

PRIVATE PILOT GROUND SCHOOL

MODULE 1-4 — AIRWORTHINESS ESSENTIALS

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MNEMONICS

ATOMATOFLAMES — Airspeed, Tachometer, Oil pressure, Manifold pressure, Altimeter, Temperature (liquid-cooled), Oil temperature, Fuel gauge, Landing gear indicator, Anticollision lights, Magnetic compass, ELT, Safety belts

The day-VFR equipment list in 14 CFR 91.205(b), one letter per item. Run it when an instrument or a light is broken before a flight. An item on this list that does not work grounds the airplane until the 91.213 flow is worked. The list also carries flotation gear for hire over water and shoulder harnesses by manufacture date, which the letters do not name.

AVIATE(S) — Annual, VOR check (IFR, 30 days), 100-hour (for hire), Altimeter and pitot-static (IFR, 24 months), Transponder (24 months), ELT (12 months, plus the battery), Static system

The inspections a pilot checks in the maintenance records before a flight. Each letter has its own clock: 12 calendar months for the annual and the ELT, 100 hours of time in service for the 100-hour, 24 calendar months for the transponder and the altimeter. Two of the letters apply only to IFR flight. Run it in the logbooks, not on the ramp.

FLAPS — Fuses (spares), Landing light (for hire), Anticollision lights, Position lights, Source of electrical energy

The night-VFR additions in 14 CFR 91.205(c). Night requires each item on the day list plus these five. Run it before any flight that will land after sunset. A position light that does not work grounds a night flight and does not ground a day flight.

FACTS TO REMEMBER

KNOW THESE COLD

- ARROW names the documents that must be aboard: Airworthiness certificate, Registration, Radio station license (international flights only), Operating limitations, Weight and balance data.

Source: 14 CFR 91.203(a); 14 CFR 91.9(b)

- An appropriate and current airworthiness certificate must be aboard the aircraft to operate it.

Source: 14 CFR 91.203(a)(1)

- An effective U.S. registration certificate must be aboard.

Source: 14 CFR 91.203(a)(2)

- Operating limitations ride in the airplane as the approved AFM/POH, plus placards, instrument markings, or any combination — that is the O in ARROW.

Source: 14 CFR 91.9(b)

- Airworthy means two things at once: the aircraft conforms to its type design AND is in condition for safe operation. Either prong alone is not enough.

Source: 14 CFR 3.5(a)

- No person may operate a civil aircraft unless it is airworthy, and the PIC is the one responsible for determining the aircraft is in condition for safe flight.

Source: 14 CFR 91.7(a), (b)

- The PIC must discontinue the flight when an unairworthy mechanical, electrical, or structural condition occurs — the duty does not end at takeoff.

Source: 14 CFR 91.7(b)

- The owner or operator is primarily responsible for maintaining the aircraft in airworthy condition; the PIC is responsible for determining it is safe for this flight — two different duties held by two different people.

Source: 14 CFR 91.403(a); 14 CFR 91.7(b)

- ATOMATOFLAMES is the day-VFR required equipment mnemonic covering the 91.205(b) list. (Mnemonic object; covers 1-4.p13–p22.)

Source: 14 CFR 91.205(b)

- Day VFR requires an airspeed indicator, an altimeter, and a magnetic direction indicator.

Source: 14 CFR 91.205(b)(1)–(3)

- Day VFR requires a tachometer for each engine.

Source: 14 CFR 91.205(b)(4)

- Day VFR requires an oil pressure gauge for each engine using a pressure system and an oil temperature gauge for each air-cooled engine.

Source: 14 CFR 91.205(b)(5), (7)

- Day VFR requires a fuel gauge indicating the quantity in each tank — one dead fuel gauge grounds a two-tank airplane until the rule is worked.

Source: 14 CFR 91.205(b)(9)

- Day VFR requires a landing gear position indicator if the gear is retractable.

Source: 14 CFR 91.205(b)(10)

- For hire over water beyond power-off gliding distance from shore, day VFR adds flotation gear for each occupant and a pyrotechnic signaling device.

