PRIVATE PILOT
STUDY GUIDE

Knowledge Reference for Student Pilots

IMPORTANT: This study guide provides a foundation of knowledge for the private pilot certificate. Using this guide alone will not pass a checkride. You must understand the material — not simply memorize it — and read every referenced source in depth.

How to Use This Guide

- Understand the material; do not rely solely on memorization.
- Some items require memorization — know exactly where each fact comes from.
- Click every reference link (e.g., PHAK 2-8 = Pilots Handbook of Aeronautical Knowledge, Chapter 2, Page 8).

Reference Key

Abbreviation	Full Title
PHAK	Pilots Handbook of Aeronautical Knowledge
AFH	Airplane Flying Handbook
POH	Pilots Operating Handbook
CFR	Code of Federal Regulations
AIM	Aeronautical Information Manual
AWH	Aviation Weather Handbook

1. Risk Management — PAVE

The PAVE checklist is a structured decision-making tool for identifying and mitigating risk before flight. Reference: PHAK 2-8.

Letter	Category	Key Considerations
P	Pilot	Health, currency, proficiency, documents, personal minimums
A	Aircraft	Airworthiness, documents, inspections, performance
V	enVironment	Weather, airspace, terrain, airports, NOTAMs
E	External Pressures	Schedule pressure, passenger expectations, get-there-itis

1.1 Pilot — IMSAFE Checklist

Use the IMSAFE checklist before every flight to assess personal fitness.

Letter	Category	Question to Ask
I	Illness	Am I sick or feeling unwell?
M	Medications	Am I taking any FAA-prohibited medications? (Check FAA website)
S	Stress	Am I under chronic or acute stress?
A	Alcohol	8 hours bottle-to-throttle; BAC ≤ 0.04; not "under the influence"
F	Fatigue	Have I had adequate sleep and rest?
E	Emotions / Eating	Am I emotionally affected? Have I eaten?

1.2 Required Pilot Documents

- Pilot Certificate — does not expire
- Valid government-issued photo ID (driver's license or passport)
- Medical Certificate — per CFR 61.23

Medical Certificate Validity

Class	Age < 40	Age ≥ 40
1st Class	Valid 60 months (1st class privileges: 12 months, then 3rd class for remaining 48 months)	Valid 12 months (1st class: 6 mo → 2nd class: 6 mo → 3rd class: 12 mo)
2nd Class	Valid 60 months (2nd class privileges: 12 months, then 3rd class for remaining 48 months)	Privileges 12 months, then 3rd class for 12 months
3rd Class	Valid 60 calendar months	Valid 24 calendar months

1.4 BasicMed (14 CFR Part 68 / AC 68-1A)

BasicMed is an alternative pathway that allows eligible U.S. private pilots to exercise Private Pilot certificate privileges without holding an FAA medical certificate.

Eligibility Requirements

- Hold a valid U.S. driver's license (or have been found eligible for one by a state, if never issued)
- Hold at least a valid U.S. Private Pilot, Recreational Pilot, or Sport Pilot certificate
- Have held a valid FAA medical certificate at any point after July 14, 2006; the most recent medical must NOT have been denied, revoked, suspended, or withdrawn
- Must NOT be under an FAA order denying an application for an airman medical certificate

Two Ongoing Requirements to Maintain BasicMed

#	Requirement	Details
1	Comprehensive Medical Examination (CMEC)	Every 48 calendar months, complete a physical exam with any state-licensed physician (does NOT need to be an FAA AME). The physician uses the FAA Comprehensive Medical Examination Checklist (CMEC). Both the physician and pilot must sign the CMEC. The pilot keeps the CMEC; it does NOT get sent to the FAA.
2	Online Medical Education Course	Every 24 calendar months, complete an FAA-approved online aeromedical education course (ALC-677) at FAASafety.gov. Topics include aeromedical factors, medications, and conditions affecting flight. Completion is logged in the FAA Safety Team (FAASTeam) system.

