Typical scenarios used for training a private pilot.

Ask the student to plan a cross country. Make sure it crosses special use airspace, over and near class B, C, & D airports.

Risk mitigations, SRM, ADM and pilot quals and privileges.

- How did you prepare for the cross country?

If they struggle ask about the PAVE check list, you can add prompt questions such as

- Tell me more about that.
- Why?
- What if you got ramp checked by the FAA? (documents, currency, proficiency)
- What if you were departing at night, does this change things?
- Your passenger shows up with allergies and sinus block or a cold. How will you handle this?

Aircraft and Airworthiness. Part of the "aircraft" evaluation is qualifying airworthiness and flying with broken equipment. Using a pneumonic such as “Aviate-A” or “A-Tomatoe-Flames” works on a multiple choice test but does not teach them to actually verify an aircraft is airworthy. They should know what regs call these out (they will remember that longer than the pneumonic)

- Using the actual aircraft logs, prove to me this aircraft is airworthy
- How do we verify AD compliance? (*hint, not the FAA website. Use AD Compliance list*)
- What are the recurring ADs and how do we know they have been complied with?
- Pick one non-recurring AD and verify in the maintenance logs it has been complied with.
- Ask student to find the AROW documents and take a picture for use in the Ground

- On preflight, you notice the (turn coordinator or ammeter or fuel gauge) is broken. What are you going to do now?
- Show me where you would verify if it is required. (KOEL, 91.205, MEL if available)
- If you are at a remote airport, how are you going to get the aircraft back for repair?
- Would you fly with it in-op? Why or why not? How does that equipment work?

- Do you have a weight and balance for the aircraft today?
- How would it change things if your passenger decided to bring 50 lbs of luggage to put in the rear compartment? Explore how to recalculate weight and balance and effects on aircraft performance.

Environment, Weather & NOTAMs. Hopefully the student will obtain a weather brief or systematically review weather products as required in the ACS. Then complete a paper or digital navigation log.

- walk me through how you get a weather brief and what products you look at.
- What does this chart tell us? Why is it important?
- Where do you find TFRs? Can you fly through them? How can this be done legally?
- Tell me about the Convective SIGMET. Does it tell you were all the TS are?
- On the Surface Analysis, what do all those symbols mean?
    - What kind of weather can we expect?
    - Why would we get that type of weather there (how fronts produce weather)?
    - Wind direction and strength? (Isobars)
    - If you aren’t sure what that means, where would you look it up?

- METARS and TAFS
  - Interpret these for me.
  - What do these abbreviations mean?
  - Where would you look them up?
  - Marginal VFR? What kind of weather qualifies for that?
  - On a cool fall evening, you notice temp and dew point are closing. What is the risk? Why? Tell me more about how fog forms.
  - On the TAF, when do expect each of these changes in weather in local time?
- PIREPS
  - Where is the best place to find PIREPS in your EFB
  - How do you interpret these and where do you look up stuff you don't know?
- Cloud Coverage
  - Tell me what these charts tell us and how you are using them
  - Would you fly under those cloud tops at FL360?
  - Let's compare this chart with the Radar and tell me what you think.
- Visibility, SFC Winds, and Precip
  - Interpret this chart and symbols.
  - If you aren't familiar with a symbol where would you look it up
- Winds Aloft
  - As a first approximation, are we going to have a head wind? Tail wind?
  - Are the reported temperatures what we would expect for a standard atmospheres at this altitude? Why?
  - Tell me more about a standard atmosphere (and Lapse rates)
  - How would this affect aircraft performance?
- Radar charts
  - What are we seeing and how do you interpret this?
  - How does radar work?
  - What are the numbers for? (the highest altitude of precip and what this means)
- What NOTAM did you find for the flight? What about TFRs?

ask simple questions to see if they understand what they are looking at and some understanding of applying weather theory to the reports. Students won't know all the symbols etc., but **they should know where to look it up.**

Here the student should refer to the ACS for the required minimum weather products to review. Most "Canned" briefs from fore flight, 1-800 WX brief cover MOST but not all of the weather products. Weather products frequently missed are:

- **Radar** many applicants don't know how radar works or how to interpret

- **Convective outlook** – slight, marginal, moderate risk? What the heck do these mean and where do you look them up? 90% of applicants have no clue.