Source: 14 CFR 91.205(b)(12)

- Day VFR requires an approved safety belt for each occupant 2 years or older, and shoulder harnesses per the airplane's manufacture date (front seats after July 18, 1978; all seats after December 12, 1986).

Source: 14 CFR 91.205(b)(13), (14)

- Day VFR requires an ELT when 91.207 applies — the ELT's rules live in their own section, not in 91.205.

Source: 14 CFR 91.205(b)(15); 14 CFR 91.207

- FLAPS is the night-VFR add-on mnemonic: Fuses (spares), Landing light (if for hire), Anticollision lights, Position lights, Source of electrical energy. (Mnemonic object; covers 1-4.p24–p26.)

Source: 14 CFR 91.205(c)

- Night VFR requires everything on the day list plus approved position lights and an approved red or white anticollision light system.

Source: 14 CFR 91.205(c)(1)–(3)

- Night VFR requires one electric landing light only if the aircraft is operated for hire.

Source: 14 CFR 91.205(c)(4)

- Night VFR requires an adequate source of electrical energy for all installed electrical and radio equipment.

Source: 14 CFR 91.205(c)(5)

- Night VFR requires one spare set of fuses, or three spare fuses of each kind required, accessible to the pilot

in flight.

Source: 14 CFR 91.205(c)(6)

– Finding installed equipment inoperative invokes 91.213 and a decision flow before flight — the flow itself is taught with full airworthiness in 3-2; the Phase 1 rule is: a broken airplane is not flown until that flow is worked with the school.

Source: 14 CFR 91.213

– AVIATE(S) is the required-inspections mnemonic: Annual, VOR (IFR), 100-hour, Altimeter/pitot-static, Transponder, ELT (+ Static). (Mnemonic object; covers 1-4.p30–p36.)

Source: 14 CFR 91.409, 91.411, 91.413, 91.207

– An annual inspection within the preceding 12 calendar months is required to operate any aircraft.

Source: 14 CFR 91.409(a)

– A 100-hour inspection is required only when carrying any person (other than a crewmember) for hire, or when giving flight instruction for hire in an aircraft that instructor provides.

Source: 14 CFR 91.409(b)

– The ELT must be inspected within 12 calendar months for installation, battery corrosion, control and crash-sensor operation, and antenna signal.

Source: 14 CFR 91.207(d)

– ELT batteries must be replaced (or recharged) after more than 1 cumulative hour of use, or when 50 percent of their useful life has expired.

Source: 14 CFR 91.207(c)

– The transponder must be tested and inspected within the preceding 24 calendar months to be used; the altimeter/pitot-static check on the same 24-month clock is required for IFR operations.

Source: 14 CFR 91.413; 14 CFR 91.411

– Standard airworthiness certificates cover aircraft type certificated in the normal, utility, acrobatic, commuter, or transport categories, plus manned free balloons and special classes.

Source: 14 CFR 21.175(a)

– Special airworthiness certificates cover primary, restricted, provisional, and limited category aircraft, light-sport, experimental, and aircraft operating under a special flight permit.

Source: 14 CFR 21.175(b)

– Before any flight, the PIC must become familiar with ALL available information concerning that flight.

Source: 14 CFR 91.103

– For every flight, preflight action includes runway lengths at the airports of intended use and the airplane's takeoff and landing distance data.

Source: 14 CFR 91.103(b)

– For a flight away from the airport's vicinity, preflight action adds weather reports and forecasts, fuel requirements, alternatives if the flight cannot be completed, and known traffic delays.

Source: 14 CFR 91.103(a)

– The preflight inspection follows the POH checklist for this airplane — the manufacturer's sequence, every time, not memory.

Source: PA-28-151 POH (preflight checklist); AFH ch. 2

– Every checklist item exists to catch a specific failure — knowing WHY each item is checked is what turns the walkaround from ritual into inspection.