Privileges and Limitations

Category	Limitation / Privilege
Aircraft Type	Non-pressurized aircraft with a max certificated takeoff weight (MTOW) of 6,000 lbs or less; up to 6 occupant seats
Altitude	At or below 18,000 ft MSL; Class A airspace (IFR only) is NOT permitted
Airspeed	Indicated airspeed at or below 250 knots
Passengers	May carry passengers; same rules as standard Private Pilot privileges apply (pro-rata cost sharing; no compensation or hire)
International Flights	NOT valid for international operations — a standard FAA medical certificate is required

1.3 Pilot Privileges

Private Pilot (CFR 61.113)

- May carry passengers
- Must pay pro-rata share of flight costs (costs split equally among occupants)
- Not required to carry logbook
- May NOT act as PIC for compensation or hire

Student Pilot (CFR 61.89)

- May NOT carry passengers
- Must carry an endorsed logbook

1.4 Currency Requirements

To Act as PIC (CFR 61.57)

- Appropriately rated in the aircraft category and class
- Flight review within the previous 24 calendar months (CFR 61.56), OR completion of a checkride for an additional rating, OR the WINGS program

To Carry Passengers (CFR 61.57)

- 3 takeoffs and landings in the previous 90 days
  - Day currency: touch-and-goes acceptable (tailwheel: full stop required)
  - Night currency: 3 full-stop landings between 1 hour after sunset and 1 hour before sunrise

1.5 Night Operations

Requirement	Rule	Reference
Navigation Lights	Sunset to sunrise	CFR 91.209
Logging Night Time	Civil twilight (30 min after sunset / before sunrise)	CFR 1.1
Night Currency	3 full-stop takeoffs & landings, 1 hour after sunset / before sunrise	CFR 61.57

2. Aircraft

2.1 Required Documents — ARROWPDC

All required aircraft documents must be on board during flight (CFR 91.203). Use the acronym ARROWPDC:

	Document	Details
A	Airworthiness Certificate	Does not expire; valid only when all maintenance requirements are met
R	Registration	Valid for 84 calendar months (CFR 91.203)
R	Radio Station License	One for pilot, one for aircraft; required for international flights only
O	Operating Limitations	FAA-approved POH or AFM (CFR 91.9)
W	Weight & Balance	Master W&B completed by authorized mechanic (CFR 23.1589)
P	Placards	As prescribed by POH Section 2
D	Data Plate	Metal plate on empennage: registration, serial, model, manufacture date
C	Compass Deviation Card	Corrects for compass installation errors

2.2 Required Inspections — AAV1ATES

Inspection	Interval	Reference
Airworthiness Directives (ADs)	Per AD terms — legally binding	FAA
Annual Inspection	Every 12 calendar months	CFR 91.409
VOR Check	Every 30 days (IFR only)	CFR 91.171
100-Hour Inspection	When aircraft is operated for hire	CFR 91.409
Altimeter / Pitot-Static	Every 24 calendar months (IFR)	CFR 91.411
Transponder	Every 24 calendar months	CFR 91.413
ELT	Every 12 calendar months; battery at 1 hr cumulative use or 50% battery life	CFR 91.207
Service Bulletins	Per manufacturer recommendation — NOT legally binding	Manufacturer

Note: *The annual inspection CAN replace a 100-hour inspection, but NOT vice versa.*

2.3 Required Equipment

Day VFR — ATOMATOFLAMES (CFR 91.205(b))

Letter	Equipment
A	Airspeed Indicator
T	Tachometer (for each engine)
O	Oil Pressure Gauge
M	Manifold Pressure Gauge (for altitude engines)
A	Altimeter
T	Temperature Gauge (liquid-cooled engines)
O	Oil Temperature Gauge
F	Fuel Gauge Indicator
L	Landing Gear Position Indicator
A	Anti-Collision Lights
M	Magnetic Direction Indicator
E	Emergency Locator Transmitter (ELT)
S	Safety Belts

Night VFR — Add FLAPS (CFR 91.205(c))

Letter	Equipment
F	Fuses / Circuit Breakers
L	Landing Light (if operated for hire)
A	Anti-Collision Lights
P	Position Lights
S	Source of Power (Alternator / Generator)

