

## PRIVATE PILOT | FULL COURSE REFRESHER

# Full Course PPL Refresher

A practical checkride focused guide to private pilot regulations, airspace, aerodynamics, aircraft systems, navigation, weather, performance, and weight and balance.

PRIVATE PILOT

VFR

AIRSPACE

WEATHER

REGULATIONS

CHECKRIDE PREP

## OPERATING MINDSET

Private pilot ground knowledge is the mental operating system behind every safe VFR flight. You use it before engine start when you decide if you, the airplane, the weather, and the route are ready, in flight when you interpret airspace, communicate with ATC, handle abnormal situations, and maintain legal separation from clouds and terrain, and during the checkride when the examiner tests whether your answers turn into sound pilot judgment.

The written test rewards recognition. The practical test rewards judgment. A strong answer states the rule, explains the safety reason, then says what you would do as PIC today.

## Pilot Qualifications, Privileges, and Personal Readiness

A private pilot may act as PIC only when properly certificated, rated, current, and medically qualified. Certification proves baseline skill, ratings define the aircraft family, currency keeps perishable skills alive, and limitations protect the public from commercial style operations without commercial level training.

### CERTIFICATE AND PRIVILEGES

- For a typical private pilot airplane certificate, category is airplane and class may be single engine land, multi engine land, single engine sea, or multi engine sea.
- A type rating is required for large aircraft over 12,500 pounds maximum certificated takeoff weight, turbojet powered aircraft, and aircraft specified by the FAA.
- A private pilot generally may not act as PIC for compensation or hire. Expense sharing must be eligible and pro rata with passengers.

### MEDICAL AND BASICMED

- A third class medical is common for private pilots. Duration depends on age at the time of the exam, not age today.
- BasicMed requires eligibility, a medical education course, and a physical exam.
- BasicMed limits include no more than six occupants, aircraft no more than 6,000 pounds maximum takeoff weight, no flight above 18,000 feet MSL, no indicated airspeed above 250 knots, and no compensation or hire.

### MEMORY AID

## IMSAFE

Illness, Medication, Stress, Alcohol, Fatigue, Emotion or Eating. Use it before accepting PIC responsibility.

### Checkride Trap

Do not confuse category and class. Airplane is the category. Single engine land is a class. Examiners listen for both words because privileges and currency depend on them.

### 14 CFR 61.23

Medical certificates and BasicMed determine when the pilot is legal to act as PIC.

### 14 CFR 61.113

Private pilot privileges and limitations separate private flying from commercial operations.

## Currency, Endorsements, and Airworthiness

Currency rules answer whether the pilot may act as PIC or carry passengers. Airworthiness answers whether the aircraft may be operated today. Both are active PIC responsibilities.

### RECENT EXPERIENCE

- A flight review is required every 24 calendar months unless a qualifying substitute satisfies the requirement.
- Passenger carrying requires three takeoffs and three landings within the preceding 90 days in the same category, class, and type if required.
- Night passenger carrying requires three takeoffs and three full stop landings from one hour after sunset to one hour before sunrise.

### ENDORSEMENT AIRCRAFT

- High performance means more than 200 horsepower and requires ground and flight training plus a logbook endorsement.
- Complex airplane privileges require training and endorsement for retractable landing gear, flaps, and controllable pitch propeller, or the applicable seaplane equivalent.
- Tailwheel privileges require training and endorsement unless the pilot logged PIC tailwheel time before the rule date.

### Complex Airplane

#### Retractable Gear



#### Flaps



#### Controllable Prop



A complex airplane has all three: retractable landing gear, flaps, and a controllable-pitch propeller.

### ORAL SCENARIO

You have not flown in 25 calendar months. Can you act as PIC on a solo local flight?

No. A qualifying flight review or equivalent event is required to act as PIC, even without passengers.

### ORAL SCENARIO

You completed three day landings 60 days ago. Can you take passengers tonight two hours after sunset?

No, unless you also completed three night full stop landings within the preceding 90 days in the same category, class, and type if required.

