoming stall (e.g., stall warning, mushy flight controls, buffeting), and add power as required to get out of stall indication condition.
9. Perform coordinated turns, climbs, and descents as directed by the instructor.
10. Recover to cruise flight by simultaneously applying maximum power, Carb Heat COLD, and immediately raise flaps one notch to 20 degrees. Adjust pitch attitude to maintain altitude and trim off pressure. Retract flaps when airspeed increases through V_X and continue to accelerate normal cruise (recovery is analogous to a Go-Around procedure).

Steep Turns (Airplane Flying Handbook Chapter 9)

1. Clear the area using clearing turns.
2. Establish cruise flight—power 16-20 in. MP for airspeed 100-120mph (at or below V_A); trim for level flight.
3. Establish and announce altitude, heading, and airspeed. Determine a visual reference point (if practical).
4. Smoothly roll into a 45-degree banked turn using coordinated ailerons and rudder (50 degrees for pilots over 200 hours).
5. Maintain a level turn by looking outside and "dragging the nose across the horizon."
6. Add slight backpressure to maintain altitude, add 1-2 inches of MP to maintain speed, adjust ailerons to maintain bank angle, and use rudder to maintain coordinated flight (step on the ball).
7. Approaching the visual reference point (within approximately 5-10 degrees of initial heading) transition smoothly back to straight and level flight using coordinated ailerons and rudder. Reduce backpressure to maintain altitude and power to maintain airspeed.
8. Smoothly transition into a step turn in the opposite direction.
9. After completion of the second 360-degree turn, return to cruise flight by setting cruise power and maintaining altitude, heading, and airspeed.

Power-On Stall (Airplane Flying Handbook Chapter 4)

1. Clear the area using clearing turns.
2. Fuel: BOTH / Mixture: RICH
3. Power: 1500-1700 RPM
4. Establish and announce altitude and heading.
5. Slow to lift-off speed (70 mph), increase power to 18-19"MP, and establish a takeoff attitude.
6. Transition smoothly from the takeoff attitude to a pitch attitude that will induce a stall. Aim for 20 degrees nose high (feet on the horizon); max allowable pitch is 30 degrees nose high.
7. Establish desired bank angle (as directed by instructor). If a turn is used, 20-degree max bank angle.
8. Recognize and announce the first aerodynamic indications of the oncoming stall (e.g., stall warning horn, mushy aileron control, buffeting).
9. Announce the stall (at the buffet), then promptly recover by simultaneously:
    a. Decreasing angle of attack (relaxing back pressure).
    b. Maintaining wings level using primarily rudder inputs.
    c. Throttle smoothly to full open and accelerate to V_Y.
10. Return to cruise flight by setting cruise power and maintaining altitude, heading, and airspeed.

Power-Off Stall (Airplane Flying Handbook Chapter 4)

1. Clear the area using clearing turns.
2. Fuel: BOTH / Mixture: RICH
3. Power: As Required to slow to traffic pattern speeds 1500-1700 RPM.
4. Establish and announce altitude and heading.
5. Airspeed in flap operating range, extend flaps in 10-degree increments to desired setting. (85 mph – flaps 10; 75 mph – flaps 20; 65 mph – flaps 30).
6. When airspeed reaches approach speed of 65 mph, reduce power to idle. Establish a glide and trim at that speed while continuing to maintain heading unless instructor directs a turn.
7. After establishing a stabilized descent, call out the altitude you have picked for the "simulated ground" and transition smoothly to a pitch attitude that will hold that altitude.
8. Recognize and announce the first aerodynamic indications of an oncoming stall (e.g., stall warning horn, mushy controls, buffeting).
9. Recognize and announce the stall, then promptly recover by simultaneously:
    a. Decreasing angle of attack (relaxing back pressure)
    b. Maintaining wings level using primarily rudder inputs.
    c. Applying full power, Carb Heat COLD, and immediately retract flaps one notch to 20.
10. As you gain airspeed past 60 mph, adjust pitch for V_Y climb picture.
11. Retract remaining flaps passing V_X with a positive climb and accelerate to V_Y; return to original altitude.