2.4 Inoperative Equipment (CFR 91.213)

When equipment is inoperative, consult the following hierarchy:

- Minimum Equipment List (MEL)
- Type Certificate Data Sheet (TCDS)
- POH / Kinds of Operations Equipment List (KOEL)
- CFR 91.205
- Airworthiness Directives

Required actions before flight:

- Remove or deactivate the inoperative equipment
- Log the removal in maintenance records (if removed by a mechanic)

- Placard the item "INOP"
- PIC determines whether the aircraft is still airworthy and safe to fly

2.5 Stall & Spin Awareness

Stall

- Occurs when the aircraft exceeds the critical angle of attack — NOT a specific airspeed or attitude

Spin Recovery — PARE

Step	Action
P	Power — Idle
A	Ailerons — Neutral
R	Rudder — Apply full opposite to direction of spin
E	Elevator — Push forward to break stall

What is a Spin?

A spin is an aggravated stall that results in autorotation — a sustained, nose-low, rotating descent in which the aircraft is in a stalled condition. It requires two conditions to occur simultaneously: a stall AND yaw (uncoordinated flight). One wing stalls more deeply than the other, causing that wing to drop and the aircraft to autorotate around a vertical axis. A spin is NOT simply a steep spiral; in a spiral the wings are generating lift and airspeed increases rapidly, whereas in a spin the wings are stalled and airspeed remains relatively constant. Reference: PHAK 5-25, AC 61-67C.

Two Required Conditions to Enter a Spin

Condition	Explanation
1. Stall	The aircraft must exceed the critical angle of attack. Without a stall, a spin cannot occur.
2. Yaw	Uncoordinated flight (skidding or slipping turn) causes one wing to move faster than the other. The faster-moving wing produces more lift AND more induced drag. If the aircraft stalls at this moment, the wing with greater drag drops and autorotation begins.

Three Phases of a Spin

Phase	What Happens
Incipient	The stall break and initial autorotation. Lasts approximately 2 rotations. The nose pitches down and the aircraft begins to rotate. This is the easiest phase in which to recover — prompt PARE application will stop the spin quickly. Most spins in training are limited to this phase.

Phase	What Happens
Developed	The spin has stabilized — pitch attitude, rotation rate, and airspeed are relatively constant. Both wings remain stalled. Altitude is lost rapidly (approximately 300–500 ft per rotation depending on aircraft type).
Recovery	PARE inputs are applied. Rotation slows and stops. The aircraft transitions from a stall into a dive. The pilot then applies back pressure to pull out of the dive, being careful not to exceed Va or structural limits.

PARE Recovery — Step-by-Step Detail

Step	Action	Why It Works
P	**Power — Idle**	Reduces torque and slipstream effects that can reinforce rotation. Reduces airspeed buildup in the subsequent dive.
A	**Ailerons — Neutral**	In a stalled condition, ailerons are ineffective and may even deepen the stall on one wing (adverse yaw / aileron drag). Neutralizing them prevents worsening the spin or confusing the recovery.
R	**Rudder — Full Opposite**	The rudder is the PRIMARY recovery control. Full opposite rudder counters the autorotation and reduces the yaw that is sustaining the spin. Must be applied briskly and held until rotation stops.
E	**Elevator — Forward**	Applied AFTER the rudder starts to take effect. Forward elevator reduces the angle of attack below the critical AOA, breaking the stall on both wings. Apply briskly but smoothly — do not yank the stick back once rotation stops.
+		

High-Risk Spin Entry Scenarios

Most inadvertent spins occur in the traffic pattern when the pilot is distracted, slow, and uncoordinated. The following are the most common accident scenarios:

Scenario	Why It Is Dangerous
Base-to-Final Turn (Skidding)	Pilot overshoots final and uses excess bottom rudder to skid the nose back. Aircraft is slow with flaps down and in uncoordinated flight — classic spin setup. Very low altitude leaves no room for recovery.
Takeoff / Climb-Out	Engine failure or distraction leads pilot to pitch up excessively and use opposite rudder. Power-on stall with yaw equals a power-on spin. Very little altitude available.
Go-Around (Balked Landing)	Pilot applies full power suddenly during a slow, flaps-extended approach. Torque and P-factor yaw the nose left. If the pilot uses aileron instead of rudder to correct, a left snap/spin can occur at very low altitude.

