

PRIVATE PILOT GROUND SCHOOL

MODULE 1-10 — TRAFFIC PATTERNS, COLLISION AVOIDANCE, WAKE TURBULENCE

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MNEMONICS

Lights, Camera, Action — Lights on, transponder on (the camera), call sign announced (the action)

The three things done when the tower clears the airplane for takeoff, or before it enters the runway at a non-towered airport. Landing light and strobes so the airplane can be seen, transponder so it can be tracked, and the call so it can be heard. The AC adds a look down final and down the runway before the airplane crosses the hold line.

FACTS TO REMEMBER

KNOW THESE COLD

- The standard traffic pattern uses left turns; right traffic exists only where light signals or visual markings (or the Chart Supplement) say so.

Source: 14 CFR 91.126(b)(1); AIM 4-3-3

- Pattern legs in order: upwind, crosswind, downwind, base, final — flown at the published pattern altitude, typically 1,000 ft AGL for piston singles.

Source: AIM 4-3-3; AFH ch. 7

- The standard nontowered entry is at 45 degrees to the midpoint of the downwind, at pattern altitude.

Source: AIM 4-3-3; AC 90-66C

- Standard departure is straight out or a 45-degree turn toward the pattern side after reaching pattern altitude.

Source: AIM 4-3-3; AC 90-66C

- The segmented circle packages the airport's visual signals: wind indicator in the center, traffic pattern indicators showing which runways use right traffic.

Source: AIM 4-3-4

- Runway choice at a nontowered field: land and take off into the wind, read the sock and the pattern in use, and never assume the calm-wind runway is in use without listening first.

Source: AIM 4-3-3; AC 90-66C

- ATIS is the towered field's recorded information, re-issued each hour or on change and lettered phonetically; AWOS/ASOS are automated weather broadcasts, continuous, at fields with no ATIS.

Source: AIM 4-1-13; AIM 7-1-10

- Listening to the automated weather and CTAF before entering the area is how the pattern is entered already knowing the runway, wind, and who is where.

Source: AC 90-66C; AIM 4-1-9

- See and avoid is every pilot's baseline duty whenever weather permits, IFR or VFR, radar or not.

Source: 14 CFR 91.113(b)

- An aircraft in distress has right-of-way over all other air traffic.

Source: 14 CFR 91.113(c)

- Converging same-category aircraft: the one on the right has right-of-way; different categories: a balloon has

right-of-way over every other category; a glider over powered aircraft; an aircraft towing or refueling others over all other powered aircraft, including airships; an airship over the remaining powered aircraft.

Source: 14 CFR 91.113(d)

– Head-on: both alter course right. Overtaking: the overtaken aircraft has right-of-way, and the overtaker passes well clear to the RIGHT.

Source: 14 CFR 91.113(e), (f)

– Landing: aircraft on final or landing have right-of-way over other traffic, and between two arriving aircraft the lower one has it — but neither rule may be abused to cut in front of or force anyone off.

Source: 14 CFR 91.113(g)

– Except for takeoff and landing, minimum altitude anywhere is one allowing an emergency landing without undue hazard to people or property if the engine fails; over other-than-congested areas the floor is 500 ft above the surface (or 500 ft from any person, vessel, vehicle, or structure over open water and sparse areas).

Source: 14 CFR 91.119(a), (c)

– Over any congested area or open-air assembly, the minimum is 1,000 ft above the highest obstacle within a 2,000 ft horizontal radius.

Source: 14 CFR 91.119(b)

– Effective scanning is a series of short, regularly spaced eye fixations — roughly 10-degree sectors held about a second each — because the eye detects nothing while sweeping.

Source: AIM 4-4-15; AC 90-48

– Traffic on a constant bearing with no relative motion is on a collision course — the target that never moves in the windshield is the one that hits you.

Source: AIM 4-4-15; AC 90-48

– High-wing airplanes hide traffic above and inside the turn; low-wing hide it below — lift a wing before turning, and clear the area with turns before maneuvering.

Source: AC 90-48; AFH ch. 3

– Most midair collisions happen in daylight VMC, near airports, below 3,000 ft AGL — the pattern is the highest-risk airspace a student flies.

Source: AC 90-48

– Distraction in the pattern (radio fiddling, passenger chatter, checklist heads-down at the turn) is the pattern's own killer; the module rule is eyes up in the turns, tasks on the straightaways.

Source: AC 90-48; AFH ch. 7

– Wake turbulence is wingtip vortices, generated whenever a wing makes lift, strongest behind aircraft that are HEAVY, CLEAN, and SLOW.

Source: AIM 7-4; PHAK ch. 14

– Vortices sink 300–500 ft per minute behind the generating aircraft, level off a few hundred feet below its path, and drift with the wind — a light quartering tailwind parks the upwind vortex on the runway.