Rectangular Course (Airplane Flying Handbook Chapter 6)

1. Clear the area.
2. Select a suitable rectangular reference area well away from other air traffic and near where an emergency landing can be made.
3. Plan the maneuver so as to enter a left pattern at 45 degrees to the downwind leg at 600 feet to 1000 feet AGL at 90-100 mph. Set power to ~16-17 inches MP.
4. All turns should be started when the airplane is abeam the corner of the field boundaries, and the bank should normally not exceed 45 degrees.
5. Vary the bank angle used during the turns as necessary to maintain a constant distance from the field.
6. Apply adequate wind-drift correction during the straight and level legs to maintain a constant ground track around the rectangular reference area.
7. Maintain entry altitude +/- 100 feet and airspeed +/- 10 mph during the maneuver.
8. Exit the maneuver at the end of the 45 degrees away from the field.

S-Turns (Airplane Flying Handbook Chapter 6)

1. Clear the area.
2. Select a suitable ground reference line, perpendicular to the wind and well away from other air traffic and near where an emergency landing can be made.
3. Plan to enter the maneuver downwind at 600 feet to 1000 feet AGL at 90-100 mph (set ~16-17 in. MP).
4. Apply adequate wind-drift correction and bank angle to track a constant radius 180 degrees turn back towards the reference line using up to a maximum bank angle of 45 degrees.
5. After 180 degrees of turn, and back over the reference line with wings level, continue the maneuver in the opposite direction.
6. Depart the maneuver on the entry heading.
7. Maintain entry altitude +/- 100 feet and airspeed +/- 10 mph during the maneuver.

Turns Around A Point (Airplane Flying Handbook Chapter 6)

1. Clear the area.
2. Select a suitable ground reference point well away from other air traffic and near where an emergency landing can be made. If desired, select four equidistant points around the ground reference point to aid in making a symmetrical circle.

3. Plan the maneuver so as to enter a left or right pattern downwind at 600 feet to 1000 feet AGL, and at a distance equal to the desired radius of turn at 90-100 mph (100mph, 15° bank ≈ 2500 ft radius or ≈ ½ nm).
4. Maintain constant airspeed, altitude, and radius around the point while adjusting bank and drift correction using up to but exceeding 45 degrees of bank.
5. Depart the maneuver after 2 circles on the entry heading.
6. Maintain entry altitude +/- 100 feet and airspeed +/- 10 mph during the maneuver.

Chandelles (Airplane Flying Handbook Chapter 9)

1. Clear the area using clearing turns. Altitude at or above 1500' AGL.
2. Establish cruise flight (power approximately 20 in. MP; airspeed at or below V_A; trim for level flight).
3. Establish and announce altitude and heading. Determine visual reference points and wind direction.
4. Smoothly roll into the wind and establish a 30-degree bank.
5. Apply full power while increasing backpressure to increase pitch to approximately 5-10 degrees nose high.
6. Maintain 30 degrees bank and continue to increase pitch until the 90-degree point (altitude is increasing, airspeed is decreasing).
7. Gradually start rolling out bank at the 90-degree point while maintaining pitch.
8. Complete the rollout to wings level at the 180-degree point. Airspeed should be approximately 1.2 V_S.
9. Momentarily hold airspeed without stalling.
10. Resume straight and level flight while letting airspeed increase to cruise.
11. Reduce power to cruise setting and maintain altitude, heading, and airspeed.

Lazy Eights (Airplane Flying Handbook Chapter 9)

1. Clear the area using clearing turns.
2. Establish cruise flight (power approximately 20 in. MP; airspeed at or below V_A; trim for level flight).
3. Establish and announce altitude and heading. Determine visual reference points and wind direction. (Select a reference point abeam the wingtip.)
4. Raise the nose above the horizon and begin a climb (approximately 5-10 degrees nose high).
5. Slowly roll in bank and enter a coordinated climbing turn.
6. Pass the 45-degree point with maximum nose-up for the maneuver. (Bank is increasing through 15 degrees; speed is decreasing; pitch begins decreasing; bank angle continues to increase).
7. Arrive at the 90-degree reference point with a maximum bank angle of 30 degrees. (Pitch is momentarily level, then descending through the horizon; bank begins to decrease; speed begins to increase).
8. Take note of the altitude and airspeed at the 90-degree point.
9. Pass the 135-degree point with the lowest pitch attitude for the maneuver. (Bank is reducing through 15 degrees; speed continues to increase; pitch begins increasing; bank angle continues to decrease).
10. At the 180 degree point the aircraft is momentarily level at the same altitude and airspeed as at entry.
11. Smoothly roll bank in the opposite direction and re-accomplish the maneuver.
12. Complete the rollout to wings level at the 180-degree point. Airspeed, altitude, and heading should be the same as at entry.
13. Resume cruise flight after completing the maneuver.