### AIRCRAFT DOCUMENTS AND INSPECTIONS

- AROW means airworthiness certificate, registration certificate, operating limitations, and weight and balance information.
- Verify annual inspection, 100 hour inspection if required, transponder inspection when used, static system and altimeter inspection for IFR, ELT inspection, and airworthiness directives.
- Airworthy means the aircraft conforms to its type design and is in a condition for safe operation.

### Inoperative Equipment Flow

Determine whether the item is required by regulation, equipment list, type certificate data sheet, kinds of operation equipment list, POH, or AD. If not required, deactivate or remove it, placard it inoperative, and make the required maintenance record entry. If required, the aircraft is not legal for that operation until corrected or handled under an approved process.

### 14 CFR 61.56 AND 61.57

Flight review and recent experience rules control PIC authority and passenger carrying.

### 14 CFR 91.7 AND 91.205

Airworthiness and required equipment rules are the starting point for the go decision.

## Airspace, VFR Weather Minimums, and Cruise Altitudes

Airspace questions are chart questions in disguise. Be ready to name the airspace, find the floor and ceiling, state entry requirements, state weather minimums, and explain what service ATC provides.

### ENTRY REQUIREMENTS

- Class A begins at 18,000 feet MSL and requires IFR.
- Class B requires an explicit ATC clearance. The key phrase is cleared into the Bravo.
- Class C and Class D require two way radio communication before entry. Communication is established when ATC responds with your aircraft identification.
- Class E is controlled airspace not designated A, B, C, or D. Class G is uncontrolled, but still has weather minimums and pilot responsibilities.

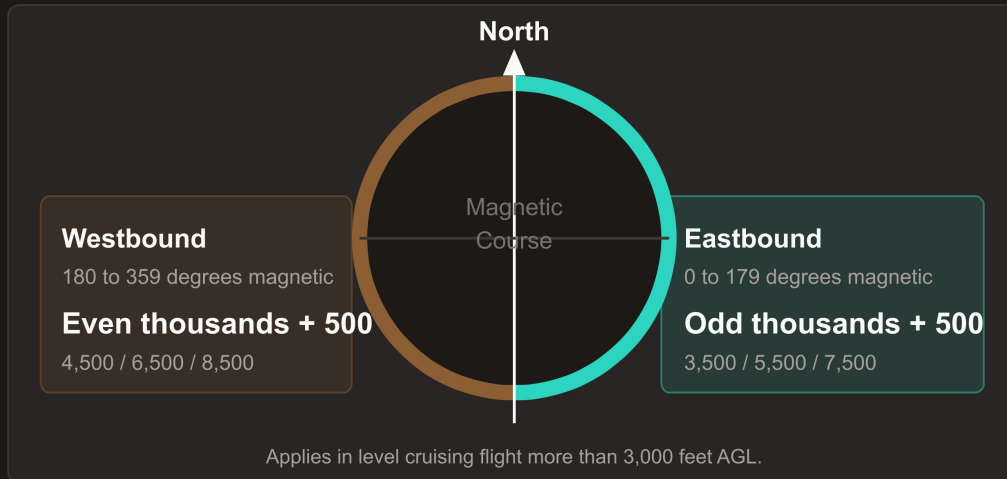
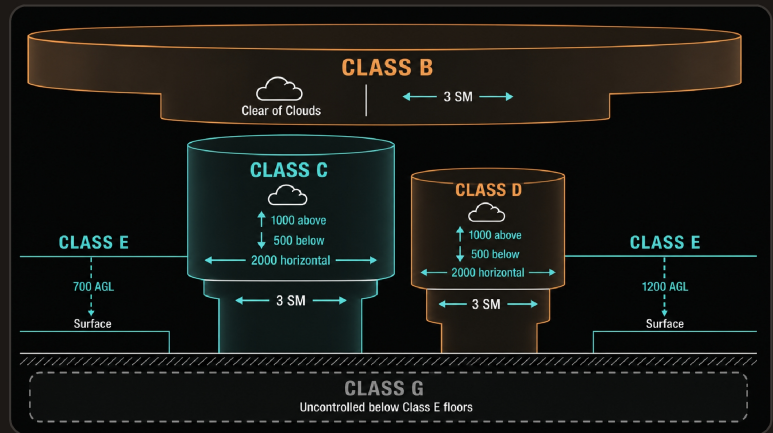
### WEATHER MINIMUMS

- Class B requires three statute miles and clear of clouds.
- Class C, Class D, and Class E below 10,000 feet MSL use three statute miles, 500 below, 1,000 above, and 2,000 horizontal.
- Class G varies by altitude and day or night. Do not answer from memory until you know which layer you are in.
- Legal VFR is not automatically safe VFR in haze, sun glare, terrain, or busy airspace.

