

PRIVATE PILOT GROUND SCHOOL

MODULE 1-9 — SYSTEMS 2 AND SYSTEM EMERGENCIES

Generated study guide — do not edit; the module page is the source.

FACTS TO REMEMBER

KNOW THESE COLD

- The Warrior's electrical system is a 14-volt, alternator-and-battery system; the alternator carries the load in flight and the battery is the reserve.

Source: PA-28-151 POH sec. 2; PHAK ch. 7

- The ammeter tells the story: charging after start is normal recovery; a persistent discharge in cruise means the alternator has quit and the battery is now a countdown timer.

Source: PA-28-151 POH sec. 2; PHAK ch. 7

- The master switch controls the battery contactor and alternator field; circuit breakers and fuses protect each circuit, and a popped breaker is reset once at most — never held in.

Source: PHAK ch. 7

- Total electrical failure does not stop the engine (magnetos are self-powered); it takes the radios, transponder, flaps-if-electric, and lights — the lost-communications drill in 1-14 is the electrical-failure drill.

Source: PHAK ch. 7; PA-28-151 POH sec. 4

- Alternator failure response: verify with the ammeter, try one reset per the POH, then shed load and plan for the battery's remaining minutes — daylight VFR gets home, night needs a landing sooner.

Source: PA-28-151 POH sec. 4

- Avionics run off the electrical bus behind an avionics master switch, which protects them from starting-voltage spikes — avionics off before start and shutdown.

Source: PHAK ch. 7

- The pitot tube feeds ram air to the airspeed indicator only; the static ports feed the airspeed indicator, altimeter, and VSI.

Source: PHAK ch. 8

- A blocked pitot tube (drain also blocked) turns the airspeed indicator into an altimeter: indication climbs as the airplane climbs — the classic insect-nest or icing signature.

Source: PHAK ch. 8

- Blocked static ports freeze the altimeter, zero the VSI, and make the airspeed indicator lie (reads low above the blockage altitude, high below it).

Source: PHAK ch. 8

- The engine-driven vacuum pump spins the attitude and heading gyros; the turn coordinator is electric precisely so one power source cannot take all three.

Source: PHAK ch. 8

- Vacuum failure is insidious: the attitude indicator dies slowly, tilting by degrees, and a pilot following it rolls with it — the suction gauge and instrument disagreement are the tells.

Source: PHAK ch. 8; IFH ch. 5

- Suspect instrument failure procedure: cross-check the committee, identify the liar by what agrees, then cover the failed instrument so it cannot recapture the scan.

Source: IFH ch. 6

- Cabin heat is ram air warmed by a shroud around the exhaust — effective, simple, and the CO pathway when the exhaust cracks (recognition and response in 1-8).

Source: PHAK ch. 7; PA-28-151 POH sec. 2

- The Warrior has no ice protection and is prohibited from flight into known icing; its anti-ice equipment is limited to pitot heat (if installed) and carb heat.

Source: PA-28-151 POH; PHAK ch. 7

- Structural ice needs visible moisture and near-freezing surface temperatures; the escape is always an immediate change — altitude, course, or a 180.

Source: PHAK ch. 12; AIM 7-1-21

- Supplemental oxygen regulation: required crew use above 12,500 ft cabin altitude past 30 minutes, crew use at all times above 14,000, and every occupant must be PROVIDED oxygen above 15,000.

Source: 14 CFR 91.211

- An abnormal indication is worked with the checklist, not memory alone — the POH emergency section exists because troubleshooting under stress invents wrong answers.

Source: PA-28-151 POH sec. 4; AFH ch. 18

- Startle is expected: the first response to any bang, light, or silence is fly the airplane — pitch, power, trim — then diagnose.

Source: AFH ch. 18

- An emergency descent is flown for cabin fire, smoke, or medical emergency: power idle, configure per the POH, bank to keep the belly's blind spot clear, descend at the appropriate limit speed for the air.

Source: AFH ch. 18; PA-28-151 POH sec. 4

- The descent target is chosen before the descent: altitude to level at, direction to turn, and where the landing goes if the emergency continues.

Source: AFH ch. 18

- Engine fire in flight: fuel selector OFF, mixture idle-cutoff, fuel pump off, cabin heat off — the engine is being starved on purpose, and the flight is now a forced landing (1-15).

