CESSNA 172 SKYHAWK

SAFETY HIGHLIGHTS

Sponsored by the United States Aircraft Insurance Group

AIR SAFETY FOUNDATION
AOPA
1950 — 2000

INTRODUCTION

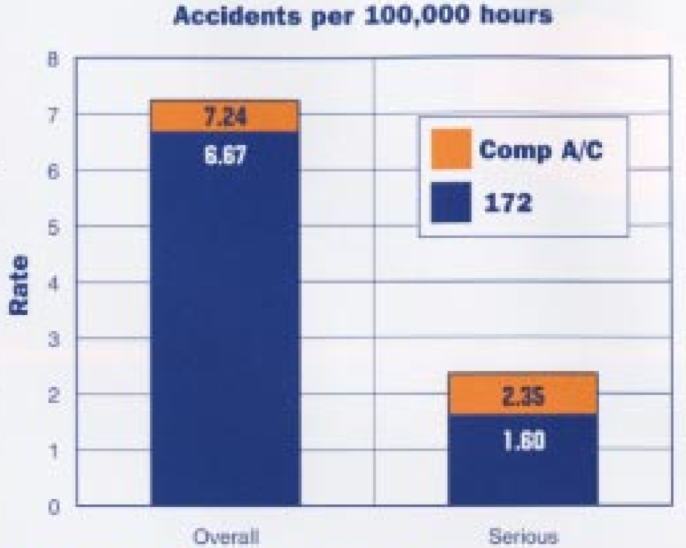
The world's most popular airplane, not surprisingly, has a great safety record. In this booklet, *Cessna 172 Skyhawk Safety Highlights*, the AOPA Air Safety Foundation compares 2,405 Skyhawk accidents to 2,364 comparable single-engine, fixed-gear aircraft accidents during the years 1982-1993. With 24,000 Skyhawks in the fleet, that's a good record, but it is sobering to think that every year about 200 Skyhawks are involved in reportable accidents—that's about four per week. Happily, most of the accidents result in little or no injury to the occupants.

The Cessna was compared to other light four-place aircraft that make up the bulk of the training and entry-level transportation fleet. Included in the comparative group are the Beech Musketeer series, the fixed-gear Cessna Cardinal, the Gulfstream American AA5 Traveler, the Piper Cherokee, and the Aerospatiale TB-10 Tobago.

The Skyhawk's safety record is good and most accidents result in little or no injury.

In terms of overall accidents per 100 aircraft in the fleet and per 100,000 hours of flight, the 172 had a very slight edge over the comparative aircraft. The FAA estimates annual flying hours from the annual GA Activity and Avionics Survey that includes reports from 30,000 aircraft owners of flying time, landings, fuel consumption, lifetime airframe hours, avionics, and engine hours.

The Skyhawk has fewer serious accidents than the comparison group of aircraft—possibly because of its extensive use as a training airplane. Flight lessons for both primary and instrument students are typically given in good weather, so the average student's exposure to marginal visual conditions or instrument meteorological conditions (IMC) is minimal. As a result, instructional flights have relatively few weather-related accidents. Unfortunately, because of this lack of exposure to poor weather, both newly certificated pilots and new instrument-rated pilots may be unprepared for flight in deteriorating weather conditions.



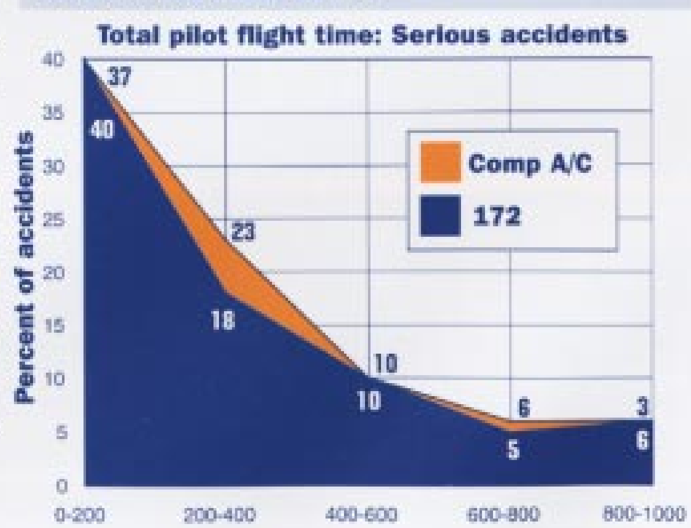
SERIOUS ACCIDENTS

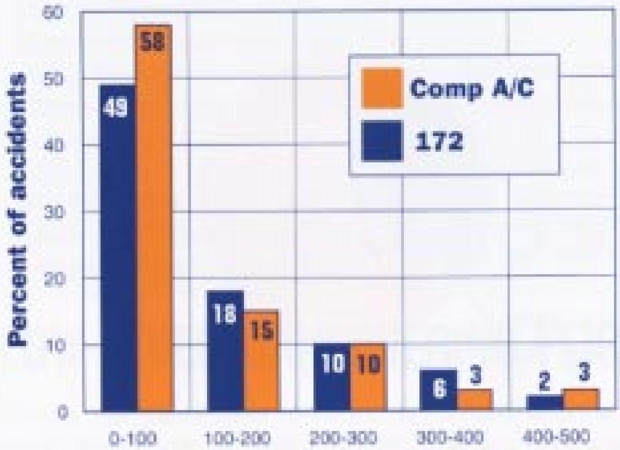
When studying the pilots of accident flights, one sees some interesting facts emerge. Forty percent of all serious accidents occur in the first 200 hours of total time.

Just after pilots obtain their private certificates, the accident involvement goes up significantly. This is not unique to the 172 and indicates that as new pilots begin to enjoy the freedom of their certificates, they also encounter some situations that exceed their experience level.

