

Fundamentals Of Flight Instruction

Practical Applications
for the CFI

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Typical scenarios used for training a private pilot. 78

Fundamentals of Instruction

PRELUDE (aka disclaimer): Fundamentals of Instruction (FOI) promotes advanced training concepts to assist the CFI in reaching the highest levels of instruction to train competent pilots. FOI is the most important foundation for excellence in instructing. **Without good FOI, instructor technical knowledge is no better than what can be found in a book.** My personal observation is the reference text, Aviation Instructors Handbook (FAA-H_8083-9) lacks personal and practical applications. In short, it is missing effective “Scenarios” and examples of practical application. Thus, it appears, the majority of FOI training is by rote memorization! What Irony! The following is a “Cliff Notes” style recapitulation with personal interpretations, “mini scenarios,” examples and some recommendations for applications.

Risk Management

Formalized process assessing the risks vs benefits and determining best course of action. Risk- probability and severity of possible adverse event.

Principles of risk Management

- Accept no unnecessary risk (don't fly new plane in IFR)
- Make decisions at appropriate level (yourself vs another pilot or controller telling you to do something)
- Accept risk when benefits outweigh costs (fly new plane in VFR)
- Integrate Risk Management into planning at all levels (think ahead, repeat process through whole event/flight)

Risk Management Process “I – AM” responsible!

Identify Hazard

PAVE**

IMSAFE**

Assess Risk-

Probability: Probable, Occasional, Remote, Improbable

Severity: Catastrophic, Critical, Marginal, Negligible

Mitigate Risk

Delay flight, Wait out weather

Go with IFR pilot

FAAST Flight Risk Assessment Tool “FRAT”: computerized questionnaire that automates the risk management process. There are other “FRAT” tools available online.

https://www.faasafety.gov/gslac/ALC/lib_categoryview.aspx?categoryId=31

Recommendation: Practice using, **I-A-M** (or a FRAT tool) before every flight starting with the first training flight (Primacy) and every flight after (Recency, Exercise). This “Habit formation” will have a better chance integrating into their “Affective” domain so they “Organizes & Integrate” into their personal beliefs.

Pilot Name
Aircraft
Date
Departure Airport
Arrival Airport

Pilot	Yes	Your Value
Less than 50 Hours in Aircraft or Avionics Type	☐	0
Less than 15 hours in last 90 days	☐	3
Flight will occur after work	☐	0
Less than 8 hours sleep prior to flight	☐	0
Dual Instruction Received in last 90 days	☐	0
WINGS Phase Completion in last 6 months	☐	-3
Instrument Rating current and proficient	☐	0

Flight Conditions	Yes	Your Value
Twilight or Night	☐	0
Surface wind greater than 15 Knots	☐	4
Cross wind greater than 7 Knots	☐	0
Mountainous Terrain	☐	0

Airport	Yes	Your Value
Non-towered Airport or tower closed at ETD or ETA	☐	5
Runway length less than 3,000 Feet	☐	0
Wet or soft field Runway	☐	0
Obstacles on Approach and/or departure	☐	0

VFR Flight Plan	Yes	Your Value
Ceiling less than 3,000 feet AGL	☐	2
Visibility less than 5 SM	☐	0
No Weather Reporting at destination	☐	4
Flight Plan filed and activated	☐	0
ATC Flight Following used	☐	0

IFR Flight Plan	Yes	Your Value
Ceiling less than 1000 feet AGL	☐	0
Visibility less than 3 SM	☐	0
No Weather Reporting at destination	☐	0

Approaches - Instrument Pilots		
Best Available Approach		
Precision Approach	☐	0
Non precision Approach	☐	0
No Instrument Approach	☐	0
Circling Approach	☐	0

Total Risk Value

15

Pilot	Experience	Low Risk	Moderate Risk	High Risk
VFR	<100 In Type	5 to 15	15 to 20	> 20
VFR	>100 In Type	15 to 20	20 to 25	>25
IFR	<100 In Type	20 to 25	25 to 30	>30
IFR	>100 In Type	25 to 30	30 to 35	>35

Instructions: Check the Yes box opposite each statement that applies to your flight. Then compare your total risk value to the Risk Matrix Chart.