Spin Awareness Training Requirement (AC 61-67C)

For the Private Pilot certificate, actual spin training is NOT required. However, an applicant must receive and log flight and ground training on spin entry, spins, and spin recovery procedures from an authorized instructor per 14 CFR 61.107(b)(1)(viii). This training is ground and flight training on awareness and

avoidance — not necessarily intentional spin practice — unless the applicant or instructor chooses to do so in a spin-approved aircraft.

Note: Flight instructors (CFI candidates) MUST demonstrate actual spin competency as part of their practical test requirements.

2.6 Wake Turbulence Avoidance (PHAK 5-9)

- Remain above other aircraft's flight path
- On takeoff: rotate prior to the preceding aircraft's rotation point
- On landing: touch down beyond the preceding aircraft's touchdown point

3. Performance and Limitations

3.1 Four Forces of Flight (PHAK 5-1)

In unaccelerated level flight, all four forces are equal and opposite:

Force	Direction	Produced By
Lift	Upward	Wings (Bernoulli + Newton)
Weight	Downward	Gravity acting on aircraft mass
Thrust	Forward	Engine / Propeller
Drag	Rearward	Air resistance on airframe

3.2 Primary Flight Controls (PHAK 6-2)

Control Surface	Movement	Axis of Rotation	Stability Type
Ailerons	Roll	Longitudinal	Lateral
Elevator	Pitch	Lateral	Longitudinal
Rudder	Yaw	Vertical	Directional

> ***Note:*** *Secondary flight controls include: flaps, leading edges, spoilers, and trim systems (PHAK 6-8).*

3.3 Types of Drag (PHAK 5-6)

Parasite Drag — Increases with Airspeed

- Form Drag — shape of the aircraft (e.g., C-172 vs. F-16)
- Skin Friction — surface texture (rivets, dirt, paint)
- Interference Drag — intersecting airstreams from different components

Induced Drag — Byproduct of Lift

- Caused by wingtip vortices spinning into the underside of the wing
- Decreases with airspeed; vortices dissipate upon reaching the ground (ground effect)

3.4 Center of Gravity Effects (PHAK 5-15)

Mnemonic: RALFSS — whatever RAL does, FSS does the opposite.

Characteristic	Forward CG	Aft CG
Range	Decreases	Increases
Airspeed	Decreases	Increases
Landing Flare	Decreases	Increases

Characteristic	Forward CG	Aft CG
Fuel Burn	Increases	Decreases
Stability	Increases	Decreases
Stall Recovery	Increases (easier)	Decreases (harder)

3.5 Left-Turning Tendencies (PHAK 5-30)

Tendency	Cause
Torque	Propeller rotates clockwise; aircraft tends to rotate counterclockwise
Spiraling Slipstream	Prop wash spirals around fuselage and strikes the left side of the vertical stabilizer, causing left yaw
Gyroscopic Precession	Applied force is manifested 90° in the direction of rotation; more pronounced in tailwheel aircraft
P-Factor	In climb or descent, the descending blade has a greater angle of attack, producing more thrust on one side and yawing the nose

4. Altitudes and Airspeeds

4.1 Types of Altitude (PHAK 4-4, 11-3)

Type	Definition
Indicated Altitude	Reading directly from the altimeter
Pressure Altitude	Altitude above the standard datum plane; altimeter set to 29.92 in Hg
Density Altitude	Pressure altitude corrected for non-standard temperature
True Altitude	Actual height above mean sea level (MSL)
Absolute Altitude	Height above the ground (AGL)

4.2 Density Altitude Effects (PHAK 11-3)

Factor	Effect on Density Altitude	Effect on Performance
Higher Elevation	Increases	Decreases
Higher Temperature	Increases	Decreases
Higher Humidity	Increases	Decreases