Overconfidence is subtle and dangerous. Get as much training in diverse situations as possible and explore the new world of flight cautiously. A private pilot certificate is not the end of learning, but rather the beginning.

A 72-hour VFR (visual flight rules) Skyhawk pilot was advised during the weather briefing that VFR flight was not recommended due to low ceilings and visibility just east of Panama City and along the Gulf Coast. Approximately 28 miles southeast of the destination, the pilot contacted Eglin Approach Control and was advised that the weather was IFR. There were no further communications with the pilot. The aircraft then appeared to be in an orbit, and a few minutes later, radar contact was lost. The pilot and two passengers were killed. The 55-year-old pilot had received his pilot certificate two weeks earlier.





Half the pilots involved in serious accidents in both the Cessna and comparison aircraft had fewer than 100 hours in type.

The unfortunate pilot in the accident above attempted a flight well beyond his skill level. It is likely he had little or no exposure to flying in marginal VFR, and he probably had not flown in actual IFR with his instructor. The combination of no actual weather experience and very poor judgment in his disregard of VFR weather minimums culminated in the loss of three lives. Pilots should either restrict their solo cross-country activities until they have more time in various weather conditions, or the checkouts need to be more rigorous. A combination of the two is the most desirable solution. Several flying clubs insist that new pilots have at least five hours solo before taking passengers, if the pilot has less than 100 hours total time. This may seem to negate the reason for checking out in the aircraft in the first place, but it provides for fewer distractions and allows the new pilot to sharpen the basic aircraft handling skills that the accident records show are needed. These flying clubs will also pay close attention to weather before dispatching the new pilot.

WEATHER

Most weather-related accidents are preventable. Weather forecasting and weather information dissemination has improved immeasurably over the past few years. It is not a guarantee, however, that once in flight, the actual weather will match the forecast. Obtain a weather briefing and monitor weather reports en route. Do not continue into bad weather. Every flight should include an alternate course of action in case the forecast is worse than expected. This advice is life saving. It is easy to say but much harder to put into action due to the desire to complete the trip.

NIGHT

Flying at night increases the risk of an accident. The reason is simple—it's harder to see where you're going. Other factors compound the challenge. If you are over 40 years of age, your vision probably isn't as sharp at night as it used to be. Visual acuity also diminishes with fatigue and altitude. Many Skyhawk cockpits are poorly lit with dim overhead lights and little or no flight station lighting for map reading. While dim lighting preserves some of the eyes' ability to adapt to the darkness outside, it is not bright enough to read charts clearly, so you often have to juggle a flashlight into the work load. Add IMC to this scenario, and the risk of an accident increases.

"Since any degree of dark adaptation is lost within a few seconds of viewing a bright light, pilots should close one eye when using a light to preserve some degree of night vision."
Cessna Pilot Safety and Warning Supplements, 1985

Pilots who fly cross-country at night should be well versed in airport lighting and publications such as the *Aeronautical Information Manual* (AIM), which not only describe the lighting available, but tell how to activate runway lighting at nontowered airports. If you are unfamiliar with the destination airport, take time to acquaint yourself with the airport approach lighting and surrounding obstructions.

Accident data suggest that instrument training and currency would greatly improve the safety of night VFR operations. *The number of noninstrument-rated pilots involved in night accidents is more than three times that of instrument-rated pilots.* This indicates that spatial disorientation may be a factor in night accidents. The use of published instrument departures and approaches at night ensures terrain and obstruction clearance. Use the VASI and ILS glideslope. Avoid short runways and small unfamiliar airports after dark.

When descending toward a distant city, keep a sharp eye on the lights at the edge of the city closest to the aircraft. Should any of these lights disappear, then something such as a ridge has risen to block the view. Start climbing immediately until the lights are once again visible. As long as these lights remain in sight, the aircraft is above all en route terrain.

Obtain a weather briefing and update weather reports en route.

The owner, a CFI, was in the right front seat and a private pilot with no instrument rating was in the left front seat of the Skyhawk. The night flight was from Florida to Esler Regional Airport in Louisiana. There was no flight plan filed. During arrival, they had inquired about the weather at Esler Regional Airport; however, the FSS and unicom had closed earlier that night, and current weather observations were not available. At that time, the England AFB weather was clear, visibility 3 miles with fog. At about 0300, they elected to make an approach to "see what it looks like." During the ILS approach, the aircraft collided with trees about 40 feet above ground level. Both pilots were killed. Weather at the time of the accident was 600 feet overcast, partial obscuration with fog. The CFI had been awake since 0400 of the previous day and had continued the trip to get back to work.

Flying in IMC when fatigued impairs even the best pilot's judgment. Add to that night, and the pressure of "having to get there," and you have a flight plan for disaster.

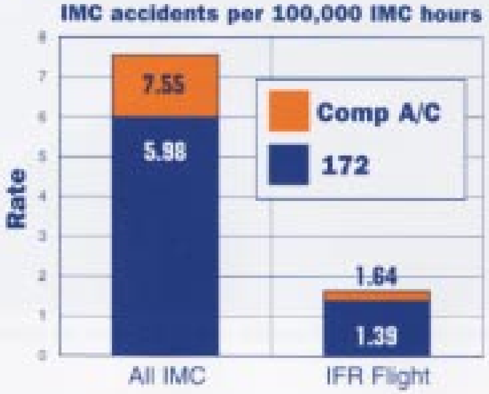
INSTRUMENT METEOROLOGICAL CONDITIONS (IMC)

The 172 is involved in IMC accidents about two-thirds as often as the other light singles.