Source: PA-28-151 POH sec. 4

- Electrical fire: master off first (kill the source), extinguisher on the fire, ventilate after — then decide what, if anything, gets switched back on to land.

Source: PA-28-151 POH sec. 4; AFH ch. 18

- A door popping open in flight is noise, not aerodynamics: the Warrior flies normally — fly the pattern, land, close it on the ground.

Source: PA-28-151 POH; AFH ch. 18

- Flap failure means a no-flap landing: faster approach speed, flatter picture, longer float and rollout — an inconvenience with a procedure, not an emergency.

Source: AFH ch. 8

- The ELT activates on impact G-forces, transmits on 121.5 and (406 models) satellite-monitored 406 MHz, and can be armed, tested, or switched on manually from the unit or a panel remote.

Source: AIM 6-2-5; 14 CFR 91.207

- A cabin fire extinguisher is checked for charge and security on preflight and used with the PASS pattern (Pull, Aim, Squeeze, Sweep) — then ventilate the cabin.

Source: AFH ch. 18; POH/AFM

- Survival gear is packed for the terrain and season overflown, not the departure weather: the planning figure is surviving 48 to 72 hours — water, clothing/shelter, signaling.

Source: PHAK ch. 2; AFH ch. 18

- Mountainous terrain adds shelter, insulation, and signaling weight to the kit; overwater beyond gliding distance adds flotation for every occupant — the gear list is a route decision.

Source: PA.IX.D refs; 14 CFR 91.205(b)(12)

- Ballistic parachutes (where installed) have a deployment envelope and a decision rule — loss of control, structural failure, pilot incapacitation — and passengers are briefed on the handle before engine start.

Source: POH/AFM supplement; FAA-S-ACS-6C IX.D

- After any forced landing, the survival sequence is people first, then fire risk, then signal: activate the ELT, stay with the aircraft, and make yourself findable.

Source: AIM 6-2-5; AFH ch. 18

GOING DEEPER

- An alternator needs engine RPM and field current but produces full output even at low RPM — the reason airplanes moved off generators.

Source: PHAK ch. 7

- An alternate static source (or, in a pinch, a broken VSI glass) feeds cabin pressure, which is slightly lower than outside — expect the altimeter and airspeed to read a bit high.

Source: PHAK ch. 8; POH supplement

- The 91.211 numbers are legal floors; physiology (night vision, fatigue, smoking) argues for oxygen well below them.

Source: AIM 8-1-2; PHAK ch. 17

- Emergency descent speed discipline: smooth air allows up to Vno/Vne judgment per the POH; turbulence caps it at Va logic — speed is survival time, but not past the airframe's limits.

Source: AFH ch. 18; PA-28-151 AFM 3-2

- Stuck trim is flown with muscle and configuration planning: choose the flap/speed combination that minimizes the force, and land early.

Source: AFH ch. 18

- 406 MHz ELTs are registered to the aircraft with NOAA, which turns an anonymous beacon into a phone call to the owner within minutes — registration currency is part of airworthiness housekeeping.

Source: AIM 6-2-5

- ELT ground testing is confined to the first 5 minutes after the hour, three audio sweeps maximum; after any hard landing, monitor 121.5 to check for inadvertent activation.

Source: AIM 6-2-5

- Emergency autoland systems (where installed) are activated when the pilot cannot fly — the briefing point is that passengers must know the button exists.

Source: POH/AFM supplement; FAA-S-ACS-6C IX.D

- Automation monitoring rule: know what mode it is in, what it should do next, and what you will do the moment it does anything else.

Source: AC 90-109A; PHAK ch. 2

THE REGULATIONS BEHIND THIS MODULE

14 CFR 91.211 – Supplemental oxygen

The required flight crew must use supplemental oxygen above 12,500 feet cabin pressure altitude for any part of the flight at those altitudes longer than 30 minutes, and at all times above 14,000 feet. Above 15,000 feet each occupant must be provided with oxygen.

Where it goes deeper: This module, in the heat, ice, and oxygen Leg.

14 CFR 91.207 – Emergency locator transmitters

A U.S.-registered civil airplane must carry an approved ELT in operable condition, inspected each 12 calendar months, with the battery replaced after 1 cumulative hour of use or half its useful life. Training flights within 50 nautical miles are exempt.

Where it goes deeper: Module 1-4 taught the rule. This module teaches the transmitter.