

# READY FOR DRONE AVOIDANCE FLYING?



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**D**ecades ago the aviation community slowly realized the dangers of wake turbulence, and so it implemented rules and training for its risk mitigation. By the time I was a student in the 90's, wake turbulence avoidance was well enconced in the consciousness of a generation of student textbooks and training. The ensuing generation of pilots embraced this training and today, wake turbulence casualties have become increasingly rare in the United States.

Similar to the evolution of wake turbulence training, I suspect drone avoidance flying will one day become routine in pilot training. At present, there has not been a single accident involving contact between an aircraft and a drone. However, we all know it is coming. Americans will turn on the news one day to learn of a GA plane crash where all aboard were killed by a drone collision. Here's a likely scenario: The young kid who borrows his dad's new drone will not pay attention to airport proximity, and will just want to see how fun it would be to fly his drone at 2,000 AGL. He will be so sorry the accident happened. He couldn't have imagined hurting anyone, he was just having fun, and didn't see the Cessna 182 until it was too late. Is the risk that serious? Each month, the FAA receives more than 100 reports from pilots (and civilians) who spot what appear to be drones operating too closely to an airport or an aircraft.<sup>1</sup> The FAA is taking the threat extremely seriously. It has worked with a British technology firm, which has developed a ray gun designed to see and destroy drones, and the FAA is testing it for airport applications.<sup>2</sup>

Consider what we learned in Miami -there are approximately 200,000 registered GA aircraft in the United States, there are already 400,000 drones. Everyone expects that number

to reach into the millions soon. Everyone has a cell phone; is there a day when each of us will own a drone? Drone/plane conflict in the airspace is surely coming. And it will change the way GA pilots fly at low altitudes.

My purpose in writing is not to whine about drones or lament their access to the nation's low-level airspace. At the AIA Miami conference, we saw the video about the commercial applications of drone technology. Lives will be saved when drones replace humans in routine tasks such as roof and cell tower inspection. The safety and productivity increases are limitless. Yes, drone use of the airspace is dangerous and will inevitably produce accidents. Yet the cost/benefit analysis yields a positive result in the column for drones. And put in perspective, drone accident risks are less than that of most transportation activity. The commercial promise of drone technology is worth the inevitable accident, and no doubt drones will continue to fill the skies at an increasing pace. Drones are here to stay, and pilots need to get on with the matter of flying accordingly.

Naysayers will surely demur on grounds that drones are prohibited within 5 miles of an airport, and cannot fly above 500 AGL, so an accident is unlikely. Sure, if you assume every drone user will always follow the rules, no exceptions. No use above 500 feet AGL is a rule, not a performance limitation on the part of the drone's power system. Recently I spoke with a drone owner who has operated his drone at 2,000 AGL with no decrease in performance. It's not realistic to expect human behavior to suddenly be perfect when it comes to drone usage. If the nation's automobile traffic laws were followed perfectly, there wouldn't be a motor vehicle accident every five seconds. The insurance industry employs actuaries who can already tell

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you the statistical probabilities of a plane/drone accident in the next few years. When driving a car, I would much rather drive defensively than count on the possibility that the texting teenage driver on the road next to me is going to carefully comply with the traffic rules.

It certainly piques my curiosity when attorneys suggest the “see and avoid” flying rule (FAR 91.113) arguably applies in rendering a pilot responsible to see and avoid a drone. Anyone who has sat left seat and looked out on the horizon after hearing ATC say, “Traffic 11 o’clock, two miles a Cessna maneuvering at your altitude,” knows that a third of the time, you never see the traffic by the time you hear “traffic no factor.” Pilots know the standard response after a traffic alert: “looking.” The point is nobody spots other traffic quickly, even when looking for an airplane the size of a bedroom. It is dubious to suggest that a pilot will see and avoid a drone before impact. Also, a drone may look little and cute, but some weigh in at 55 pounds, and this size drone will be absolutely lethal to any GA pilot who sustains a windshield strike. Such a collision would also possibly be lethal in the event of a strike on the elevators or rudder. I’m not betting on my propeller to sufficiently shred or deflect the drone before reaching my windshield (or to have a usable propeller after the strike). A strike on the wing may be sufficient to tear the metal and throw the sparks into the ripped open gas tank in the wing. A light aircraft strike with a drone isn’t going to produce fatalities every time, but the probabilities are far more than just hull damage. In my hometown of Billings, the local hospital deploys its helicopter routinely around dense neighborhoods at 200 AGL. Anyone want to take bets on the effects of a drone strike on the helicopter’s rotor blades over the top of a building full of thousands of hospital patients? I assume the little toy size plastic drones are not a concern. But the new