4.3 Airspeed Types (POH 1-6)

Abbreviation	Type	Definition
IAS	Indicated Airspeed	Reading from the airspeed indicator
CAS	Calibrated Airspeed	IAS corrected for instrument/position error
TAS	True Airspeed	CAS corrected for non-standard temperature; actual air molecules encountered
GS	Ground Speed	TAS corrected for wind; speed over the ground

4.4 V-Speed Reference

V-Speed	Definition	N9526H (KIAS)	N6539H (KIAS)
Vr	Rotation Speed	55	52
Vx	Best Angle of Climb (most altitude over distance)	59	59
Vy	Best Rate of Climb (most altitude over time)	78	78
Vso	Stall Speed, Landing Configuration (full flaps)	41	40
Vs	Stall Speed, Clean Configuration (no flaps)	47	48

V-Speed	Definition	N9526H (KIAS)	N6539H (KIAS)
Vg	Best Glide Speed	65	70
Va	Maneuvering Speed	97	97
Vfe	Maximum Flap Extended Speed (white arc)	85	85
Vno	Normal Operating Speed (yellow arc)	128	126
Vne	Never Exceed Speed (red line)	158	158

5. Environment

5.1 Weather Resources (PHAK Chapter 13)

- ForeFlight
- aviationweather.gov
- 1800wxbrief.com / 1-800-WX-BRIEF
- ATIS / AWOS / ASOS
- Flight Service Station (FSS)
- ATC (en route weather advisories)
- ADS-B In
- PIREPs — Pilot Reports (icing, turbulence, cloud bases/tops, wind shear)

5.2 Aviation Weather Products

Product	Type	Update	Valid Period	Coverage
METAR	Observation	Every 50 min	Current	Within 5 SM of airport
SPECI	Special Observation	As needed	Current	Significant change only
TAF	Forecast	Every 6 hours	24 hours	Within 5 SM of airport
Winds Aloft	Forecast	Daily	Up to 24 hours	Various altitudes
AIRMET	Advisory	As needed	6 hours	Moderate conditions / GA
SIGMET	Advisory	As needed	4 hours	Severe — all aircraft
Convective SIGMET	Advisory	As needed	2 hours	Thunderstorms / tornadoes

AIRMET Types

- Tango — Turbulence, surface winds > 30 kts, low-level wind shear not associated with thunderstorms
- Sierra — IFR conditions and mountain obscurations
- Zulu — Icing

Convective SIGMET Criteria

- Thunderstorms
- Tornadoes
- Surface winds > 50 kts
- Hail ≥ 3/4 inch in diameter

5.3 International Standard Atmosphere (PHAK 4-3)

Parameter	Standard Value
Pressure (Sea Level)	29.92 in Hg / 1013.25 mb
Temperature (Sea Level)	15°C / 59°F
Pressure Lapse Rate	~1 in Hg per 1,000 ft of altitude
Temperature Lapse Rate	2°C per 1,000 ft of altitude

5.4 Weather Systems & Fronts (PHAK 12-7, 12-18)

System/Front	Movement	Clouds	Precipitation	Visibility
High Pressure	CW, down, outward	Stable / clear	None	Poor (settling)
Low Pressure	CCW, up, inward	Unstable / building	Likely	Good (lifting)
Warm Front	Slow-moving	Stratiform	Steady	Poor (stable air)
Cold Front	Fast-moving	Cumuliform	Showery / TS possible	Improving after passage
Stationary Front	Stalled	Mixed	Persistent	Poor, prolonged
Occluded Front	Complex (3 air masses)	Mixed	Variable	Variable

5.5 Thunderstorm Stages (PHAK 12-22)

Three ingredients required: high moisture content, uplifting action, and unstable air.

