INSTRUMENT STUDY GUIDE

Area of Operation I.

Task A. Pilot Qualifications

- You logged 1 approach in January, 1 in February, 2 in March, 3 in April, 1 in May, 1 in June, 2 in July, and 1 in August (along with a hold). Each of these approaches occurred on the first of the month. What is the first day that you are no longer instrument current? November 1

- What IRA privileges did you just lose as of November 1? I.e. what were you permitted to do on October 31 that you are now no longer allowed to do until you regain your IRA currency? Can no longer act as PIC under IFR or in weather conditions less than those prescribed for VFR. More specifically, you can not longer: 1) fly in class A airspace, 2) file an IFR flight plan, 3) fly special VFR at night, and 4) fly in conditions less than basic VFR.

- How many approaches must you accomplish and log in November to regain your currency? One

- What are your options for how to accomplish this approach? Either an appropriately rated simulator or a flight with a safety pilot or CFII.

- Would you be current if you came in one night and did the approach(es) by yourself in one of our AATDs? Yes, as long as you log it. And as long as the approach is in IMC down to mins.

- Let’s say you did two approaches in November, now when does your currency expire? Expires Jan 1 the following year.

- In order to log and count an approach toward instrument recency, what are the requirements for how the approach needs to be conducted?

  https://www.faa.gov/other_visit/aviation_industry/airline_operators/airline_safety/info/all_infos/media/2015/InFO15012.pdf:

  In the plane

  - If in VMC: you must be wearing a view limiting device and the approach must be shot down to mins. Because you’re in VMC and wearing a VLD, a safety pilot is required as well.
- If in IMC/actual (so you’re not wearing a view limiting device): you must start the approach and remain in IMC until after the FAF.

**In the sim:**

- Full approach needs to occur in IMC down to mins.

- Let’s say your IRA currency is about to expire. Can you take a plane up by yourself (so this is a solo flight) in clear-sky VMC weather like today, put a hood on, shoot 6 approaches/hold/track, log it all, and be current? No, you need a safety pilot any time you’re in Vmc wearing a view limiting device.

- What qualifications must the safety pilot have? Must be rated in category and class and **hold a current medical.** *(Everyone leaves off the medical part.)*

- What additional qualifications do your safety pilot and aircraft need to have if you are going to regain currency while flying in actual on an IFR flight plan? SP needs to be IRA current and the plane needs to be IFR certified. The SP will need to act as PIC on this flight.

- Show me in this logbook how you would log an instrument currency flight with a safety pilot. We’ll say you shot the GPS23 and VOR/DME5 into P08 and John Doe was your safety pilot. It was a 2.0 flight and you were under the hood for 1.5. The part that trips students up: simply write “John Doe - SP” in the remarks section. You could also write something like, “Holding, intercepting, and tracking per 61.57” in the remarks section. Also, yes the pilot flying can log PIC (for the entire flight), so 2.0. The safety pilot can log PIC for the time that the PF is wearing a view limiting device IF the safety pilot had agreed to act as PIC beforehand. Good article on when you can logging PIC: [https://www.faa.gov/about/office_org/field_offices/fsdo/sdl/local_more/avsafety_program/media/LOGGING%20PILOT-IN-COMMAND%20TIME.pdf](https://www.faa.gov/about/office_org/field_offices/fsdo/sdl/local_more/avsafety_program/media/LOGGING%20PILOT-IN-COMMAND%20TIME.pdf)

- Now show me what the safety pilot will log for this flight. The SP will log 1.5 PIC and write something to the effect of “Safety Pilot for ____” in the remarks.

- Are you required to log instrument approaches that you use to establish IRA currency? Yes.

- Let’s say that you haven’t flown a plane in a few years. Legally, could you do a couple refresher sims, take and pass an IPC in the plane, then start flying around single-pilot IFR? No, you need a flight review to stay current as a pilot as well.

- Show me (or just tell me) where the certification requirements for the instrument checkride are listed in the FAR/AIM *(weird question, but required by IR.I.A.K1).* 61.65
Why do you think it’s important to distinguish between currency and proficiency? It’s the difference between legality and safety. Just because you’re current doesn’t mean you’re safe and proficient. Conversely, just because you’re proficient doesn’t necessarily mean you’re legal.

Task B. Weather Information

General

- Justify your go (or no-go) decision. In other words, I want you to walk me through all the weather charts that you used during your planning for this XC IFR flight and prove to me that you won’t encounter any adverse weather. If there is adverse weather, show me that you’ve planned around it.

For each weather source review:

- Symbology
- Associated weather of each symbol, i.e. cold/warm/occluded/stationary fronts, high/low pressure systems, etc.
- Release/valid times

- What are the various ways that you can check the weather while flying enroute? ATC, HIWAS, FSS, listen to the weather frequencies of nearby airports.
- What kind of weather would legally require us to be on an IFR flight plan in order to take off today out of KIWA? Anything below VFR T/O mins, i.e. below 3sm or 1000ft ceiling when departing from a controlled airport.
- What about out of KCGZ? Vis below 1sm or if you can’t maintain clear of clouds.
- Show METARs with various weather and ask, could we take off VFR if this were the weather at our departure airport, or would be need to be on an IFR flight plan?
- With whom can you file a PIREP? ATC or a FSS.
- Interpret this PIREP: KCMH UA /OV APE 230010/TM 1516/FL085/TP BE20/SK BKN065/WX FV03SM HZ FU/TA 20/TB LGT/IC MDT MXD 040-050/RM LLWS –15 KT SFC-030 DURGC RY 22 CMH
- What would “UUA” (instead of UA) on a PIREP signify? Urgent.

Thunderstorms/Microbursts

- With these charts, show me how you determined that we will not fly into any thunderstorms.
- What ingredients are necessary for a thunderstorm to form?
- Are all three always required? Yes.
- Is it VISIBLE moisture or just any moisture in the air, like water vapor, that is required for thunderstorm formation? Doesn’t have to be visible.
What charts can you use to determine the presence each ingredient? Plenty of options here. One viable answer: For moisture look at the temp/dew point spread; for instability look at the temperature lapse rate on the winds aloft; for a lifting action look at the surface analysis and/or prog chart for low pressure systems, frontal activity, etc.

What is meant by “unstable air?” Air that, when it’s pushed up, keeps rising. Conversely, stable air resists upward movement.

What are some examples of weather phenomena that can cause a lifting action? Orographic effects (wind moving across mountains and valleys), frictional effects (low pressure systems), frontal lifting, buoyancy (uneven heating of surface).

What weather is associated with a thunderstorm?

If you accidentally fly into a thunderstorm what airspeed will you fly?

If you’re stuck in one would you try to maintain a level altitude or level attitude?

What are the different types of thunderstorms? Describe them.

What are the stages of a thunderstorm?

By how many miles are you supposed to circumvent a thunderstorm? Why?

Let’s say you see a thunderstorm ahead along your victor airway, it seems to be moving to the right and it’s clear to the left, what are you going to do/say to ATC?

What does the METAR symbol -TSRA mean? (No it does not mean light thunderstorm, there’s no such thing. It means LIGHT RAIN associated with a thunderstorm.)

As you turn final at your destination airport, you notice virga just above the runway. Your indicated airspeed starts increasing despite that fact that you’re not adding power or descending any more rapidly. What do you think is going on here? Microburst.

What additional sign might you see at the surface? Blowing ring of dust.

What are you going to do? Add full power and start climbing; go around.

How strong can the downdrafts get? 6000 ft/min. How about the horizontal winds? 45kts (90kt shear).

How long would you expect this microburst to last? 15 minutes.

What sort of weather activity needs to exist for a microburst to form? Convective.

Icing (will go MUCH more in depth on icing in Task C below due to IR.I.C.S5)

Pretend that the weather at your destination airport at your ETA is this: 071653Z 03004KT 10SM OVC040 07/02 A3029 RMK AO2 SLP260 T00670017. You intend to file IFR and this airport has multiple approaches. Would you make a go or no go decision? Why or why not? No-go due to icing. With a normal lapse rate the temp at 4000ft would be -1 degrees, and the ceiling is overcast at that altitude.