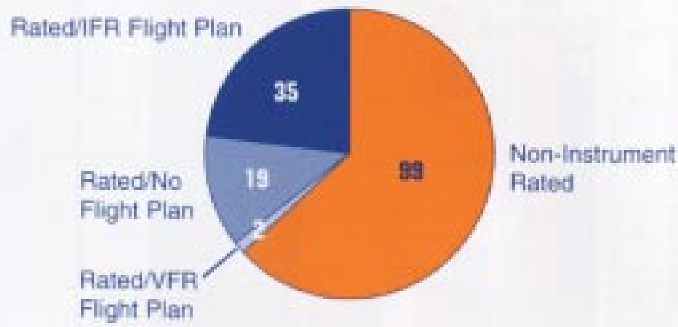
These accidents include noninstrument-rated pilots who continued flight into instrument meteorological conditions, as well as instrument-rated pilots on IFR flight plans.

At 0555 EDT, this VFR, 130-hour Skyhawk pilot obtained a weather briefing for a flight from Limington, Maine, to Pawling, New York. At that time, he stated he was unsure when he would depart; it depended on the weather. The briefer advised that VFR flight was not recommended and that the pilot should obtain another briefing before departing. At 0900, the flight departed with an en route fuel stop at Concord, New Hampshire. The route of flight was to the southwest along Victor 93. When the aircraft was determined to be overdue, a search was initiated. Later, it was found where it had crashed near the top of Mount Monadnock at an elevation of 2,900 feet. A witness in the vicinity saw an aircraft matching its description flying below a broken layer at about 2,000 feet msl. He stated that he could see an overcast above the broken layer and that Mount Monadnock was obscured by clouds most of the day.

IMC accidents per 100,000 IMC hours



Number of C-172 IMC accidents



Of the 155 accidents occurring in IMC, 64 percent involved noninstrument-rated pilots. The Skyhawk is the first cross-country airplane for many pilots. The high rate of VFR-into-IMC accidents indicates relatively inexperienced pilots are launching cross-country without an understanding of the weather and a plan to escape if it exceeds their capability.

Obtaining an instrument rating greatly increases the pilot's chances for a successful flight when IMC conditions are encountered. It is the best single investment a pilot can make to improve trip completion—more so than any piece of equipment you could add to the instrument panel. Once rated, the pilot has the responsibility to maintain currency and proficiency and to obtain an IFR clearance before entering IMC conditions. It is recommended that partial-panel training be included in the pilot's currency requirements.

STRUCTURAL ICE

Skyhawk pilots need to avoid ice. The Skyhawk is not approved for flight in icing conditions, and most of these aircraft have only a heated pitot tube. Although ice forecasts are notoriously broad and, in some cases, inaccurate, the pilot needs to have an escape route if ice is encountered. The AOPA Air Safety Foundation's *Safety Advisor, Aircraft Icing,* discusses both structural and carburetor icing, and how to fly safely when icing conditions are forecast.

CARBURETOR ICE

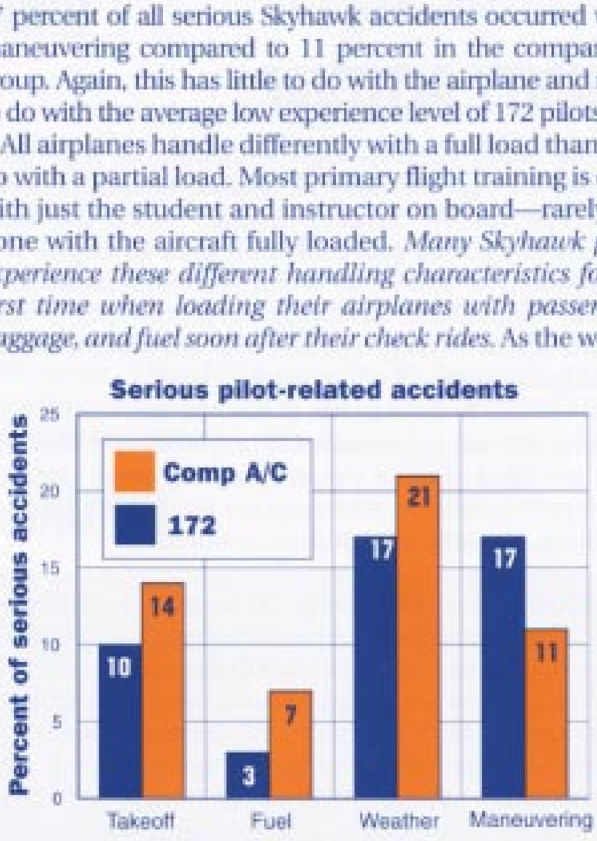
Accident summaries contain many reports of unexplained power loss. At least some of these may be attributed to carburetor ice. At the first indication of carburetor ice (unexplained engine roughness or power loss), apply full carburetor heat and leave it on. Partial heat should not be used. The engine may run rougher as the ice melts and goes through the engine, but it will smooth out again.

A 106-hour Skyhawk pilot reported that the engine began to run rough and lost power as the airplane climbed through 9,000 feet msl. She then switched fuel tanks and moved the mixture to full rich, but the engine continued to lose power. Carburetor heat was not used at any time. A forced landing was subsequently made in a field, where the airplane collided with a utility pole and landed in a ditch. An examination of the engine revealed no evidence of preexisting mechanical failure or malfunction. An icing probability chart revealed that the reported weather conditions in the area were favorable for the formation of moderate carburetor icing at cruise power. The Cessna 172M owner's manual notes that a gradual loss in rpm and eventual engine roughness may result from the formation of carburetor ice and prescribes the use of carburetor heat to clear the ice.

