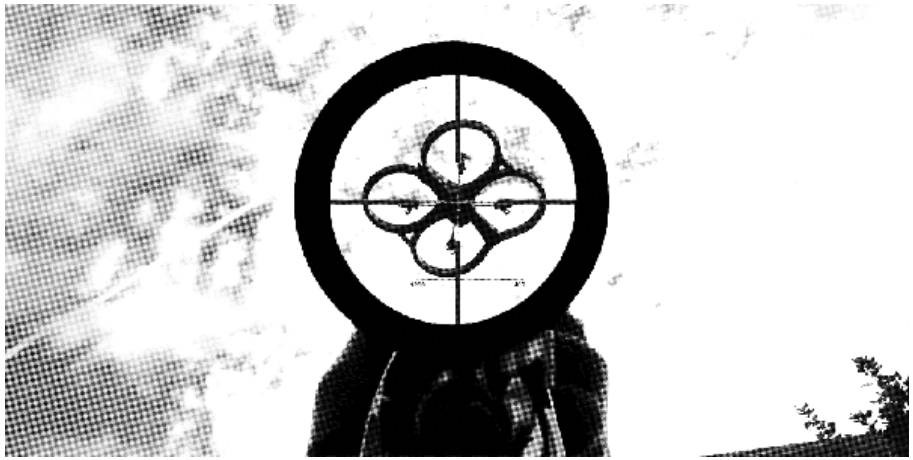
[A] shotgun is your best bet at taking down a drone. Preferably one loaded with the largest spread ammunition you can find. […] Of course not all methods of taking out a drone need to involve literal firearms. […] Paintballs are a no-go. […] Airsoft guns and other plastic-pellet guns are worthless. […] Slingshots will likely work—again, assuming you can hit. […] Last but not least, you never want to underestimate the power of just throwing crap. A rock, a baseball, anything you can fling straight, accurate, and fast.

No Trace Project / No trace, no case. A collection of tools to help anarchists and other rebels **understand** the capabilities of their enemies, **undermine** surveillance efforts, and ultimately **act** without getting caught.

Depending on your context, possession of certain documents may be criminalized or attract unwanted attention—be careful about what zines you print and where you store them.

How to Shoot Down a Drone



How to Shoot Down a Drone

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No Trace Project

notrace.how/resources/#shoot-drone

Of course that wouldn't have gotten him—and won't get you—off scot-free. There's still the matter of civil damages to deal with, and broader endangerment offenses. As drone-lawyer Brendan Schulman pointed out to me over email, not using a "gun" is a pretty weak dodge around the very letter of the law (and one that might not even work):

> "I suppose you might avoid state laws specific to the discharge of firearms by using something other than a gun, such as a rock. But I think the best response is a telephone call to the police, not the intentional destruction of someone else's property. […] There are many existing technology-neutral laws that apply to activity that would fall into the categories of stalking, peeping or unlawful surveillance."

So if you want to take down a drone, the order goes: Shotgun loaded with birdshot, maybe a Super Soaker or a hose, followed by a rock or a baseball, and never ever a pistol or a rifle. All of which is superseded, of course, by not being such a drama queen cowboy, cooling your jets, and calling the cops instead[21].

[21] *N.T.P. note:* Of course, we wouldn't advise you to call the cops if they are the ones flying the drone over your head.

Other good non-gun options include pretty much any other solid-projectile slinger. Slingshots will likely work—again, assuming you can hit. Slingshot master Joerg Sprave has a few designs[17] that would probably take out a drone[18] with ease. Along those same lines, you can probably do well with a potato gun or similar DIY cannon, barring aim issues. If you were to load the thing with DIY buckshot, perhaps. But now we're just getting back to gun territory aren't we?

Last but not least, you never want to underestimate the power of just throwing crap. A rock, a baseball, anything you can fling straight, accurate, and fast. All it takes to down a drone is a bent propeller or enough of a jolt to flip it.