Stage	Characteristics	Hazards
Cumulus	Updrafts; clouds building	Moderate turbulence
Mature	Updrafts and downdrafts; precipitation begins	MOST DANGEROUS — severe wind shear, lightning, hail
Dissipating	Mostly downdrafts; storm weakening	Microbursts up to 6,000 fpm downdraft

5.6 Types of Fog — AIRMUS (PHAK 12-15)

Type	Formation Mechanism
Advection	Warm moist air moves over colder land or water
Ice	Temps below -10°C; tiny ice crystals suspended in air
Radiation	Calm, clear nights; ground cools air to dewpoint
Mountain / Valley	Cool air sinks into valleys at night, reaching dewpoint

Type	Formation Mechanism
Upslope	Wind pushes moist stable air up a slope until it reaches dewpoint
Steam	Cold air moves over warm water; evaporation adds moisture to air

Note: *Expect fog when temperature and dewpoint spread is within 3°C.*

6. Airspace

6.1 Airspace Classes Summary (PHAK Chapter 15)

Class	Altitude	Entry Requirements	Weather Minimums
A	18,000 MSL – FL600	Instrument rated; IFR flight plan filed	N/A (IFR only)
B	Surface – ~10,000 MSL	ATC clearance; ADS-B out; Mode C transponder	3 SM; clear of clouds
C	Surface – 4,000 AGL(5NM/10NM rings)	2-way radio comms; ADS-B out; Mode C transponder	3 SM; 1-5-2
D	Surface – 2,500 AGL(5 SM ring)	2-way radio comms	3 SM; 1-5-2
E	700 or 1,200 AGL – 18,000 MSL	None for VFR	Below 10k: 3-1-5-2; Above 10k: 5-1-1-1
G	Surface – 700 or 1,200 AGL	None	Day: 1 SM clear of clouds; Night: 3-1-5-2

Note: *All airspace above 10,000 MSL requires a transponder (CFR 91.215). ADS-B out required above 10,000 MSL in Class E (CFR 91.225).*

6.2 VFR Flight Categories

Category	Color	Ceiling	Visibility
VFR	Green	> 3,000 ft AGL	> 5 SM
MVFR (Marginal VFR)	Blue	1,000 – 3,000 ft AGL	3 – 5 SM
IFR	Red	500 – 1,000 ft AGL	1 – 3 SM
LIFR (Low IFR)	Magenta	< 500 ft AGL	< 1 SM

6.3 Special Use Airspace — MCPRAWN (AIM 3-4-1)

Type	Entry	Notes
MOA (Military Operations Area)	Permitted with caution	Separates military and IFR traffic
Controlled Firing Area	No restriction	Not charted; lookout used for approaching aircraft
Prohibited Area	NEVER	Cannot enter under any circumstances
Restricted Area	With permission	Requires ATC authorization prior to entry
Alert Area	Permitted with caution	Concentrated student training or unusual aerial activity

Type	Entry	Notes
Warning Area	Permitted with caution	Extends 3 NM from US coastline
National Security Area	Voluntarily avoid	Increased security; restrictions via NOTAM

6.4 VFR Cruising Altitudes (CFR 91.159)

Applicable at or above 3,000 ft AGL:

Magnetic Course	Altitude
0° – 179° (eastbound)	Odd thousands + 500 ft (e.g., 3,500 / 5,500 / 7,500)
180° – 359° (westbound)	Even thousands + 500 ft (e.g., 4,500 / 6,500 / 8,500)

7. Navigation

7.1 Navigation Systems (PHAK 16)

System	Type	Description
GPS	Satellite	Triangulates position using satellite signals
VOR	Radio (Short Range)	Determines relative bearing to/from ground station
DME	Radio (Distance)	Uses slant range (line-of-sight) to determine distance; most inaccurate directly overhead

7.2 Compass Errors — VDMONA (PHAK 8-24)

Error	Cause
Variation	Difference between true and magnetic north; depicted by isogonic lines on sectional charts
Deviation	Interference from aircraft electronics; shown on compass correction card
Magnetic Dip	Compass tilts toward magnetic poles near high latitudes
Oscillation	Combination of all errors; aircraft in motion
Northerly Turning Errors (UNOS)	Undershoot North, Overshoot South when turning
Acceleration Errors (ANDS)	Accelerate = North indication; Decelerate = South indication