Show me with these charts and weather information how exactly you determined that we won’t be at risk of flying into icing conditions? This will involve using the charts to both show where the clouds/visible moisture will be during every phase of the flight, as well as to determine the freezing level throughout the route. There are many ways to effectively do this. Some options: as the TAF range extends only 5sm from the airport, and seeing as only larger airports have TAFs, determining cloud coverage beyond the range of these
airports involves using the area forecast. The graphical area forecast (GFA) tool on aviationweather.gov allows you to plot your flight path, then it shows the cloud coverage along the entire route at various selected times. To determine precise freezing levels along your route involves using the winds aloft; be sure to use the stations along the entire route, not just departure and destination airport stations. More options include using graphical icing forecasts, PIREPs, freezing level charts, etc. Using the “show flight path” feature is always extremely helpful, as it allows you to prove the location of this weather relative to your exact route.

- What kind of weather conditions need to exist for structural icing to form? Temperatures around freezing and visible moisture.
- What are the different types of ice and what characterizes each?
- What temperature ranges correspond to the formation of each of these types of structural ice?
- How can you use the weather charts to determine whether there’s a possibility of freezing rain along the route? Look for temperature inversions on the winds aloft coupled with precipitation on the radar summary, weather depiction, etc. Some more obvious answers: PIREPS, METARs/TAFs, and look for thunderstorms along the route.
- What are the different intensity levels of structural icing that one can report to ATC? Trace, Light, Moderate, Severe.

**Fog**

- Tell me about every type of fog, and in particular, what causes each type to form.
- Transcribe this METAR: KYYQ 301300Z 35011KT 1/8SM FG VV001 02/02 A2991 RMK SLP131
- What kind of illusion would you expect when you’re approaching to land and you enter fog? Entering fog gives the sudden feeling of pitching up, causing the pilot to pitch the nose down.
- What can you do to mitigate this? Rely on your instruments. Use visual aids like PAPI’s/VASI’s.
- What’s the difference between fog and a cloud?
- If the METAR shows a temperature of 5 and a dewpoint of 4, what sort of weather would you expect?

**Alternates**

Brief primer/warning on the alternate rule: First of all, remember that filing an alternate is always required unless TWO conditions are met at the destination airport: 1) you have at least a 2000ft ceiling and 3 sm vis within +-1 hour of arrival, and 2), the destination airport has an IAP. Everyone forgets about the second part. For some students it is easier to think of the alternate filing criteria inversely, i.e. in terms of when you MUST file an alternate: you must file an alternate if 1) within +-1 hour of arrival at your destination airport the weather is reported to be
LESS than 2000ft ceiling or less than 3sm visibility, or, 2) the destination airport doesn’t have any IAP’s. Again, just don’t forget the second part.

- Bring up TAFs and METARs from around the country and highlight ceilings and vis and ask whether, at certain ETAs, the highlighted weather would require the pilot to file an alternate airport.
- What is the definition of a ceiling? The FULL definition in part 1 of the FAR: Ceiling means the height above the earth’s surface of the lowest layer of clouds or obscuring phenomena that is reported as “broken”, “overcast”, or “obscuration”, and not classified as “thin” or “partial”.
- Can you file IFR to a VFR airport (an airport without IAPs)? Sure, you’ll just need to file an alternate.
- On a day like today where the skies are clear across the valley, would you have to file an alternate if your IFR destination were E63? Yes because E63 doesn’t have approaches.
- Could you use E63 as your alternate? Yes, as long as you can descend from your MEA to land while maintaining basic VFR.
- Can you use _____ airport for your alternate if the ______ approach is going to be in use and the weather at your ETA is ______? CHECK FOR NON-STANDARD ALTERNATE MINS FIRST! They are so common they’re practically standard. Good airports to use here are SDL with the VOR-C in use with an 800ft ceiling and 5sm vis, or PHX with the ILS7L in use, a 650ft ceiling, and 5sm vis.
- What factors should you consider when choosing an alternate airport?
  - Airport should be close enough to fly to and still have IFR legal fuel reserves remaining, yet far enough away that the weather will be different/better than the weather at the original destination airport.
  - Should have approaches, preferably precision or precision-like approaches that get you down the lowest.
- Enroute the weather at your destination drops below 2000ft/3sm within 1 hour of your ETA. Would you continue to your destination or are you required to divert to your alternate? Continue to destination. The 123 rule is for FILING the IFR flight plan.

Task C. Cross-Country Flight Planning

Nav Log/General

- Take me through this line on your XC nav log, show me how you calculated each number.
- How did you calculate your initial climb TAS?
- Define IAS, CAS, TAS, GS.
- Are the airway courses depicted on the low enroute chart magnetic or true?
- Where and how did you calculate our IFR fuel reserve?
- Approaching the INW VOR, ATC tells you, “Cessna 976SP, due to delays at KABQ you can expect to hold over the INW VOR for approximately two hours. Advise if able to accept.” Will you accept? Calculate the expected fuel burn and determine whether, after holding for
two hours, you would still have enough fuel to continue to KABQ then fly for 45min at normal cruise. The math is straightforward: multiply your cruise GPH by 2 and subtract this number from your original total fuel remaining. Make sure that this final number is more than ¾ of the cruise GPH.

How do you close your IFR flight plan at towered and non-towered airports?

DPs

Is the Phoenix One Departure a SID or ODP? ODP.
How can you tell? “Obstacle” in the title.

What are some of the differences between SIDs and ODPs?

You take off on the PXR1.PXR but right after lift off tower starts giving you vectors. What minimum climb gradient are you expected to maintain? Look at the DVA under departure procedures. In this case 250 ft/nm.

How many ft/min does this translate to if we’re going to be climbing out at a ground speed of about 80kts?

Will we be able to maintain this ft/min climb to 3000?

When you see “standard” written on an ODP, what does this mean? It is referring to the standard visibility weather mins for 121/135. It does not mean 200 ft/nm climb gradient. Hence the reason some ODPs read, say, “Standard with minimum 250 ft/nm climb to 5000.” Clearly this does not mean, “200 ft/nm climb with minimum 250 ft/nm climb to 5000.” The way you can tell that the climb gradient is the standard 200 ft/nm is when it is not depicted at all.

What are standard 121/135 weather mins? 1sm if the plane has 2 or fewer engines; ½ sm if the plane has more than 2 engines.

Take me through your options for picking up an IFR clearance out of a non-towered airport. National clearance hotline, briefer/FSS, and most common, calling up the controlling agency in the plane while on the ground with the engines started.

Let’s say you wanted to pick up your IFR clearance in the plane at KHII. Who do you call, what frequency would you use, what would you say? LA Center on 134.65. “LA Center, Cessna 976SP is on the ground at KHII, we’d like to pick up our IFR clearance to KIWA.”

Center gives you a clearance void time. Are you required to be off the ground by that time, or is the requirement that you’ve departed and contacted LA Center by that time? Just off the ground.

What kind of weather is required to fly the VCOA out of KHII? 1500 AGL ceiling - 3sm vis.

Do you need to inform ATC or will they propose it? Inform them.

How would you fly it? As described in the T/O minimums, ODPs, DVAs section: After departure, circle back over the airport and climb while circling to at or above 2300ft MSL, then proceed northwest and intercept EED VORTAC R-138 to EED VORTAC, continue climb in EED VORTAC holding pattern (East, right turns, 257° inbound) to cross EED VORTAC at or above 6100 before proceeding on course.

Scenario: Center gives you the following clearance: “Cessna 976SP, cleared to KIWA via EED V12 DRK V105 PXR Direct SNOWL, climb maintain 11,000....” It’s night out, the ceiling is 1000ft OVC, 2sm vis. You’re departing RWY32.

How are you going to navigate to EED? Fly the ODP (posted below).

LAKE HAVASU CITY, AZ
LAKE HAVASU CITY (HII)
TAKEOFF MINIMUMS AND (OBSTACLE) DEPARTURE PROCEDURES
AMDT 2 12152 (FAA)
TAKEOFF MINIMUMS: **Rwy 14**, std. w/min. climb of 465’ per NM to 4800, or 1500-3 for climb in visual conditions. **Rwy 32**, 600-13/4 w/min. climb of 492’ per NM to 1100, or 1500-3 for climb in visual conditions.