### CLOUD CLEARANCE MEMORY

**3 | 500 | 1,000 | 2,000**

Three statute miles, 500 below, 1,000 above, 2,000 horizontal for Class C, D, and E below 10,000 feet MSL.



MAGNETIC COURSE	ALTITUDE FAMILY	EXAMPLES
0 through 179	Odd thousands plus 500	3,500, 5,500, 7,500
180 through 359	Even thousands plus 500	4,500, 6,500, 8,500

## Airspace, VFR Weather Minimums, and Cruise Altitudes, Continued

### Examiner Trap

Use magnetic course, not heading. Wind correction changes heading, but the regulation sorts traffic by magnetic course when operating more than 3,000 feet AGL.

### ORAL SCENARIO

You are VFR at 4,500 feet AGL on a magnetic course of 090 degrees. Correct?

No. Eastbound examples are 3,500, 5,500, and 7,500 feet. 4,500 belongs to westbound courses.

### 14 CFR 91.155

Basic VFR weather minimums protect see and avoid by airspace and altitude.

### 14 CFR 91.159

VFR cruising altitudes separate opposite direction VFR traffic above 3,000 feet AGL.

## Right of Way, Tower Signals, and Airport Surface Operations

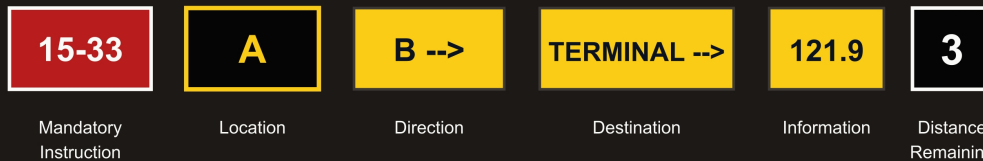
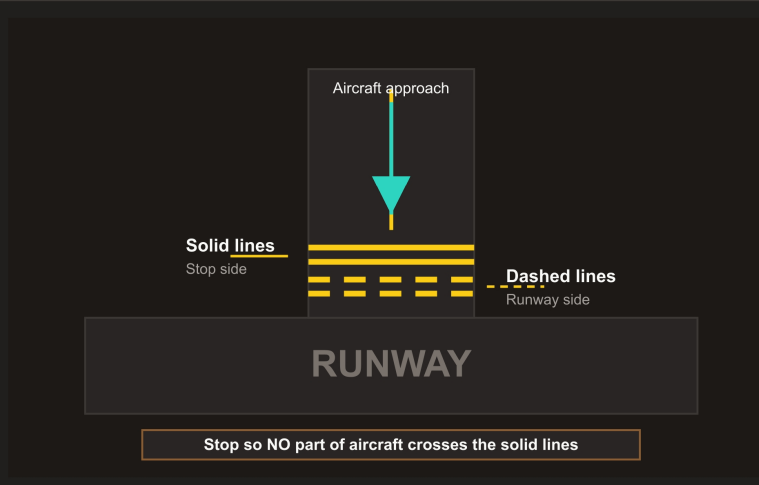
Right of way rules create predictable expectations, but they never cancel see and avoid. Surface operations require the same mindset: know the taxi route, expected hotspots, hold short points, and runway crossings before the aircraft moves.

### RIGHT OF WAY RULES

- Aircraft in distress have priority over all other air traffic.
- When same category aircraft converge, the aircraft to the right has the right of way.
- Head on aircraft both alter course to the right.
- Aircraft on final or landing have right of way, and the lower aircraft has priority, but may not cut in front of another aircraft.