Conclusion

According to drone-downer William Merideth, the offending quadcopter was floating just 10 feet above the ground[19] just before he shot it, a claim the drone's owner refutes[20]. If it actually was that low, he might have been better off just beaning it with a freakin' rock. Had he hit, at least his claims about the drone being close would be virtually airtight.

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[17]https://www.youtube.com/watch?v=Zz2oGkggCCs

[18]https://www.youtube.com/watch?v=qxtHtPK2MH8

[19]https://web.archive.org/web/20150818165807/http://photographyisnotacrime.com/2015/07/kentuckyman-arrested-for-shooting-drone-out-of-the-sky

[20]https://www.youtube.com/watch?v=rFODkWcdqIE

Contents

Introduction

You're hanging out in your backyard when suddenly a drone approaches, a friendly little recreational quadcopter. It zooms over your house before it doubles back and sits there in the sky, hovering over you and staring you down. It doesn't look so friendly anymore. It looks like a spy.

In the past few years, there's been a lot of time and effort devoted to the complicated question of whether you ought have the right to shoot that sucker down. Last month, a Kentucky[1] man was arrested on charges of criminal mischief and wanton endangerment[2] for doing just that. In 2014, a New Jersey man faced similar weapons charges for shooting down a drone over his property[3]. The state of Colorado smacked down a fervent effort to bring about official "drone-hunting licenses"[4] and the FAA[5] has come out to ask that you please not

[1] *No Trace Project (N.T.P.) note:* Kentucky, New Jersey and Colorado are three states from the United States.

[2] https://arstechnica.com/tech-policy/2015/07/kentucky-man-shoots-down-drone-hovering-over-hisbackyard

[3] https://slate.com/technology/2014/10/new-jersey-man-shoots-down-drone-over-his-property-getsarrested.html

[4] https://time.com/46327/drone-hunting-deer-trail

[5] *N.T.P. note:* The Federal Aviation Administration (FAA) is a government agency which regulates civil aviation in the United States.

Non-lethal can work as well

Of course not all methods of taking out a drone need to involve literal firearms. A shotgun loaded with birdshot is clearly the most effective option, but it's worth considering some alternatives that don't necessarily involve traditional "guns."

First, what doesn't work. Paintballs are a no-go. Yes, it hurts to get blasted by one of the suckers, but they're actually very specifically bad at injuring drones. What you're looking for is a concentrated jolt of force. Paintballs offer the exact opposite. "Paintballs have no effect on the airworthiness of a drone," Cornblatt says. "They're designed to hit and splatter with no real force."

Not even a direct shot to the rotors will do much. Don't believe it? I didn't either but Cornblatt's had a bit of experience[14].

Along the same lines, Airsoft guns and other plastic-pellet guns are worthless, as are Nerf guns presumably (and obviously). But Super Soakers[15], on the other hand, can actually work—if you manage to hit the drone. Cornbatt's testing (with his closed-body drones) showed that high-pressure sprinklers can throw a drone off-course[16] but not necessarily crash it. But on a less robust drone where the water stands a chance of getting inside, a few electrical shorts would spell doom.

[14] https://www.youtube.com/watch?v=vICfKPoCubw

[15] *N.T.P. note:* A brand of recreational water guns more powerful than conventional water guns.

[16] https://www.youtube.com/watch?v=XTlwYwi-Uys

That's not to mention that firing a rifle into the air is a horrifically bad idea, as the Kentucky drone shooter William Merideth was quick to point out in an interview with Ars Technica[2]:

> "Now, if I'd have had a .22 rifle, I should have gone to jail for that. The diameter of those things are going to come down with enough force to hurt somebody. Number 8 birdshot is not. Number 8 is the size of a pinhead."

Go figure, the guy who shot a drone is onto something. Yes, a shotgun is your best bet at taking down a drone. Preferably one loaded with the largest spread ammunition you can find. You'll want to go with birdshot (more, smaller pellets) over buckshot (fewer, larger pellets). In fact, you'll want as many pellets per cartridge as you can reasonably find. Drones are so structurally weak but so elusive to actually hit that you want maximize your chance of touching the thing at all—stopping power should be the least of your worries.