LOW-LEVEL MANEUVERING FLIGHT

Cessna 172 pilots have more low-level maneuvering accidents than pilots of similar aircraft. The graph shows that 17 percent of all serious Skyhawk accidents occurred while maneuvering compared to 11 percent in the comparative group. Again, this has little to do with the airplane and more to do with the average low experience level of 172 pilots.

All airplanes handle differently with a full load than they do with a partial load. Most primary flight training is done with just the student and instructor on board—rarely is it done with the aircraft fully loaded. *Many Skyhawk pilots experience these different handling characteristics for the first time when loading their airplanes with passengers, baggage, and fuel soon after their check rides.* As the weight



changes, so does the center of gravity (CG). This affects the stall characteristics of the airplane, as well as the amount of runway needed for takeoff and landing. A full-load checkout is highly recommended.

Many mishaps involve low-level flight interrupted by terrain, obstacles, or water. While flying close to the ground may give a great sensation of speed, the sudden stop that frequently ensues is usually lethal.

A 700-hour pilot and his passenger were flying low over a sailboat regatta to photograph the boats. The weather was estimated at 700 feet overcast, 3 miles visibility with light rainshowers and fog. As the pilot maneuvered for a photograph, he throttled back and banked the aircraft in a steep bank. Subsequently, the aircraft stalled, and there was insufficient altitude to recover. The aircraft impacted the water in a left-wing low, nose-down attitude and sank almost immediately. The passenger escaped with serious injuries, but the pilot's injuries were fatal.

APPROACHES

Study the appropriate chart to identify the airport elevation and any obstacles or terrain along your route of flight and, in visual conditions, keep a sharp eye out the window. Do not descend too soon, especially at night. Colliding with wires and descending into terrain causes fatalities every year.

VFR approaches should be planned so that descent from cruising altitude results in airport arrival at pattern altitude. Begin the landing checklist before pattern entry. When in the pattern, be alert for other traffic.

Most midair collisions occur within ten miles of an airport. On approach and in the pattern, don't rely on just the radio to tell you where the traffic is. LOOK for it. Remember that not all airplanes have radios, and not all pilots use the radios they do have.

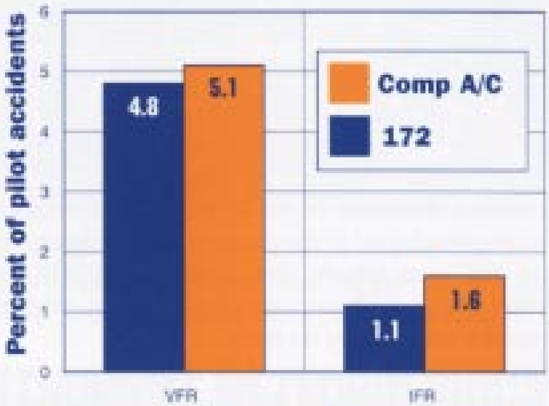
The Skyhawk's high wing must be lifted to clear for traffic before turning. Look around the struts on both sides of the airplane and shift your position to see around the framing in the cockpit. If your Skyhawk has a rear window, turn around and look behind you. It is difficult to see, but looking may help. Many midairs occur when a faster aircraft overtakes a slower one in the traffic pattern—often on base or final. When using the Skyhawk for instrument training, be sure that your instructor looks outside while you are on the gauges.

A Skyhawk and a Mooney were involved in a collision while both aircraft were landing at a nontowered airport. The pilots of the Cessna were in the pattern, practicing touch-and-go landings. The Mooney aircraft was returning on a straight-in approach after an instrument training flight. The Mooney was above and overtaking the Cessna. The collision occurred while both aircraft were in the landing flares. The Mooney's propeller severed the empennage of the Cessna. The Cessna nosed up and struck the tail of the Mooney before crashing on the runway. The Mooney made a safe landing. The Mooney was high, according to the

Remember—the airplane handles differently with a full load than when it is light.

pilot, so they slipped the aircraft for the majority of the final approach. The Mooney pilots did not note the announced position of the Cessna in the traffic pattern or a warning from another pilot that there were two aircraft landing. Fortunately, all four people aboard the two aircraft received only minor injuries. It would have been much safer to enter upwind or downwind and complete the traffic pattern.

Critical phase of flight—approach



In addition to being a primary training airplane, the Skyhawk is used extensively for instrument training—usually in VFR conditions. On a nice weekend at busy nontowered airports, VFR traffic will mix with instrument students flying simulated IFR approaches. This combination of straight-in approaches with standard traffic pattern procedures requires extra vigilance to maintain a safe distance from other aircraft. Instructors must divide their attention between the student and the outside environment, and students should keep their ears open to potential traffic conflicts announced on the radio.

Instructors should show their VFR students the instrument approach books and explain where the fixes are in relation to the airport. This will help primary students and newly certificated pilots visualize the location of an airplane at one of these fixes.

Some flight training occurs in marginal VFR conditions. Primary students, both dual and solo, may take advantage of the typically lighter traffic, when the weather is marginal, to practice in the pattern. These pilots must be particularly alert to approaching IFR traffic when on base and final—or on climbout and crosswind if the winds are such that approaching instrument pilots will circle to land. High-performance singles and business jets fly relatively fast final approaches, and in marginal conditions, there is not much time to react to a sudden appearance of aluminum. VFR and IFR pilots can help avoid the surprise by listening to both the CTAF and approach control.

For safe mountain operations, double the required runway distance for takeoffs and landings. If the temperature is hot, allow even more distance.

TAKEOFF

It requires more distance to take off than to land. But how much more? The pilot's operating handbook (POH) states that the takeoff distance required for a Skyhawk at 2,300 pounds, zero wind, sea level, and 59 degrees Fahrenheit is 865 feet, but it can land and roll out in only 520 feet. *So it takes about 40 percent more distance to take off than to land.* Unwary pilots have skillfully landed their airplanes in tight quarters, only to find they didn't have enough room to take off again.