- **Prognosis Charts:** These are really helpful, but most can't find them. Easy to interpret.

- **Enroute, you notice the weather seems to be deteriorating 50 to 100 nm ahead.** How are you going to assess this?
  - **Call FSS-** how to get frequencies
  - **Call ATC-** what services are available? Weather 50 to 100 miles out?

- **Listen to ATIS, AWOS-** what is reception range at your altitude?
- **My EFB-** cellular data reliable at altitude?
- **ADS-**B in. How does that work? What are limitations? What weather products are available?

Cross country Nav Log: Then there is the NAV log.

- How to pick way points?
- How to choose Altitude? What is minimum safe altitude and how do you know?
- Any other considerations for altitude? (MEF, Terrain, Airspace, Glide distance)

- Describe how you determined Compass Heading and steps you took.
- How did you determine the TC? How is this different to the true heading?
- Does the order of operations matter? (yes, winds aloft reported in true, should not used on a magnetic course). Why?

True Course vs TH vs MC etc. How the determine TC and take it to CH. If they use an EFB, have them show you how they got TC. Frequently it will be an MC or MH and then they add variation to it not realizing variation has already been added. Then winds aloft (reported in True, are added to the magnetic course or heading (oops).

Performance Charts as part of the Nav Log.

- Tell me how you determined TAS. Assess use of performance charts including:
  - Pressure altitude, ISA, fuel burn
  - What is the standard temperature at your cruise altitude? (temp lapse rate)
    - *Frequently students think 15^0C is the standard temperature at ALL altitudes.*
  - How are we going to obtain the POH stated fuel burn? (how to lean)
  - What is the leaning procedure called out in the POH? Why do we lean?
  - What do you think your IAS will be? Higher, lower, same? Why? (how the ASI works)
  - How will a head wind or tail wind affect the TAS, IAS, and Ground Speed? Why?

- **TAS**: Then a discussion on how they determine TAS (performance charts) and how they come up with a ground speed and how much fuel they burn.

  - IAS vs TAS: Do they really understand difference between IAS and TAS? I might ask what they think there IAS will be at cruise relative to TAS. this can lead to a discussion on how airspeed indicators work and the practical applications and use of IAS vs TAS. This sometimes leads to high altitude performance as discussed below.

  - Pressure altitude? Frequently calculate pressure altitude at departure airport but then apply to cruise. What?

- **Factors that affect fuel burn and recalculating**:
  - Enroute, you determine it takes 45 minutes to a way point when it should have only been 30 minutes. Will we have enough fuel or will we have to divert?

  - Landing at our destination, the fuel pumps are out of service. How much fuel did you calculate we have and is it enough to return home?
    How would you verify the fuel load?

- **WCA-** you plugged all the numbers in an electronic E6B or EFB.
    - But does the WCA make sense? Why?
    - Many can't tell you if adding or subtracting numbers to a heading is left or right or correlates to winds aloft. Many have no clue or visualization of wind angles or triangles. Do they have a test of reasonableness?

- **Fuel burn:** does it make sense? Is there a test of reasonableness besides just trusting the EFP or E6B?
- **If using an EFB, how does the program determine fuel burn?** Does it change with flight conditions?
- Ok show me where in the EFB you plugged in the fuel burn and how does that correlate to the performance chart?

Aircraft performance: The nav log will then lead to discussion on high altitude operations and aircraft performance.

- How do we handle approach speeds?
- Why is landing and takeoff distance longer? (have to know more than the aircraft performs worse).
- Your grandmother and spouse want to depart a high elevation airport in the afternoon because they want to make a social engagement. What are the risks and how will you handle them?
    - Best time of day to depart
    - How to manage loading of aircraft and fuel load
    - When and how to lean for high density altitude departure

- What about grass vs pavement?
- Headwind vs tailwind?
- At high elevation airport, what airspeeds use for take-off/land/climb? Will Vx Vy be the same? Use of flaps?

