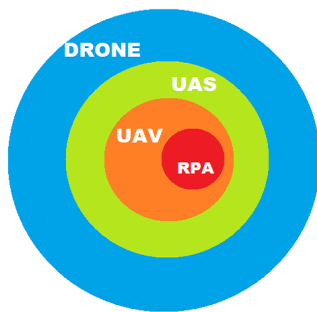# DRONES
By Christian Djerving and Sara-Lynn Lepage

*As part of the REELER research project, the following document is a short report on drones. For our purposes, drones will be preliminarily explored as a **type of robot**. More specifically, this report aims to provide analytical and ethical guidelines in issues relating to the now-widespread use of commercial and recreational drones.*

1.0 Useful terms and definition

The term drone is often used interchangeably with the acronyms UAV or UAS, standing respectively (and most commonly) for "unmanned aerial vehicle" and "unmanned aircraft system". There is a number of variation on the acronyms for UAV, and though most only substitute "aerial" for near-synonyms (air, aircraft, aerospace, airborne).[1] We can make a subtle distinction between each of these terms, however; the website of the drone flight software company Botlink offers a useful review of this. According to an article on their website[2], we can consider "drone" to be a general umbrella term for all kinds of unmanned vehicles, which may include those designed to roam land or sea. While this is important to consider, this report will only cover airborne drones; that is, UAV. As for the term UAS, it is also specific to aerial drones, but while UAV

Figure 1: How the terms relate to each other

refers only to the drone or vehicle itself, UAS includes the whole system and structures on the ground which are in place to pilot or control it. Another common acronym is RPA: "Many pilots prefer the term 'Remotely Piloted Aircraft.' This is because flying certain types of UAVs require a lot more skill (think years of training) than anything you could buy in a store."[3] For convenience, this report will continue to use a **drone**, as it is the broadest and most commonly used term. Hence, for our purpose, a drone is an aerial vehicle whose flight is either automated or controlled remotely. They may use a variety of different systems for flight, and their size can vary from an object that can be held within the palm of a hand to a vehicle as big as an airplane.

2.0 Brief history

The history of drones provides an illuminating glance into our relationship with this aerospace technology and reaches much farther than the past ten years, which saw the release of widely available commercial drones. According to many sources, the history of drones begins in 1849[4], a few decades ahead of the first car. In 1849, the Austrian military loaded unpiloted balloons with explosives to attack the city of Venice. Technologically, these balloons, of course, had little to do with the sophisticated aircraft that would follow, but they did set a precedent for using unmanned aircraft in the military. The first pilotless airplane was invented in the midst of the First World War[5] and was meant to be used as a flying bomb, just like the balloons. As the 20th century unfolded, drones continued to be developed for military purposes, acquiring

---

[1] Curiously, two of those possible acronyms for UAV listed on the drone manufacturer Altigator website also strip some of the general meaning away, namely "unmanned autonomous vehicle" which gives no more sense of a flying vehicle, and "upper atmosphere vehicle" which sounds like it could refer to just about any aerial vehicle. (https://altigator.com/drone-uav-uas-rpa-or-rpas/)

[2] https://botlink.com/blog/whats-the-difference-between-a-drone-uav-and-uas
[3] Ibid.
[4] https://www.uavsystemsinternational.com/who-invented-drones/ ;
´[5] Dates cited for this range from 1915-18:
https://www.theflightbay.com/uav/ ; https://www.preceden.com/timelines/345843-the-history-of-drones ; https://consortiq.com/en-gb/media-centre/blog/short-history-unmanned-aerial-vehicles-uavs ; https://www.digitaltrends.com/cool-tech/history-of-drones/ ;

AARHUS UNIVERSITY

more diverse uses (i.e. surveillance, reconnaissance, surveying) and becoming increasingly more reliable and easier controllable.

In 2005, the aftermath of Hurricane Katrina leads to the first uses of drones in civilian air space, equipped with infrared cameras to aid in the rescue effort. Shortly thereafter, in 2006 the Federal Aviation Administration (FAA) in the United States formally authorizes the use of drones in civilian airspace for similar rescue initiatives following natural disasters.

Then the Parrot AR, first smartphone-controlled consumer drone, was released to the public and made widely available in 2010.[6] This marked a dramatic increase in drone use for both consumer and commercial purposes. Since then the use of drones has spread well beyond warfare and rescue, including but not limited to: agriculture, construction, real estate, law enforcement, journalism, private security, wildlife conservation, mapmaking, scientific research, delivery services, etc. For the sake of simplicity, we divide drones into three types: military, commercial, and recreational. Granted, commercial and recreational drones can and are being used in very similar circumstances; however, the distinction may become useful in distinguishing the different agents to consider in ethical discussions. Since this report focuses on the circumstances sounding commercial and recreational drones, this report will not dive deeper into ethics related to the use of military drones.

