Situating Hobby Drone Practices

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Abstract

Consumer drones are entering everyday spaces with increasing frequency and impact as more and more hobbyists use the aerial tool for recreational photography and videography. In this article, I seek to expand the common reference to drones as "unmanned aircraft systems" by conceptualising the hobby drone practice more broadly as a heterogeneous, mobile assemblage of virtual and physical practices and human and non-human actors. Drawing on initial ethnographic fieldwork and interviews with drone hobbyists as well as ongoing cyber-ethnographic research on social networking sites, this article gives an overview of how the mobile drone practice needs to be situated alongside people, things, and data in physical and virtual spheres. As drone hobbyists set out to fly their devices at a given time and place, a number of relations reaching across atmospheric (e.g. weather conditions, daylight hours, GPS availability), geographic (e.g. volumetric obstacles), mobile (e.g. flight restrictions, ground traffic), and social (e.g. bystanders) dimensions demand attention. Furthermore, when drone operators share their aerial images online, visual (e.g. live stream) and cyber-social relations (e.g. comments, scrutiny) come into play, which may similarly impact the drone practice in terms of the pilot's performance. While drone hobbysists appear to be interested in keeping a "low profile" in the physical space, many pilots manage a comparatively "high profile" in the virtual sphere with respect to the sharing of their images. Since the recreational trend brings together elements of convergence, location-awareness, and real-time feedback, I suggest approaching consumer drones as, what Scott McQuire (2016) terms, "geomedia." Moreover, consumer drones open up different "cybermobilities" (Adey/Bevan 2006) understood as connected movement that flows through and shapes both physical and virtual spaces simultaneously. The way that many drone hobbyists appear to navigate these different environments, sometimes at the same time, has methodological implications for ethnographic research on consumer drones. Ultimately, the assemblage-perspective brings together aviation-related and socio-cultural concerns relevant in the context of consumer drones as digital communication technology and visual production tool.

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Consumer drones and their rapid rise in the domestic sphere over the past few years have been polarising individuals, communities, regulators, and governments by generating "equal parts of excitement, fascination and consternation" (Rabley 2015). Over 670.000 users registered their aerial vehicle in 2016, and the Federal Aviation Administration (FAA) estimates that as many as seven million consumer drones could be sold in the US by 2020 (Huerta 2017). Together, personal and artistic use appear to make up the largest non-violent drone user category in the US (Choi-Fitzpatrick et al. 2016). Popular recreational uses such as aerial photography, videography, and drone racing are predicted to continue to increase significantly over the next few years (Grand View Research, Inc. 2016). While numerous hobbyists feel empowered by this unprecedented access to the skies, skeptics are concerned about potential threats to privacy and physical safety "with the remote 'pilot' controllers having little or no aviation experience or exposure" (Bartsch et al. 2016: 2). The drastic proliferation of the trend and its potential socio-cultural implications suggest a need for a closer look at recreational drone practices.

In this article, I draw on my initial findings from ethnographic fieldwork with hobby drone photographers and videographers in the Philadelphia area, my virtual engagements with hobbyists on social networking sites, and eight interviews with consumer drone pilots based on the US East Coast. The aim is to better situate and interrelate people, things, and data in this mobile practice. Here, I seek to expand on the preferred reference of the FAA to drones as "unmanned aircraft systems." The term "system" encompasses both the unmanned aircraft and "associated elements (including communication links and the components that control the unmanned aircraft) that is required for the pilot in command to operate safely and efficiently in the national airspace system" ("Drone Operation and Certification Regulations – 14 CFR 107" 2016). Moving beyond the aviation lingo and the term "system" suggesting a somewhat static and closed-off network between ground control station, operator, drone, and other equipment, I suggest conceptualising the recreational drone practice more broadly as a mobile assemblage of physical and virtual movements and human and non-human actors. This assemblage-perspective allows for the consideration of many heterogeneous relations and mobile connections between the drone and its surrounding which extends into the digital sphere. Since the aerial device is merged with the communicative affordances of high-definition cameras and streaming capabilities as manifested in the thousands of aerial still and moving images that are regularly uploaded onto the Internet, the recreational trend needs assessment from a social-scientific perspective considering digital visual culture. In the following, I will first discuss what the empirical data have thus far revealed about the spatial situating of the drone practice before moving onto its cyber-spatial situating. While the term "cyberspace" has become somewhat outdated by now, it is helpful for putting the sometimes overlapping physical and virtual activities of hobby pilots into relation, as will be shown.

Spatial Situating of the Drone Practice

Having joined hobby pilots for flight sessions on several occasions now, the complex spatial relations between the "aerial system" and the respective setting become clear. Ranging from atmospheric and geographic to mobile and social relations, all of these conditions play a role in whether and how hobbyists can fly their devices at a given time and place.