Eights-On-Pylons (Airplane Flying Handbook Chapter 6)

1. Clear the area using clearing turns.
2. Establish cruise flight at 800 feet AGL. (power approximately 20 in. MP; airspeed at or below V_A; trim for level flight).
3. Calculate pivotal altitude (ground speed in knots squared divided by 11.3; rule of thumb is 100 knots = pivotal altitude of 900' AGL, with 100' up or down for every 5 knots faster or slower than 100 knots).
4. Select 2 pylons approximately ½ nm apart, perpendicular to the wind.

NOTE: Fly over one of the 2 pylons, put the wingtip on the other pylon and note the bank angle on the attitude indicator. 20 degrees bank angle means the pylons are approximately ½ nm apart. If the bank angle is more

than 20 degrees, the pylons are less than ½ nm apart. If the bank angle is less than 20 degrees, the pylons are more than ½ nm apart.

5. Enter the maneuver by approaching the midpoint between the pylons diagonally, with the wind to your back.
6. Just past the intended pylon, roll into a turn around that pylon (approximately 30 to 40 degrees of bank) and place the wingtip on that pylon.
7. Use ailerons to correct up and down movement and elevator (pivotal altitude) to correct fore and aft movement of the pylon on the wingtip.

NOTE: If the pylon moves forward of the wingtip, apply forward elevator (i.e. descend to increase ground speed). If the pylon moves aft of the wingtip, apply aft elevator pressure (i.e. climb to decrease ground speed). Do not use rudder to maintain wingtip position on the pylon.

8. Crossing the midpoint between the pylons, roll back to wings level.
9. Just past the opposite pylon, roll into a turn around that pylon (approximately 30 to 40 degrees of bank) and place the wingtip on that pylon.
10. Use ailerons to correct up and down movement and elevator to correct fore and aft movement of the pylon on the wingtip.
11. Complete the maneuver by crossing the midpoint between the two pylons wings level, at the same altitude and airspeed at which the maneuver was entered.

<u>Steep Spiral</u> (Airplane Flying Handbook Chapter 9)

1. Clear the area using clearing turns.
2. Establish cruise flight (power approximately 20 in. MP; airspeed at or below V_A; trim for level flight), at an altitude that will allow at least 3 descending 360 degree turns.
3. Select an appropriate landing area.
4. While maneuvering to the intended landing area, slow the aircraft to best glide speed and configure for landing (flaps up to full down may be used).
5. Maintain altitude and trim for hands-off at best glide speed.
6. Abeam the intended landing area, reduce power to idle, allow the nose to drop, and retrim for hands-off at best glide speed.
7. Maintain a constant radius turn around the intended landing area by varying bank angle to correct for wind (normal 20-30 degrees of bank; max 60 degrees).
8. After the 3rd 360-degree turn, execute a power off landing or go around, as applicable.

NOTE: Clear the engine at least once during the maneuver.

<u>Power-Off 180 Degree Accuracy Approach and Landing</u> (Airplane Flying Handbook Chapter 8)

1. Position the aircraft on a normal downwind and complete the before landing checklist.
2. Determine projected ground track for a continuous turn to final (based on wind).
3. Determine desired reference altitudes around the turn to final (based on field elevation).

NOTE: As a general rule of thumb, divide the final turn into thirds. If the pattern altitude is 1000 feet AGL, plan on being approximately 700 feet AGL at the first 3rd of the turn, 500 feet AGL at the second 3rd of the turn, and rolling out on final at approximately 300 feet AGL and ¼ nm from the intended touchdown point. If you are above these projected altitudes, add more flaps or extend the ground track. If you are below these projected altitudes, shorten the ground track.

4. Close the throttle abeam the intended touchdown point.
5. Establish glide speed based on wind and projected ground track.
6. Evaluate aircraft performance based on determined ground track and reference altitudes.
7. Lower flaps as desired. (Consider delaying the last 10 degrees of flaps until landing is assured).
8. Touchdown at or within 200 feet beyond the intended touchdown point, on centerline, with the aircraft aligned parallel to the runway.

Forced Landing Pattern

(Typical - No Wind, Windmilling Prop)