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Flying in Moisture (USAirNet.com)
Flying would be much easier if moisture were not such an influential component found in the atmosphere. Moisture in the air creates more hazards during flight than any other weather phenomenon. Water in the atmosphere is measured by relative humidity and dew point accompanied by a temperature-dew point spread. Knowing the conditions during which water changes state also helps pilots to avoid moisture-related problems during flight.
Relative humidity relates the actual amount of moisture in the air (in the form of a percentage) to what total amount of moisture could be held in the air (That means it is also a ratio!). Relative humidity expresses the degree of saturation. As a rule, cold air holds fewer water molecules than warmer air holds. If air is completely saturated with water molecules the humidity is 100%.
In relationship to the humidity is dew point. Dew point is the temperature (in degrees) to which air must be cooled to be saturated with water vapor already in the air. Weather reports for pilots usually include the dew point as well as the temperature. When the two are compared, the difference reveals to the pilot how close the air is to being 100% saturated. This difference is called the temperature-dew point spread.

On a clear night when the dew point is colder than 32 F and the temperature-dew point spread is 5 F or less and decreasing, then frost will form. Fog is most likely when the temperature-dew point spread is 5 F or less and decreasing. The fog would be lifting when the temperature-dew point spread begins increasing. Fog usually forms when the dew point and the temperature are within a few degrees of each other. The air temperature being lowered to the dew point, or the dew point being increased to the air temperature causes fog formation. Air temperature can be lowered as the air crosses over a colder surface like cold lake waters or a snow-covered area. Increasing atmospheric moisture occurs when air flows from a water source (large lake, ocean) and then moves over land. Pilots need to be mindful of the conditions which cause radiation fog and advection fog. Of the two types of fog, radiation fog does not hang around as long, it is less hazardous and more localized. This means that when flying at low altitudes, a pilot will encounter patches of it and be able to fly through it quickly.

Radiation fog (also known as ground fog) occurs most often during clear, cool autumn nights while the Earth's surface is rapidly cooling. It may hang in the air through the morning but dissipates a few hours after sunrise. Advection fog however, forms when air laden with moisture from a maritime area moves from the water area over higher terrain while gradually cooling. As the air temperature is reduced to the dew point advection fog forms. This happens most often during the winter months over the eastern half of the United States as moist air flows northward from the Gulf of Mexico across the land increasing in elevation and cooling as it moves. This same phenomenon occurs along the coastal region of California as warm winds blow across the chilled California Current resulting in advection fog that can stretch from San Francisco to San Diego.

More on Engine Outs and the Propeller – (LtCol C. Mayer VAWG)
In the March issue of the Stan/Eval Newsletter, we published an article on pulling the prop on our constant speed prop airplanes, specifically our C182Ts. The article noted that if the engine fails and you can get the prop back to coarse pitch, your glide will improve due to less drag from the windmilling propeller. However, it was also noted that the emergency engine failure checklist does not call for this to be done. The bottom line was that it probably doesn’t hurt to pull the prop but

don't expect it to make much difference. Note that if you do this in a simulated engine out, you may get better results since the engine is still really running (hopefully), higher oil pressure may do a better job of getting the prop to coarse.

Several keen-eyed readers of the Stan/Eval Newsletter noted that POH's for other airplanes do call for pulling the prop on engine failure. The GA-8 amplified emergency procedures calls for the prop to be in "full coarse" and the glide ratio depends on that (see the performance section). For non-CAP typical aircraft, the Beechcraft emergency procedures says "propeller…pull to full low RPM" for best glide configuration. The Mooney POH notes, "Greater glide distance can be attained by moving the propeller control full aft (low RPM)." The amplified emergency procedures for the Piper Arrow also calls for "the propeller control in full decrease RPM." The Cessna C182T POH is silent on this.

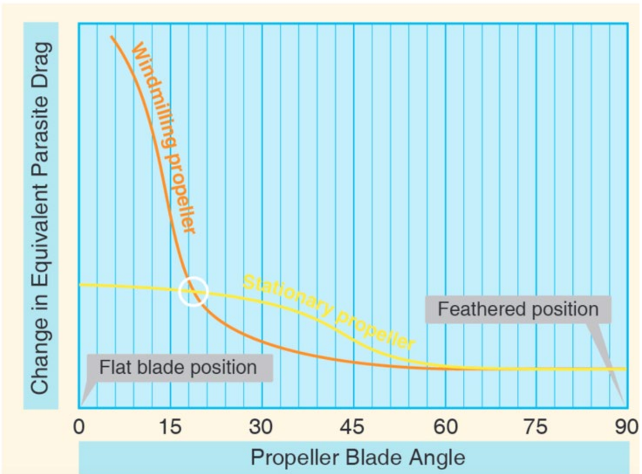
In a constant speed prop, if the aircraft is moving at any flying speed and has engine oil, it will have oil pressure and the propeller governor will do its best to maintain the RPM set. If there is no oil pressure, then the engine will seize, and the prop will not spin at all – so you don't need to worry about pulling the prop control back.

