

Appendix A — Instrument Discipline Concepts (Book 6)

This story is fiction.

The instrument training is not.

Everything Tamias experiences in this book is based on real instrument flight principles—organized, simplified, and explained in a way a serious student can understand.

Book 1 was about beginning.

Book 2 was about discipline.

Book 3 was about responsibility.

Book 4 was about operations.

Book 5 was about judgment under scrutiny.

Book 6 is about control without sensation.

In Book 6, Tamias discovers something critical:

Your instincts are not reliable in the air.

This appendix collects the major instrument concepts from Book 6 in one place, so you can review them the way instrument students do:

Without drama.

Without romance.

Without excuses.

Instrument Flight Rules (IFR) — What Changes

Under VFR, you look outside and avoid weather.

Under IFR, you look inside and avoid yourself.

IFR allows flight:

- In clouds
- In reduced visibility
- Under air traffic control structure
- Using published procedures

IFR is not permission to ignore weather.

It is permission to operate within it—precisely.

The key change is psychological:

You must trust information over sensation.

The Instrument Scan (Cross-Check Is Survival)

Instrument flying is built on scan discipline.

Primary instruments:



Airspeed indicator



Attitude Indicator



Altimeter



Turn Coordinator



Heading Indicator



Vertical Speed Indicator

The scan is not random.

It is:

Attitude → Performance → Supporting → Back to Attitude.

If one instrument disagrees:

Cross-check.

If two disagree:

Diagnose.

If three disagree:

You are the problem.

The lesson:

You do not trust a single gauge.

You trust the system.

Basic Attitude Instrument Flying (BAIF)

Before approaches, before holds, before procedures—

You must control the airplane.

BAIF includes:

- Constant airspeed climbs
- Constant airspeed descents
- Standard-rate turns
- Timed turns

These are not glamorous.

They are foundational.

If you cannot hold altitude, heading, and airspeed under the hood,
You are not ready for complexity.

Unusual Attitude Recovery (Sequence Over Panic)

When disoriented, recovery follows sequence.

Nose High:

- Power
- Pitch
- Wings

Nose Low:

- Power idle
- Wings level
- Raise nose gently

Order matters.

Reverse it and you risk:

- Stall

- Overspeed
- Structural stress

Unusual attitude recovery is not instinctive.

It is procedural.

Spatial Disorientation (The “Useless Tail” Lesson)

Your body lies.

The vestibular system in the inner ear evolved for walking, not coordinated turns.

Common illusions include:

- The leans
- Somatogavic illusion (false sensation of pitch change)
- Graveyard spiral

In Book 6, *Tamias* blames his tail.

The metaphor is accurate.

Ground orientation tools do not function in the air.

The lesson:

If it feels wrong but the instruments are stable,
Trust the instruments.

Sensation is optional.

Physics is not.

Partial Panel (When Instruments Fail)

Vacuum systems can fail.

Attitude indicators can lie.

Heading indicators can drift.

When primary instruments fail:

- Shift the hub of your scan

- Use remaining instruments
- Maintain control first

You fly:

Turn coordinator

Airspeed

Altimeter

Power settings

The principle:

Never marry one instrument.

Cross-check prevents catastrophe.

IFR Clearances (Entering the System)

When filing IFR:

You become part of a structured traffic system.

A clearance includes:

- Clearance limit
- Route
- Altitude
- Departure frequency
- Transponder code
- Void time (if applicable)

You must:

- Copy accurately
- Read back precisely
- Depart within assigned window

ATC expects:

- Precision
- Concise communication
- Compliance

They are not impressed by personality.

They are reassured by competence.

Radar Contact (You Are Being Separated)

When ATC says:
“Radar contact.”

It means:
You are being separated from other aircraft using measurable standards.

Commonly:

- 3 miles lateral
- 1,000 feet vertical

Controllers do not see your size.
They see altitude, speed, and position.

Precision is respect for the system.

Holding Patterns (Delay With Discipline)

Holding is structured waiting.

A hold includes:

- Inbound course
- Fix
- Standard turns (usually right)
- One-minute legs (below 14,000 feet)

Entry methods:

- Direct
- Parallel
- Teardrop

Holds test:

- Anticipation
- Wind correction
- Patience

Holding is not punishment.

It is proof that you can remain stable when delayed.

We will dive into holding much more in the next volume of this series.

Simulators (Repetition Without Credit)

Not all simulators are equal.

An FAA-approved Aviation Training Device (ATD):

- Can count toward required instrument hours
- Must meet certification standards

Home simulators:

- Do not count for loggable time
- Can improve scan discipline
- Can reinforce procedure memory
- Can allow practice in weather and situations no sane pilot would ever encounter in the real world
- Can allow experimentation with different aircraft, some of which would never be available in the real world (renting a Boeing 747 is, shall we say, ‘difficult’.)