PAVE: four fundamental risk elements

Pilot

- Proficiency
- Currency -3 takeoff/landings 90 days, Flight review, IPC
- Required documents -pilot certificate, medical, Gov ID
- **IMSAFE** checklist

Aircraft-

- load, weather, range, runway, equipment
- documents in Aircraft **AROW**
- inspections **AVIATE-A**
- **91.205 equipment** day/night VFR, IFR
- **Weight and Balance** for current flight

enVironment –

- **NWKRAFT+ NAV LOG**
 - NOTAMs, weather, runway, Terrain, airport facilities, NOTAMs
 - Airspace, TFRs, survival gear, alternates, nighttime, take off/land
 - distance, Performance/Nav Log

External pressures:

- someone waiting, take challenge or impress, Get there it is, pride.

Single Pilot Resource Management “SRM” includes:

- Aeronautical Decision Making (ADM)
- Risk Management
- Task & Automation Management
- CFIT & Situational awareness
- “Crew” Resource Management - passengers and ATC to help!

5 P Checklist for SRM.

- **Pilot-** IMSAFE, before, during and end of flight
- **Plan-** the mission and alternate plan A, B, C and D, abort
- **Plane-** autopilot for single pilot IFR, databases, fuel, oil etc.
- **Programming-** best time, best phase, avoid fixation, fly aircraft
- **Passenger-**special needs, ground transport, alternate transport

Operational Pitfalls:

- Peer pressure (my CFI does it, bob does it, I can do it)
- Mind set (cognitive rigidity= stubbornness despite evidence)
- Get-there-itis
- Duck-under –(go below minimums on IFR approach)
- Scud Running –(just this once or I've done it before and it worked out)
- Continue VFR into IMC (when scud running doesn't work out)
- Getting behind the aircraft (lack of experience, training, planning)
- Loss of positional or situational awareness (automation dependence)
- Inadequate fuel reserves – poor planning, pushed limits before without problem
- Exceeding flight capabilities of aircraft- overconfident
- Neglect Pre-flight planning, inspections, checklists- overconfident, done before

Aeronautical decision making: Systematic approach to determine best course of action to a set of circumstances. Pilot error 80% of accidents. (chain of events that can be interrupted)

- **Risk Management:** See previous
- **Decision making process**
 - Define problem
 - Choose course of action
 - Implement and evaluate
 - **Repeat**
- **Hazardous attitudes that affect decision making and Anti-Dotes**
 - **Anti authority:** “Don’t tell me what to do!”
 - *Follow the rules-they are right*
 - **Impulsivity:** “Do it NOW!”
 - *Not so fast, think about it*
 - **Invulnerability:** “it won’t happen to me!”
 - *I could happen to you!*
 - **Macho:** “I can do it! I am super pilot!”
 - *Taking chances is foolish (don’t be stupid)*
 - **Resignation:** “What is the use... we are just screwed!”
 - *You are not helpless, KEEP FLYING!*

WARNING: *if a learner demonstrates a persistent and pervasive hazardous attitude, there is not an ANTI-DOTE as suggested by the FAA-H-8083-25. This may be woven into the fabric of their personality (search Personality Disorders). They may not be suitable for further flight instruction. Consult with senior CFI.*

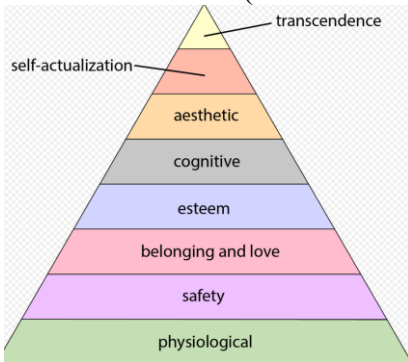
- **Stress Management:**
 - Physical and Psychological affect performance and learning
 - **Recognize, admit, and intervene-**(self or on behalf of student)
 - Take a break
 - Re-group, re-plan, re-prioritize
 - Get assistance- CFI, ATC, significant other
 - Re-schedule

Instructor-Learner Relationship- teach to learner style or personality. Aviation Instructors Handbook (FAA-H-8083-9) ambiguous about this vast topic. See section 2-1.