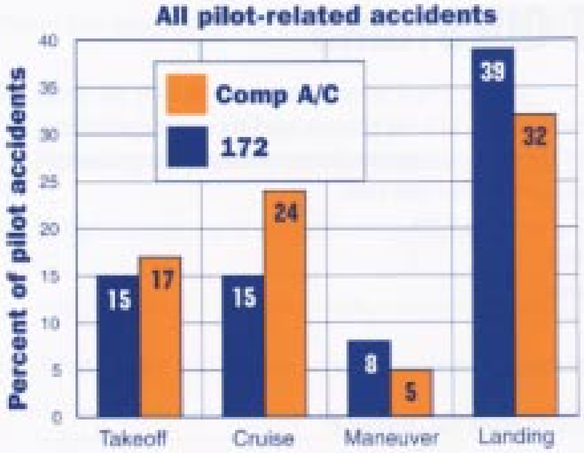
The numbers in the POH are accurate only under perfect circumstances. They are based on a new aircraft, excellent test pilot, and flawless performance. Takeoff over a 50-foot obstacle is measured with an optical measuring device, not a 50-foot brick wall.

DENSITY ALTITUDE

High elevation airports, high temperatures, high gross weight, and high humidity all degrade aircraft performance. The takeoff distance doubles when the same airplane mentioned above takes off from an airport with an elevation of 7,500 feet when the temperature is 57 degrees Fahrenheit. Although most new pilots have learned about density altitude, the airplane's compromised performance is often unanticipated.

The 172 has four seats; but unless the fuel load is light, the odds are that the aircraft will be overloaded when the seats are filled—unless you are carrying small children. Climb performance is anemic at sea level under this load condition, let alone at high density altitudes.

An 800-hour pilot with nearly 700 hours in the Skyhawk took off with three passengers on a warm, clear May afternoon in Escalante, Utah. The 5,000-foot runway is 5,740 feet msl, and the temperature was 70 degrees Fahrenheit. According to the NTSB report, the density altitude was about 7,500 feet. The aircraft wing tanks were full. The pilot stated that the aircraft would not climb over 50 feet. The stall warning sounded, so he put the wheel forward and the airplane touched the end of the runway, skipped over a gully, and hit the side of a hill. Fortunately, no one was injured. Density altitude was certainly a factor in this accident. The airplane was likely over gross, as well.



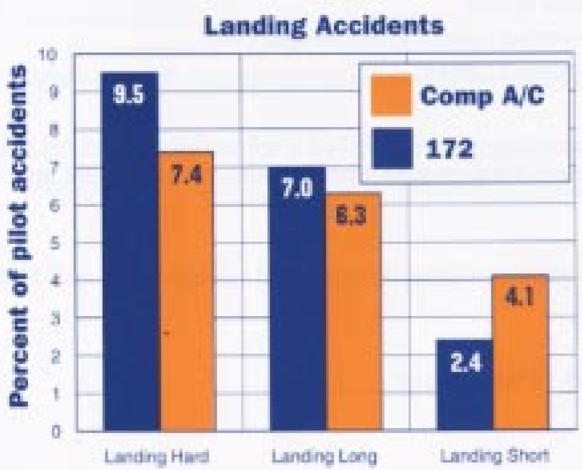
WIND

Poorly flown, windy-day takeoffs result in damaged airplanes but, fortunately, not many injuries. Before attempting to take off, the pilot should ensure that—considering aircraft performance, wind direction and speed, runway length, and obstructions—the takeoff can be made safely.

The POH recommends that for positive aircraft control, especially in a crosswind, controls must be positioned properly and power applied judiciously. Keep the airplane on the ground until it reaches a slightly higher than normal speed. Then lift it into the air positively to avoid settling back to the runway. Make a coordinated turn into the wind to correct for drift.

LANDING

More accidents occur during landing than any other phase of flight—the majority of them caused by pilots' inability to control the airplanes in windy conditions. The Skyhawk's high wings and big flaps have been said to be more of a challenge in wind than low-wing airplanes. Traditional wisdom says that low wings handle wind better because it is less likely to get underneath the wing and the center of gravity is lower. Statistically, this hasn't been proven. Cessna built tens of thousands of high-wing machines in Kansas, where the winds are anything but gentle. There were no particular ill effects, but Cessna test pilots also knew how to fly.



Crosswinds are a particular challenge to all pilots (not just Skyhawk pilots), accounting for about 80 percent of the wind difficulties. Demonstrated crosswind component is a favorite test question for examiners to ask. It is the highest wind observed during certification testing of the airplane, not what it is theoretically capable of handling. It is not a limitation governing the aircraft's operation. As a guideline, though, particularly for new pilots, consider it limiting. The Skyhawk POH states that "with average pilot technique, direct crosswinds of 15 knots can be handled with safety." The POH also recommends that when landing in a strong crosswind, the minimum flap setting required for the field length should be used.

Loss of control during the landing rollout accounts for numerous accidents. Align the nose with the runway centerline at touchdown and then maintain a straight course with rudder, steerable nosewheel, and/or brakes, if necessary, while holding the aileron control into the wind. Wait until the rollout is complete and the airplane is clear of the active runway to complete the landing checklist.

Practice go-arounds frequently.

Go-arounds are another area where problems occur. A rule of thumb that has been around for a long time is still valid. "If you are not down safely in the first third of the runway, go around immediately." Skyhawks have exceptionally effective flaps—some models allow for flap deflection up to 40 degrees. This characteristic accommodates tight patterns and steep final approaches but also mandates that the pilot retract the flaps to no more than 20 degrees on a missed approach. The airplane will not climb with 40 degrees of flaps down. In an attempt to simplify go-around procedures and reduce the number of botched go-arounds, Cessna reduced the maximum flap deflection from 40 degrees to 30 degrees on later models. Go-arounds should be practiced frequently.