Repetition builds familiarity.

Certification builds legitimacy.

Both have value.

They are not interchangeable.

“Sometimes You Can’t Win” (Emergency Decision-Making)

In Book 6, Strix lands in a meadow in the simulator.

Not because he cannot fly.

Because the variables exceed the margin.

The lesson:

- Pride is irrelevant
- Physics is absolute
- Survival is the objective

Declaring an emergency is not failure.

Continuing into deteriorating conditions can be.

A safe off-field landing is superior to a heroic accident.

Live to fly again.

What Tamias Really Learns in Book 6

Book 6 is not about advanced procedures.

It is about removing instinct.

Tamias learns:

- Sequence over sensation
- System over ego
- Structure over speed
- Survival over pride

He discovers:

His tail is useless in the clouds.

What replaces it is scan discipline.

He enters the system.

He trusts the math.

He accepts a new instructor.

He accepts disorientation.

And most importantly—

He accepts that mastery is not about winning every scenario.

It is about knowing when to give in.

Book 6 prepares him for the next phase.

Not just to fly.

But to hold.

And holding requires more than skill.

It requires stability under pressure.

Which means—

The real work has only begun.

David I Schoen

Notes and Ideas

Appendix B — Glossary

ADM (Aeronautical Decision Making) — A structured way pilots learn to make safe choices. ADM means using facts, training, and judgment instead of emotion or wishful thinking.

Aileron — A hinged control surface on the outer part of each wing. Ailerons move in opposite directions to roll the airplane left or right.

Airman Certificate (Pilot Certificate) — The official document granting legal authority to act as Pilot in Command. It confirms that the holder met required knowledge and skill standards. It does not guarantee experience or wisdom.

Airman Certification Standards (ACS) — The official FAA document defining what a pilot must know and demonstrate to pass a practical test. It combines knowledge, risk management, and flight skill into measurable standards.

Airworthiness Certificate — An official document that proves an aircraft is legally allowed to fly. It must be carried in the airplane.

AIRMET — A weather advisory for pilots about conditions that may be dangerous, such as turbulence, icing, or low visibility.

Altimeter — An instrument that shows how high the airplane is above sea level, based on air pressure.

Alternate (Airport) — A backup airport a pilot plans to use if the original destination becomes unsafe or unavailable.

Angle of Attack (AOA) — The angle between the wing and the airflow. If the angle becomes too steep, the wing stalls.

Applicant — The pilot being evaluated during a practical test. During a checkride, the student is referred to as the applicant.

Approved — In aviation, “approved” means allowed by official rules and authorities. It does not mean “someone thinks it’s fine.”

ATC (Air Traffic Control) — The system of controllers and procedures that helps airplanes stay organized and separated, especially near busy airports.

Attitude — The airplane’s position compared to the horizon (nose up, nose down, wings level, banked, etc.).

Attitude Indicator — An instrument that shows the airplane’s attitude using a small artificial horizon.

Avionics — The electronic equipment in an airplane, especially radios, navigation tools, and transponders.

Axis (Axes) — The three invisible lines an airplane rotates around: pitch, roll, and yaw.

Balance (Center of Gravity) — The location inside the airplane where its weight is centered. If balance is outside limits, the airplane may be unsafe.

Baggage Compartment — A storage space in the airplane, usually behind the seats.

Base Leg — The part of the traffic pattern flown perpendicular to the runway, just before turning onto final.

BasicMed — An alternative to a traditional FAA medical certificate for certain private pilots. It requires a state-licensed physician exam and periodic training but does not allow commercial privileges.

Beacon — A flashing red light on the airplane used to warn others that the engine is starting or

running.

Brake(s) — Controls that stop the airplane while on the ground.

Briefing — A structured review before a flight or maneuver explaining what will happen and what to do if something goes wrong.

Buffet — A shaking felt as the wing approaches a stall.

Cabin — The inside of the airplane where the pilot and passengers sit.

Ceiling — The height of the lowest cloud layer covering most of the sky.

Center of Gravity (CG) — The exact point where the airplane balances. It must remain within safe limits.

Certificate Action — The formal outcome of a practical test. It may be issuance (pass), discontinuance, or notice of disapproval.

CFI (Certified Flight Instructor) — A pilot trained and certified to teach flying.

CFII (Certified Flight Instructor Instrument) — A pilot trained and certified to teach flying and the requirements for the Instrument Rating.

Checkride (Practical Test) — The final flight evaluation with a Designated Pilot Examiner to determine whether a pilot meets certification standards.

Checklist — A written list of required steps. Checklists exist because memory is unreliable under pressure.

Circuit Breaker — A safety device that stops electrical flow if there is a problem.

Climb — Flying upward to gain altitude.

Cockpit — The front part of the airplane where the pilot controls the aircraft.