FAA rules allow drones to weigh 55 pounds and fly at 100 mph. At that weight and speed, the collision won’t be pretty.

So back to the matter of drone avoidance flying, it’s probably not much of an issue for an Airbus 320 with a one-inch thick windshield. Today’s jet aircraft windshield is a

\$300,000 marvel of engineering technology; mine is not. My windshield is thin, and 35 years old. And unlike the 767, I can’t be flying at 1,000 AGL by the end of the runway. So, like the defensive driver, I have my own plan for drone defensive flying. I suspect after a few accidents, drone defensive flying will make its way into the textbooks and student pilot curricula. For now, I intend to handle it on my own.

Let’s start with take-off. I can think about reducing my risk of a drone strike even before entering the airspace. I can consider the population center location in relationship to the airport. In VFR conditions might an area surrounding the airport be less likely to be subjected to drone use? Can I request a runway that would have me on a vector over an area less likely for drone use, assuming acceptable winds? I certainly hope no errant drone operator wants to try his skills in IMC around an airport because standard departures (SIDs) eliminate most of the foregoing options discussed for VFR flight.

Once off the runway, let’s talk about climb rate. Most pilots are accustomed to selecting their best rate of climb rate (VY), or perhaps a rate that produces the most favorable engine temperatures. Not me. Upon rotation, I go to VX every time.





I climb at just above stall speed with my climb rate pushed to maximum rate for the temperate/gross weight/density altitude considerations of that flight. If my engine gets hot on climb-out, so be it. My goal is to be as far out of drone range as possible by the time the end of the runway disappears. I can deal with an engine temperature at redline better than I can a 55 lb drone coming through my windshield in 100 sharp pieces after an encounter with my propeller.

One aspect of safety training is to leave the gear retracted on take-off until the runway disappears. Of course, the thinking goes, if you lose an engine or have another emergency requiring an immediate landing, at least your gear is already out and ready for landing. I used to employ that technique, but no more. I'll take my chance of needing to throw the gear in a hurry; I'd much rather have the increased rate of climb to avoid the drones out there.

Speaking of rates of climb, pilots recall from their first lessons what it's like to try to climb in a C152 on a hot summer day. You're lucky get 100 fpm. That means leaving the airport environment at very low altitudes and remaining at low altitudes long after you've passed the 5 mile mark where drone activity is prohibited. I love flying almost more than anything, but if my only option were low altitudes over drone territory, I might

consider hanging it up or upgrading to a high performance aircraft. Drones provide an entirely new reason to be interested in high performing aircraft. For me, this concern augments the list of excuses to pay a September visit to Tornado Alley Turbo in Ada Oklahoma. My A36 will soon be turbo-normalized with a Continental IO550, and I'll be climbing away from the drones at 1,500 fpm after leaving the runway.

As you know, the FAA allows flight 1,000 AGL above populated areas and 500 AGL above rural areas, mostly in class G airspace. As a Montana pilot, we love our wide open class G; within bounds do what you want to do. While that type of flight might have been fun a few years ago, I suggest the proliferation of drone activity ought to end any consideration of flight at those AGL levels. Fly close to the ground ever again? No thank you.

Then there's the issue of the stabilized descent- typically regarded as a 3 degree descent rate. This is the descent currently taught. Of course, that rate of descent places an aircraft fairly close to the ground 5 miles from the runway. From now on, I'll be staying high and dropping in steeply with full flaps to avoid more than just the bugs on my windshield.