### Do Not Become Passive

Having right of way does not mean waiting for the other pilot to solve the problem. Maintain visual separation, communicate when appropriate, and maneuver early enough to avoid ambiguity.



## Airport Surface Operations, Continued

SIGNAL	AIRCRAFT ON GROUND	AIRCRAFT IN FLIGHT
Steady green	Cleared for takeoff	Cleared to land
Flashing green	Cleared to taxi	Return for landing
Steady red	Stop	Give way and continue circling
Flashing red	Taxi clear of runway in use	Airport unsafe, do not land
Flashing white	Return to starting point	Not applicable
Alternating red and green	Exercise extreme caution	Exercise extreme caution

### AIRPORT SIGN MEMORY

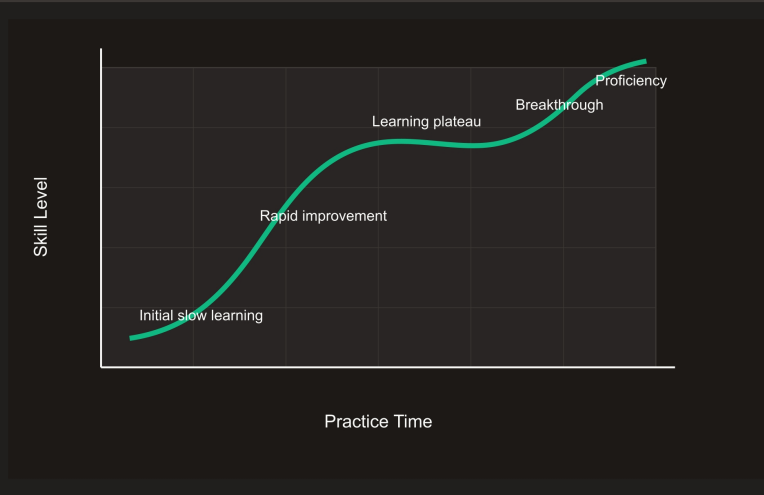
Red is a command. Black tells you where you are. Yellow tells you where to go.

### LOST RADIO AT TOWERED AIRPORT

Keep flying the airplane, stay predictable, look for light gun signals, and avoid creating a runway conflict.

## Aeronautical Decision Making and Risk Models

Many accidents are not caused by a lack of stick and rudder skill. They are caused by continuing a poor plan after warning signs appear. ADM gives you a structure before pressure makes the decision smaller and worse.



### PAVE

**Pilot | Aircraft |  
enVironment | External  
pressures**

Use before flight and again when conditions change.

### IMSAFE

**Illness | Medication |  
Stress | Alcohol | Fatigue |  
Emotion or Eating**

A personal readiness gate before acting as PIC.

### HAZARDOUS ATTITUDES

**Anti authority |  
Impulsivity |  
Invulnerability | Macho |  
Resignation**

Recognize the pattern, then use the antidote.

### ORAL SCENARIO

How should you answer, would you go today?

Give a PIC decision, not just weather facts. Discuss pilot readiness, aircraft status, weather, route, terrain, airspace, performance, fuel, alternates, and external pressures.

### Personal Minimums

Build a simple structure for ceiling, visibility, crosswind, runway length, fuel reserve, density altitude, terrain, night operations, and recent experience. A new private pilot with honest limits sounds safer than one who treats every legal flight as acceptable.

## Aeronautical Decision Making and Risk Models, Continued

### 14 CFR 91.3

The PIC is directly responsible for and final authority as to the operation of the aircraft.

### ACS

The practical test evaluates knowledge, risk management, and skill, not rote recall alone.

## Aerodynamics and Performance Awareness

A stall is not caused by a magic airspeed. A stall occurs when the wing exceeds its critical angle of attack, regardless of airspeed, attitude, or power setting. Performance planning is the same kind of discipline: understand the cause, then choose the margin.

### LIFT, DRAG, AND STALLS

- Lift is controlled by airspeed, angle of attack, wing shape, and air density.
- Load factor increases stall speed because the wing must produce more lift.
- Induced drag is strongest at high angle of attack and low airspeed. Parasite drag increases with speed.
- Ground effect reduces induced drag near the surface, which can make an airplane float or lift off before it can climb safely.