C-172/SKYHAWK TEST QUESTIONS

The purpose of this open-book test is to familiarize the pilot with the Cessna 172/Skyhawk and its corresponding POH. There are many variations in the models. The 1977 Model C-172N was chosen as the test airplane; answers given pertain to that aircraft. Refer to the POH for your aircraft as you complete the test.

1. What is the total fuel capacity? _____gallons Usable? _____gallons
   With long-range tanks, total? _____gallons Usable? _____gallons

2. What is the approved fuel grade(s)? ____________ Color(s)? ______________

3. Where are the fuel drains located?________________ When should they be drained?________________

4. How should the fuel selector valve be positioned when refueling? ______________________________
   Why?______________________________ For takeoff? _______ For landing?_________

5. What is the prescribed oil quantity for normal flights of less than three hours? ________
   For extended flights? ________ Minimum for flight? ________

6. What is the proper type of oil for use after engine break-in?________
   What is the proper grade for OAT between 30 degrees F and 90 degrees F? ______ Above 60 degrees F? ______

7. What is the empty weight? _______ Maximum certified gross weight? _________ Useful load? _______
   Payload with full fuel? _______ (Refer to your weight and balance papers.)

8. How much fuel can you carry with a front seat payload of 340 lb, rear seat, 300 lb, and 80 lb of baggage? _______

9. What is the maximum demonstrated crosswind velocity (takeoff or landing)? ____________

10. What is maneuvering speed (Va) at 1,950 lb? ________
    What airspeed should be maintained when penetrating turbulent air? ________Why? ________________
    How does Va vary with gross weight?____

11. What is the recommended airspeed (KIAS) for:

	FLAPS	AIRSPEED
Normal takeoff/climb:	Up	_______
Normal landing:	Up	_______
Normal landing:	Down	_______
En route climb, sea level:	Up	_______
Short-field takeoff/climb:	Up	_______
Short-field landing:	Up	_______
Short-field landing:	Down	_______

12. List the following airspeeds:

Best rate of climb (Vy) @ sea level________
Best angle of climb (Vx) @ sea level______
Maximum flap extension (Vfe)______
Stall speed, clean (Vs)________
Stall speed, full flaps (Vso)_____
Best glide speed ______
Maneuvering speed, gross weight (Va)______
Never exceed (Vne)_____

13. What is the range in zero wind, @ 65% power at 4,000 feet, standard temperature with 40 gallons usable fuel and 45 minutes reserve?______________________

14. What is the hourly fuel consumption (lean mixture) at 4,000 feet pressure altitude, standard temperature and 75% power?______________________________

15. What is the airspeed for maximum gliding distance? ______KIAS Flap setting?_____

Note: For questions 16, 17, and 18, refer to POH Section 3, Emergency Procedures.

16. How do you detect carburetor ice? ______________________________

17. How do you prevent carburetor ice? ______________________________

18. If carburetor ice is suspected in flight, what is the proper procedure?
____
____

19. What is the indication of alternator malfunction?
____

20. How would you restore electrical power?
____

21. What would you do if unable to restore the alternator?
____

22. In the event the vacuum pump failed (no backup systems), what flight instruments would be lost?
____

23. In the event the electrical system failed, what flight instruments would be lost?
____

24. Where is the alternate static source (if installed) located? ______________________________

25. What flight instruments would be lost if the static system was plugged up and there was no alternate static source? ______________________________

26. What is the power setting, fuel consumption, and TAS at maximum gross weight at 8,000 feet, 75% power, standard temperature? RPM______ Fuel consumption______ TAS ________

27. What is the procedure for engine failure immediately after takeoff? ______________________________

28. Why is it important to lock the engine primer after use? ______________________________

29. The following questions should be answered by referring to the flight manual supplement pertinent to the autopilot installed in your aircraft.

    Operating limitations______________________
    List all the ways to disengage the autopilot. ______________________________
    ____

30. What aircraft documents must be on board during flight? ______________________________

31. List the procedure for a balked landing (go-around).
____

ANSWERS TO C-172/SKYHAWK TEST QUESTIONS

Note: Answers given here are from the pilot's operating handbook (POH) for the 1977 Cessna/Skyhawk Model C-172N. Because the C-172/Skyhawk has been produced in several models over the years, pilots should consult the owner's manual or POH with supplements for their particular aircraft.

1. Total fuel capacity is 43 gallons, usable 40 gallons. With long-range tanks, the total fuel capacity is 54 gallons, usable 50 gallons. Refer to the POH, Section 2, Limitations, and Section 8, Handling, Service & Maintenance.

2. Approved fuel grade(s) and color(s): 100LL Aviation Fuel (Blue); 100 (formerly 100/130) Grade A Aviation Fuel (Green). Refer to POH, Section 2, Limitations.

3. Fuel drain locations are left wing, right wing, and engine. Sumps should be drained on preflight and after refueling. Refer to POH, Section 4, Preflight Inspection.

4. During refueling, the fuel selector valve position is Left or Right to prevent crossfeed and ensure maximum fuel; during takeoff and landing, the position is Both. Refer to POH, Section 2, Limitations.

5. The prescribed oil quantity for normal flights of less than three hours is 5 quarts, for extended flights 6 quarts (full), and minimum for flight 4 quarts. Refer to POH, Section 8, Handling, Service & Maintenance.

6. The proper oil type and grade for use after engine break-in is ashless dispersant; for use between 30 degrees F and 90 degrees F, SAE 40; and for use above 60 degrees F, SAE 40 or SAE 50. Refer to POH, Section 1, Descriptive Data.