DEPARTURE PROCEDURE: **Rwy 14**, climbing right turn heading 300° to intercept EED VORTAC R-155 to EED VORTAC, continue climb in EED VORTAC holding pattern (East, right turns, 257° inbound) to cross EED VORTAC at or above 6100 before proceeding on course or ...

**Rwy 32**, climbing left turn heading 290° to intercept EED VORTAC R-155 to EED VORTAC, continue climb in EED VORTAC holding pattern (East, right turns, 257° inbound) to cross EED VORTAC at or above 6100 before proceeding on course or ...

**Rwy 14, 32**, ... For climb in visual conditions: cross Lake Havasu City airport northwest bound at or above 2300, then Intercept EED VORTAC R-138 to EED VORTAC, continue climb in EED VORTAC holding pattern (East, right turns, 257° inbound) to cross EED VORTAC at or above 6100 before proceeding on course. When executing VCOA, notify ATC prior to departure.

TAKEOFF OBSTACLE NOTES: **Rwy 14**, pole 3327’ from DER, 46’ right of centerline, 107’ AGL/868’ MSL. Poles 3468’ from DER, 195’ left of centerline, up to 107’ AGL/890’ MSL. Trees/bushes 976’ from DER, 380’ left of centerline, up to 46’ AGL/829’ MSL. Terrain 143’ from DER, 346’ left of centerline, up to 804’ MSL. **Rwy 32**, trees 1544’ from DER, 416’ right of centerline, up to 44’ AGL/793’ MSL.

- Let’s say you’re departing during the summer, the temperature is 35C and the altimeter is 29.82. You’re taking off into a slight headwind. Would you fly this ODP? Why or why not? Convert 492 ft/nm to ft/min. Then calculate your expected ft/min climb rate using the performance charts and confirm that you will safely be able to achieve the required performance.
- Do you need a clearance to fly an ODP? **No.**
- What if you are assigned a heading and altitude after departure, are you required to fly what you’ve been assigned or can you still take the initiative and fly the ODP? **You must fly what you’ve been assigned.**
- What does DER mean on the ODP?
- By how many ft AGL are you expected expected to cross the DER on a DP?
- On an IFR departure, to what minimum altitude must you climb before making your first turn?
- After departure, what does your initial call to LA Center sound like?
- After calling approach on the departure leg you are told, “Cessna 976SP, radar contact…” Is obstacle clearance their responsibility now? **No, not unless they give you a vector.**
- Draw the hold for this KHII ODP. What hold entry will you use?

Low Enroute Charts

Students must be able to identify and explain all Low Enroute Chart symbology. The following symbology has been historically weak:

- White vs brown-shaded areas; blue vs green vs brown airports; airport symbols with the tick marks extending out from them vs the circle inside the circle symbol; VOR-to-VOR DME (boxed DME) vs VOR-to-fix DME (DME with arrow) vs fix-to-fix DME (just the DME number); MOCAs vs MEAs vs OROCAs vs MRAs vs MCAs vs MTAs; interpret all the information in the Airport Data Block; T’s on either side of fixes that represent MEA change; class B vs C symbology; ARTCC box; RCOs; compulsory reporting points; negative H
(HIWAS) symbol in the VOR box; symbols representing different types of VORs; SFRA/Grand Canyon boundary; ILS feather; MTRs; (T) vs (L) in VOR box; NDBs.

- The low enroute chart shows airspace up to but not including what altitude? 18,000 MSL.
- What is the purpose of an M.O.A.? To separate military and IFR traffic.
- Let’s say you’ve departed ABQ and you’re on V12 established at 9000 approaching CARTY. You’re on with Albuquerque Center. What are you going to do? REQUEST a higher altitude, 10,000 min, due to the MCA.
- A lot of students respond to the previous questions with, “Climb to 10,000 due to the MEA,” at which point ask, “Are you going to ask for approval from ATC before initiating that climb, or just take the initiative and start climbing?” Need to request the climb!
- If ATC assigns altitudes that keep you above MCAs, why are MCAs even depicted? I.e. what are some situations where you would need to know them? Lost coms, situational awareness, or if ATC makes a mistake and forgets to give you a climb.
- Let’s say you’ve lost coms and there’s no MCA at the next fix. You cross the fix at 8,000ft and start your climb to the MEA for the next route segment, 10,000ft. What climb gradient must be maintained in order to guarantee obstacle clearance? 120ft/nm. (The rule is 150ft/nm < 5000msl. 120ft/nm from 5000 - 10,000. 100ft/nm > 10,000.)
- When you cross INW enroute to KABQ are you required to make a position report? No, only if out of radar contact.
- What does “out of radar contact” mean? You’re not showing up on ATC’s radar.
- How would you know that you’ve lost radar contact? ATC will inform you: “Cessna 976SP, radar contact lost.”
- ATC tells you that radar contact has been lost. You’re crossing INW and now turning eastbound onto V12 enroute to KABQ. Simulate a position report to Albuquerque Center.
- Do any of the IFR altitudes guarantee you communication coverage? No.
- You’re on V190 westbound toward PXR at 5,300 and you’ve just crossed ZERLO. Are you guaranteed nav coverage on this segment between ZERLO and LAKEY? Not for the first 2 miles of the segment; yes for the next 5 miles (because you’d be within 22 nm of the VOR).
- Give me some examples of when you would use the OROCA (ask the same question with MSA’s). Emergencies that occur off-airway. E.g. hypoxia, icing, lost coms in IMC.

**STARs**
NOT FOR NAVIGATIONAL PURPOSES - GlobalAir.com

[Diagram of LZZRD THREE ARRIVAL (RNAV)]

**ARRIVAL ROUTE DESCRIPTION**

**CHISUM TRANSITION (CME LZZRD3)**

From LZZRD on track 315° to cross MKYON between 13000 and 15000.

**LANDING RUNWAY 3:** From MKYON on track 319° to cross HAPEE between 11000 and 13000, then on track 328° to cross COMRO at 10000 and at 210K. Expect RNAV (RNP) or ILS approach or RADAR vectors to final approach course.

**LANDING RUNWAY 6:** From MKYON on track 319° to cross HAPEE between 11000 and 13000, then on track 328° to cross COMRO at 10000 and at 210K. Expect RNAV (RNP) approach or RADAR vectors to final approach course.

**LANDING RUNWAYS 21/26:** From MKYON on track 003° to SOPPA, then on track 002° to cross PILLA at 10000 and at 210K. Expect RNAV (RNP) approach or RADAR vectors to final approach course.

**NOTE:** Chart not to scale.
Clearance: “Cessna 976SP, ABQ Center, proceed direct CHISUM. Maintain FL280 to CHISUM. You are cleared for the LZZRD THREE arrival, CHISUM transition.”

- Provided we have supplemental oxygen, if we received a clearance for this arrival, could we accept it? **No, turbojet only.**
- For the sake of this scenario we’ll say you’re flying a turbojet. With the above clearance, what altitude will you either maintain or descend to after crossing CHISUM? **FL280.**
- How about after crossing LOKKE? **FL280**
- Different clearance, “Cessna 976SP, ABQ Center, proceed direct CHISUM. Maintain FL280 until crossing CHISUM. Descend via the LZZRD THREE arrival, CHISUM transition.”