### PERFORMANCE FACTORS

- Density altitude increases when pressure decreases, temperature increases, or humidity increases.
- High density altitude reduces engine power, propeller efficiency, and wing lift for a given indicated airspeed.
- Takeoff distance increases with high weight, high temperature, high airport elevation, tailwind, uphill slope, soft field, and contamination.
- Landing distance increases with high weight, high approach speed, tailwind, downhill slope, and poor braking.

<b>Stall Speeds</b> <b>V<sub>so</sub></b> landing configuration <b>V<sub>s1</sub></b> clean configuration	<b>Climb Speeds</b> <b>V<sub>x</sub></b> best angle <b>V<sub>y</sub></b> best rate	<b>Structural Speeds</b> <b>V<sub>a</sub></b> maneuvering <b>V<sub>no</sub></b> max normal cruise <b>V<sub>ne</sub></b>
<b>Configuration</b> <b>V<sub>fe</sub></b> flaps extended <b>V<sub>lo</sub></b> gear operating <b>V<sub>le</sub></b>	<b>Emergency / Glide</b> <b>V<sub>g</sub></b> best glide <b>V<sub>b</sub></b> turbulence, if published	<b>Approach / Landing</b> <b>V<sub>ref</sub></b> threshold reference <b>V<sub>app</sub></b> approach speed

All values are indicated airspeeds and must come from the specific aircraft POH/AFM.

### DENSITY ALTITUDE MEMORY

## High | Hot | Humid | Heavy Hurts

High elevation, high temperature, high humidity, and high aircraft weight reduce performance.

### ORAL SCENARIO

Your calculated takeoff distance is just under runway length. Is the flight acceptable?

Not automatically. Add margin for runway surface, slope, wind variability, pilot technique, aircraft condition, and obstacles. Legal does not always mean smart.

### Common Mistake

Do not say stalls happen at a fixed airspeed. A steep turn, abrupt pull, or base to final overshoot can exceed critical angle of attack at a higher indicated airspeed.

### ORAL SCENARIO

Why does maneuvering speed matter?

At or below maneuvering speed, the airplane should stall before exceeding design limit load in one full abrupt control input. Maneuvering speed decreases as weight decreases.

## Aircraft Systems and Flight Instruments

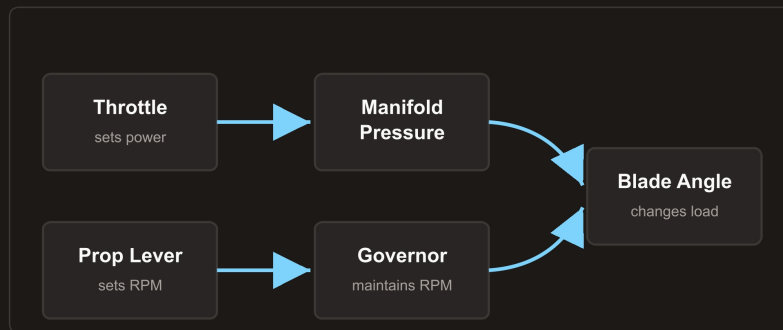
Systems knowledge is not trivia. It tells you what a normal indication should look like, what a failure affects, and which cockpit action is likely to make the situation better.

### ENGINE AND PROPELLER

- A fixed pitch propeller usually shows static RPM on the ground below full rated RPM because the aircraft is not moving through the air efficiently.
- A controllable pitch propeller lets the pilot select blade angle indirectly through RPM, improving efficiency across phases of flight.
- Carburetor ice can form well above freezing when moisture and temperature drop inside the carburetor are present.
- Detonation is uncontrolled explosive combustion. Preignition is ignition before the normal spark event, often caused by a hot spot.

### INSTRUMENTS

- Pitot static instruments include airspeed indicator, altimeter, and vertical speed indicator.
- Gyroscopic instruments commonly include attitude indicator, heading indicator, and turn coordinator.
- The magnetic compass works without aircraft electrical power, but has turning and acceleration errors.
- A blocked static port affects the altimeter, vertical speed indicator, and airspeed indicator.



