

PHILIP GREENSPUN: So remember, as VFR pilots, you're actually going to be doing stuff that is in some ways more challenging than what airline pilots do, because you're always trying to keep clearances from clouds that the IFR pilots don't care about. And if you're flying a low performance airplane, you're also dealing with flying through the weather instead of just going on top of it. So while you're the VFR only pilot, these non-local flights, really pay attention to weather.

Airspace, go and study this a little bit before the exam. Here are the different kinds.

Remember Class A is up high. You need an instrument clearance. Class B is around the biggest airports. Class Charlie's around Manchester, New Hampshire. And D is for Hanscom. And E is everywhere else.

OK. The goal for the basic VFR weather minimums is to make sure that an IFR plane coming out of the cloud has time to see and avoid you, because the air traffic controller's job is to separate IFR airplanes from each other. It's not to separate IFR and VFR traffic. They will tell you about them. But you're responsible as a VFR pilot for staying reasonably clear of clouds. So just review these cloud clearances.

Class E, you can see that this is a pretty good one to remember for the test-- 500 below, 1,000 above, 2,000 horizontally. If you're really low in Class G airspace, you can do some crazy stuff. Again, I don't think that this is really there to let you go from Boston to Chicago scud running with one mile of visibility and just clear of the clouds. I think it's more to enable people to say, take off and do pattern work at their home airport in some kind of little tiny, very slow airplane.

TINA SRIVASTAVA: Pattern work is just what we were drawing on the chalkboard, flying the traffic pattern at an airport.

PHILIP GREENSPUN: OK. So again, yeah, just review the presentation or the FAA book so you know your weather minimums. Yeah, incredibly at night for Class G, getting back to that pattern work thing, if you want to go out and practice takeoffs and landings at night, if you stay within half a mile of the runway, you can go right down to one mile of visibility and right up to the clouds.

OK. Here's that chart again. Learn it. Know it. A special VFR-- actually if you're at Hanscom and the weather is below the basic minimums and you say you want to do some pattern work anyway either in a helicopter or in an airplane, you can request-- they can't offer it, but you can request-- a special VFR clearance.

And they'll say, OK, there's not too much IFR traffic right now. So you take off and land and do your stuff. If it's at night, you'll have to be an IFR pilot basically.

Cirrus publishes this good Personal Minimum Matrix. I wouldn't say that you have to adopt their specific numbers. But I think their way of thinking isn't bad.

So notice they're saying if you are, let's see, an average pilot, so you've got 10 IFR hours within the last 90 days, you've done one not on autopilot with approach within the last 90 days, well, go over here and go down to a 500-foot ceiling and two miles of visibility. Don't go down to the published approach minimums, which are designed for a two pilot professional crew unless you know you're very current, you've done a whole bunch of flying in the last 90 days.

Anyway, so they just try to fit-- they try to say, how challenging is this flight, how experienced are you in general, how experienced are you recently, and come up with some numbers. So again, you can pull this out of the slide.

**TINA
SRIVASTAVA:**

And just to clarify what we're talking about when we're talking about personal minimums, so there are minimums that you have to know for the FAA exam like we were just talking about in terms of the minimum visibility that must be there in order for you to fly in certain classes of airspace. But then there are also minimums that you set on yourself to be a safe pilot and to be knowledgeable about what your restrictions and what your experience and what your currency is.

So for example, we talked about crosswind. So there isn't an FAA reg necessarily. As long as it's within your aircraft's operating conditions, there's no specific reason why a 15 or 20 knot crosswind is a problem.

But maybe you're not very comfortable with it. You haven't done a lot of slips recently. You're still getting used to your aircraft.

So you might say a smaller crosswind or gusting winds would be appropriate for you to land it. So that's setting a personal minimum on yourself. And this is an example of personal minimums based on your experience and your currency.

**PHILIP
GREENSPUN:**

Yeah, and the FAA will never suggest this. But the appropriate escape from a challenging situation that you think might be on the edge of safety is to rent the five seat SR22 instead of the four seat SR20 and go with an instructor. So it's as easy as that.

OK, remember, this was confusing. They used category in class to mean two totally different things-- forgetting your pilot's certificate. The category is there on the left, something like an airplane versus a rotorcraft. And the class would be multi-engine land versus a helicopter category class.

But then for aircraft, they do something totally different. And they say category would be normal category or acrobatic. And class would be airplane. So they may ask you about this just because they like to torture you.

The four forces of flight, remember these. Tina talked about them. If you're just bombing along, straight and level, not accelerating, then they're going to all be in balance, because F equals ma . a equals whatever-- can't remember the math. Anyway, F equals ma . I know that much.

Remember these three axes. They'll ask you about this on the test usually in combination with some other stuff. So rotation about the vertical axis is going to be yaw.

Rotation about the-- this is complicated. Let's see. Rotation about the lateral axis is going to be pitch. Rotation around the longitudinal axis I believe will be roll.

So that's a little bit confusing since-- yeah, here we have it-- pitch, roll, yaw. So think about it. Roll is really the lateral motion. But it's around the longitudinal axis. So don't get confused there.