3.0 The potential for commercial and recreational drones

In the book "Ethics and civil drones"[7], Maria de Miguel Molina and Virginia Santamarina-Campos argue that the biggest markets; North America, Europe and China will further experience an increasing demand for drones in the next decade. They argue that drone technology is progressively improving and that the financial market for commercial and recreational drones is growing exponentially. In addition to this they argue that strict and inflexible regulations are the biggest obstacle for the market and that these regulations could have an undesirable influence on the European robot industry. According to Miguel Molina and Santamarina-Campos these inflexible reforms prohibits the potential for technological and economic growth in the industry. In addition to this, Europe could experience a gap in academic, technological, business and social developments in

the drone industry, when compared to the other big markets; North America and China. In order to avoid this, they argue that it is crucial to create more flexible rules on the area while still implementing certain ethnical guidelines for how, when and where to use (and not use) commercial and recreational drones.
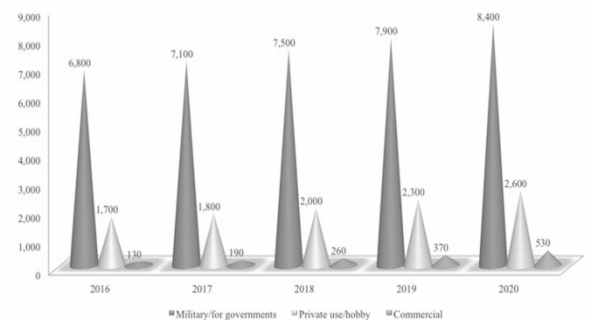
4.0 New EU reform

While strong regulations have been made in regards to the use military drones, the focus on commercial and recreational drones has not been deeply debated before 2019, when EASA´s (European union aviation safety agency) published a rapport on the use of drones in European airspace. This rapport has led to a new universal EU reform,[8] which will supersede the nations present regulations in June 2020. The new reform states that drone operators are subject to mandatory registration and that drones must have a viewable serial number. Furthermore the new reform also allows for the more free use of drones by allowing drones

---

[6] https://www.theflightbay.com/uav/
[7] "Ethics and civil drones: European polices and proposals for the industry" (2018), Miguel Molina, M. & Santamarina-Campos, V.
[8] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=OJ:L:2019:152:FULL&from=EN

AARHUS UNIVERSITY

to be used at higher heights and in more populated areas. The reform is intented to create more free and harmonized regulations for the use of both commercial and recreational drones across European countries, and to develop further the potential for drone-companies operating in Europe, while protecting the privacy of European citizens from any undesirable involvement or monitoring. One of the issues with allowing more freely use of drones is managing the basic guidelines for; what is actable or unactable to monitor. In one of our interviews we disused one of grey-zones of ethical/unethical use of drones, which could be relevant in regard to the new reform.

> "(…) I met someone the other day, who had concerned a business plan that involved having either robots or small drones circling a construction site, primarily outside of the working hours."[9]

Using drones on constructions sites like this is not necessarily an unethical use of drones. Yet the drones could monitor everything close to the construction site which (if placed in the populated area) could affect uninvolved individuals, thereby crossing the line for what is ethically actable (or unactable) to monitor.

5.0 Findings In relation to the ethical use of drones

While not explicitly focusing on the subject, RELLER has throughout our research found several statements, indicating the fear of drones being used for unethical conduct. In our interviews, drones have been continuously mentioned as a spying tool.

> "(…) when us engineers have made some brilliant drones, I find that there are heaps of issues, also ethical, in our society if we can purchase cheap drones and send them over the neighbour's garden and photograph private"[10]

As seen in the statement above, the increasing marketed for commercial and recreational drones, and the loosen restrictions, could allow for further unethical use of the technology.

> "Yes, it is [a] very cool use. On the other hand, a wrong use is here, by contrast, we have ethics - spying robots. For example, [a robot company] has made several such robots that are able to jump over the fence, take some pictures and come back, or spy drones."[11]

As discussed above the new reforms made by the European Union will allow for the more free use of drones, which will potentially increase the purchase of drones and optimize the possibility for drones companies, thereby allowing for new technology and economic growth. Yet the new loosened restrictions for drones and the potentially advancing technology, could allow for further unethical use of drones and maintain the existing fear of drones, which we see in our interviews. As the EU allows for more flexible use of commercial and recreational drones, it becomes ever more necessary to discuss how (and how not) to use drones and who is ethically responsible.