Practical memory: throttle controls manifold pressure; prop lever selects RPM; governor changes blade angle to hold RPM.

### COMPASS ACCELERATION

#### ANDS

In the Northern Hemisphere on east or west headings, accelerate north, decelerate south.

### COMPASS TURNING

#### UNOS

Undershoot north, overshoot south when rolling out using the magnetic compass.

### Carb Ice Habit

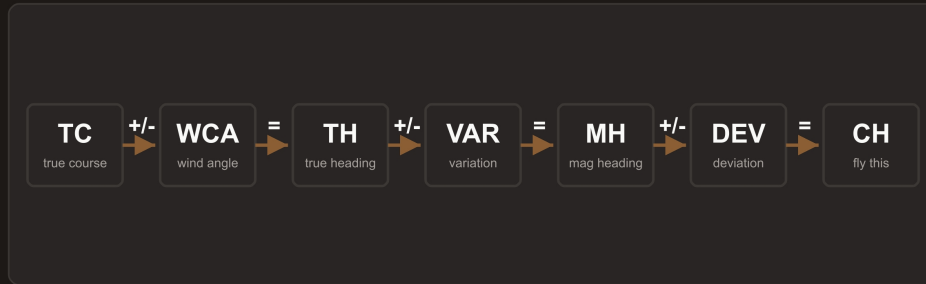
Do not wait for freezing outside air temperature. Carb heat is often a prevention and troubleshooting tool during reduced power operations. Expect enrichment and a temporary RPM drop or roughness as ice melts.

### Mixture Habit

Leaning adjusts fuel flow for altitude, temperature, and power. Too rich wastes fuel and fouls plugs. Too lean at high power can damage the engine. If rough after leaning, enrich slightly.

## Navigation, Sectionals, and Flight Planning

Electronics reduce workload, but chart literacy protects you when displays fail or the plan changes. Navigation planning connects course, heading, wind, groundspeed, fuel, airspace, terrain, and alternates into one PIC decision.



Easterly variation subtracts; westerly variation adds. Deviation comes from the compass correction card.

### SECTIONAL LITERACY

- Sectionals show airspace, airports, navigation aids, terrain, obstacles, special use airspace, frequencies, and visual checkpoints.
- A blue airport symbol generally means towered. A magenta airport symbol generally means nontowered.
- Maximum elevation figures show the highest known terrain or obstacle in a quadrangle plus safety buffer.
- VOR radials are named from the station. On the 090 radial, you are east of the station.

### PREFLIGHT ACTION

- Before a flight not in the vicinity of an airport, become familiar with all available information concerning that flight.
- Include weather reports and forecasts, fuel requirements, alternatives, known delays, runway lengths, and takeoff and landing distances.
- A standard briefing fits most planned flights. An outlook briefing fits flights six or more hours away. An abbreviated briefing updates prior information.

### VFR FUEL MINIMUMS

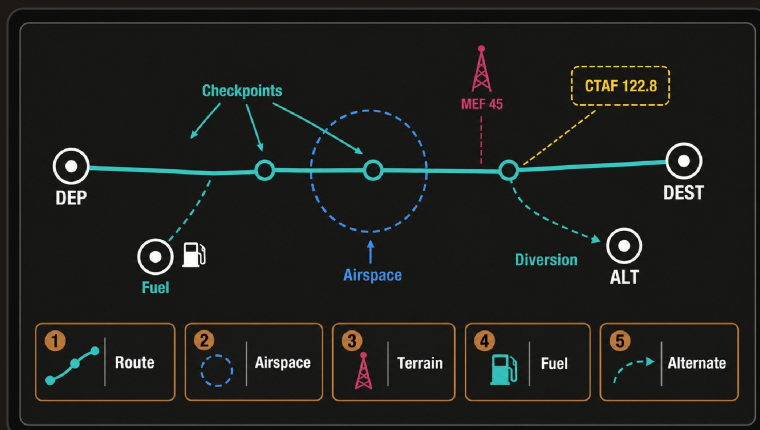
#### Day 30 | Night 45

Enough fuel to reach the first point of intended landing, then 30 minutes by day or 45 minutes by night at normal cruising speed.