  How does this change how you will fly the arrival? **Now you can laterally AND vertically track the arrival.**

- To what altitude(s) will you descend after crossing CHISUM and LOKKE now? **Only restriction is that you must cross JETOS between FL300 and FL260. So when crossing CHISUM and LOKKE you must still be between those altitudes.**
- What does “RADAR required” on arrival, departure, and approach plates mean?
- Are the waypoints on this arrival fly-by or fly-over?
- How can you differentiate between MEAs and Minimum/Maximum/Mandatory Attitudes on an arrival plate? **The min/max/mandatory altitudes have bars either below, above, or above and below them.**
- What does STAR stand for?
- When you hear, “cleared for the _____ arrival, _____ transition,” what does the “______ transition” part mean? **This is a connecting point. It is where you transition onto an arrival from your prior route; or on a DP, it’s where you transition off of the departure and onto the next part of your route.**
- Some arrivals, like the BRUSR ONE, have segments composed of dots representing the flight track. **What does this signify? Lost coms flight track.**

**IAPs**

- Identify and explain all instrument approach plate symbology.
- After being cleared for a visual approach, do you have to maintain your last assigned alt or can you initiate your descent into the airport? **You can descend.**
- There are some clouds between you and the airport. Once cleared for the visual approach do you have to circumvent them or can you fly through them? **You have to maintain clear of clouds.**
- Do you have to maintain the basic VFR cloud clearances on a visual approach? **No, just clear of clouds.**
- What are the requirements to receive a visual approach clearance? **Weather-wise: 1000ft ceiling and 3sm vis reported at the destination airport. The pilot must have the destination airport or the preceding aircraft in sight.**
- What is a contact approach?
- When and why would you use it?
How would you go about getting cleared for one?
What are the weather requirements for a contact approach?
Tower clears you for an RNP approach, can you accept?
What are the segments of an instrument approach? Explain what each is for.

Here is an example approach clearance and series of questions an IP might ask while the student finger flies this approach:

“Cessna 976SP, proceed direct EWM, maintain 8000 ‘til crossing EWM, you are cleared for the ILS22 into KELP.” Use the approach plate to finger fly and explain every step of how you would fly this approach. (Tip: don’t skip the procedure turn. Being aligned straight-in is different from receiving a “cleared straight in” approach clearance. The former does not, by itself, allow you to bypass the PT.)
Given your clearance, what altitude will you fly until reaching the EWM VOR?  8000.

What if instead of the previous clearance, you were instructed, “Cessna 976SP, proceed direct EWM, you are cleared for the ILS22 approach into KELP.” Now what altitude would you maintain or descent to while enroute to EWM?  8000. You’re cleared, but not established, on a segment of the approach. So maintain last assigned altitude.
What are you going to do after crossing EWM in terms of course and altitude? Track outbound on EWM 191 radial and descend to 7300.

When can you descend below 7300 and to what altitude will you descend? After crossing VALTR, once established outbound in the PT, descend to 7100.

How will you know you’ve reached VALTR? The localizer will center up in the other Nav.

What are some other ways to identify VALTER? Outer marker or DME (from the LOC).

What is an LOM? Stands for Locator Outer Marker. It’s an Outer Marker coupled with an NDB.

So you’ve crossed VALTR, what’s next? Turn outbound on 042 localizer course. Descend to 7100.

For how long will you fly outbound? 2 minutes works well. Not mandatory.

What is your distance limitation on the PT outbound? 10 nm from VALTR.

How will you reverse course in order to re-establish yourself inbound? Fly 357 outbound for one minute, then make a right 180 degree turn to re-establish yourself inbound.

Are you required to fly 357? No the heading is recommended. The barb simply points to the protected side.

For how long will you fly your 357 course reversal heading? Recommended one minute.

After that will you make a left or right turn to re-intercept the localizer? Recommended to the right, that way you won’t re-intercept too close to AGUAS (or the FAF on other approaches).

When can you descend below 7100? Once re-established inbound.

To what altitude? 5900.

How can you tell you’re established? Course alive.

When can you descend below 5900? Once you’ve crossed AGUAS.

How will you know that you’ve crossed AGUAS? DME (from the Localizer).

What are some other ways to identify this fix? Cross radial from EWM, radar ID, GPS.

To what altitude will you descend after crossing AGUAS? 5100.

What is your FAF on this approach? Glideslope intercept.

What is the glideslope descent angle on this approach? 3 degrees.

What descent rate will you use once established, and how did you calculate it? Either use a rule of thumb calculation (e.g. ground speed divided by 2, tack on a 0 at the end, then add 50. So 80kts/2 = 40. Tack on a 0, so 400. Then add 50, so 450fpm), or just use the chart in the digital terminal procedures supplemental for the exact number. Students should either know this number beforehand or be able to quickly calculate it.

After intercepting glideslope, to what altitude can you descend now? 4149.

What’s that altitude called? DA, Decision Altitude.

Is this the altitude at which you make your decision to go missed and thus dip slightly below it during the time that you are adding power and initiating a climb pitch? Or will you start going missed just before your DA so that the plane never descends one inch below the DA? This is the DECISION altitude. It is expected that you will dip slightly below the DA during the time it takes to initiate the go around.

Upon reaching your DA you have a taxiway and the control tower in sight, can you continue your descent and land? No, these are not listed under 91.175.
What is required under 91.175 in order to continue your descent beyond DA/MDA? List 91.175 (should be virtually verbatim).

What type of visibility is required here? Flight visibility or the reported ground visibility on the ATIS? Flight.

How many SM visibility is 2400 RVR? ½.

What if we were flying a plane with autopilot, how many RVR would be required now? 1800, per the notes on the plate.

If the required visibility were 1800 RVR how many SM flight visibility would be required? ½ still, per the chart in the digital terminal procedures supplemental.

Let’s say you’re in pretty heavy IMC, which lights would you expect to see first? MALSR.

Is the MALSR pilot controlled? No, the symbol isn’t shaded in.

What’s if it’s inop, by how much does the visibility requirement increase? ¼ sm, per the table in the Digital Terminal Procedures Supplemental.

So you get the MALSR in sight, what exact altitude can you descend to now? 100 ft above TDZE, so 4049.

What do you need before you can descend below that altitude? Anything else listed in 91.175.

Let’s rewind. Let’s say that as you’re approaching glideslope intercept you notice that your glideslope never comes alive, what are you going to do? Report the failed nav equip per 91.187 and switch to the Localizer approach, use localizer minimums.

Do you now have to get an additional clearance for the localizer approach or when you were cleared for the ILS does that suffice? That suffices, you were cleared for the entire plate when you were cleared for the ILS.

What is your FAF on the LOC22? VALTR.

To what altitude will you descend after crossing VALTR? 4300 if on a straight in approach.

What do we call that altitude? MDA, Minimum Descent Altitude.

When you get to that altitude will you hold it or go missed as soon as you reach it? Hold it until the MAP.

What is your missed approach point (MAP) on the Localizer approach? 2.2 DME from the localizer.

Is DME required for this approach? No.

So how would you know when to go missed if you don’t have DME? Time. Or ask ATC.

Are the MAP speeds depicted in ground speed or KIAS? Ground speed.

What is your VDP on this approach? 351/300 = Approximately 1.2 nm from the approach end of runway 22, so I-ELP 3.4.

If you don’t have 91.175 requirements by the VDP are you going to go missed right there, or would you hold the MDA until your MAP? Hold until your MAP.

Simulate a missed approach call. “El Paso Tower, Cessna 976SP is going missed, request…” Here you generally have three options: You can request 1) to fly the published missed, 2) vectors for a different approach into the same airport, or 3) to proceed to an alternate airport.

What is the standard climb gradient on a missed approach that guarantees obstacle clearance? 200 ft/nm.
Additional questions about this approach:

- What is your decision height? **200ft AGL.**
- How is this different from decision altitude? **DA is MSL, DH is AGL.**
- You said that the REILs qualify as part of the runway environment, what are REILs, what do they look like? **Flashing white lights on the sides of the approach end of the runway.**
- What is the definition of Touchdown Zone Elevation? **The highest elevation in the first 3000ft of the landing zone.**
- Why is it helpful to know your DH (as opposed to the DA) when you’re on an approach in IMC? **DH is AGL and therefore matches up with how cloud ceilings are reported.**
- Pretend that during your set-up for the approach you listen to the ATIS and hear that the ceiling and visibility are below mins for the approach, can you still legally shoot the approach? **Yes, although depending on just how low the IMC is, continuing with the approach might be poor ADM.**
- You’re on the Localizer 22 approach, tower tells you to circle Southeast of the field for runway 8. While circling to land you drop the right wing to turn and briefly lose sight of the runway when the wing blocks your view. Do you have to go missed? **No, per 91.175(e).**
- How many feet obstacle clearance are you guaranteed while circling right at mins? **300.**
- Now let’s say you’re halfway through your right circle-to-land downwind and you lose sight of the runway due to IMC. How exactly are you going to go missed here, seeing as you’re past the MAP? **Make an immediate climbing right turn over the runway and join the missed approach course.**

For additional practice: “Cessna 976SP, cleared direct TFD, maintain 6000 until crossing TFD, you are cleared for the ILS30C into KIWA.” Finger fly and explain every step of how you would fly this approach:
This approach offers a few nuances for further questioning:

- Are the DME fixes based on DME from the localizer or the VOR? **VOR.**
- On the localizer approach, to what altitude would you descend after crossing SNOWL? **1940.**
What if you never switched over to KIWA’s altimeter setting and were still using Sky Harbor’s? 2020, per the “*”.