7.3 Pilotage and Dead Reckoning (PHAK 16-12)

- Pilotage — Identifying visual landmarks on the ground to confirm position
- Dead Reckoning — Using time, groundspeed, and distance calculations to estimate position

7.4 Fuel Requirements (CFR 91.151)

Operation	Fuel Requirement
Day VFR	Destination + 30 minutes at cruise
Night VFR	Destination + 45 minutes at cruise

8. Aeromedical Factors (PHAK Chapter 17)

8.1 Hypoxia

Hypoxia is a deficiency of oxygen affecting the body. It impairs judgment and reaction time before the pilot is aware of symptoms.

Type	Cause	Example
Hypoxic	Insufficient oxygen in atmosphere	High altitude; thin air
Hypemic	Blood unable to carry oxygen	Anemia, CO poisoning, blood loss
Stagnant	Poor circulation	Excessive G-forces
Histotoxic	Body unable to use oxygen	Alcohol or drug impairment

Supplemental Oxygen Requirements (CFR 91.211)

- 12,500 – 14,000 MSL: Required crew use after 30 minutes of cumulative flight time
- Above 14,000 MSL: Required crew use at all times
- Above 15,000 MSL: Must be provided to all passengers

8.2 Carbon Monoxide (CO) Poisoning

> **Caution:** CO is colorless and odorless. The most common source in piston aircraft is a cracked heat exchanger allowing exhaust fumes into the cabin heat system.

Symptoms: headache, dizziness, drowsiness, confusion, vomiting, convulsions, incapacitation.
Resolution: Turn off cabin heat, open windows, notify ATC, declare emergency, land as soon as possible.

8.3 Hyperventilation

Rapid or deep breathing that decreases CO_2 levels in the blood. Caused by stress, panic, or anxiety.
Symptoms: lightheadedness, nausea, tingling in extremities, rapid pulse.
Resolution: Slow and control breathing; talk or sing aloud; breathe into a bag; remove cause of stress.

8.4 Scuba Diving Waiting Periods

Dive Type	Max Altitude ≤ 8,000 MSL	Any Altitude
Uncontrolled Ascent	Wait 12 hours	Wait 24 hours
Controlled Ascent	Wait 24 hours	Wait 24 hours

9. Hazardous Attitudes & Decision Making (PHAK 2-5)

These five attitudes can undermine aeronautical decision making (ADM). Every pilot must recognize and actively counter them.

Attitude	Thought Pattern	Antidote
Anti-Authority	"Don't tell me what to do."	Follow the rules — they exist for a reason.
Impulsivity	"Do something quickly!"	Not so fast — think it through first.
Invulnerability	"It won't happen to me."	It could happen to me.
Macho	"I can do it — watch this."	Taking chances is foolish.
Resignation	"What's the use?"	I am not helpless. I can make a difference.

10. Radio Communications & Airport Operations

10.1 Radio Communication — The 4 W's (AIM 4-2)

W	What to State	Example
Who you're talking to	ATC facility or tower name	"Pueblo Approach,"
Who you are	Aircraft N-number	"Cessna N6539H,"
Where you are	Current position or altitude	"10 miles south, 7,500,"
What you want	Your intentions	"Request flight following to KCOS."

10.2 Light Gun Signals

Signal	On Ground	In Air
Steady Green	Cleared for takeoff	Cleared to land
Flashing Green	Cleared to taxi	Return for landing
Steady Red	Stop	Give way; continue circling
Flashing Red	Taxi clear of runway in use	Airport unsafe — do not land
Flashing White	Return to starting point	N/A
Alternating Red/Green	Exercise extreme caution	Exercise extreme caution

10.3 Lost Communication Procedures (PHAK 14-23)

Troubleshoot First

- Verify radio is on and volume is up
- Confirm headset is plugged in
- Check frequency
- Request a radio check
- Return to previous frequency
- Continue announcing intentions (ATC may hear you even if you cannot hear them)

In Controlled Airspace — Squawk 7600

- Remain above traffic pattern altitude and circle while observing traffic flow
- Watch for light gun signals from the tower

10.4 Traffic Pattern Entry (AC-66C)

- Enter midfield downwind at pattern altitude, OR
- Cross over the field at 500 ft above TPA and execute a teardrop entry while descending to TPA
- Check Airport Flight Directory (AFD) or sectional chart for field elevation and traffic pattern direction

10.5 Runway Incursion Awareness (PHAK 14-31)

Definition: any occurrence in the runway environment involving an aircraft, vehicle, person, or object creating a collision hazard or loss of required separation.