It seems that some inconsistent information has come out of Textron on this topic. A June 2021 IFR Magazine titled, "Extending the Glide" reported, "Textron (Cessna) representatives told the (C-182) owners that in an engine failure, the pilot should pull the prop control back." The same article also included, "Cessna test pilots responding to a request from the Civil Air Patrol (following two accidents) stated that pulling the prop has minor effect." But minor effect is still an effect. I will take any help I can get in an emergency!

A real engine out includes many variables. Did the engine stop or is it still producing some power? Is it on fire? (If so, the FAA Airplane Flying Handbook says to pull the prop back – after you shut off fuel and spark.) Did it seize completely? (If so, then you don't have to worry, the prop is stopped). Did you really run out of fuel, or did you just empty one tank? The Emergency procedures in the POH must be applicable to a wide range of scenarios and pulling the prop back may not be the appropriate response for some of them. I am not suggesting a change to the POH or CAPS 72-6. However, if you can't get the engine restarted, it is still spinning and you are committed to an emergency landing, then pulling the prop control back as part of configuring for best glide may help – it certainly won't hurt.

Windmilling Prop versus a Stopped Prop

Last month we featured an article on pulling the prop when an engine fails on an airplane with a constant speed but not feathering prop. The bottom line was that in most cases it doesn't really help. It's of interest to look at the difference in drag between a windmilling prop and a stopped prop. Here's an interesting graphic from the FAA's Airplane Flying Handbook.



As you can see, a stopped prop creates much less drag at lower blade angles than a windmilling prop. One way to look at it is that a stopped prop only creates parasitic drag but a windmilling prop sucks energy out of the "system" to keep the engine turning which translates to even more parasitic drag.

Most POH's don't give a number for the difference between a stopped prop and a windmilling prop. But the POH for the Diamond Star DA40 (constant speed prop) does. Here's what it says.

"The glide ratio is 8.8; i.e., for every 1000 ft (305 meter) of altitude loss the maximum horizontal distance traveled in still air is 1.45 NM (2.68 km). During this the propeller will continue to windmill.

With a stationary propeller the glide ratio is 10.3; this corresponds to a maximum horizontal distance of 1.70 NM (3.14 km) for every 1000 ft altitude. In consideration of a safe airspeed however, this configuration may not be attainable."

That's a big difference in dead stick gliding range! Although this is specific to the Diamond Star, the relative difference in glide ratio is probably not that different for other similar airplanes. Unfortunately, the POH doesn't tell you how to get the prop stopped when the engine fails, a small but important detail. One tried and true method is to pull the nose up to reduce the airspeed enough that the prop quits windmilling. But if you are low to the ground this is self-defeating as the maneuver will ensure you won't get best glide. It also puts you near a stall at a most inopportune time. There might be an argument for this maneuver if you are high enough that the 10.3 glide ratio will make up for the loss due to the maneuver compared to just sticking to the 8.8 glide ratio.

So, what does that mean to CAP in a C182T or our other aircraft with a constant speed propeller? Not much. In an engine failure we have a lot to do and following the emergency engine out checklist will keep us pretty busy. No time for fine tuning our glide ratio. If the manufacturer really thought that getting the prop stopped would make a significant difference, I suspect there would be a procedure for that. So, thinking about stopped props and windmilling props can help us better understand aerodynamics but it's not much help in the real world – at least not in the airplanes we fly.

Drones Forever

CAP has been quick to adopt drones into Emergency Services Operations. They have proven useful and as time goes on and drone technology advances, we can expect their use to grow. Of course, we are not alone in using drones. This recent article appeared in the American Society of Mechanical Engineers about how the usage of drones across many sectors is exploding. Worth a read here.