When, if at all, can you descend further? If you have DME, then you can identify ORIYE so you can descend after crossing ORIYE; if you don’t have DME then you hold 1940 until the MAP: .6 DME from IWA.

You have DME and KIWA’s altimeter setting, to what altitude would you descend after crossing ORIYE? 1800.

What if you have DME but you don’t have KIWA’s altimeter setting, what is your MDA now? 1880, per the notes.

For additional practice, use a similar clearance for an approach starting at SLI for the ILS30 into KLGB:
Additional nuances to address:
What does the black square symbol with the white letter “C” inside it next to the circling mins indicate?  Expanded circling mins.

How can you tell that runway 30 has a displaced threshold?  The connected-ovals symbol crossing the runway threshold in the airport sketch.

If you’re landing on this airport at night, which lights represent the beginning of where you’re permitted to touch down?  Green line of lights called runway end/threshold lights.

For additional practice, try the VOR-B into KPGA starting at PGA:
The approach above is unique in that it is an on-field VOR approach and therefore does not have a depicted FAF/maltese cross. Because of this, some additional questions should include:

- What is your FAF on this approach? The equivalent would be, re-established inbound on the approach.
When will you configure? Generally, re-established inbound.

Why are only circling mins depicted for this approach? Either because the approach course is not aligned within 30 degrees of the runway, or because more than a 400 ft/nm is required on the final approach course. In this case, the latter. Put differently, circling is likely.

Why is there no runway specified in the title of this approach? Same as the answer to the previous question: either it's not a straight in approach or the descent gradient exceeds 400 ft/nm.

Do you have to circle to land on this approach (because only circling mins are published) or could you land straight in if you can descend in time to make a normal descent? Straight in is approved.

Icing (IR.I.C.S5 and IR.I.B.K3i)

The following is an example series of scenarios and questions that an instructor can use to test a student’s icing knowledge:

- You’re about to fly a new airplane for the first time, how can you determine whether it’s certified to fly into icing conditions? Section 2 (Limitations) of the POH.
- Is our aircraft (C172) certified to fly into known icing conditions? No.
- What does the FAA consider to be known icing conditions? The AIM defines known icing as “atmospheric conditions in which the formation of ice is observed or detected in flight”. However, an FAA letter of interpretation clarifies known icing to be: when a “reasonable and prudent” pilot would determine that, along the proposed route and altitude, the weather information indicates that ice would form on the plane.
  
- At times enroute the temperature is expected to be around 5 degrees and it looks like you’ll be flying through some clouds. What’s something you would certainly need to check during your preflight that you typically wouldn’t if you were just preflighting for a local practice flight on a clear day? Pitot heat.
- During your preflight you notice that there’s a small amount of frost on top of the wing that hasn’t melted yet. You’re practically certain that by the time you’re finished with your run-up that it will have melted. Would you start the plane up and proceed with your flight? No, terrible ADM, you’ll have taken off without confirming that the plane is free of ice.
- You’ve just departed KIWA on runway 30L. After departure you followed your IFR clearance which was to turn left heading 120 and climb and maintain 5000. You enter the clouds at 3000ft MSL and immediately start picking up structural icing. Where would you expect this ice to form first?
- What are you going to do? Declare an emergency, turn on all of your anti-icing equip (pitot heat, which should’ve been turned on well prior to entering the clouds in order to give it time to heat up), descend below the clouds, rejoin the VFR traffic pattern and land.
Let’s say that after declaring an emergency, tower tells you to continue your climb, that they need the airspace clear so that Allegiant can takeoff. What are you going to do? You’ve declared an emergency. Descend anyway.

Up at cruising altitude your OAT reads 4 degrees C. You see some stratiform clouds up ahead in about 5 miles, it looks like you’ll be in them in a few minutes. What are you going to turn on? Turn on the pitot heat, give it plenty of time to heat up.

Is pitot heat intended to be anti or de-icing? Anti. What’s the difference? The former is intended to prevent ice from forming, the latter removes ice that has already formed.

You’re enroute and it’s raining and the OAT reads -2 degrees C. What’s the concern here? Freezing rain/supercooled water droplets.

What kind of ice would form when the rain hits the plane? Clear or glaze ice.

What is the most dangerous type of airframe icing? Why? Clear or glaze ice, because it’s heavy, hard to see, changes shape of airfoil, disrupts lift characteristics, and spreads out over parts of the wing that are un-equipped with anti/de-icing features.

Further along on your flight the temp rises to +2 degrees C and you re-enter the clouds. Is it still possible to pick up airframe icing even though the temp is above 0? How? Yes, from aerodynamic cooling. Also, the exterior of the plane, due to wind chill, is generally colder than the ambient air temp.

On the arrival into your destination airport you’re in IMC with the temperature around freezing. You find yourself having to add more and more nose-up trim in order to relieve control pressure. You extend flaps and suddenly the nose drops. What just happened? Tailplane stall.

How do you recover? Pitch up, reduce throttle, retract flaps, i.e. reduce negative lift on the tail.

You’re in the clouds descending into an airport and the OAT is approx 0 degrees C. You notice your airspeed increasing as you descend despite the fact that you haven’t increased pwr or increased your rate of descent. What do you think the problem is? Blocked static.

What are you going to do? Use alternate static.

Where is this alt static air being taken from? Inside the cabin.

What indications will you get on your pitot/static instruments when you use the alt static? ASI and altimeter will show a small increase/climb. VSI will momentarily jump up a bit then return to 0.

So you’ve picked up some structural icing. What will you change about your approach to land, if anything? Increase approach speed, and don’t extend the flaps.

Area of Operation II. Preflight Procedures

Task A. Airplane Systems Related to IFR Operations (The task was addressed almost entirely in the IR.I.C.S5 icing scenario in the Cross Country Flight Planning task, as well.)
During a climb in IMC with the temperature around 0 you notice the airspeed oddly increasing. What do you think is going on here? Ram air and drain holes are both iced over.

Enroute you’re in IMC with the temperature around 0. Your KIAS gradually drops to 0. Why did this happen? Ram hole is iced over, drain is open.

How does the pitot heat work? There’s a heating element (essentially a wire coil that partially resists electric current and the resistance leads to heat) inside the pitot tube that heats up when supplied with electricity. This heats up the metal pitot tube that surrounds it.

**Task B. Airplane Flight Instruments and Navigation Equipment**

For each flight instrument and nav instrument students should be able to answer these questions:

1. How does it work?
2. What does each marking on the instrument mean?
3. What are its limitations?
4. How would you know if it were inoperative?

Below are some additional, more specific questions about the flight/nav instruments that tend to trip up students:

- On the Attitude Indicator, is the gyro attached to the artificial horizon/ground-sky card or to the miniature airplane? The artificial horizon. Just like the actual horizon, the artificial horizon doesn’t move and the plane rotates around it.
- What Attitude Indicator design feature keeps the gyro upright and prevents it from precessing? Pendulous veins.
- Does the VSI have an aneroid wafer or a diaphragm? Diaphragm.
- Does it expand or contract during a climb? Contract.
- What do the crosshatches represent on an Altimeter? Below 10,000.
- What is the difference between a Turn Coordinator (TC) and a Turn and Slip Indicator (TSI)? TC shows rate of roll then rate of turn; TSI shows only rate of turn.
- What enables the TC to show rate of roll? 30 degree canted gyro.
- Let’s say you’ve lost your AI. You’re in a standard rate turn to the left per the airplane on your TC. You start leveling the wings. What will your TC show you when you’re wings level? It shows rate of roll first, so because you’re rolling right it will show approximately a standard rate turn to the right. At this point stop rolling right and the wings on the TC will level...because you’re no longer rolling or turning.
- While establishing a fwd slip to land on final, what will the needle and ball on a TSI show? The needle will continue to point straight up and down. The ball will show a slip.
- You’re turning to the left and the ball falls to the inside, is this a slip or a skid? Slip.
- What are the definitions and causes of a slip and a skid? A slip is when you have too much bank for your rate of turn, causing the ball on the inclinometer and the tail of the
aircraft to slip inward (in the direction of the bank). A slip is generally caused by adverse yaw and insufficient rudder in the direction of the turn. A skid occurs when your rate of turn is too great for the angle of bank, causing the ball (and the tail of the airplane) to swing to the outside. This is caused by too much rudder in the direction of the turn.