- Have airport diagram available before taxi
- Brief hotspots before flight
- Announce intentions and listen carefully (uncontrolled); read back all instructions (controlled)
- Write down ATC instructions if needed
- Practice sterile cockpit — minimize distractions during ground movement
- Look both ways before entering any runway or intersection
- Clear the hold-short line after landing before performing checklists or communications

11. Aircraft Systems — N6539H & N9526H

11.1 Airframe & Controls

System	Type / Configuration
Primary Flight Controls	Differential Ailerons, Elevator, Rudder
Secondary Flight Controls	Single-slot wing flaps (electrically actuated); 0°, 10°, 20°, 30°, 40°
Trim	Elevator (manual, center column); Rudder (ground adjustable)

11.2 Powerplant

Parameter	Specification
Manufacturer	Lycoming
Model	O-320-E2D
Configuration	4-cylinder, horizontally opposed
Displacement	320 cubic inches
Aspiration	Naturally aspirated
Horsepower	150 HP @ 2,700 RPM
Ignition	Dual magnetos
Fuel System	Carbureted
Propeller Drive	Direct
Cooling	Air-cooled

11.3 Fuel System

Parameter	N9526H	N6539H
Feed Type	Gravity Fed	Gravity Fed
Fuel Pump	Engine Driven	Engine Driven
Total Capacity	42 gal	52 gal
Usable Fuel	38 gal	48 gal

11.4 Electrical System

Parameter	Specification
System Voltage	14 volts
Main Battery	12 volts

Parameter	Specification
Power Generation	60-amp alternator

11.5 Landing Gear

Component	Type
Configuration	Fixed tricycle
Brakes	Differential toe brakes (hydraulic)
Nose Gear	Steerable, air/oil shock strut (OLEO)
Main Gear	Tubular spring steel
Hydraulic Fluid	5606A

12. Maneuvers Reference Guide (AFH)

12.1 Short Field Takeoff

Step	Action
1	Set flaps 10°
2	Use maximum available runway
3	Hold brakes and apply full power
4	Release brakes; rotate at 51 KIAS
5	Climb at Vx until obstacles are cleared
6	Transition to Vy; retract flaps at 200 ft AGL

12.2 Soft Field Takeoff

Step	Action
1	Set flaps 10°
2	Apply full aft elevator while entering soft surface
3	Apply full power smoothly
4	Rotate at earliest opportunity
5	Maintain ground effect until reaching Vr
6	Accelerate to 73 KIAS once clear of obstacles; retract flaps at 200 ft AGL

12.3 Slow Flight

Step	Action
1	Reduce power to 1,800 RPM; carb heat on
2	Extend flaps progressively as speed enters white arc; full flaps
3	Maintain 45 KIAS; increase power to ~2,100 RPM to hold altitude
4	Recovery: full power; retract flaps to 20°, then 10° at Vx, then up at Vy

12.4 Power-Off Stall

Step	Action
1	Reduce power to 1,800 RPM; carb heat on
2	Extend flaps progressively; full flaps in white arc
3	Establish 65 KIAS in descent (approximately 100 ft descent)
4	Reduce to idle and pitch up approximately 10°; hold pitch to full break
5	Recovery: full power, flaps 20°; Vx with flaps 10°; positive rate, flaps up

12.5 Power-On Stall

Step	Action
1	Reduce to 1,500 RPM; carb heat on
2	Slow to 55 KIAS, then apply full power
3	Pitch up approximately 20° and hold through the full break
4	Recovery: full power; Vx climb-out