Weight and balance: Then part of the preparation should be weight and balance.

- Where did they get the BEW? AFM or POH or Dispatch sheet?
- I brought a karoke machine and some soda (50 lbs) to load in the aft baggage. How will this affect the flight?
    - Cruise speed and fuel burn
    - Stall speed and recovery
    - Longitudinal Stability
    - How will the controls respond

- How does weight and balance change during flight with fuel burn?
- What are the risks associated with flying out of weight and balance?
- What are the weight load limits of the luggage compartment?

The Cross country, airspace, chart figures, special VFR, where to get frequencies and transponders requirements! Then we will actually simulate taking off and flying the route by looking at a sectional. Here you can use different scenarios to see if they understand how to use airspace, visibility and cloud clearance requirements.

- What if clouds at intended cruise altitude? What are our options?
- How low can you go (MEF)
- What if visibility or ceilings decrease? What airspace are you in and what are visibility and cloud clearance requirements?
- Where is class G? can you descent down there to be legal? But is it safe that low?

- Can you divert to a controlled airport (SVFR)?
- What are the entry requirements if diverting to a Class D, C, or B?
- Do you need a transponder?
- What if you need to fly through a MOA or Restricted airspace? Who do you call and where do you get the frequencies?
- How do you identify 3D of airspace and how to transit.

Then look at chart symbols and consider diversion options, using VFR sectional can you tell

- what kind of lighting system, runway lengths, services?
- Can we fly over that body of water? What do we need to have on board?
- what if you wanted to call FSS to get a weather update?

Again, students won't know all the symbols but should know how to look them up. . What about onboard weather - TIS-B and FIS-B, XM satellite weather and limitations.

Stall and spin awareness: Then scenario is you are on final at a controlled airport, number 2 to land behind an ultralight. You are catching up. The controller ask pilot to slow down to 55 kts and do "S" turns or maybe 360 for spacing.

- What are the risks?
- Why is stall speed higher?
- What are signs of a stall and how do you recover?
- What is the risk for spin?
- How do spins occur and how do you recover from them?
- What other phases of flight are high risk and how will you handle this.

This will lead to a discussion of how stalls and spins occur and how weight, CG, aerodynamic loading (accelerated stalls) affect. What phases of flight are higher risk and how to recognize incipient stall or incipient spin and then react to them.

- **Airport markings and wake turbulence:** Then there will be a discussion about what to look for landing at the airport for runway signage, pattern entry scenarios and of course jets landing or taking off in front of you and how to handle wake turbulence.

- **Night operations:** Then after our visit at the destination airport, we stayed later than we thought and now have to return at night. Many students are not good at analyzing night operations, but it is the same method as preparing for a normal cross country just with consideration of the added risks of night flight. It is the PAVE, IMSAFE check lists, pilot quals, currency and proficiency. They can work through the required equipment in 91.205 and or the POH.

    - What are the regulatory requirements for night equipment and currency?
    - How to preflight?
    - What personal equipment do you need?
    - What are the risks of night flying and how do you mitigate?
        - illusions of night flight?
        - featureless terrain, false horizon, absent horizon.
    - How will your flight planning change?
        - altitudes, VFR points (lakes are not helpful)
        - destination airport lighting VASI, PAPI, PCL
        - Use attitude indicator and altimeter.

Aircraft systems, emergency procedures and more; Then departing back at night, something will go wrong with the electric system. T

- How will you handle it? (Divert?, Memory items and checklist?
- How long will the battery last?
- How does that alternator work? How do we know if it is working?
- Describe the electrical system components and the roles of the alternator and battery. What equipment will fail if we lose all electrical?
- What will still work and why?

This means student will have to know how all the aircraft instruments work, vacuum, electrical, and pitot static. For each instrument or system that will work without electricity, ask them how that equipment works.

