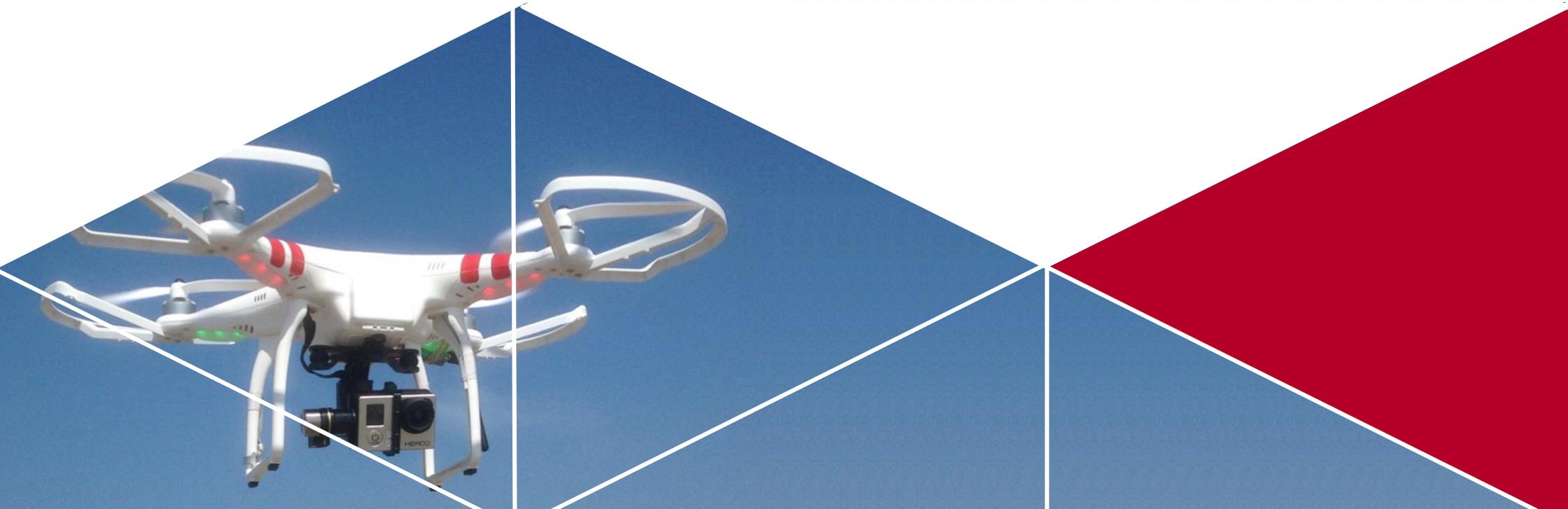


# Drones – the next generation of aviation?



## Introduction

Remotely-piloted aircraft systems (RPAS), also known as drones, have seen an increase in both commercial and recreational usage. However, regulations have not been completely applied to the usage of drones, causing multiple incidents around airports (IATA, 2016). These incidents have placed drones in a bad light by media across the globe. This fact sheet looks at both sides of drones and describes their positive and negative effects, concluding with whether drones are going to have a large impact on aviation in the future.

## Rules and Regulations

Regulations are used to make sure drones operate safely within current airspace. These regulations differ depending on the national legislation, as well as whether the drones are for commercial or non-commercial use. In most cases, regulations for commercial drone operations are stricter, which is why this fact sheet focuses on non-commercial drone regulations.

Drone regulations are created by government agencies. In the United States, they are created by the Federal Aviation Authority (FAA, 2016), while in Europe they are currently created by national governments. Not all countries have written clear legislation for drones yet. The European Aviation Safety Agency (EASA, 2016), which develops European regulations for the aviation industry, is still working on regulations for drone operations. Currently, the EASA only has a concept regulation, which means there is no official drone regulation by EASA.

Drone technology is developing very rapidly – faster than the development of legislation. EASA currently is designing legislation in such a way that drones cannot enter restricted airspace. At the same time, several drone manufacturers (such as DJI) place safety systems in their drones to ensure that they do not fly into restricted airspace. This is called ‘geofencing’ (DJI, 2016).

National regulations are very specific about drone operations around airfields. In the United States, drone operations are not allowed within 8 kilometres of an airport (FAA, 2016). In the Netherlands, drone operators are not allowed to fly in the control zone around an airport (Rijksoverheid, 2016). The control zone is, in principle, a circle around an airport with a radius of 15 kilometres. The EASA concept regulation contains strict rules for drones and their operators, including the regulation that drones may not fly farther than 100 meters (horizontally) from the operator.

Privacy issues surrounding drones are important to take into account, and according to Cavoukian (2012), this is for good reason: in the context of video surveillance, for example, privacy scholars, advocates, and regulators have all warned of the dangers of ‘sleep-walking into a surveillance society’. Drones could also be a threat to the Fourth Amendment in the USA, which protects individuals’ privacy from unreasonable intrusions by the government.

In general, the regulations created by governments are a safe guideline for drone operations. But are all drone operators aware of these regulations? And do authorities check whether drone operators comply with them? Research shows that 9.9% of drone incidents (near misses with other aircraft) in the USA occur below an altitude of 400 feet (Centre for the Study of the Drone, 2015). This means that 90.1% of all near misses happen above the maximum altitude stated by federal legislation. In other words, most near misses happen when drone operators do not operate according to legislation.