### Planning Minimums

Legal minimum is not planning minimum. Add reserve for taxi, climb, headwind error, reroute, approach delays, and personal comfort.

OPERATION	REQUIRED RESERVE	PLANNING NOTE
Day VFR	30 minutes at normal cruising speed	Legal minimum only
Night VFR	45 minutes at normal cruising speed	Legal minimum only



### 14 CFR 91.103

Preflight action is the legal backbone of weather, fuel, runway, performance, delay, and alternative planning.

## Weight and Balance

Weight and balance is not paperwork. An airplane outside limits may still taxi and even take off, but may not have enough control authority, stability, or performance when you need it most.

**Useful Load Includes Everything You Add**

**Useful Load**

**Payload**  
people + bags

**Usable Fuel**  
gallons x weight

**Other Load**  
oil, equipment

Useful load = max gross weight minus basic empty weight. Payload excludes fuel.

**Weight**  
pounds

x

**Arm**  
inches

=

**Moment**  
lb-in

**CG = Total Moment / Total Weight**

Calculate each item moment, total all weights and moments, then divide to find CG.

**CG EFFECTS**

- Weight affects performance, structural margins, stall speed, takeoff distance, landing distance, climb, and maneuvering limits.
- A forward CG improves longitudinal stability but can make rotation and flare harder.
- An aft CG reduces stability, can make stalls and spins harder to recover from, and may reduce elevator authority margins.
- When weight moves forward, CG moves forward. When weight moves aft, CG moves aft.

**Forward CG**

**Effects**  
 Higher control forces  
 Reduced elevator authority  
 Difficult flare near limit  
 More stable, less efficient

**Aft CG**

**Effects**  
 Reduced longitudinal stability  
 Light control forces  
 Harder stall/spin recovery  
 May become unrecoverable

Forward CG is usually controllability-limited; aft CG is stability-limited and generally more dangerous.

**MOMENT**

**Moment = Weight x Arm**

Calculate each item contribution to aircraft balance.

**CENTER OF GRAVITY**

**CG = Total Moment / Total Weight**

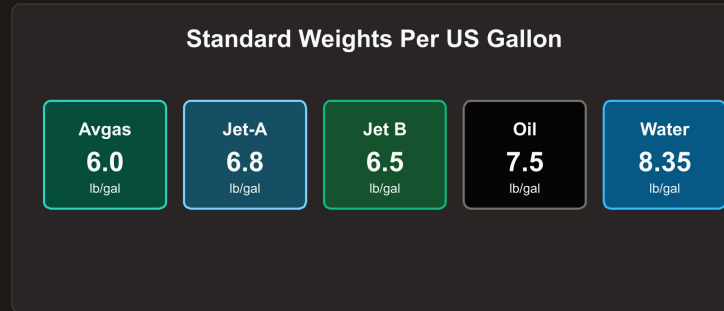
Compare the result to the approved envelope.

**WEIGHT SHIFT**

**CG Change = Weight Moved x Distance / Total Weight**

The direction should match common sense movement.

## Weight and Balance, Continued



Use actual POH values when specified; these are standard planning weights.

### ORAL SCENARIO

How do you calculate CG?

Multiply each weight by its arm, add weights, add moments, then divide total moment by total weight.

### Common Mistake

If the POH chart uses moment divided by 100 or 1,000, keep the scale consistent. A correct formula with a wrong moment scale gives a wrong airplane.

## Weather Theory and Weather Products

Weather is driven by uneven heating, pressure differences, moisture, and stability. The private pilot task is to translate products and theory into a go decision that respects visibility, ceilings, thunderstorms, terrain, fuel, and personal limits.

### WEATHER THEORY

- Standard sea level pressure is 29.92 inches of mercury and standard sea level temperature is 15 degrees Celsius.
- Standard temperature lapse rate is about 2 degrees Celsius per 1,000 feet.
- Stable air tends to produce smooth air, stratiform clouds, steady precipitation, and poorer visibility.
- Unstable air tends to produce turbulence, cumuliform clouds, showery precipitation, and better visibility between showers.