7. Standard empty weight is 1,379 lb; maximum certified gross weight (Normal category) 2,300 lb; useful load is 921 lb; and payload with full fuel is 681 lb. Refer to POH, Section 1, General, and weight and balance papers for your aircraft.

8. Allowable fuel load with passengers and baggage is 33.5 gallons. Refer to POH, Section 6, Weight & Balance, and weight and balance papers for your aircraft.

9. The maximum demonstrated crosswind velocity (takeoff or landing) is 15 kt. Refer to POH, Section 4, Speeds for Normal Operations.

10. Maneuvering speed (Va) at 1,950 lb. is 89 KIAS. Va is turbulence-penetration speed used to avoid overstressing the airplane in rough air. Va decreases as gross weight decreases. Refer to POH, Section 2, Airspeed Limitations, and Section 4, Speeds for Normal Operations.

11. Recommended airspeed (KIAS) for:

Normal takeoff/climb:	Rotate @ 55, climb @ 70-80
Normal landing, flaps up:	60 to 70
Normal landing, flaps down:	55 to 65
En route climb, sea level:	75 to 85
Short-field takeoff/climb, flaps up:	59 (until clear)
Short-field landing, flaps up:	60 to 70
Short-field landing, flaps down:	60 (until flare)

Refer to POH, Section 4, Normal Procedures.

12. V speeds, KIAS unless otherwise indicated:

Vy Best rate @ sea level :	73
Vx Best angle @ sea level:	59
Vfe Max. flap ext.	85
Vs Stall, clean:	53 KCAS
Vso Stall, full flaps:	47 KCAS
Best glide:	65
Va Maneuvering:	97
Vne Never exceed:	160

13. Range @ 65% power: 521 nautical miles. Refer to POH, Section 5, Performance.

14. Hourly fuel consumption: 8.4 gallons. Refer to POH, Section 5, Performance.

15. Maximum gliding distance: 65 KIAS. Flaps: Up. Refer to POH, Section 3, Emergency Procedures.

16. Carburetor ice: Loss of power (RPM/MAP/engine roughness). Refer to POH, Section 3, Carburetor Icing.

17. To prevent carburetor ice, use carburetor heat. Reference, same as number 18.

18. Proper procedure in event of ice: Apply full heat, reset mixture. Reference, same as number 18.

19. Alternator malfunction: Overvoltage warning light On. Refer to POH, Section 3, Electrical Power Supply System Malfunctions.

20. Attempt to reactivate the alternator system by turning both sides of the master switch off, and then on, again. Refer to POH, Section 3, Electrical Power Supply System Malfunctions.

21. Unable to restore alternator: Terminate flight as soon as possible. Reference, same as number 22.

22. Vacuum pump failure would result in the loss of the attitude indicator, directional indicator, and suction gauge. Refer to POH, Section 7, Vacuum System and Instruments; Pitot-Static System and Instruments.

23. Electrical system failure would result in the loss of the autopilot, radios, transponder, fuel, oil, and carburetor gauges, turn and bank coordinator, wing flaps, interior and exterior lights, and pitot heat. Refer to POH, Section 7, Airplane Systems and Descriptions.

24. Alternate static source: Located next to the throttle. Refer to POH, Section 7, Pitot-static System and Instruments.

25. If the static system was plugged up, the airspeed indicator, rate of climb indicator, and altimeter would be lost. Refer to POH, Section 7, Airplane Systems and Descriptions.

26. Power setting/fuel consumption: 2,650 rpm, 8.4 gal/hr, TAS 122 kt. Refer to POH, Section 5, Cruise Performance.

27. Engine failure procedure: Establish 65 KIAS glide, avoid obstacles, flaps as required. Refer to POH, Section 3, Engine Failure Immediately After Takeoff, and Amplified Procedures.

28. Lock primer after use to avoid possible engine failure from excessively rich mixture. Refer to POH, Section 7, Carburetor and Priming System.

29. Autopilot: Operating limitations—None; disengage (1) A/P On/Off Switch—OFF, (2) Pull A/P circuit breaker. Refer to POH, Autopilot Supplement.

30. Required documents: Airworthiness certificate, registration certificate, weight and balance papers, equipment list. Refer to POH, Section 8, Airplane File.

31. Balked landing procedure (go-around): Throttle—full; carburetor heat—cold; wing flaps—20 degrees (immediately); climb speed—55 KIAS; wing flaps—10 degrees until obstacles cleared. Refer to POH, Section 4, Balked Landing.

C-172/SKYHAWK TRAINING COURSE OUTLINE

INTRODUCTION

This outline is a training guide for pilots and flight instructors. Because of variables involving pilot experience and proficiency, the training should be flexible. Pilots should perform all tasks to practical test standards (PTS). At the satisfactory conclusion of training, the pilot should receive a flight review endorsement and, if instrument rated, an instrument proficiency check.

This training course outline is divided into four blocks of instruction. The first block concentrates on the Skyhawk's systems and pilot procedures. The second block reviews normal and emergency VFR procedures and elementary IFR procedures. The third block reviews instrument flight operations, and the fourth block concentrates on cross-country flight. The time required to complete this training will vary with pilot proficiency and the training outline should be modified as needed. Average time to complete each block is indicated below.

BLOCK 1: GROUND ORIENTATION

The pilot will review normal and emergency operations, and calculate weight and balance, takeoff and landing performance data. All documents covering aircraft and electronic modifications will be reviewed.