The atmospheric relations, for instance, include weather conditions, sunlight hours, and satellite availability. Weather plays a major role in the outdoor drone activity as the equipment is generally not water-proof and thus unsuitable for rain. Moreover, strong winds may overpower the smaller quadcopter models and thus present possibly dangerous flying conditions. More generally, the FAA warns recreational pilots not to fly during times of "reduced visibility" ("Recreational Users | Know Before You Fly" 2017). Another pertinent atmospheric dimension is satellite availability for the GPS signal. The advancement and availability of Global Positioning Systems count as a driving factor for the explosion of drone innovation next to improvements in battery technology, and lightweight cameras, along with the integration of multiple sophisticated sensors (Bartsch et al. 2016). One drone hobbyist shows me his "drone" smartphone folder with five apps that he consults before launching his drone [Figure 1]. Apart from four other drone-specific apps that display weather conditions, sunrise and sunset hours, or no-fly-zones, he uses Solar Sphere to check on the possibility of solar flares having generated geomagnetic storms. Such storms could affect satellites which would then introduce GPS errors for the drone along with other disturbances. The complex and far-reaching interrelations that the consumer drone practice is entangled in come to light.

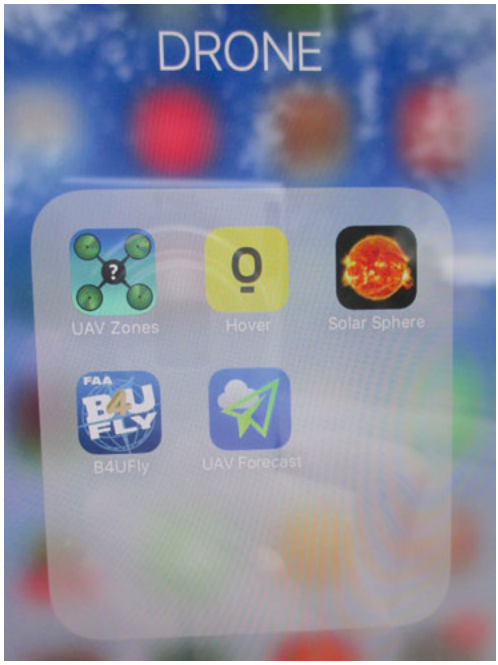

Figure 1: The smartphone folder titled "Drone" of this recreational pilot includes the mobile apps UAV Zones, Hover, Solar Sphere, B4UFLY, and UAV Forecast (foto credit: Julia M. Hildebrand).

By geographic relations I refer to any volumetric obstacle that could potentially interfere in the flight path of the drone along with the texture of the ground suitable for lift-off and landing. The list includes tall architecture, trees, power lines, fences, and so forth. The FAA, furthermore, requires operators to "not fly near or over sensitive infrastructure of property such as power stations, water treatment facilities, correctional facilities, heavily traveled roadways, government facilities, etc." ("Recreational Users | Know Before You Fly" 2017). When I meet Ahmed, a drone hobbyist in his twenties, one Sunday afternoon, the task to find a safe place to fly becomes quite a challenge.[1] An Ultimate Frisbee game is taking place on the open field that we had originally picked, so we continue to search for a suitable space. "Half the time is finding a place to fly," mentions Ahmed as he dismisses another location because of some power lines and a big antenna. While the device's obstacle recognition and collision avoidance systems may prevent crashes into such volumetric obstacles, Ahmed prefers a wide open space with less navigational challenges.

Apart from the atmospheric and geographic relations, the assemblage of the hobby drone practice is deeply embedded in mobile relations. Those relations can be of regulatory or observational nature. Consumer drones cannot fly anywhere at any height. Besides the FAA's rule for consumer drones to operate under 400 feet, the pilots also need to respect controlled airspace and flight restrictions. The FAA adopted classes A, B, C, D, E, and G to its national airspace and requires drone pilots to either stay away from classes B to D or notify Air Traffic Control prior to flight. While class A starts 18.000 feet above Mean Sea Level and is thus prohibited for recreational drone pilots, class G counts as the "good-to-go" uncontrolled airspace. Again several apps, such as Airmap, Skyvector, and the FAA's own B4UFLY can help drone hobbyist determine the respective airspace delineations [images 2 and 3]. Moreover, the apps also inform of any temporary flight restrictions which may be put into effect due to "a temporary hazardous condition, such as a wildfire or chemical spill; a security-related event, [...]; or other special situations" ("Airspace Restrictions" 2017).

Beyond these regulatory relations in the drone practice, several other dimensions potentially restricting mobility that are more of observational nature surface. When tracing Ahmed's DJI Mavic Pro drone in the sky on that partially cloudy afternoon [Figure 4], I am surprised by the amount of 'aerial traffic' occurring throughout the session. Apart from passenger planes visible in the far distance, a news helicopter passes well above us, several other quadcopters fly by, and a handful of model aircrafts close by are ready to take off once Ahmed's last Mavic Pro battery has run out. Moreover, a ball and a Frisbee occasionally enter the lower parts of the aerial space similarly posing a potential crash threat. All the while, Ahmed is cautious of the movements around him and the drone, his gaze moving back and forth between the screen on his controller and the drone in the