### THUNDERSTORMS AND ICING

- Thunderstorms need moisture, unstable air, and lifting action.
- The mature stage is usually most hazardous because updrafts, downdrafts, precipitation, lightning, and gust fronts can coexist.
- Wind shear can occur near thunderstorms, fronts, temperature inversions, and terrain.
- Frost disrupts airflow and can prevent an airplane from becoming airborne at normal takeoff speed.

### CLOUD BASE ESTIMATE

$$\text{(Temp minus Dew Point)} / 4.4 \times 1,000$$

Fahrenheit estimate for cumulus cloud base AGL. Add field elevation if the answer must be MSL.

### THUNDERSTORM INGREDIENTS

**Moisture | Unstable Air | Lift**

All three are needed for thunderstorm development.

## Weather Theory and Weather Products, Continued

PRODUCT	TYPE	PILOT USE
METAR	Observation	Current reported airport weather
TAF	Forecast	Expected weather near an airport during stated times
GFA	Forecast graphic	Broad area VFR and IFR planning
SIGMET	Advisory	Significant nonconvective hazards
Convective SIGMET	Advisory	Thunderstorm related hazards

STAGE	DOMINANT MOTION	MAIN CONCERN
Cumulus	Updrafts	Building storm energy
Mature	Updrafts and downdrafts	Greatest hazards
Dissipating	Downdrafts	Gusts, turbulence, rain

**ORAL SCENARIO**

What stage of a thunderstorm is most hazardous?

The mature stage, because both updrafts and downdrafts are present and precipitation begins.

**Product Answer Habit**

Do not answer weather products by name only. Say whether it is observed or forecast, what area it covers, and how current it is.

## Oxygen, Emergencies, Reporting, and Final Checkride Integration

Some private pilot rules live at the edges of normal VFR training, but they reveal whether you think like PIC. Oxygen protects judgment, transponder codes communicate urgency, and NTSB reporting preserves evidence after serious events.

CABIN PRESSURE ALTITUDE	CREW REQUIREMENT	PASSENGER REQUIREMENT
Above 12,500 through 14,000 feet MSL	Required for crew after 30 minutes	Not required by this rule
Above 14,000 feet MSL	Required for crew continuously	Not required by this rule
Above 15,000 feet MSL	Required for crew continuously	Must be provided

**1200**

VFR

**7500**

Hijacking

**7600**

Lost Comm

**7700**

Emergency

If ATC assigns a discrete code, use the assigned code unless the emergency requires otherwise.

## Oxygen, Emergencies, Reporting, and Final Checkride Integration, Continued

### NTSB REPORTING

- Certain accidents and serious incidents require immediate NTSB notification.
- Reportable events include flight control system malfunction or failure, in flight fire, aircraft collision in flight, overdue aircraft believed involved in an accident, and certain crewmember incapacitation events.
- Preserve wreckage and records unless moving them is necessary to protect life, prevent further damage, or protect the public.

### 14 CFR 91.211

Supplemental oxygen rules define required crew use and passenger oxygen availability by altitude.

### Altitude and Oxygen Trap

Oxygen rules use cabin pressure altitude thresholds. Hypoxia often appears first as impaired judgment, not obvious distress. Treat the rule as a minimum, not a wellness guarantee.

### NTSB PART 830

Accidents and specified serious incidents may require immediate notification and later written reports.

## FINAL ORAL REVIEW

### AIRWORTHINESS

What makes an aircraft airworthy?

It conforms to its type design and is in a condition for safe operation. Verify documents, inspections, required equipment, maintenance records, ADs, and physical condition.

### RESTRICTED AREA

What if you are unsure whether a restricted area is active?

Check current chart information, NOTAMs, controlling agency information, and ATC if available. If active and unauthorized, remain clear.

### CLASS B ENTRY

What do you need to enter Class B?

An explicit ATC clearance, proper communication equipment, Mode C transponder and ADS B Out where required, and applicable pilot qualifications.

### FINAL MINDSET

When a question includes age, sunset, night, oxygen altitude, units, or medical duration, slow down.

These are classic thresholds. Identify the unit and the exact rule before solving.