Remember why Johnny Cessna can't hover is also a limit for-- this limits everything basically. The stalling angle of attack is why you need a helicopter if you want to hover. And it is why you need to maintain a reasonable airspeed when you're landing. And it's also-- it limits your runway. If you had an airplane that didn't stall till it reached some crazy angle of attack, you could probably take off and land in 50 feet.

TINA
SRIVASTAVA:

Right. And remember that we talked about even a paper airplane can generate lift. So it's not about the shape of the cross section of the wing that is making you be able to generate lift. It's the angle of attack and your ability to deflect air molecules down. That's what generates lift. That shape of the airfoil is just what Philip was saying. That allows you to have the stall speed be lower.

PHILIP

All right, so remember your left turning tendencies. Mostly you just remember that you need

GREENSPUN: right rudder.

TINA
SRIVASTAVA: And a couple questions had come up on gyroscopic procession. So I added two videos about gyroscopes to help you understand gyroscopic procession and why that force is applied 90 degrees later. And so those are really fun videos you can look at. There's in this slide deck called Q&A and Review.

PHILIP
GREENSPUN: OK, so let's go back to the altitudes. So true altitude is your actual height above sea level. This is what's important if you want to get over a mountain, because the altitude on the chart for the mountain is also the actual height above sea level. Indicated is what your altimeter shows.

If you're below 18,000 feet and it's not some insane temperature and you've got a current altimeter setting from air traffic control as you fly along with VFR advisories, they'll keep updating you with altitudes. If you're not talking to ATC, you may tune in to the airports that you're flying over to get the altimeter there. If you have your correctly set altimeter, it should be pretty close to your true altitude. But and the GPS will give it to you as well.

All right, absolute height above the ground, I don't think that's ever really relevant. Pressure altitude is what you see if you tune your altimeter to 29.92. Density is critical for determining performance of both the aircraft and the engine. So that's a measure of how many actual molecules of air are there going to be in a 1-liter cylinder, for example.

Know your taxiway and runway markings. This has practical value and also test value. One easy thing to remember is, if you're driving along a taxiway in your aircraft, you will see yellow paint on a black paved surface. So that sign tells you what taxiway that you're actually on, just like the real world experience of yellow paint on black. Everything else is reasonably self-explanatory.

They probably-- even though if you're not an instrument pilot, they want you to know about this ILS hold short line. So if it's bad weather conditions and they're using the ILS, they don't want you going beyond there, because your metal airplane might interfere with the radio beams that are being sent up to landing IFR airplanes.

Remember L/D MAX for best glide speed. So all these climb speeds, glide speeds, et cetera, are driven off of the points at which the various drags reach a minimum, or a minimum per mile traveled.

Thunderstorms, the one thing you-- I hope you do remember is that everything's bad about convective clouds. Unstable air leads to cumulus clouds. They can become cumulonimbus clouds. And now you have a really bad hazard to aviation with terrible icing, terrible turbulence, maybe hail.

So the squall line, I think they sometimes ask about this on the test. The frontal band of thunderstorms are just-- it's hard to get around them. And you may have to go 500 miles out of your way to get around a cold front. Or hang out on the ground for a few hours and wait for it to pass.

TINA SRIVASTAVA: Also, just big changes in weather usually are not a good thing. So whether it's a big change in the barometric pressure, or as we saw from yesterday to today, a 40, 50 degree increase in the temperature is going to be accompanied by massive gusting winds. Today is not a good day to go flying.

PHILIP GREENSPUN: Yeah, although actually it might not just be the day. It might be how are we ferrying a helicopter from Los Angeles back to Boston. And there was a thunderstorm coming in. So we just landed in an airport.

It was probably gusting about 30 knots at the time, which isn't that bad for a Robinson, a four seat Robinson. Put the helicopter in a hangar. There's a huge storm. And two hours later, we took off in beautiful weather and continued our flight.

There is an airport usually every 10 or 15 minutes of flight time. So take advantage of that. If things are getting beyond your comfort zone, don't just blindly continue to your destination.

So remember, the lee side of mountains is where you can get a lot of turbulence and downdrafts. A little airplane doesn't have a whole lot of climb performance usually, especially up at higher altitudes. So be cautious about crossing big mountain ranges unless the winds aloft forecast is for very light winds indeed.

Icing, also super bad-- again, as VFR pilots, you shouldn't have to worry about this once you get into instrument flying, as I hope a lot of you will. This is really what limits your ability to travel around in a Piper Cessna or Cirrus during the winter and shoulder seasons.

Remember how to read the METAR. So this is back to Peachtree Dekalb Airport in Atlanta. So there sits the 16th at 1653, so about almost 5:00 PM in London Zulu Time.

Winds are variable at 4, 10 statute miles of visibility, overcast 6,000 feet. That's 6,000 feet above the airport, not above sea level. Temp's 14. Dew point's minus 7. Altimeter's 3015. Oh and in the remarks, it says the rain ended 46 minutes after the hour. There you have it.

All right, human factors summary-- so you are the weakest link. And if you develop some personal minimums, you'll be way ahead of the game. They should also factor in your recent experience, not just your overall level of flying.