- Describe how the compass works as well as all of its errors.
- While heading 360 you accelerate. What will the compass heading indicate? It will continue indicating north. The acceleration/deceleration errors only apply to east and west headings.
- You’re southbound and you make a left turn with the goal of rolling out on a compass heading of 360. What will the compass read when you should roll wings level in order to roll out on the 360 heading? 030. Undershoot north by 30 degrees.
- What if you want to roll out on a heading of 060 instead? Undershoot by 10 degrees. (Ultimately goes down to 0 under/overshoot when rolling out due east or west.)
- Where does the 30 degree under/overshoot correction for rolling out on 360/180 headings come from? Is it always 30 degrees? The formula is 15 degrees plus half the latitude. So no, this number can vary depending on your latitude.
- On conventional instruments, what indication on the HSI shows that you are not receiving a navigation signal? Nav flag.
- What about on the G1000 HSI? Missing course deviation bar.
- What is the range of DME?
- How can you tell if there is DME co-located with a VOR?
- Can we get DME from a TACAN VOR?
- When and where is a Mode C transponder required?
- How is a marker beacon depicted on an approach plate?
- What are the types, their colors, sounds, and what does each represent along an approach?
- What is an LOM?
- How exactly will you be notified that you’ve crossed the OM if flying glass?
- What are the components of an ILS? Guidance (LOC and GS), Range (DME, MBs, Time), and Visual (Lights)
- Where are the localizer and glideslope ground equipment located on the field?
- Where is the localizer and glideslope antenna on the aircraft?
- How many times more sensitive is a localizer than a VOR?
- You are full scale deflection on the localizer at the approach end of the runway. Approximately how far off course are you?
- When on glideslope, by approximately how many feet AGL do you cross over the approach end of the runway?

Task C. Instrument Flight Deck Check

Required Equipment
List out all of the equipment required for an IFR flight at night. As you do so, tell me how you can confirm that each item is operational.

What equipment is required for an IFR flight during the day? ATOMATOFLAMES and GRABCARD. But NOT FLAPS, which would only be required during a night flight, either VFR or IFR.

Can the distance on our GPS substitute for the DME required at altitudes above FL240? Yes.

Take me through your after-start instrument check. What do you look for and why?

Inoperative Equipment

Let’s say it’s marginal VFR outside due to, say, 4sm visibility. You’re planning on a VFR flight out to the practice area to shoot practice approaches. You get in the plane and see that there’s an “INOPERATIVE” sticker right under the alternate static knob. Take me through your process for determining whether you would proceed with the flight. Go down 91.213(d)(2). Not required by: Part 91, TCDS, ADs, the Equipment List, or by the Kinds of Operations Equipment List (KOEL). In fact the KOEL specifies that the Alternate Static is not required for VFR flights. However…it is required for IFR. Because the weather is MARGINAL, there’s a chance that you may have to pick up an IFR clearance on this flight, in which case you’d need an operating alternate static source. Even if the conditions never became IMC, flying around in marginal VFR without an alternate static would demonstrate poor ADM. Make a no-go decision.

Scenario #2: This time you’re flying on an IFR flight plan at night in VMC. After starting the engine, you turn the cockpit lights on and notice that the light is out on your standby ASI. Take me through your process for determining whether you would proceed with the flight. Go through the same process that is detailed in the answer to the previous scenario. On the KOEL, the internal lighting for the ASI is listed as required for IFR night operations. Make a no-go decision and squawk the plane. This fix is not listed under Part 43 for preventative mx, so appropriately rated mx personnel must perform the mx and update the mx logs prior to an IFR night flight taking place.

Area of Operation III. Air Traffic Control Clearances and Procedures

Task A. Compliance with Air Traffic Control Clearances

Lost Coms

The following is your clearance to KABQ, be ready to copy: “Cessna 976SP, cleared to Albuquerque International Airport via, PHX ONE DEPARTURE, V95, INW, V12, ABQ, climb
maintain 5000, expect 11,000 in 10 minutes, Phoenix Departure frequency 123.7, squawk 4141."

Read that back to me.

After departing IFR on Runway 30L you fly immediately into IMC and lose coms, what are you going to do? Take me through your lost coms process here."

1st troubleshoot (provide examples). 2nd squawk 7,600. 3rd continue flying your assigned route (at this point the ODP) and fly the highest of your Minimum IFR Alt (you're not off-route, so in this case it's the 4,000 listed on the ODP), your expected alt (but only if the time has elapsed, which in this case has not), and your assigned alt (5,000). So climb to 5,000 until 10 minutes passes, then climb to 11,000. Maintain 11,000 for the remainder of the route, as this is the highest of the Min IFR/Expected/Assigned for every segment.

Different note: if you’d lost coms after having been vectored off of the DP, then you are off route, so your Min IFR Alt becomes the OROCA during departure and enroute phases of flight, or, the MSA once inbound on an approach and within the MSA’s range. Then adjust the altitude upward so that it conforms with the IFR hemispherical rule. Route-wise, if you lose coms after having been vectored off-route, proceed direct to the fix or airway that you are being vectored to join.

You’re still lost coms in IMC when you get to the end of your route. How will you descend from your enroute altitude and land the plane? (Everyone knows that IFR lost com procedures are as gray as anything in aviation. Every FSDO, every examiner, every instructor . . . they all have different interpretations and expectations when it comes to 91.185, and in particular, procedures surrounding how and when to descend and land at the destination airport. The key here is to abide by the regs when they are clear, to have a plan that will get the plane safely on the ground, and to demonstrate good ADM throughout. The following are 3 valid options:)

1) The Literal-Interpretation-of-the-FAR’s Option.

Here’s what 91.185 says about leaving the clearance limit, defined in the glossary as “the fix, point, or location to which an aircraft is cleared when receiving an ATC clearance” (therefore our clearance limit would be KABQ): “(ii) If the clearance limit is not a fix from which an approach begins (like KABQ, in our case), leave the clearance limit at the expect-further-clearance time if one has been received (one hasn’t, in our case), or if none has been received (we don’t have an EFC, so this next part applies to us), upon arrival over the clearance limit (KABQ), and proceed to a fix from which an approach begins (an IAF) and commence descent or descent and approach as close as possible to the estimated time of arrival as calculated from the filed or amended (with ATC) estimated time en route (time off the ground + filed ETE). How would this play out in reality? After arriving at ABQ VOR, you would have to use the GPS to navigate off-route over the airport (abide by the MSA), then upon crossing KABQ head to an IAF (say, BIBQU
for the RNAV3 if you expect the winds to favor runway 3; or head to JILUG for the RNAV8 if you expect runway 8), preferably use IAF’s with holds so that you have the option to hold if you arrive early, then start your descent at your ETA.

2) **The SDL FSDO Option Circa 2016.**

During an examiner meeting at the FSDO a few years ago, the lack of consistency surrounding 91.185 procedures on checkrides was raised. It was determined that applicants should end their IFR XC routes at an IAF, hold at that fix in the event that they arrive prior to the ETA, then descend along the approach at the ETA. This matches up with the FAR’s perfectly if “clearance limit” were instead defined as being the final fix along the assigned route (which very well could’ve been the FAA’s intention when they wrote 91.185).