Human Behavior

Product of innate nature (genetics) , experience, environment. Attempts to satisfy needs-food, respect, recognition (Value)

Maslow's Needs- (start at bottom, no food, then the rest doesn't matter):



- ❑ **Physiologic-** can't learn if don't have basic needs:
 - Did you eat? Can I get you something?
 - Warm enough? Need a coat or changing rooms?
 - Get enough sleep?
 - How are things at home? Stressed about anything?
 - Health- COVID, Headache, etc.
- ❑ **Security/Safety-** hard to learn if doesn't feel safe/private
 - Professional well-mannered CFI
 - Aircraft and facilities clean and well maintained
 - introduces maneuvers slowly and with pre-brief
 - Ground and debriefs done in private
- ❑ **Belonging** –Newby's feel alienated, outcast- (see esteem below)
 - Be kind, courteous, polite
 - introduce to other pilots
 - invite to social events
- ❑ **Esteem**-self-confidence required to learn and fly
 - Highlight well done activities and efforts
 - Positive re-enforcement
 - do not be condescending, rude, harsh, or demeaning
- ❑ **Cognitive need to know-** gives feeling of security, increases motivation
 - Outline what it takes to get a pilot certificate
 - Provide training curriculum- Syllabus or **Training Course Outline**
 - **What lesson are we doing next week**
 - **Give specific reading assignments w/ specific questions or problems**

- Outline and update training schedule with reachable milestones (i.e., SOLO)
- ❑ **Aesthetic**- Do things we “like,” agreeable, fun. Should like CFI or learner!
- ❑ **Self-Actualization** –reaching full potential only after all the above realized.
 - Problem focused, appreciation of life, concerned
 - about personal growth, have peak experiences

Principles for Learn/teaching a skill:

- ❑ Motivation-required. Assess first!
- ❑ Patterns- step by step examples best (see organization)
- ❑ Physical practice- muscle, visual, tactile senses
- ❑ **Progress reports** – use **TCO or syllabus**
- ❑ Evaluate vs critique – don't beat them up
- ❑ **Learning plateaus** – **switch it up**
- ❑ Time – don't wear out the student-
 - (avg 30 min ground, 1 hour flight)
- ❑ **Organization** – framework for information improves
 - Assimilation, understanding
 - memory, recall, application and correlation
 - **TCO, Syllabus, organized lesson plans**
- ❑ Application – use it or lose it!!! Ie currency requirements!

Characteristics of Learning: *Learning is change in behavior as result of experience.*

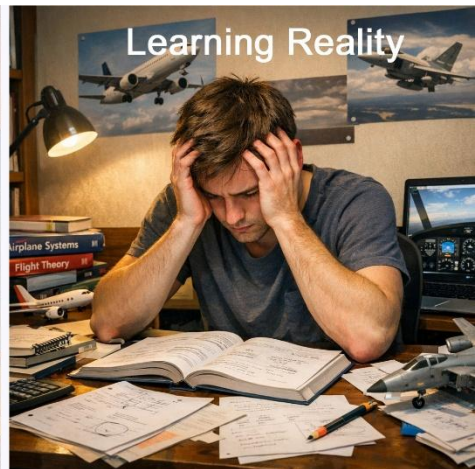
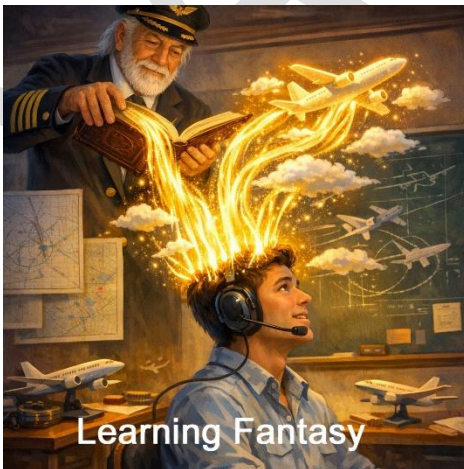
Learning is Purposeful: Learn what tends to further their goals.

Learning is result of experience: USE skills to learn them. Best way to learn to

overhaul an engine is to do it.

Learning is Multifaceted: Learn much more if use mind, feeling, and muscle. Use all 5 sense, problem solving, experience, emotion. Concepts etc.

Learning is an Active Process: you can't do it for them or stuff it in their head.



Don't Feed the bears. If you “spoon feed” a student who has not done their homework or study questions, it is like feeding the bears. They quickly learn (**Primacy, Recency, and Exercise**) they don't have to study; you will just feed them anyway. This enables the student into complacency and rarely does learning progress to proficiency or independent learning. **DON'T FEED THE BEARS!** A parent will show up one day and feed on the instructor!