Number 8 birdshot, like Merideth used, is a good start, but you can go further; the higher the better. Number 10 birdshot will net you around 1,000 tiny pellets per 1 oz. cartridge. Number 12 birdshot (which tends to be harder to find) has as many as 2,500 tinier ones. The only time you might need to go bigger is if that drone is way off in the distance, in which case you should double-triple think your decision to fire at it.

shoot drones[6], citing dangers of collateral damage and firing guns into the air.

The ways you can end up in a sticky legal situation by shooting at a drone are many and terrifying. I reached out to Brendan Schulman[7], drone-lawyer[8] turned VP of Policy & Legal Affairs for drone company DJI, for specifics on the legal nightmare. Naturally, it depends a bit on state law, but the broad strokes are widely applicable:

> "In some states, you could face reckless endangerment charges or be prosecuted under laws relating to the discharge of firearms. By destroying the drone, you may be liable for civil damages to its owner. Although I have not seen it raised yet, there is also a federal crime in Title 18 relating to destruction of an aircraft that could apply, and that would involve very serious penalties."

All that is to say that shooting drones is probably a bad idea and we don't recommend it. But let's set that all aside for just a second and ask a different question: What's the best way to do it anyway?

To that end, I had a chat with Marque Cornblatt[9], founder and CEO of Game of Drones which specializes in DIY drone-kits and heavy-duty air-

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[6] https://web.archive.org/web/20150810160117/http://www.huffingtonpost.com/2013/07/19/faa-gunsdrones_n_3624940.html?utm_hp_ref=politics

[7] https://twitter.com/dronelaws

[8] https://web.archive.org/web/20150204195808/https://motherboard.vice.com/blog/meet-americas-firstdrone-defense-lawyer

[9] https://twitter.com/cornblatt

frames. These are the kind of drones designed for in-air, BattleBot-style shenanigans[10]. He's overseen his fair share of durability tests, including ones that involved the (safe and controlled) firing of actual guns at actual flying drones[11].

Once more time: Neither Popular Mechanics nor Marque Cornblatt suggest you actually try this. Just in case you didn't pick up on that, you big doofus.

You don't need much stopping power

Taking a drone out of the sky, especially with an actual gun, does not take a whole lot of firepower. According to Cornblatt, "Drones are so fragile that almost anything that hits them or touches them is likely to cause them to crash or lose orientation."[12]

That being the case, virtually any firearm can absolutely thrash a drone if it draws blood, so to speak. 9mm pistols on up to full-on sniper rifles stand roughly the same chance of turning a hit into a kill. Even lowly pellet guns—some of which have muzzle velocities on order with that of a .22 caliber rifle—stand a good chance at doing fatal harm. "If you were to hit a drone with [a BB], that pellet would penetrate and certainly cause some damage," Cornblatt told me. Should you find yourself in range to hit it with a rock or a baseball, that's likely to be a game-ender as well.

[10] https://www.youtube.com/watch?v=QxG3lk5NRTM

[11] https://www.youtube.com/watch?v=pl2Z9N4Q82g

[12] *N.T.P. note:* This, as most of this text, is of course not applicable to some military drones which can be way tougher than civilian drones.

Consumer drones aren't designed with a whole lot of redundancy in mind. A quad needs every single one of its rotors to stay in controlled flight. Yes, software that can dynamically reroute power to help a crippled quad hobble to safety does exist[13], but you won't find it in whatever winds up on the wrong end of your barrel, at least not yet. Add to that the fact that most consumer quads have frames that are designed to be lightweight and compact and it is easy to see how a direct hit to anything but the landing gear is going to be serious trouble.

Hitting is the hard part

But while the typical quad is a fragile target, it's also an elusive one which takes most pistols and rifles—even scoped ones—off that table at ranges that aren't straight up point-blank. Cornblatt has seen actual trained snipers take on moving drones on a firing range. "The snipers only hit it after five or six shots, and that was in a completely controlled environment. You can imagine a guy running out into his back yard with a .22 just taking potshots at the sky, he's never gonna hit it."

[13] https://www.youtube.com/watch?v=bsHryqnvyYA