3) **The Emergency Option**

Being lost coms in IMC while descending into an airport environment could certainly be considered an emergency. 6-4-1 in the AIM states the following: “It is virtually impossible to provide regulations and procedures applicable to all possible situations associated with two-way radio communications failure. During two-way radio communications failure, when confronted by a situation not covered in the regulations, pilots are expected to exercise good judgment in whatever action they elect to take. Should the situation so dictate they should not be reluctant to use the emergency action contained in 14 CFR Section 91.3(b).” This option would have the pilot squawk 7700 and do what he or she needs to do to get the plane safely on the ground. As long as you have ended your route at a feeder fix or IAF, start your descent whenever you arrive at the IAF.

- At what time are you trying to get to an IAF? Your ETA
- How did you calculate your ETA? Time off the ground + filed ETE
- What will you do if you arrive at the fix early? Hold until your ETA (unless you’ve chosen The Emergency Option). Hopefully you were smart and ended your route at a fix with a published hold associated with it.
- As you approach the INW VOR you break out of the clouds, visibility is at least 5sm in every direction. What are you going to do? Maintain VFR and descend and land at Winslow Regional Airport.
- Let’s rewind back to KIWA. Same clearance except now it’s clear skies at KIWA. You’re departure leg and you lose coms so you troubleshoot, squawk 7600 . . . and then to what altitude do you climb? What route do you fly? Fly 500ft above the highest TPA (in this case the turbine pattern is 3,100, so climb to 3,600), join the traffic pattern, and look for light gun signals.
- How can you tell if you have a stuck mic? “TX” appears permanently next to the frequencies.
What would you do if you had a stuck mic while climbing out of KIWA in VMC on an IFR flight plan? Try to fix it first. Then announce to twr that you have a stuck mic and that you’d like to turn around, join the pattern, and land. Switch off frequency (123.45 is a valid option) so that you’re not clogging up the radios. Look for light gun signals. You can switch back to 120.6 periodically in order to acknowledge the signals or to announce intentions.

Task B. Holding Procedures

- Draw the hold for the _____ ODP. (Good airport options are HII, PGA, RAL, and ABQ.)
  - What hold entry will you use?
  - Simulate the call you would make to ATC as you cross the holding fix.
- You’re told to hold at ____ thousand ft. What is your max airspeed?
  - How long will you fly the inbound leg?
- Draw this hold on the board: “Hold over the IWA VOR on the 180 radial, right turns.”
  - Let’s say there’s a crosswind from the left/west that forces you to fly heading 350 in order to maintain the 360 inbound track. What heading will you fly on the outbound leg? Triple the wind correction, so 210.
  - What is the risk involved in not tripling the correction on the outbound leg? You could end up on the unprotected side of the hold, as the wind will push you toward that side during the turns.
- Draw this hold: “Cessna 976SP, hold Southeast of the 10DME fix on the IWA 330 degree radial, left turns.”
  - Are the left turns here standard or non-standard?
- After holding for awhile, you’re now running rather low on fuel. If you have to wait much longer you think you’ll have to declare an emergency. Without declaring an emergency, what is something that you could declare to ATC that might help them to realize you’re a priority and that they should work to get you on the ground without further delay? Declare “minimum fuel.”

Area of Operation IV. Flight by Reference to Instruments

Task A. Instrument Flight (Many element(s) in this task were addressed earlier in the Airplane Flight Instruments and Navigation Equipment task.)

- Describe how you would use the primary/supporting technique during straight and level flight, climbs, turns, and descents.
- Describe how you would use the control and performance technique during straight and level flight, climbs, turns, and descents.
- You’re enroute and ATC says, “Cessna 976SP, climb maintain one three thousand feet, expect lower in approximately 45 minutes upon crossing INW.” What’s your response? Something to the effect of: “Unable, we do not have supplemental oxygen.”
You’re cleared for the visual while flying at night. While approaching the airport you accidentally fly into a cloud. First of all, what is the major instrument-flight principle you should keep in mind in order to prevent spatial disorientation? Trust your instruments.

Your aircraft’s flashing lights start making you feel nauseous. What is this called and what are you going to do about it? Flicker vertigo. Turn off the strobes.

The runway you’ve been cleared for is upsloping and narrow. What illusion should you expect as you turn onto final? Expect to feel like you’re higher than you actually are; pilots fly low approaches with narrower-than-usual and/or upsloping runways.

What should be done to prevent flying a lower-than-usual approach? Follow VGSI.

Task B. Recovery from Unusual Flight Attitudes

Which instruments should you reference for unusual attitude recoveries? Turn Coordinator (the rate-of-turn indicator part) and the Airspeed Indicator.

Why? They don’t tumble, as opposed to the HI and AI which do. An inop AI, in particular, might be the reason you’re in the unusual attitude in the first place.

Does this change in glass cockpits? If so, how? Yes, there are no spinning gyros that can tumble in a G1000, therefore the AI can be utilized as well.

You’re in the soup getting bounced around and the stall horn sounds. You look at your turn coordinator and the miniature airplane is showing a turn to the right. What is your recovery procedure?

Why is reducing angle of attack paramount in this situation? To prevent a stall.

Your vacuum system fails but you don’t notice. So as your Attitude Indicator slowly starts to droop, you follow it. Your airspeed is climbing and you look at your turn coordinator and it’s showing a turn to the left. What is your recovery procedure?

Why is it important to level the wing before pitching up? To unload the aircraft first.

Area of Operation V. Navigation Systems

Task A. Intercepting and Tracking Navigational Systems and Arcs

Show the student a picture of either an HSI with the CDI deflected, or, an HI and an OBI with a deflected CDI. Draw a VOR on the whiteboard. Hand a model plane to the student and tell them to place the plane in its position relative to the VOR per the indications on the instruments.

ATC instructs, “Fly heading ____ to intercept the IWA ____ radial and track (inbound/outbound)”. Show me how you would use the nav instruments to accomplish this, then show me how this would look on the board with the model plane.

After crossing the VOR ATC says, “Cessna 976SP, track outbound on the IWA _____ radial, at 10DME arc (direction)bound.” Show me step by step with the instruments how you would fly this, then show me on the board with the model plane how this would look.
Task B. Departure, En Route, and Arrival Operations *(knowledge elements addressed earlier in XC Flight Planning task due to IR.I.C.S4)*

- You’re on an IFR flight plan in VMC. ATC has given you a heading and altitude to fly. You spot an aircraft that appears to be same altitude, heading in your direction. Whose ultimate responsibility is it to maintain separation from this aircraft, yours or ATC's? *Yours.* When meteorological conditions permit, regardless of type of flight plan or whether or not under the control of a radar facility, the pilot is responsible to see and avoid other traffic, terrain, or obstacles.
- When it comes to see and avoid, why is it more important to keep attention outside the airplane scanning for traffic, as opposed to relying more heavily on TIS or ADS-B? *These features won’t pick up aircraft that are not equipped with working transponders, or in the case of TIS, aircraft out of radar coverage. Also, attention should be outside for terrain avoidance.*

Area of Operation VI. Instrument Approach Procedures

Task A. Nonprecision Approach

- You’re flying an RNAV/GPS approach. Take me through all the annunciations, modes, and scaling that you can expect during the various phases of the approach.
- What needs to be loaded at the end of your flight plan for all that sequencing and scaling you just described to occur? *An approach.*
- Some approach plates list multiple types of mins, e.g. LP, LPV, LNAV, LNAV/VNAV. How will you know to what mins you can descend? *The approach mode annunciator on the GPS unit will notify you of which minimums you may use.*
- As you approach the FAF, RAIM integrity becomes compromised. What signifies this to the pilot in a G1000 equipped aircraft? “LOI” will appear on the HSI, meaning GPS integrity insufficient. You could also get a “RAIM not available between FAF and MAP” message.
  - What indication would you get in a G430 equipped airplane? *A yellow “INTEG” warning.*
  - If you get one of these indications/messages before the FAF, what will you do? *Don’t descend, just continue tracking the approach laterally and go missed at the MAWP.*
  - What about after? *Same procedure, i.e. stop descending, continue tracking the approach, go missed at the MAWP.*
- Let’s say “LP” pops up on the HSI as you approach the FAF. How will you expect the scaling on final to be different from if “LNAV' were showing? *The scaling on an “LP” approach becomes more and more precise and sensitive as the airplane approaches the runway (aka angular scaling), i.e. it acts like a localizer. LNAV, on the other hand, maintains a .3 lateral scaling on final all the way to the MAP (aka linear scaling).*
What if, after you cross the FAF, ATC informs you that the ceiling is now 001 BKN with 1/4sm visibility. Can you legally continue the approach? Under part 91, yes.