6.0 Ethical responsibility

As we have underlined in the REELER handbook, we see *policymakers*, *robot-makers* and *affected stakeholders* as part of the ethical discussion. Yet we have throughout our findings seen a patten which indicates, that robot-makers and affected stakeholders (developing, buying, using or otherwise being affected)[12] have a very limited understanding of ethics. In our research, we asked these individuals for their

---

[9] REELER interview
[10] REELER Interview
[11] REELER interview
[12] In order to separate drone-operators and affected third parties, the word "operators" will cover drone-operators while "affected stakeholders" will involve affected third parties

AARHUS UNIVERSITY

association with the word "ethics" and a cross-case finding in REELER shows that most robot-makers and affected stakeholders are not very familiar with the word "ethic". Something which is rather problematic, since understanding ethics is fundamental in this matter. As discussed earlier the European Union has been focused on protecting the privacy of its citizens. However, the robot-makers responsibility does not seem to be enhanced by anything more the new regulations, and since a large part of drones function is monitoring (and photographing), the responsibility in case of unethical conduct is mostly directed at the operator. The robot-makers seem to rely on their costumer's common sense and recommendations from the ethics committees to ensure that the technology is not unethically used.

In addition to this, Miguel Molina and Santamarina-Campos operate with two different positions in relation to ethical responsibility. The "manufactures"[13] and the "operators". They argue that both the manufactures and the operators have a responsibility in regards to the ethical use of drones and that manufacturers should work with operators and affected stakeholders to optimize their products and avoid situations, where drones could be misused. Furthermore, they argue that by knowing the stakeholder's concerns, the robot-makers can add considerable value to the product. When focusing on the "Operators", they argue that even though a better understanding of the affected stakeholders, and - as REELER recommended; a better understanding of the term ethics - might help the manufactures, it is still necessary to offer guidance on basic ethical conducts to the operators. Miguel Molina and Santamarina-Campos suggest, - as implemented by the new reform - that the EU should view drone regulations as car regulations where a mandatory licensing, registration of the drone and third-party insurance, is required before operators can use drones. They argue that though licensing and registration it becomes possible to assess the operators and create a registry to link each drone to its owner. Finally, the mandatory licensing would create a possibility to introduce guidance on ethical conduct. In this case it could be constructive to use the concept "Relational responsibility", which REELER as introduced in our Handbook.

7.0   Relational responsibility

Relational responsibility build on the collective ideal of "we". REELER argues that instead of simply following ethical guidelines, robot-makers, operators and affected stakeholders must understand "ethics" as a personal and collective engagement. The traditional understanding of *individualism* focuses on individuals being distinct subjects, fully responsible for their conduct and ethical responsibility. Relational responsibility focuses – as mentioned before – on individuals as collective subjects or "relational beings" whose perspectives are constructed by interaction with other individuals. By introducing this concept, operators and robot-makers most see their conduct as part of a larger collective with consequences surpassing themselves. In chapter 4 of our handbook, REELER suggests that by engaging robot-makers, operators and affected stakeholders through "dialogue", all three parties are able to express and interact with each other, thereby changing their perspective and allowing for new understandings. By adding such dialogue to the mandatory licensing, the operators are included in a "culture of responsibility" adding and forming their perspective on their own ethical responsibility.

8.0   Concluding thoughts

Throughout the REELER-project we have seen a cross-case finding, which indicates a concern for robot-technology - in this case drones – being use without moral concerns. As we have come to understand; most people involved with designing and using robot technology have given little or no thoughts to ethics. While

---

[13] As this is a REELER rapport the term "robot-makers" will cover both the term "robot-makers" and "manufactors"

the technology has progressed, universal Europeans regulations have been lacking, thereby allowing the individual countries to implement their own regulations centred on their fear for unethical conduct. As Miguel Molina and Santamarina-Campos argue, universal European regulations are crucial in order to avoid falling behind in technological innovation and market share. These new universal regulations have now been agreed upon and will supersede the European countries individual regulations in June 2020. The new regulations are intended for creating better opportunities for the market. However by allowing for more free use of drones in European airspace, a need for a basic understanding of ethical and moral responsibility arises. This is where REELERS definition of the concept "Relational responsibility" becomes useful. By raising awareness of "relations responsibility" to robot-makers and operators, the chances for unethical conduct decreases. REELER suggests that by creating a space for dialogue between robot-makers, licensed operators and affected stakeholders all three parties are giving the change to share and form their perspectives and gain a better understanding their ethical responsibility.

