

Appendix A — Flight Training Concepts (Book 4)

This story is fiction.

The airplane is not. The aviation training is not.

Everything Tamias learns in this book is based on real pilot training—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 is about something larger.

Book 4 is where Tamias stops practicing flying...
and starts operating like a pilot.

This appendix collects the major flight concepts from Book 4 in one place, so you can review them the way real pilots do:

Systematically.

Without drama.

Without guessing.

The Operational Shift (When Flying Becomes Transportation)

Local flying teaches control.

Cross-country flying teaches operation.

In the traffic pattern:

- you take off
- you land
- you stay near home
- your instructor watches everything

On a cross-country flight:

- you plan a route
- you manage fuel
- you account for wind

- you communicate with unfamiliar airports
- you arrive somewhere that is not waiting for you

The airplane does not change.

The responsibility expands.

That is the shift in Book 4.

The Map Is Not the World (Navigation Begins in Humility)

A sectional chart is not a picture.

It is a translation.

It translates:

- terrain
- obstacles
- airspace
- frequencies
- airports
- elevation
- restrictions

But it is still a representation.

Captain Corax's warning is real:

“The map is not the world.”

This means:

- the chart can be correct
- your interpretation can still be wrong
- the wind can change
- the ground can look different than you imagined

Navigation is not memorization.

Navigation is comparison.

Pilotage (Flying by Seeing)

Pilotage is the oldest navigation method.

It means:

- looking outside
- identifying landmarks
- matching them to the chart

In Book 4, Tamias uses:

- a water tower
- a highway bend
- a lake
- a radio tower

Pilotage is powerful.

But it is fragile.

Flat terrain, haze, or repetition can make everything look the same.

This is why pilotage must be layered with other methods.

Dead Reckoning (Planning Before You Go)

Dead reckoning sounds dramatic.

It is not.

It means:

- choose a heading
- calculate distance
- estimate time
- account for wind
- monitor fuel

Wind correction becomes critical here.

Wind does not just affect landings.

It affects where you arrive.

Small heading errors feel harmless.

Over twenty miles, they are not.

Dead reckoning teaches something subtle:

The plan keeps you honest.

Wind Correction in Navigation (Drift at Scale)

Book 3 taught drift in crosswinds.

Book 4 scales it.

In navigation:

- the nose may point one direction
- the ground track may be different

If you ignore wind:

- you arrive late
- you burn extra fuel
- you miss checkpoints
- you begin doubting your own math

Competent pilots adjust early.

Not dramatically.

Quietly.

VOR (Very High Frequency Omnidirectional Range)

A VOR is a ground-based radio station. At present, there are over one-thousand operational VOR stations in the United States. There are plans to reduce this number over the next few years (2026 is the year of this publication) to around six hundred stations. With the wide use and increased reliability of GPS systems, this is a money-saving and logical progression.

VOR's provide:

- radials (lines extending from the station)

When you track a radial:

- you know what line you are on

It does not give distance by itself.

It gives direction.

The VOR does not care what the ground looks like.

It gives reference when your eyes become uncertain.

DME (Distance Measuring Equipment)

DME adds distance to a VOR signal.

With:

- a radial (line)
- and a distance (number)

You do not just know the line.

You know the point.

That combination creates a fix.

This is one of the most important transitions in Book 4:

From “approximately here”

to

“exactly here.”

NDB (Non-Directional Beacon)

NDBs are older systems.

They transmit.

The airplane points toward them.

They:

- do not give distance
- are more vulnerable to interference
- require interpretation

Learning NDBs is not about nostalgia.

It teaches something deeper:

Not all tools are equally precise.

And not all tools are equally reliable. (a side note- some pilots use NDB receivers to listen to AM radio stations while flying. They are on the same frequency band.)

GPS (Confirmation, Not Religion)

GPS is powerful.

It is accurate.

It is fast.

It is seductive.

Captain Corax warns:

“You will not let GPS fly your brain.”

GPS should:

- confirm
- support
- verify

It should not:

- replace planning
- replace understanding
- replace judgment

Over-reliance on automation creates passive pilots.

Book 4 trains against that.

Weight and Balance (Physics Does Not Negotiate)

Weight and balance is not decoration.

It is mathematics protecting survival.

Before flight, a pilot must calculate:

- total weight
- fuel weight

- passenger weight
- baggage weight
- aircraft limits
- center of gravity (CG)

Two truths matter:

1. An airplane can be under maximum weight and still be unsafe.
2. An airplane can be balanced incorrectly and become uncontrollable.