Would you? Why or why not?

What should you do to the CDI needle when you’re flying a localizer back course? Why?

Fly the tail of the needle in order to prevent reverse sensing.

Task B. Precision Approach (Knowledge and risk management element(s) addressed earlier in the XC Flight Planning task.)

Task C. Missed Approach (Knowledge and risk management elements largely addressed earlier in the XC Flight Planning task.)

While holding the MDA you cross the VDP without the runway in sight. Do you go missed or continue holding the MDA until crossing the MAP? Why? Best procedure is to hold the MDA until the MAP. If you get the runway environment in sight after the VDP but before the MAP, you retain the option to circle to land, either straight in or opposite direction depending on the wind. And when you’re flying slower aircraft, it’s still feasible that you could make a straight in descent using normal maneuvers after crossing the VDP. Technically, however, the only requirement here is that you don’t TURN (provided the missed approach procedure involves an initial turn) until crossing the MAP; initiating the missed approach CLIMB prior to the MAP is permitted.

On an RNAV/GPS approach, when you cross the MAP will the GPS unit sequence automatically to the missed approach segment, or do you as the pilot have do something manually to trigger the GPS unit to sequence properly?

What happens if you don’t do this?

Unless stated otherwise, what minimum climb gradient is required on a missed approach? 200 ft/nm.

You’ve gone missed after not being able to get the runway in sight. When you call up ATC to report having gone missed they tell you to say intentions. What are your request options here?

On an approach, you break out of the clouds around 1,500ft AGL with the runway clearly in sight. During the landing roundout a gust of wind knocks you off centerline causing you to reject the landing. What are you going to do? No need to go missed here, you still have the runway in sight. This is a simple go around. Just climb to TPA, turn around and join the pattern, and land.

Task D. Circling Approach (Knowledge and risk management elements largely addressed earlier in the XC Flight Planning task.)

Which approach category are we, and what determines it?

List the protected radii for all the approach categories?

What exactly does it mean to have a 1.3 nm protected circling radius? I.e. radius around what?
Let’s say you have a tail wind during your descent and your groundspeed is 105kts, which category would you use?

At what point in the traffic pattern do you typically leave your circling mins in order to start your descent to land? **On base or final.**

Is there a way to circle to land straight in? If so, how?

When might you use this?

Let’s say that you fly a right downwind way too tight out of fear of losing sight of the runway. This shortens your base dramatically, ultimately causing you to overshoot final. In an attempt at expediting your right base-to-final turn you start putting in more and more right rudder (so in the direction of your turn) which causes the nose to drop toward the earth. You correct by pitching back and using left aileron… why is this situation critical, what could this scenario lead to? **A cross-controlled stall, then into a spin.** Given the low altitude, there would be minimal room to recover.

Which direction would we spin? **The plane will spin in the direction of the yaw/rudder application, so to the right.**

How would you attempt to recover from this spin?

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**Task E. Landing from an Instrument Approach**

You break off your VOR RUNWAY 5 approach in order to circle right traffic runway 23. Wind is reported to be 320 @ 15. Show me how this wind is going to affect the way you fly your circle-to-land pattern, your final approach, the landing, and the roll out.

While circling at night you see blue lights on the ground. What do these represent?

Within how many degrees of runway centerline and how far out from the runway threshold do VASIs and PAPIs provide obstacle clearance? **Within 10 degrees either side of centerline for both, 4nm out for VASI, 4sm for the PAPI.**

You touch down on the runway at night and tower tells you to roll out to the end of the runway and exit onto taxiway ___. Take me through the edge lights and centerline lights that you will see as you taxi down the runway.

Question the student on the signs and markings they will pass while taxiing to park.

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**Area of Operation VII. Emergency Operations**

**Task A. Loss of Communications** *(Knowledge and Risk Management elements addressed fully in the “Compliance With Air Traffic Control Clearances” task.)*

**Task B. One Engine Inoperative (Simulated) during Straight-and-Level Flight and Turns** *(Multi-Engine Only)*

**Task C. Instrument Approach and Landing with Inoperative Engine (Simulated)** *(Multi-Engine Only)*
Task D. Approach with Loss of Primary Flight Instrument Indicators (Knowledge and Risk Management elements addressed largely earlier in the “Airplane Flight Instruments and Navigation Equipment” task.)

- Your AHRS just failed. Which instruments will this affect, and what indications/notifications will you receive? The AI, rate-of-turn indicator, slip skid indicator, and HI will all fail. A large red “X” will appear over the AI along with the words “ATTITUDE FAIL” in yellow letters. A red “X” will also appear over the HDG.
- Can you still shoot precision approaches? Yes. Glideslope and localizer will still function properly. Use stby instruments along with the GPS course on the MFD and compass for heading.
- Nonprecision? Yes.
- Will you have a heading indication on your HSI? If not how will you know your heading? No, this fails if the AHRS or magnetometer fails. Use the GPS course, GPS moving map, and the compass for heading info.

- Your ADC just failed. Which instruments will this affect, and what indications/notifications will you receive. The ASI, altimeter, VSI, TAS, and OAT will fail. They will all display a red “X”.
- Can you still shoot precision approaches? Yes. Use stby instruments.
- Nonprecision? Yes. Use stby instruments.
- Are you still mode C? If not, what mode are you now? Why is this important to recognize? No, you are now mode A. This means you can no longer operate in areas that require a mode C transponder without permission, so your flight plan should be adjusted accordingly.

- If the ram air hole and/or static port on a G1000 equipped aircraft become blocked, will you see red “X”s over the affected instruments? Or will the pitot/static instruments function abnormally like they do with pitot/static blockages in conventional aircraft? No red “X”; the instruments will behave like they do after blockages in conventional aircraft. The “X”s only appear after the equipment itself malfunctions or breaks.
- You’ve just been cleared for the ILS approach into KCGZ and the AHRS fails as you approach TFD. You’re on an IFR flight plan in IMC. Is this a required call? Yes.
- Simulate this equipment malfunction report to ATC.

Area of Operation VIII. Postflight Procedures

Task A. Checking Instruments and Equipment

Note: If any mx issues occur during the flight, applicants need to be sure to squawk the plane upon return from the flight. This is still part of the practical test/EOC.
Why is it important to conduct a thorough post-flight inspection?

Describe what you look for during your post-flight inspection?

Why is it important to placard inop equip “INOPERATIVE” and document discrepancies?

Safety of Flight

Stall and Spin Awareness. *(Addressed in the Circling Approach task.)*

Use of Checklists. *(Demonstrated in flight.)*

Use of Distractions. *(Demonstrated primarily in flight.)*

- Ask the student for the flight times while taxiing back to the ramp. Student should respond, “Sterile cockpit.”
- During taxi, ask the student to show you EXACTLY where the aircraft is on the taxiway diagram.

Positive Exchange of Flight Controls. *(Demonstrated in flight.)*

ADM, Risk Management, CRM and SRM. *(Demonstrated largely in flight.)*

- Define ADM, Risk Management, CRM, and SRM.
- What are some models a pilot can use by way of practicing good ADM?
- Explain the 5P, 3P, DECIDE, IMSAFE, and PAVE models/checklists. In particular, explain how each can be utilized in a way that contributes to good ADM.
- The door just popped open after takeoff. Use the DECIDE model to address this situation. Alternate scenario: Enroute you start picking up trace amounts of rime ice on the leading edge of the wing. Use the DECIDE model to address this situation.
- What are the hazardous attitudes? Provide an aviation related example of each.

Written Exams

Applicants should research and learn everything they can about the subjects corresponding to each PLT code. Some are unfortunately vague, but many aren’t. E.g. no excuse for a student not being able to determine a plane’s position given a set of nav indications if the PLT subject reads, “Interpret VOR / CDI - illustrations / indications / position.” No excuse for a student not being able to describe the ASI markings if the PLT subject says, “Interpret speed indicator readings.” Etc.