9.0   Literature Review

We have conducted a literature review inspired by the EPPI research method, using the multidisciplinary database Scopus. The first search on Scopus looked for the words "drone OR drones" in the article title. This yielded 3561 results, most of which were published after the year 2010 (3085 hits). Among these articles, only 97 hits also included the word "ethic*" (while also filtering out results concerned with bees). Because this report is not concerned with military drones, we have narrowed the search further to exclude them (by excluding the words war*, military, weapon, "drone strike", kill*, battle*, attack*, and fight*); this yielded 26 hits, the earliest articles having been written in 2014. Since only five of these belonged to the social sciences, it is clear that the overt discussion of ethics regarding drones in our field is still lacking. Notably, this does not mean that the social sciences have entirely neglected ethical discussions regarding the spread of commercial drones; it is, however, interesting that they have not been framed that way. Luppicini & So (2016) have conducted a thorough technological review of commercial drones, identifying 9 areas of both social and ethical concern: safety, ethics, morals, legality, privacy, air space, informational integrity, human versus machines, and commercial concerns. In their systematic literature review, they have found that among these constructs, ethics was the least cited. (p. 113) According to their findings, safety and regulations have been much discussed in the literature, but not yet enough work has been done on the issues of ethics and privacy. (p.117).

Though drones users are subject to data protection laws (such as the GDPR and national regulations), their occupying of air space blur the boundaries between private and public spheres. Is it enough to ban drones from hovering above private properties? As Rao et al. (2016) point out, even in public spaces, drones may "capture images and sound that aren't traditionally available to the public." (p. 87). At the same time, one of the key privacy issues creating mistrust and uncertainty in the public on the use of drones is the lack of transparency about who is using them and for what purpose. (Bajde et al., 2017; Finn & Wright, 2016). Moreover these issues do not appear to be well understood among drone industry members, as Finn & Wright (2016) have found in a survey that 55% of their respondents stated that their systems did not capture images of the public, or that they did not know, and 72% believed that their use of drones raised no privacy issues. (p. 581). Additionally, few of them appeared to have in-depth knowledge of European data protection laws and most believed it to be irrelevant to their work. (Ibid, p. 578).

It is worth noting that the rising concerns on most points coincide with the spread of drone use in civilian (non-military) spaces. My database research on Scopus showed even that the earliest publication involving both the words "**drones and safety**" dates from 2006, when drones began to be used in search and rescue, and have been rising from two hits in 2012 to 77 in 2018. Similarly, of the 118 hits for "**drones and privacy**", the first was published in 2012. This does, however, follow the general spike in drone publications around the year 2011, right as the commercial drones became commonplace. Due to how recent that is, there does

not appear to be ethnographic work yet done on the topic, or at least not to be found on Scopus or Anthrosource. Scopus also shows no results for the search for drones and collaborative learning.

Finally, most ethical considerations arising from consumer or commercial drones revolve at the interception of privacy and safety: "The commercial drone challenges are safety, ethics, and privacy at the individual, organizational, and societal levels" (Luppicini & So, 2016). Moreover, even with laws and regulations beginning to be put in place, it is yet unclear how these can be realistically enforced in practice. (Luppicini & So, 2016; Finn & Wright, 2016).

References

Molina, M. de M., & Santamarina-Campos, V. (Eds.) (2018), *Ethics and Civil Drones: European Policies and Propsals for the Insudtry*. Springer: Open Access.

REELER (2019). *Perspective on robots: a reality check on imagined future.* Vig: Trundholm Tryk.

Rao, B., Gopi, A., & Maione, R. (2016). The societal impact of commercial drones*. Technology in Society, 45*(1), 83-90.

EASA (2018) Flying Drones; do'es and don't's

Villadsen, J., Sylvest, j. & Lund, L. (2017). *Dronebrancehen i Danmark: Opdateret kortlægning,* Teknologisk institut.

Luppicini, R., & So, A. (2016). Technoethical review of commercial drone use in the context of governance, ethics, and privacy. *Technology in Society, 46*(1), 109-199.

Bajde, D., Woerman, N., Bruun, M. H., Gahrn-Andersen, R., Sommer, J. K., Nøjgaard, M., ... Bucher, J-H. (2017). *Public reactions to drone use in residential and public areas*. Retrieved: https://pure.au.dk/portal/files/142682693/Report_Public_reactions_to_drone_use_in_residential_and_public_areas_1_.pdf

Finn, R. L., & Wright, D. (2016). Privacy, data protection and ethics for civil drone practice: A survey of industry, regulators and civil society organisations. *Computer Law & Security Review, 32*(2016), 577-586.

REGULATION (EU) 2018/1139 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 4 July 2018 on common rules in the field of civil aviation and establishing a European Union Aviation Safety Agency, and amending Regulations

AARHUS UNIVERSITY