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## The dangers of drones

Multiple issues make the flying of drones near airports dangerous. First of all, anyone can buy a drone. No licenses are needed because of the lack of laws, which makes flying drones interesting for hobbyists. The UK Civil Aviation Authority (2016) states in their drone code to: “Use your common sense and fly safely, you could be prosecuted if you don’t.” This statement is advice, but it will not stop people without sufficient knowledge from flying drones close to aircraft. The images in Figure 1 from CRASH Lab Virginia Tech (2015) display what would happen to an engine if a drone entered an aircraft motor. It would take out multiple turbofan blades, completely demolishing the motor with resulting consequences for the aircraft.

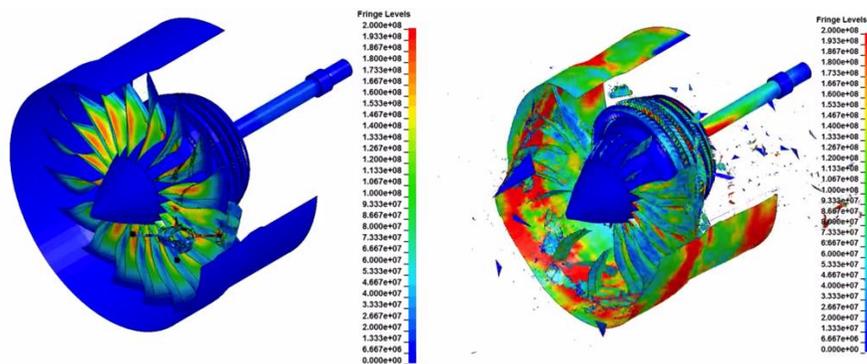


Figure 1 Damage to an aircraft engine by drones

Although drones are increasingly seen at airfields, none have actually caused an incident. Dourado (2016) described the fact that drone pilots can control the drone and avoid aircraft, as birds often do. But Dourado (2016) also mentions the following calculation: strikes with birds weighing two kilograms will injure one person every 500 strikes. Assuming a standard drone has a weight of two kilograms, this means that when looking at the difference in ratios of birds and drones, and combining them with the years, statistically one person every 187 years is injured by a “drone strike.”

## The opportunities of drones

Although not all involved parties/stakeholders have a positive opinion on drones, they can be used effectively. EasyJet, for example, is using drones to conduct aircraft inspections (Flightglobal, 2015). These drones use a laser beam to measure reflection time for the scanned object. This enables the drones to make a 3D-map of the aircraft to identify oddities, while streaming live footage to engineers. For instance, this is sometimes used after a lightning strike to conduct a quick check on the aircraft, enabling EasyJet to put the aircraft back into operation quickly. Checks without a drone take much longer and create the threat of delay.

Drones can also be used to help control wildlife around airports (Vas et al., 2015) by observing the area around the airport and its surroundings to see which aspects attract animals. Multiple researchers have observed wildlife with drones, and it is something that could be useful for airports as well.

In the future, drones may be able to protect aircraft from being hit by a missile (Kirkpatrick, 2009). Honeywell has a patent on a missile-detecting drone that could fly in formation with passenger aircraft. If the drone did detect a missile through its missile sensor head, it would then lay down a predetermined pattern of exploding flares to divert the missile away from the airliner, try to redirect the missile using laser countermeasures, or even sacrifice itself to protect the airliner.

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## Summary

This examination of positive and negative aspects of drones within the aviation industry highlights some key facts :

- Each country has different laws and regulations for drones, and in countries in which drone rules apply, some people are not aware of the regulations and/or don't comply.
- Drones are a threat to aviation when laws are violated by drone operators. If a drone flies near an aircraft's engine, it will become ingested and ruin the motor.
- Drones can be used to inspect areas around airports to help control wildlife – a positive aspect of the usage of drones.
- Commercial and technical developments of drones are in advance of the legislation.

If these four elements find a balance, a drone-friendly environment will be result for all parties involved. However, as drones become more popular and smarter, they may cause danger to aviation if not used properly. Clear regulations are needed – and must be enforced – to prevent incidents and accidents.

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#### Image references (top to bottom, left to right)

- 1 Front page: Image made by Bas Wiggerman, 2016
- 2 Figure I: Virginia Tech, 2016

#### Dutch Summary

Drones zijn in de afgelopen jaren populairder geworden en het aantal drones groeit nog steeds. Binnen de luchtvaartindustrie worden drones vaak als negatief gezien. De regels en voorschriften met betrekking tot drones zijn of wereldwijd niet bestaand. Wanneer deze bestaan zijn de regels onduidelijk voor de vele gebruikers. Drones zijn gevaarlijk als deze dicht bij een vliegtuig komen, maar drones kunnen ook worden gebruikt op een nuttige manier. Drones kunnen worden gebruikt om vliegtuigen snel te inspecteren.

Op dit moment lopen de commerciële en technische ontwikkelingen van drones voor op de wetgevende ontwikkelingen. Deze drie elementen moeten in evenwicht zijn om een drone vriendelijke omgeving te creëren voor alle betrokkene partijen. Drones worden populairder en slimmer, waardoor drones een gevaar vormen, wanneer deze op een wet overtredende manier wordt gebruikt. Om eventuele incidenten of ongelukken te voorkomen, is het nodig om duidelijke regelgeving te hebben en die regels te handhaven.

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