Source: AIM 7-4

– Landing behind a larger aircraft: stay at or above its final approach path and land BEYOND its touchdown point.

Source: AIM 7-4

– Departing behind a larger aircraft: rotate BEFORE its rotation point, climb upwind of its path, and give it time — two to three minutes is the controller's standard separation for a reason.

Source: AIM 7-4

– Windshear near the pattern (gust fronts, thermals, terrain rotors) shows up as sudden airspeed excursions; the response is power, pitch for the target speed, and a go-around decision made early.

Source: AIM 7-1 (wind shear PIREPs); PHAK ch. 12

- Towered pattern operations run on tower instructions — but a clearance never transfers the see-and-avoid or wake-avoidance duty away from the PIC.

Source: 14 CFR 91.113(b); AIM 4-3-2

- A stabilized approach is on speed, in configuration, on glidepath, and aligned, with a constant descent to the aiming point — energy managed so that no large correction is needed close to the ground.

Source: AFH ch. 8 (pin-needed)

- An approach that goes unstable ends in a go-around: the go-around is planned on every approach and is a normal outcome, never an admission of failure.

Source: AFH ch. 8 (pin-needed)

- The go-around decision is made early and high — delaying it at low altitude to salvage a bad landing, in the flare or after a bounce, is how runway-loss and stall accidents happen.

Source: AFH ch. 8 (pin-needed)

- A crosswind drifts the airplane off the runway track and weathervanes the nose into the wind on the ground — every takeoff and landing carries a computed crosswind component and a correction plan.

Source: AFH ch. 5/8 (pin-needed)

- Crosswind takeoff: full aileron into the wind at the start of the roll, easing out as speed builds, with a clean, positive liftoff — no skipping sideways off the runway.

Source: AFH ch. 5 (pin-needed)

- Wind correction on final is a crab transitioned to a wing-low sideslip (or a sideslip throughout): the low wing stops the drift, opposite rudder holds the nose on the centerline, and touchdown comes on the upwind main wheel first.

Source: AFH ch. 8 (pin-needed)

- A LAHSO clearance means land and hold short of a crossing runway or point; accepting it is the pilot in command's choice, and declining costs nothing.

Source: AIM 4-3-11

- Accept LAHSO only after comparing the published available landing distance (ALD) against your real landing performance with margin — and student pilots flying solo should not accept LAHSO at all.

Source: AIM 4-3-11

- The rectangular course is the traffic pattern abstracted: the same legs and the same wind corrections — a crab on each straightaway, the steepest turn where the groundspeed is highest.

Source: AFH ch. 6 (pin-needed)

GOING DEEPER

- Arriving from the far side, the preferred alternate is crossing midfield at least 500 ft above pattern altitude, descending clear of the pattern, then joining the 45.

Source: AC 90-66C

- Landing lights and strobes on in the pattern and within 10 miles of an airport make the airplane findable — the Operation Lights On practice.

Source: AIM 4-3-23; AC 90-48

- Helicopters shed strong downwash and vortices in hover taxi and slow flight — give a hovering helicopter at least three rotor diameters.

Source: AIM 7-4

- A go-around off an accepted LAHSO clearance is still shaped by it: fly the expected path to stay clear of the crossing traffic — which is why the out is briefed before the clearance is accepted.

Source: AIM 4-3-11

THE REGULATIONS BEHIND THIS MODULE

14 CFR 91.113 – Right-of-way rules

Vigilance shall be maintained by each person operating an aircraft so as to see and avoid other aircraft. An aircraft in distress has the right-of-way over all other air traffic. Converging: the aircraft on the right has it. Head-on: both alter course to the right. Overtaking: the overtaken aircraft has it. Landing: the aircraft on final has it, and between two arriving aircraft the lower one has it.

Where it goes deeper: This module, in the right-of-way Leg.

14 CFR 91.119 – Minimum safe altitudes

Takeoff and landing are excepted. Anywhere else the altitude must allow an emergency landing without undue hazard if the engine fails. Over a congested area the minimum is 1,000 feet above the highest obstacle within 2,000 feet. Elsewhere it is 500 feet above the surface. Over open water and sparse areas it is 500 feet from any person, vessel, vehicle, or structure.

Where it goes deeper: This module, in the minimum altitudes Leg.

14 CFR 91.126 – Operating on or in the vicinity of an airport in Class G airspace

When approaching to land at an airport without an operating control tower, each pilot of a powered fixed-wing aircraft must make all turns to the left unless the airport displays approved light signals or visual markings indicating right turns.

Where it goes deeper: This module, in the first Leg.