Homework assignments (list of study questions**) are critical** to guiding students through reading material and help focus their effort on critical concepts, promoting comprehension and keeping their interest. They can ‘Read with a purpose.’ Thence, the ground lesson can spend time on Application and Correlation with Scenarios. *If the student does not do the homework, then they clearly did not have “Time and Opportunity” or lacked “motivation,” and the lesson should be rescheduled.*



Acquiring Skills

- ❑ **Cognitive** – step by step example, memorize, has **no hearing** ability-
- ❑ **Associative**- with practice, can compensate to improve, **hearing improves**
- ❑ **Automatic response**- **can hear and talk** while performing task, lands on centerline

Note: during training, the CFI handles the radios during high workload till the student skills reach the automatic response stage. This is most apparent during instrument training where ATC calls with missed approach instructions right as the student reaches the FAF. They have no idea what ATC said and then they cannot fly either.

Knowledge of results: **feedback** informing learners about the correctness or outcome of their actions, helping them understand their progress and adjust their approach for better learning. Best done as part of **Collaborative Assessment**.

How to Develop a Skill: Practice.

Learning Plateau:

- ❑ Take a break, try again later or another day
- ❑ switch it up to different maneuvers
- ❑ Break down maneuver to parts and do “block practice”- see below

Types of Practice

Deliberate practice- same skill, repetitively, with no distractions *and feedback* after. Steep turns, landings etc. “full stop landings-with debrief off runway”

Blocked practice- component or subset of maneuver (or skill) till it becomes automatic...fast learning but may be short term. Risk of thinking we learned it well however the skill or knowledge evaporates quickly. “touch and goes” may fall in this category. For Example, after the 10th repetition of an exercise, the student finally does it well the last few times. The CFI and student are convinced it is now a permanent skill only to have the maneuver fall apart on a check ride. Recommend checking skill later or use random practice to verify before moving on.

***Note:** variation of blocked practice can be very powerful way to break through a learning plateau if done correctly. For example, break down the landing sequence into components and devise exercises to develop the subset skill.*

For traffic patterns- ground reference and tracking exercises

- Start with tracking a road with a cross wind
- Track to object with cross wind and no road
- 90 degree turns with outside references
- Rectangular course with wind correction

Maintain stable airspeed on final

- Start in practice area at high altitude
- Set landing configuration and approach power
- Trim off pressures
- Maintain Vref while descending over a few miles
- Use power to change descent rates but maintain airspeed

How to use spot landing method:

- Instructor flies' approach and landing
- Student observes aiming point move up/down wind screen
- Students call out if high/low, to add or remove power
- Instructor verifies call outs

Stabilized approaches

- Use specific power settings configurations sequences entering downwind, abeam touch down, base, and final.
- Check airspeed and trim at each station
- Execute go around till learns stabilized approach

Random practice-variety of skills randomly practiced. Recognize similarities and differences. Slower learning but good long recall and skill.

- ❑ **Practice makes Permanent**- practicing wrong is worse than no practice.
- ❑ **Do it right the first time and every time.** Allowing mistakes is different than allowing incorrect procedure.
- ❑ **Overlearning:** repetitive study after initial mastery or proficiency. Improves short term memory but does NOT improve long term memory. Consequently, pilots believe they retain the knowledge but may be more automatic or pattern reading. Check lists (we do them, but don't remember why), You can do weight and balance well in your own aircraft but not anyone else's.
- ❑ **Multi-tasking:** Attention switching, Simultaneous performance. Overwhelms newer students.
- ❑ **Distractions and interruptions:** loose place in check list. Run off taxiway while programming GPS. Sterile Cockpit!
- ❑ **Fixation:** crash trying to close door that opened in flight, Blow through altitude restriction trying to program autopilot or GPS.
- ❑ **Inattention:** monitoring gauges, starts daydreaming.

Errors (*memorize for written test*) :

- 1) **Slip:** Plan correct thing, do another. Drive to office instead of store. Forget to do something. Confusing two similar things. Time pressure increases errors.
- 2) **Mistake:** Plan wrong thing sometimes still works out. Incorrect understanding of concept. Oversimplification of concept (weather)

Reducing Errors:

- 1) Learn and practice
- 2) **Take your time**
- 3) Check your work
- 4) Use reminders-**checklists, bugs, notes**
- 5) **Develop Routines-"SOP"**
- 6) Awareness of high risk- in a hurry, interruptions, fatigue, lack of practice

Learn from Errors: Good judgment comes from experience. Experience comes from bad judgments. Don't make excuses, make it a learning opportunity.