Source: AFH ch. 2; PHAK ch. 2

– Fuel is sumped to catch water and sediment: water sits at the bottom as a clear bubble, and the sample is

checked for color, smell, and grade before every first flight and after each fueling.

Source: AFH ch. 2; PA-28-151 POH (preflight)

- Common preflight catches: control-surface freedom and security, tire condition and strut extension, fuel vents clear, pitot and static openings clear, oil quantity within limits, no fresh stains under the cowl.

Source: AFH ch. 2

- Any discrepancy found in flight or after it is written up and reported to the operator before the next flight — the next pilot's preflight starts from your squawk.

Source: 14 CFR 91.7; AFH ch. 2

- "Is it legal" and "is it safe" are different questions, and the PIC must answer both yes before flying — equipment can pass every rule and still be wrong for tonight's flight.

Source: 14 CFR 91.213(d)(4); FAA-H-8083-2

GOING DEEPER

- A standard airworthiness certificate stays effective only as long as maintenance, preventive maintenance, and alterations are performed per Parts 43 and 91 — its blank expiration is conditional, not eternal.

Source: 14 CFR 21.181(a)(1)

- The FCC radio station license is required only for flights outside the United States.

Source: FCC rules; PHAK ch. 9

- Day VFR requires a manifold pressure gauge for each altitude engine and a temperature gauge for each liquid-cooled engine — neither applies to the Warrior, and knowing why is the point.

Source: 14 CFR 91.205(b)(6), (8)

- Small airplanes certificated after March 11, 1996 need an approved red or white anticollision light system for day VFR; if one light fails, the flight may continue to a place where repairs can be made.

Source: 14 CFR 91.205(b)(11)

- 91.205 applies to powered civil aircraft holding a STANDARD U.S. airworthiness certificate — an experimental's equipment rules live in its own operating limitations instead.

Source: 14 CFR 91.205(a); 14 CFR 91.319

- The 100-hour limit may be exceeded by up to 10 hours only to reach a place where the inspection can be done, and the overrun counts against the NEXT 100 hours.

Source: 14 CFR 91.409(b)

- An annual may substitute for a 100-hour inspection, but a 100-hour may never substitute for an annual — same checklist scope, different signer.

Source: 14 CFR 91.409(b); 14 CFR 43 App. D; 14 CFR 65.95

- A ferry (special flight) permit is itself a special airworthiness certificate — the full permit machinery is taught in 3-2.

Source: 14 CFR 21.175(b)(4); 14 CFR 21.197

THE REGULATIONS BEHIND THIS MODULE

14 CFR 91.7 – Civil aircraft airworthiness

No person can operate a civil airplane unless it is airworthy. The pilot in command decides whether the airplane is in condition for safe flight, and must discontinue the flight when an unairworthy mechanical, electrical, or structural condition occurs.

Where it goes deeper: This module. Module 3-2 adds the owner's side: maintenance records, ADs, and preventive maintenance.

14 CFR 91.203 – Civil aircraft: Certifications required

An appropriate and current airworthiness certificate and an effective U.S. registration certificate must be in the airplane. The airworthiness certificate is displayed at the cabin or cockpit entrance, legible to passengers or crew.

Where it goes deeper: This module, as the A and the first R of ARROW.

14 CFR 91.205 – Instrument and equipment requirements

A powered airplane with a standard airworthiness certificate must carry the listed instruments and equipment, in operable condition, for the kind of flight. Paragraph (b) is the day-VFR list. Paragraph (c) adds the night-VFR items.

Where it goes deeper: This module, as ATOMATOFLAMES and FLAPS. Module 3-2 works the 91.213 flow for a broken item.

14 CFR 91.409 – Inspections

No person can operate an airplane without an annual inspection in the preceding 12 calendar months. An airplane that carries any person for hire, or is provided for flight instruction for hire, also needs an inspection in the preceding 100 hours.

Where it goes deeper: This module, as the A and the 1 of AVIATE. Module 3-2 reads the maintenance records.