GROUND: 1.0 HOURS

Airplane and Systems

- Instruments and avionics
- Brakes/landing gear
- Seats, doors, and windows
- Engine and engine instruments
- Propeller
- Fuel system
- Electrical system
- Lighting systems
- Heat/ventilation
- Pitot-static system
- Flight instruments
- Vacuum system

Aircraft Inspections and Servicing

- Required inspections
- Ground handling
- Fuel/oil
- Transponder
- Pitot-static system
- ELT
- Annual/100 Hour
- ADs and service bulletins
- Recommended service intervals
- Preflight line inspection

Performance Charts

Weight and Balance

Limitations

- Airspeeds
- Powerplant
- Fuel system
- Instrument indications

Normal Procedures

- Preflight inspection
- Engine start and runup
- Speeds for normal operation
- Normal, short-field, and crosswind takeoffs
- Normal and maximum performance climbs
- Normal, short-field, and crosswind landings
- Balked landings and go-arounds

Emergency Procedures

- Engine failure
- Precautionary landings
- Fire
- Icing
- Vacuum, pitot, and static system failures
- Electrical system malfunctions
- Door opening in flight

Troubleshooting

- Autopilot and electric trim malfunctions
- Relationship of vacuum failures to autopilot operation
- Electrical system and what to do if charging system fails
- Load shedding and estimated time of usable battery life

BLOCK 2: GENERAL FLIGHT OPERATIONS

The pilot will review instrument regulations, requirements, and local approach procedures.

GROUND: .5 – 1.0 HOURS

Weight and Balance

Review of Normal and Emergency Procedures

FLIGHT: 1.5 – 2 HOURS

Preflight Operations

- Takeoff, climb, landing performance calculations
- Preflight line check
- Starting:
    - Normal
    - Hot
    - External Power
- Runup and checks

Takeoff Operations
- Normal
- Rejected
- Crosswind
- Instrument
- Short field
- Soft field

Airwork
- Slow flight
- Stalls
- Steep turns
- Approach/landing configuration

Instrument
- Turns, climbs, descents
- Slow flight
- Unusual attitude recovery

Emergency Procedures
- Engine failure
- Fire in flight
- Alternator failure
- Vacuum pump failure
- Emergency checklist use

Landings
- Normal
- Crosswind
- No flap
- Short field
- Soft field
- Balked (Go-around)

BLOCK 3: IFR OPERATIONS

The pilot will review equipment requirements, charts, and aircraft-specific procedures.

GROUND: 1.0 HOURS
Requirements for Instrument Flight
- Pilot—Certificates, ratings, and currency
- Aircraft—Required equipment certification RNAV/Loran/GPS

Autopilot

Preflight Briefing

FLIGHT: 1.5 HOURS
Clearance Copy, Accurate Readback
- Avionics configuration

Pretakeoff
- Checklist
- Clearance copy and readback
- Instruments
- Avionics
- Charts

Departure
- Heading and altitude
- Route interception
- Amended clearance

Holding
- Aircraft configuration
- Entry procedure
- ATC reporting

NDB Approach
- Approach clearance
- Configuration
- Tracking, orientation, altitude, MDA
- Interception of bearings
- Timing, MAP
- ATC coordination

Missed approach
- Climb, heading, altitude
- Course interception
- Climb checklist
- ATC and CTAF

DME Arc
- Arc interception
- Orientation
- Radial identification
- ATC and CTAF

VOR Approach
- Approach clearance

Aircraft Configuration
- Tracking, orientation
- Altitudes, MDA
- MAP identification
- ATC and CTAF

GPS Approach
- Approach clearance
- Approach programming
- Approach arm
- Missed approach

Circling Approach
- Altitude
- Distance from airport
- Traffic avoidance
- MAP procedure
- ATC and CTAF

ILS Approach
- Approach clearance
- Aircraft configuration
- Tracking, orientation
- Altitudes, DH
- MAP procedure
- ATC and CTAF

Partial-Panel ASR or Alternate Approach
- Approach clearance
- Configuration
- Orientation
- Altitudes, MDA
- MAP
- ATC and CTAF
- Unusual Attitudes

Inoperative Equipment
- Lost communications: route and altitude, position reporting, approach, holding
- Lost navigational equipment: Revised minimums, ATC report, alternative actions
- Alternator failure: load shedding, flight plan revision
- ATC

Emergency Procedures
- Engine failure
- Airframe ice
- Vacuum pump/gyro failure
- Magnetic compass orientation
- Electrical system failure
- Fire
- ATC

BLOCK 4: CROSS-COUNTRY VFR/IFR OPERATIONS

The pilot will demonstrate proficiency in VFR and/or IFR cross-country operations.

GROUND: 1.0 HOURS
The Flight Environment
- Airspace
- FAR Part 91

Weather
- The atmosphere
- Winds and clear air turbulence
- Clouds and thunderstorms
- Icing
- Weather products and services available for pilot use

Flight Planning and Navigation
- Fuel: Wind and ATC routings
- Navigation
- Charts
- Navaids
- Planned descents

Emergency Operations
- In-flight fire
- Turbulence
- Thunderstorms
- Ice

FLIGHT: 1.5 HOURS
Preflight Briefing
- Line check
- Charts, documents
- Checklist use
- Clearance copy and readback
- Departure

Climb
- Checklist

Cruise
- Checklist
- Power setting
- Mixture

Emergencies
- Descent (discussion only)
- Alternator failure
- Load shedding
- Flight plan change
- ATC coordination
- In-flight fire
- Checklist use

Descent
- Planning
- Engine temperature
- Airspeed

Approach and Landing
- Checklist use

Safe Pilots. Safe Skies.

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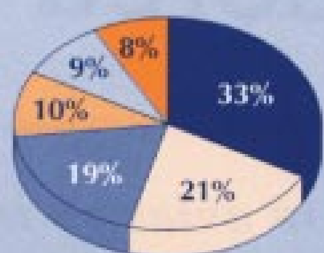

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