Demonstration-performance

- ❑ **Demonstration and Performance method**-kinesthetic (hand eye) skills. Recommend student starts with “Play or Flash Card” with key elements of each maneuver. Chair fly with this technique before repeating in aircraft. *VERY EFFECTIVE*.
 - **Explanation phase**-(*on the ground*)
 - Guided discussion on the ground
 - Aerodynamics, how and why of a procedure
 - Discuss objectives and control inputs
 - Discuss completion and evaluation criteria
 - **Demonstration Phase**- (*in the air*)
 - Describe technique **before** beginning maneuver
 - Call out key control inputs as CFI demonstrates
 - Call out any errors in demonstration
 - **Student Performance** –
 - Student describes before performing (*CFI has controls*).
 - CFI transfers controls to Student
 - Student performs (*minimal or no coaching*)
 - **Evaluation Phase: Collaborative Assessment**
 - CFI takes controls so students can self-assess
 - Students recall, replay, reflect- how to improve
 - Instructor assessment- verify or correct student’s self-assessment
- ❑ Telling and Doing -variation of Demonstration –Performance
 - Instructor tells and does
 - Student tells and instructor does
 - Student tells and does
 - Student does and instructor evaluates
- ❑ **Use of Distractions**-maintain control of aircraft while distracted
 - Chat about recent events or ball game
 - Divert to airport using chart
 - Get ATIS or Call AFSS
 - Computing true air speed or asking what fuel reserves are
 - Ask to re-program a new waypoint in GPS
 - Get something from back seat

❑ **Integrated flight instruction:**

- Use outside reference, verify performance with instrument
- If student fixates inside, cover instruments
- If student fixates outside, ask “what is our altitude or bank angle”
- See and Avoid-look outside for traffic

- ❑ **Assessment of piloting ability** *Best done with Collaborative Assessment. Only way to know if student understands errors and how to correct.*
 - Demonstrated ability on standards of performance,
 - Student recalls and performs procedural steps for maneuver
 - Student able to identify and correct errors
 - Consistently meets ACS standards
 - Proficient with flight tasks for solo, practical
 - Post flight Evaluation:
 - Keep student informed of progress after each maneuver or in debrief
 - Written Post flight critiques
 - Traditional: discuss errors and corrective measures
 - SBT: collaborative assessment with self and instructor critique
 - Correction of Student Errors:
 - Allow mistakes if safe
 - Vary procedures (Random Practice) to ensure understanding of principles.
 - Pilot Supervision (for solo work)
 - Guidance and restraint for solo operations
 - Demonstrate consistency in fundamental maneuvers
 - Dealing with challenges
 - Teach how to work with congested patterns, unexpected cross winds, change in active runway
 - **Visualization techniques** (chair flying)
 - Practice procedure on ground before flight
 - Call out control inputs to achieve outcome standards
 - Instructor gives realistic variations/challenges to evaluate student ADM
 - **Practice Landings:**
 - Full stop in first third of runway
 - practice check list use
 - can stop solo flight if needed
 - If unable in first third, immediate go around
 - Practical Test Recommendations: FAA 8710-1 Certificate or rating application requires written recommendation. See regs.

When is your student ready to solo?

After they have met the training standards as required in 61.87, the student demonstrates:

- **Consistency** in take-off and landing over different training sessions
 - **random practice** where landings are mixed with other maneuvers
- **Cognitive** understanding of common **landing errors and how to correct**
 - can only be assessed with **collaborative assessment**
- **Psychomotor skills** and ADM of how to respond to common errors
 - **CFI observes recovery from** bounce, porpoise, floating, balloon and when to execute go around
 - CFI may need to “induce” these errors in a safe manner
- **Take off and landing** is in the **automatic phase of skill acquisition**
 - They can *talk on radio and land on center line*
 - Landing on centerline is low priority for students learning to land as they are more worried about crashing. Only when the landing sequence is automatic do they have enough bandwidth to think about landing on centerline.

SAMPLE