INSTITUTE OF TECHNOLOGY ASSESSMENT

ITA DOSSIER

A sky full of delivery drones?

In brief

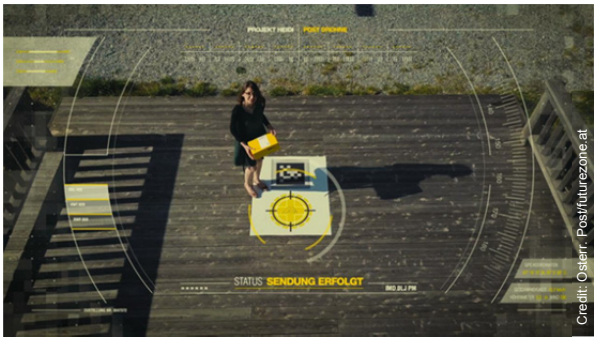
- Worldwide, large online retailers, postal operators and numerous start-ups are developing and testing drone-operated parcel deliveries.
- Despite technology not having been fully developed, feasibility has been demonstrated. However, in most countries, the law does not yet allow autonomous drones; specific air traffic rules would have to be developed.
- Omnipresent drone flights would have a series of environmental, safety, ethical, and societal implications that stipulate a need for public debate before implementation and regulation.

What is it about?

A drone is an unmanned aircraft, i.e. a flying object which has no pilot on board (see ITA Dossier no. 6). Whilst drones have been predominantly used by the military until quite recently, by now they have arrived in the civil domain and in everyday life. Hundreds of thousands of toy drones or quadrocopters are around worldwide and we have gotten used to breath-taking shots from so far unimagined perspectives. Increasingly, we encounter surveillance drones or tourists filming themselves with a 'flying selfie stick'. In many other areas pilot tests are carried out, for instance in agriculture, in the humanitarian and medical sector, for the inspection of facilities (e.g. power lines), for mapping & surveying, and in research, to mention just a few examples. After all, large online retailers and numerous start-ups worldwide want us to imagine a world in which everyday commodities will be delivered by drones. The market for the delivery of consumer products is huge and so is the potential market for drones.

Some business models and specific applications are built on the idea of transporting special goods that aim to serve a niche market, some target a wider audience. The former specialise on the delivery of medicine, blood samples, organs and business-specific small parcels. The latter business models usually target local delivery such as fast food and drinks or small non-perishable goods such as books or small electronics. Others would aim to expand perhaps even revolutionise the whole market of delivery of small-scale parcels that are presently delivered by delivery vans. These services are closely linked to the parallel implementation of other digital tools, in particular online ordering.

In addition, several public sector entities such as national postal operators have also started to perceive the idea of delivery by drones as a potential opportunity: they entered partnerships with start-ups and launched pilot projects, most notably in Switzerland, France, Finland, the UK, Ukraine, South Korea, Australia and also Austria. In September 2017, the Austrian Post conducted a pilot project with 1000 test flights with drones carrying parcels of up to 3.5 kg up to 10 km into a rural setting near Graz. Apart from the drones, a special utility vehicle was also tested from which the drones were flying off and repeatedly returning to whilst it was in motion.



Drones need to autonomously recognise the point of delivery.

There are three important preconditions for the launch of such delivery services: it has to be technically feasible and safe, and the law must allow autonomous flights. Drone delivery seems only reasonable when drones can be operated in an autonomous mode – except for very special scenarios (e.g. occasional fast delivery to remote areas). Otherwise, the main reasons for launching such service (cost reduction, automatization, and speed) would be compromised if pilots were needed for each drone. However, to operate a drone autonomously is still challenging in technical terms. Moreover, they are currently not permitted for use in Austria and in most other countries. In addition, delivery drones would have to fly over people and urban areas, something which under current regulations can only be allowed by the authorities on a case-by-case basis – which is obviously not suitable for a business model relying on regular deliveries.

Basic data

Project title: Delivery drones from a technology assessment perspective
Project team: Nentwich, M.; Horváth, D.
Duration: 10/2017 – 03/2018

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Key results

The introduction of commercial delivery drones would have numerous consequences of varying degrees, with the difference depending on whether we would encounter regular and frequent drone flights for goods of all kinds or more specific, less frequent flights for special goods in the future.

A sky full of delivery drones would have major consequences.

Amongst the possible implications are:

Health and safety issues: Malfunction of the navigation system, in particular in bad atmospheric conditions, may lead to accidents; in case the drone carried dangerous goods, consequences would be even more severe.

Environmental aspects: When drones intrude into the habitat of wildlife, animals may be harmed or disturbed. Debris may also be an issue. Also, whether drones are eco-efficient is still an unanswered question.

Effect on the labour market: In the event of widespread use of drones for the so-called “last mile”, the labour market for drivers of delivery vans would shrink as would the labour market share for unskilled workers.

Ethical aspects: Similar to algorithms discussed within the context of driverless cars, drones must be able to make a number of decisions in split seconds prior to an event (e.g. impending accidents) in order to remain operative.

Privacy concerns: The drones’ sensors gather sensitive data during the flight, e.g. over private property or in front of windows. These may be stored and misused.

Potential areas of societal conflict: Omnipresent drone flights may cause noise pollution and people may oppose the negative aesthetic impact their presence has in airspace.

Law enforcement would be a particular challenge for air traffic police as drones are small, versatile and easy to misuse.

What to do?

The preliminary analysis of possible consequences shows that it would currently be too early to legalise delivery services with autonomous drones. Instead, a serious and open-minded societal debate is necessary on whether or not omnipresent drone flights should be part of our common future.

- The best option to bring the various perspectives to the fore would be through an encompassing technology assessment study with the participation of experts, stakeholders and lay persons.
- In any case, there are a number of areas where it would be necessary to regulate this emerging market of goods delivered by drones:
- Air traffic laws would have to be adapted to allow for autonomous flying and for the regulation of how and where drones can fly and land.
- In order to protect privacy, the use of these new devices that constantly gather data must be regulated.
- Under which conditions public ground-level airspace can be used for commercial purposes needs to be regulated (e.g. in tax law).
- Measures for law enforcement would have to be taken to avoid various types of misuse.
- Finally, a serious assessment of the ecological footprint (life-cycle assessment) is mandatory, including – amongst other factors – the lifetime of batteries.

Further reading

Nentwich, M., Horváth, D. (2018) Delivery drones from a technology assessment perspective. Overview report, No. 2018-01, Vienna: Institute of Technology Assessment. epub.oeaw.ac.at/ita/ita-projektberichte/2018-01.pdf/2018-01.pdf

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