If the CG is too far forward:

- takeoff roll increases
- elevator authority decreases
- landing flare becomes difficult

If the CG is too far aft:

- the airplane becomes unstable
- stall recovery becomes harder
- pitch control becomes sensitive and dangerous

In Book 4:

Captain Corax anticipates weight and balance before allowing Esquilo aboard.

That detail matters.

A disciplined pilot:

- does not guess
- does not assume
- does not “think it’s fine”

They calculate.

Because gravity does not care how experienced you feel.

Simulated Engine Failure (When Planning Meets Reality)

In Book 4, the engine “fails” enroute.

Not near the runway.

Not near comfort.

This tests:

- best glide
- field selection
- checklist discipline
- radio communication
- energy management
- composure

Best glide is not a feeling.

It is a number.

Field selection is not optimism.

It is geometry and probability.

Checklist use is not theater.

It prevents memory failure under stress.

This scenario reinforces Book 3's lesson:

You have time—if you fly correctly.

Energy Management (Altitude Is Stored Time)

Altitude is potential.

Speed is flexibility.

Flaps are commitment.

In an off-field scenario:

- keep the airplane clean
- preserve glide
- delay configuration until landing is assured

Students who rush configuration remove options.

Options equal survival.

Non-Towered Operations (CTAF Discipline)

At Cricket Meadow:

- no tower
- no controller
- no one “watching”

The pilot is responsible for:

- position reports
- listening
- scanning
- sequencing

Correct radio calls are not performance.

They are clarity.

A pilot sounds calm because calm communicates competence.

The “Hundred-Acorn Hamburger” (Why Pilots Go Places)

In aviation culture, pilots sometimes fly somewhere “just for lunch.”

Fuel costs money.

Time costs money.

But the deeper lesson is not food.

It is purpose.

Pilots who never leave the pattern:

- stay comfortable
- never test navigation
- never test planning
- never test independence

Cross-country flying creates real pilots.

Because going somewhere forces you to come back.

Gaetano (Aviation Is Universal)

Gaetano’s presence is not random.

Aviation transcends language.

Procedures remain:

- checklist
- numbers
- headings
- discipline

Whether in Italy, Texas, or anywhere else:

Guessing lands you in trees.

Preparation prevents embarrassment.

Aviation is one of the few disciplines where:

Accent does not matter.

Precision does.

The Checklist Voice (Thinking Out Loud Under Pressure)

In Book 4, Tamias speaks checklist items aloud.

This is not performance.

Under stress:

- memory degrades
- assumptions increase
- shortcuts tempt you

Speaking:

- slows panic
- structures thought
- prevents skipped steps

Professional pilots verbalize for a reason.

Silence under pressure is rarely safe.

Carry-Over Lessons from Book 3 (Scaled Up)

Book 4 does not abandon Book 3's truths.

It expands them.

- Drift now affects miles, not feet.
- Go-around discipline becomes diversion discipline.
- Night humility becomes navigation humility.
- Solo responsibility becomes operational responsibility.

The skill set is the same.

The consequences are wider.

What Tamias Really Learns in Book 4

Book 4 is not about landing at a new airport.

It is about:

- planning before departure
- adjusting in flight
- managing fuel
- handling unexpected failures
- communicating clearly
- calculating weight and balance
- using tools without becoming dependent
- and arriving intentionally

Tamias does not become confident in Book 4.

He becomes structured.

He learns that:

Flying locally proves you can control an airplane.

Flying cross-country proves you can manage risk.

And somewhere ahead—beyond Cricket Meadow—waits something different.

Not a lesson.

A checkride.

And a pilot who will not be impressed by effort.

Only by judgment.



Many modern aircraft, big and small, feature glass cockpit displays like the one simulated here. They incorporate all the instruments from regular instrument panels as well. Many of them can feature traffic warnings, and make navigation much simpler and more visually understandable. They are expensive!

Appendix B — Glossary (Contains all aviation terms in this series)

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.

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.

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.

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.

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

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.

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.

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.

Final Approach (Final) — The last straight part of the traffic pattern aligned with the runway.

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.

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.

Horizon — The line where sky and ground appear to meet.

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.

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.

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.

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.

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.

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

Preflight — Inspection of the airplane before flight.

Propeller — The spinning blades that create thrust.

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.

SIGMET — A severe weather advisory for dangerous conditions.

Solo Endorsement — Written instructor authorization allowing solo flight.

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

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

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

TAF — A coded airport weather forecast.

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.

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.

Cessna 172R Gauge Cluster

Primary instruments:



Airspeed indicator

Attitude Indicator

Altimeter



Turn Coordinator

Heading Indicator

Vertical Speed Indicator

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David I. Schoen

Notes and Ideas

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 *Tamias Learns to Fly* and *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!