Commercial Pilot — A certificate level allowing a pilot to be paid for flying, provided required training and experience standards are met.

Control Surface — A movable part (aileron, elevator, rudder) that changes airflow to control the airplane.

Control Wheel Lock — A device that locks flight controls when parked. It must be removed before flight.

Correct — In aviation, “correct” means the proper, approved method — not “close enough.”

Cowling — The outer covering around the engine.

Crab — Pointing the airplane’s nose into the wind to maintain correct ground track.

Critical Angle of Attack — The angle where the wing stops producing enough lift and stalls.

Cross-Country Flight — A flight from one airport to another. Required in real pilot training.

Crosswind — Wind blowing across the runway.

CTAF (Common Traffic Advisory Frequency) — The radio frequency used at uncontrolled airports for pilot coordination.

Dead Reckoning — Navigation using heading, time, speed, and wind estimates to determine position.

Density Altitude — A value combining altitude, temperature, and pressure. High density altitude reduces performance.

Designated Pilot Examiner (DPE) — An experienced pilot authorized by the FAA to conduct practical tests and issue pilot certificates.

Discontinuance — A temporary stop to a practical test due to weather, mechanical issues, or other external factors. It is not a failure.

Downwind Leg — The traffic pattern leg flown parallel to the runway in the opposite direction of landing.

- Drag** — Air resistance that slows the airplane.
- Drift** — Sideways movement caused by wind pushing the airplane off course.
- Elevator** — A hinged surface on the horizontal tail controlling pitch.
- Emergency** — Any situation where safety may be threatened and immediate action is required.
- Empennage** — The tail assembly of the airplane.
- Engine** — The machine that provides power and turns the propeller.
- Engine Instruments** — Gauges showing engine health (oil pressure, RPM, etc.).
- Estimated Time En Route (ETE)** — Calculated time to reach a destination.
- FAA** — Federal Aviation Administration, the U.S. aviation regulatory authority.
- FAA Approved** — Officially accepted under aviation rules.
- FAST MOOSE** — An acronym used to remember daytime VFR requirements: Fuel gauge, Airspeed indicator, Seat belts, Tachometer, Magnetic compass, Oil pressure gauge, Oil temperature gauge, Strobes (anti-collision lights), ELT.
- Final Approach (Final)** — The last straight part of the traffic pattern aligned with the runway.
- First-Class Medical** — The highest level of FAA medical certificate, required for Airline Transport Pilots flying for airlines.
- Flap** — A hinged surface on the inner trailing edge of the wing used during takeoff and landing.
- Flight Controls** — Yoke, rudder pedals, trim, and other controls used to fly the airplane.
- Flight Instruments** — Instruments that show altitude, speed, attitude, and other flight data.
- Flow** — A memorized cockpit setup pattern verified by checklist.
- Forecast** — A prediction of future weather.
- Front** — A boundary between two air masses that often causes changing weather.
- Fuel Burn** — The rate at which the engine consumes fuel, usually gallons per hour.
- Fuel Reserves** — Required extra fuel carried for safety.
- Fuselage** — The main body of the airplane.
- Gauge** — An instrument that shows a measurement.
- Go-Around** — Abandoning a landing attempt and climbing away to try again.
- Glideslope** — The vertical guidance component of an ILS that provides a stabilized descent path to the runway.
- Ground Effect** — Reduced drag when flying close to the ground, which can cause floating during landing.
- Ground School** — Ground-based instruction in weather, regulations, and systems.
- Groundspeed** — The airplane's actual speed over the ground.
- Heading** — The direction the airplane's nose is pointing.
- Heading Indicator** — An instrument showing heading using a gyro.
- Holding Pattern (Hold)** — A racetrack-shaped flight path used to delay an aircraft in a structured, predictable manner while awaiting further clearance.
- Horizon** — The line where sky and ground appear to meet.
- IFR (Instrument Flight Rules)** — Regulations that allow flight using instruments for navigation and control when outside visual reference is limited or unavailable.
- ILS (Instrument Landing System)** — A precision instrument approach providing both lateral (localizer) and vertical (glideslope) guidance to align an aircraft with a runway.
- Ignition** — The system that starts and powers the engine.
- Instrument Panel** — The area containing flight and engine instruments.
- Judgment** — Choosing the safe action even when risk feels tempting.

Landing Gear — The wheels supporting the airplane on the ground.

Leans (The Leans) — A common spatial disorientation illusion in which a pilot feels level when actually banked, or feels banked when actually level.

Lift — The force created by the wings that holds the airplane up.

Load Factor — The force placed on the wings during turns or pull-ups.

Localizer — The lateral guidance component of an ILS that keeps the aircraft aligned with the runway centerline.

Logbook — The official record of flight time and endorsements.

Magneto — A device that produces spark for the engine.