And always remember that it's a big aviation community. There's a lot of people that are happy to go flying-- can send mail to the members of the MIT Flying Club and just take a copilot. That's how the airlines have cut risk almost to zero.

Magnetic variation, this is a topic that tends to snag people on the knowledge test. So just remember, you can re-derive it from the VOR if you ever get stuck. And east is least, west is best.

Deviation-- then don't get deviation and variation confused. So deviation, remember, is that tiny little correction that's printed right underneath the compass. Flight planning tip, you saw this slide earlier. Even if FAR 61 and FAR 91 allow it, it doesn't mean it's wise. So if you look at FAR 121 and FAR 135 for charter and scheduled airline service, they show you that there are some extra safety margins that can be built in.

Night flying advice you just heard. Remember, as the owner/operator, you're responsible for keeping the airplane airworthy if you do choose to go out and buy an aircraft. So these responsibilities are for most of you going to be on the flight school.

However, you're still the final authority as the pilot. And you can deviate from the rules in an emergency. And you only have to report the deviation if requested.

I think the feds like to ask this on the knowledge test, because the natural answer is, of course, you have to report the deviation. And I declared it an emergency, and I broke the rules. But you don't actually have to report that unless they ask you to.

**TINA
SRIVASTAVA:**

But even aside from an emergency, you're the pilot in command. Even if someone very assertively tells you to land and hold short or to fly straight to the numbers, which means don't fly the proper traffic pattern but land very quickly, or tells you no delay on the go because they want you to get out quickly, they have other jets, you can just say, unable. And they have to deal with it and make sure you're flying safely.

And if you, especially as a student pilot, need extra time or extra consideration, just add student pilot to the end of all your radio calls. And they'll give you plenty of room to make mistakes. But they might also make you sit there and fly a bunch of 360s while they land everybody else and then give you time to land.

PHILIP

GREENSPUN:

Yeah, so safety is not high tech. It should be probably. We should actually-- all the stuff that Michael showed you that's embedded in that DJI drone should probably be in these multimillion dollar aircraft. But it's not.

So in the meantime, since an airliner isn't actually that much smarter than a little Cessna, why is it safer? And if you take that perspective and just adapt all the things the airlines have done, you can make flying that little Cessna dramatically safer. So that means recurrent training. Maybe go up with an instructor every three months instead of the every two years that the FAA requires.

The instrument flying skills are really important for VFR safety. They make you a much better pilot at night, as we've just discussed, and even bombing around during the day. You'll be able to fly with about 5% of your mental energy instead of 50% if you are an instrument-rated pilot on a nice VFR day.

The two pilot crew and checklist is really the cornerstone of the airline safety system. So and you can take advantage of that as a GA pilot even though the FAA really-- about 5% of the FAA, which is the one you've seen and interacted with, is all about encouraging people to be single pilots. And 95% of the FAA is about forbidding people to operate single pilot.

Every part of the FAA that regulates the airlines and charters of sizable airplanes, they say no. Of course, you can't operate single pilot. That would be incredibly dangerous.

All right, so just remember, study a little bit about the Part 61 and Part 91 for learning to-- now, what does it take to be and maintain your status as a pilot or be able to exercise your privilege as a pilot. That certificate never expires. Part 91 is about what you can do with an airplane operated privately. And then there's this little corner over there under Title 49, Part 830, having to do with accident reporting and investigation.

If you want to get 100 on the FAA knowledge test, a lot of East Coast Aero Club customers seem to over-study. I see a lot of 95s, 97s, 98s, and 100s, actual 100s. Just reread the FAA

textbooks. I mean, they can't ask you anything that's not in one of their own PDFs. That includes the FAR/AIM, though, the regulations and the Aeronautical Information Manual. There are test prep books and online equivalents that are worth it.

To finish this course, actually, you can get this-- you'll be able to get-- actually, we don't even need to email you, because if you have the course homepage, you can see it here. You go to this King Schools thing. And you say you want to do 60 questions.

TINA 60 is the number of questions on the actual exams. We're making our final exam be the same.
SRIVASTAVA:

PHILIP And then you Start Test. You need to send us the results. And we'll be happy.

GREENSPUN:

All right, next steps-- if you want to continue your journey beyond this class, maybe that's for the one or two people--

TINA And can I borrow that the--

SRIVASTAVA:

PHILIP --for whom that applies that actually want to continue their journey.

GREENSPUN:

TINA Can I borrow the pointer for just a second? Just for the guys that were getting tripped up
SRIVASTAVA: thinking it was a river, this is exactly what we were talking about. This is Boston Logan. These blue lines, circles that are around it, are not rivers. It's indicating that Class Bravo airspace. And I have it open over here if you want to take a look.

PHILIP OK, so yeah, join the flying club. Go visit a flight school. Most of the busier US airports have
GREENSPUN: some kind of flight school that you can do. And yeah, in the two hours that are remaining to me for this presentation, I would just like to say thank you.

TINA Now, we're saying thank you. But just to clarify, there's a really cool guest speaker coming
SRIVASTAVA: next. But for the purposes of our teaching, thank you very much. And we'll take any questions.