Consider the rectangular patterns which pilots are taught to fly

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in the pattern for landing. Many of these standard rectangular patterns will place an aircraft close to the perimeter of that 5 mile area where drones are free to operate and require 1,000 AGL. Worse, when I'm in the pattern at 1000 AGL, it's not unheard of to receive a vector for sequencing from ATC that turns me miles out away from the airport. Just the other day in Helena, Montana, the tower extended my downwind; I practically had to start climbing for McDonald pass before being allowed to turn inbound. The route took me directly over the most densely populated part of Helena. This situation throws all of my carefully conceived drone avoidance plans out the window. So there is a strong case to be made that the 5 mile prohibition just isn't going to cut it for the airport environment. Please take note, FAA.

Let's move on to considerations beyond the flight environ-

ment. I've mentioned what pilots need to consider for drone risk mitigation. But, that said, drone owners need to bear the burden of risk mitigation as well. What about requiring TCAS? TCAS was once a luxury exclusive to jetliners, but now ADSB now functions just like TCAS in concert with my Garmin 430 WAAS. The FAA requires ADSB out by 2020 (I bought it early for the safety), so why not impose the same burden on drone owners? We all know the technology is there to arm these drones with the avionics to link into the ADSB-in/out system and create alerts to the drone user, or better yet, automatically divert the drone out of the aircraft's path. The DJI Phantom 4, for instance, comes equipped with a collision avoidance system, so it's not a huge leap to suggest it. Some might say the cost is prohibitive, an unreasonable burden on drone users. I beg to differ. The cost to comply with the burdens imposed on GA pilots is mind numbing, and getting worse every year. It may sound conspiratorial, but many in the GA community believe the FAA wants us GA pilots out of the air for good. Hopefully that is urban myth. I do know, personally, of the annual expense and time commitment to maintain





my license, rating, plane, and medical certificate. If GA pilots can be burdened to such an extent, fairness dictates imposing similar systems (and the attendant expenses) on drone users to mitigate the risk of the inevitable drone user who carelessly allows a collision with a small plane.

And when the risk mitigation fails, what about loss compensation? Many states provide that an aircraft may not enter its airspace without insurance coverage- New Mexico is one such state. What about mandatory drone liability insurance? When the aviation insurers start to pay hull loss claims for \$600,000, (or worse passenger death liability claims in the millions against the pilot based upon the silly negligence allegation that the pilot failed to see and avoid the drone), how do you think the subrogation prospects will look against the young kid who is so sorry? When the insurer gets its million dollar subrogation judgment against him, how will it collect it- a judgement execution sale of his Xbox?

I apologize for my curmudgeonly whining about the good old days before drones. I do love the new technology. When it comes to aviation technology like my Stratus enabled Fore-flight AHRS and real time weather streaming in my I-pad, I wouldn't care to go back. The new technology is simply amazing, and we are all far safer for it. Occasionally, the technolo-

gy development will produce a few down sides. For GA pilots, drones are such a downside- another hassle and restriction on the freedom of flight. Drones ought to change the way we fly- or at least how we fly at low altitudes. I know my grandchildren will one day love their drones more than my old Bonanza. And I like that it will be hard for the FAA to kick us GA pilots out of the airspace if that same FAA is going to be accommodating to drone enthusiasts. So, you GA pilots-just be careful, and stay out of the low altitudes- climb quickly and descend at the very last moment for a safe landing. If you're vectored for sequencing out of the pattern and over the city, consider asking to gain altitude until you're on back inbound on short final.

What does the future hold for drone avoidance? Stay tuned- it's likely to be a wild ride as the nation's airspace makes room for millions of drones. Let's hope this wild ride does not include a drone crashing through a pilot's windshield. And let's also encourage regulations that require drone owners to share the burden and expense of risk mitigation.

1: [www.faa.gov/news/updates/?newsid=84810](http://www.faa.gov/news/updates/?newsid=84810)

2: <https://www.theguardian.com/technology/2015/oct/07/drone-death-ray-device-liteye-auds>. & <http://www.hstoday.us/channels/global/single-article-page/faa-is-testing-british-ray-gun-to-shoot-down-drones.html>