Master Switch — The main electrical power switch.

Medical Certificate (FAA Medical) — An official document confirming a pilot meets required health standards to fly.

METAR — A coded weather report describing current conditions.

Mixture — A control adjusting the fuel-to-air ratio in the engine.

Moment — A number calculated by multiplying weight by distance from a reference point, used to determine CG.

Navigation Log (Nav Log) — A written planning sheet calculating headings, time, and fuel.

Notice of Disapproval (“Pink Slip”) — The document issued when an applicant does not meet required standards on a practical test. Retraining and retesting are required.

Oral Exam (Oral Portion) — The ground-based portion of a practical test where the examiner evaluates knowledge, judgment, and risk management before flight.

Partial Panel — Flying using limited instruments after a primary instrument failure.

Personal Minimums — A pilot's personal safety limits stricter than legal minimums.

Pilot — The person controlling the airplane.

Pilot's Operating Handbook (POH) — The official manual containing limitations and procedures.

Pitch — The up-and-down angle of an aircraft's nose, controlled mainly by the elevator; pulling back on the yoke raises the nose, and pushing forward lowers it.

Pitot Tube — A tube measuring air pressure to determine airspeed.

Preflight — Inspection of the airplane before flight.

Propeller — The spinning blades that create thrust.

Practical Test Standards (PTS) — The former FAA evaluation system used before the ACS.

Radar Contact — An ATC phrase meaning the aircraft has been identified and is being tracked on radar.

Roll — The side-to-side banking motion of an aircraft, controlled mainly by the ailerons on the wings; rotating the yoke left or right raises one wing and lowers the other.

Rotation — The moment the pilot lifts the nose during takeoff.

RPM — Revolutions per minute; engine speed measurement.

Runup — Engine test performed before takeoff.

Runway — The strip used for takeoff and landing.

Second-Class Medical — A medical certificate required for pilots exercising commercial privileges.

SIGMET — A severe weather advisory for dangerous conditions.

Simulator (Aviation Training Device) — A ground-based training system used to practice procedures, scan discipline, and emergencies. Only FAA-approved devices may count toward required flight time.

Solo Endorsement — Written instructor authorization allowing solo flight.

Somatogravic Illusion — A false sensation of pitch change caused by acceleration, which can make a pilot believe the aircraft is climbing or descending incorrectly.

Spatial Disorientation — A condition in which a pilot's sensory system provides misleading information about attitude, altitude, or motion.

Stall — Loss of lift caused by excessive angle of attack.

Stall Recovery — Steps used to return to normal flight after a stall.

TAF — A coded airport weather forecast.

Tactical Pause — A moment to stop rushing and think clearly.

Third-Class Medical — A medical certificate required for private pilots and student pilots who are not flying for compensation.

Throttle — The control adjusting engine power.

Trim — A control that reduces the need for constant pressure on the yoke.

True Course — Intended direction of flight measured on a chart.

Turbulence — Rough, uneven air.

VFR (Visual Flight Rules) — Flying by visual reference in clear weather.

Vertical Speed Indicator (VSI) — Instrument showing rate of climb or descent.

Weight — The total load carried by the airplane.

Weight & Balance — The calculation of total weight and its distribution. The airplane must be below maximum weight and within CG limits to fly safely.

White One — Informal pilot slang meaning a clean practical test pass with no unsatisfactory areas and no retest required.

Wind Correction Angle — Adjustment to heading to compensate for wind drift.

Wing — The structure producing lift.

Yaw — The nose moving left or right.

Yoke — The primary control used to manage pitch and roll.

David I Schoen

Notes and Ideas

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About the Author

David I. Schoen, known to generations of students as Professor Dave, has spent decades helping learners of all ages discover clarity, confidence, and even a little joy in the worlds of language, math, and learning. A veteran educator, tutor, and writer—and an unapologetic lover of books—he specializes in turning complicated ideas into simple, friendly explanations that actually stick.

Dave has guided thousands of students through English, math, writing, grammar, and test preparation, as well as the always-adventurous process of becoming a stronger thinker. His teaching blends humor, precision, and storytelling—a combination that has helped learners from elementary school through adulthood feel empowered instead of intimidated.

He is also an active private pilot, and has been flying for over three decades—an experience that has shaped the realism, detail, and sense of wonder behind *The Flying Explorers Series*. Before becoming an author and educator, he worked as an Air Traffic Controller at JFK International Airport, one of the world's busiest airports, for almost two decades. Aviation is in his blood, just as it is slowly coming to be in *Tamias*.

When he isn't teaching or writing, Dave can usually be found creating new educational books, experimenting in the kitchen, playing the piano, or working on inventive projects that combine family, learning, and fun. He lives on Long Island, New York, where he is constantly surrounded by stories waiting to be told.

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Keep your head up!