Aircraft Instruments

- How do the Attitude Indicator, ASI, Altimeter, DG work?
- What drives the vacuum system?
- Are there any backup electrical systems or batteries? how long do those last?
- Flaps, brakes, fuel gauges work?
- Describe the pitot static system and associated instruments.
    - Right after take-off you notice your Airspeed indicator is reading Zero. What could be the problem? What do you do now? (mud dauber?, Water from high pressure hose?)
    - For your Cross country, you planned a 100 kts TAS at 6500 MSL. What do you think your IAS will be? Higher, lower, same? Why?

Light Gun signals and lost comms

- Then if we lose all electricity how do we get into a class D?
- do we enter the D airspace to get their attention?
- What are the light gun signals?
- What are other ways we can communicate(cell phone).

Engine and propellor

- If the engine is still running, how and why?
- How do the mags work?
- What is the combustion cycle? How does it spin the prop?
- How does fuel get into cylinders?
- Why do we have two mags and 2 spark plugs for each cylinder?
- How do we do a mag check and what are we looking for?
- What if there is a large RPM drop with mag check, then what?
- What if no RPM drop, then what?

- If you have a carburetor, what is carb ice, how does it occur, how and when to use carb heat
- why does aircraft performance decrease with carb heat on?

Control Surfaces

- Are flaps going to work?
- what is the function of flaps?
- How will our landing change if no flaps? How to clear an obstacle?

On the way back home, the passenger reports feeling very tired and has a headache with difficulty thinking. The lights seem very dim.

- What could be going on?
- How can we become hypoxic at such low altitude?
- What do we do now?
- How could carbon monoxide get in the cabin?

We may also have various failures. Engine failure low altitude vs high altitude.

- Facing an engine failure, what are the memory items at low vs high altitude?
- What to do and how to prioritize workload.
- What is the best glide? why?
- how does this relate to the L/Dmax curve?
- At the current cruise altitude, how far does your aircraft glide?
- Where can we make it to?
- Does glide distance depend on weight?
- does Vg change with weight?
- How does head wind or tail wind affect glide distance?

We may look into scenarios where we hear a funny engine noise and notice oil pressure reading is low.

Impending or Complete Engine Failure

- What do we do now?
- what is function of oil, what is going to happen to aircraft?
- do we try and make it to an airport or just put it in a field?
- do we divert first then trouble shoot or trouble shoot first?
- We may get to engine failure and then follow the scenario above.
- If landing off airport, what are the priorities for landing locations?
- Does it matter beans, corn or against plow rows?
- Add flaps or no flaps?

Partial Power Loss and Rough Engine

- What if we have a partial power loss? How does this change how we handle it?
- Does the engine have to completely quit before troubleshooting?
- What is the procedure to eval?
- What about a rough engine?
- What are the causes of rough engine or partial power loss?
- How do you evaluate?
  think carb ice, air intake blockage, wrong fuel, detonation, pre-ignition, bad mag, contaminated fuel

ON Fire

- what do we do for an engine fire on the ground vs in the air?
- How to identify and react to Electrical fire in wing tip vs in the cockpit?
- What are the reasons to do an emergency descent?
- How does the POH or airplane flying handbook say to do an emergency descent?
- We land in the field with aircraft damage.
- What do we have to report and to whom?
- how long to do we have to report?

IMC, Diversion, Radar Services and use of Navigation equipment: WE may also look at how to respond to inadvertent flight into IMC.

- When is this likely to happen?
- Is this an emergency?
- What are our egress options?
- Can we legally and safely continue to fly without declaring an emergency?
- How do we use the onboard navigation equipment? VOR? GPS?
- How does that stuff work?

Other Human factors:

- What are your personal limitations or guidelines you are going to use with alcohol or medication usage and flying? Why?
- Your passenger had been scuba diving the day before, as you climb to 10,000 ft, complains of pain in his joints and the worst headache and begins to vomit. Explain the most likely reason and what you are going to do.

Emergency operations equipment and survival gear

- If this flight were to be in the middle of a cold winter, describe how you would prepare prior to departure for a possible forced landing.
- How about if you were crossing Lake Michigan or flying to the Bahamas? Wilderness? (after forced landing, NTSB reporting requirements)
- Describe emergency equipment installed on this aircraft, where it is located and how to use it.