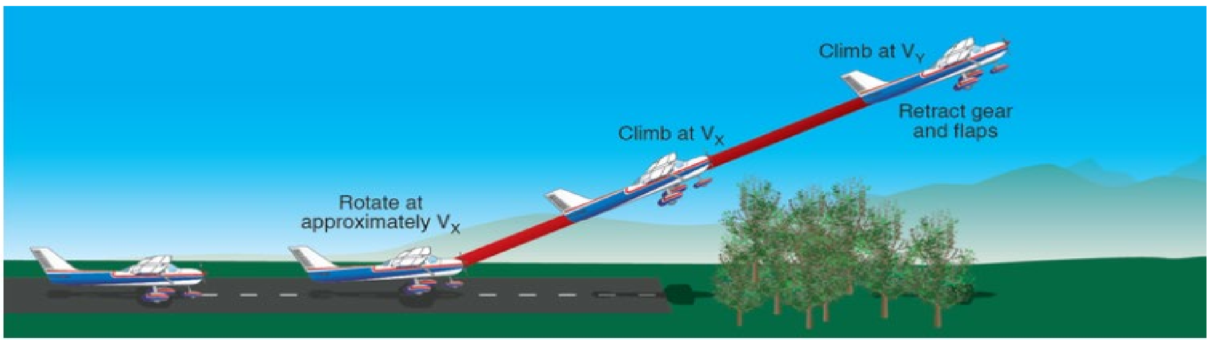
Pilot's Role in Avoiding Collisions – (LtCol P. Holt TNWG)

They say that flying is inherently dangerous. However, through our risk assessment and risk management in our flight planning combined with our flying skills, we can make flying a safe adventure. One of the dangers in flying (that most pilots probably fear) is a mid-air collision. Recently the FAA issued an Advisory Circular (AC) AC-90-48E in October 2022 titled "Pilot's Role in Collision Avoidance". This AC supersedes AC-90-48D dated June 2016. So, what changed in the pilot's role in collision avoidance for the FAA to issue a new AC? Could it be Technically Advanced Aircraft (TAA) or could it be the advent of ADS-A/B in aircraft? It's probably a little bit of both. When TAA aircraft came into being there was a concern that pilots would keep their heads in the cockpit looking at the screens instead of outside looking for traffic. When the ADS-A/B came along dictated by the FARs there was another concern that the pilots would be looking at the screens in the cockpit for traffic instead of looking outside. I suggest you read the relevant parts of FAR 91.225 and especially FAR 91.225d(4). This section does not require ADS-B Out in certain aircraft below 2500 AGL. So, if you are flying an actual or practice SAR pattern at 2500 AGL or below, beware of possible conflicts. Drone technology has advanced dramatically in the past few years and there are thousands out there that will not show up on your traffic display. The ADS-B information is great but your Mark I eyeball is your greatest asset to collision avoidance. AC-90-48E lists 10 limitations of the eye in collision avoidance and I recommend you read it.

Pitching to Vx NOT!

Many instructors, when teaching primary students the proper takeoff techniques, will instruct them to pitch to Vx after rotation until reaching (XX choose a number) feet of altitude and then at (YY choose a number) pitch to Vy for the remainder of the climb. I can't blame them for this as the FAA's own Airplane Flying Manual seems to encourage this. However, this technique ignores critical safety factors and can get the student into trouble (and the instructor to boot). This technique ignores two critical safety factors on takeoff. First is the possibility of engine failure. The second is having a clear view of traffic in front of you.

Let's talk about engine failure on takeoff. If you experience an engine failure after rotation but before you've reached traffic pattern altitude, you must do everything right to prevent a stall and subsequent loss of control. The number one action is to pitch down to maintain airspeed. Everything is secondary to that. If you fly into a stall, you are not going to survive. So, here's an experiment I would encourage all instructors to do (at a safe altitude!). At a safe altitude configure the airplane for takeoff. Slow to rotation speed (don't stall!), then apply takeoff power, rotate at the recommended airspeed, and pitch to Vx. Immediately pull the throttle and do nothing for 3 seconds to simulate the startle factor. Then pitch down. You will either be in a stall at the three second mark or you will be below your takeoff altitude by the time you recover (i.e., you hit the ground). Results vary by aircraft. But in all cases, it's easy to see that pitching to Vx after rotation greatly increases the risk of loss of control after engine failure. That's not to say that pitching to Vx is always wrong, but in most takeoffs, it is not worth the risk. If you perform the same experiment at Vy you'll do better but it's still not much margin. Rotating to a cruise climb is a much better answer for most takeoffs. Forget Vx and Vy.



The second safety factor is "see and avoid". Climbing initially at Vx or even Vy in most aircraft obstructs your forward vision. Most of us fly in and out of very busy airports with lots of folks in the pattern. Collision avoidance is a full-time job. Putting the nose up in front of you restricts your forward vision and should be avoided. A cruise climb is a better answer.

John Deakin's article on Vx and Vy provides a quantitative look at these two airspeeds and is worth reading here. Fly safe!!!

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