1 All names have been changed to protect the individuals' identities.

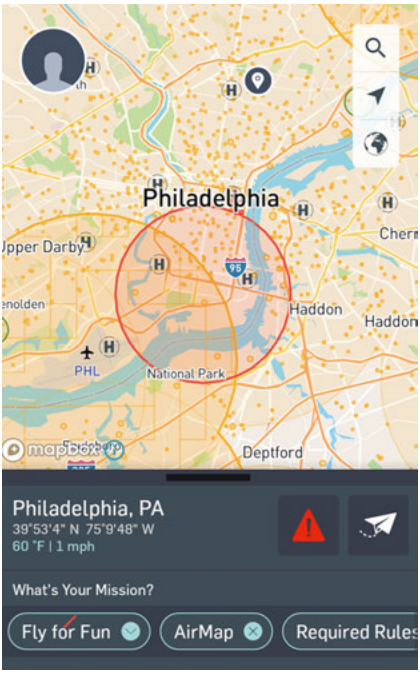

Figure 2: AirMap – an application for planning flight sessions. (screenshot)

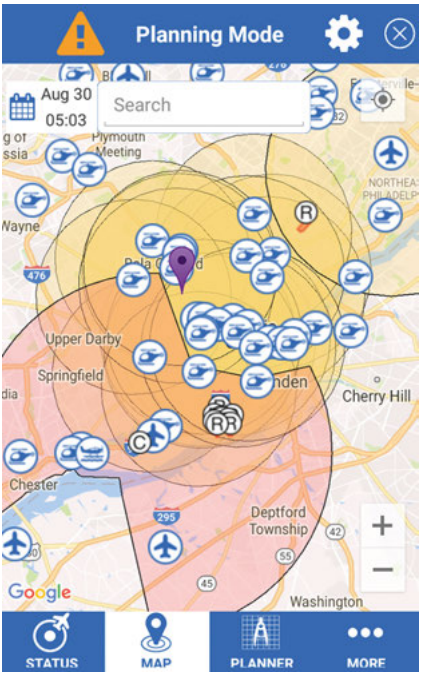

Figure 3: The B4UFLY smartphone app was released by the Federal Aviation Administration. (screenshot)

Figure 4: The DJI Mavic Pro hovering in the sky (foto credit: Julia M. Hildebrand).

sky. On another occasion, Terrence is flying his DJI Mavic Pro quadcopter and a pair of birds starts to circle around the device. "The Mavic has sparked their interest" observes Ahmed standing next to him and recounts how frequently birds get attracted by his own model. Not sure about what the birds will do, Terrence decides to land his drone. These examples illuminate the variety of human and non-human actors necessary to consider in the mobile assemblage of hobby drone practices. Finally, the mobile traffic on the ground needs to be acknowledged. The FAA states, "Do not intentionally fly over unprotected persons or moving vehicles," ("Recreational Users | Know Before You Fly" 2017). Following those guidelines, the pilots I observed made efforts to not fly too close or above busy streets, vehicles, and pedestrians.

Moreover, the photographers and videographers were careful to respect other people's privacy in light of the social relations the drone assemblage includes. While the majority of interviewees thus far reported positive encounters with bystanders who are mainly curious about the trend, a few pilots also mentioned being met with skepticism and distrust as to their intentions. "Peeping Tom"-privacy concerns are brought up in the discourse surrounding the flying camera (Bartsch et al. 2016). Another complaint relates to the drones' noise as a nuisance in public space (Custers 2016). Such perceptions may then shape pilot behaviour regarding flight time, direction, height, distance, speed, and how the camera is operated around bystanders. Ahmed tells me how "people can get really pissed" sometimes about drones. He, consequently, tries to stay out of the way and "keep a low profile" with his flight manoeuvres as much as he can. Besides safety, respect towards others by keeping the small aircraft and camera at a distance is a priority. The position and location of the pilot is relevant, too, as approaching bystanders may pose a distraction to the operation. Hence, several of the pilots I accompanied preferred secluded locations for launching, flying, and landing the drone. The potential agency of others, hence, influences the agency of the pilot. An interviewee in her sixties mentions that she even adjusts her flight times according to the presence of others among other things: "I am a real early-in-the-morning flyer because I don't like to bother people and I like the light in the morning. I am sensitive to people wanting quiet etc., so you have to be a good neighbour. I always talk about the golden rule of droning: Drone unto others as you would want others to drone unto you." The social relations and agency of others are thus another influential component in the assemblage of the hobby drone practice.

Cyber-spatial Situating of the Drone Practice

Next to a spatial situating of the drone practice, a more comprehensive view of the trend also includes its situating in the online environment. In particular, the visual and what I refer to as 'cyber-social' relations on the Internet can be influential in the mobile assemblage when hobbyists choose to showcase their drone-

generated imagery online. After the aerial shots have been collected, numerous hobby pilots upload their – frequently edited – creations online. The drastic increase in civilian drone use and the respective image production has resulted in the creation and growth of multiple online archives thematically or geographically organizing thousands of drone-generated photos and videos. Besides Instagram storing several thousand aerial images under hashtags such as #dronevideo or #dronefly and YouTube hosting several drone-specific channels, such as DronedOut, Epic Drone Videos, and Drone Compilations, several platforms exists exclusively for sharing amateur and professional still and moving images by consumer drones, such as Dronestagram, Travel By Drone, Skypixel, and Dronetrotter [images 5 and 6].

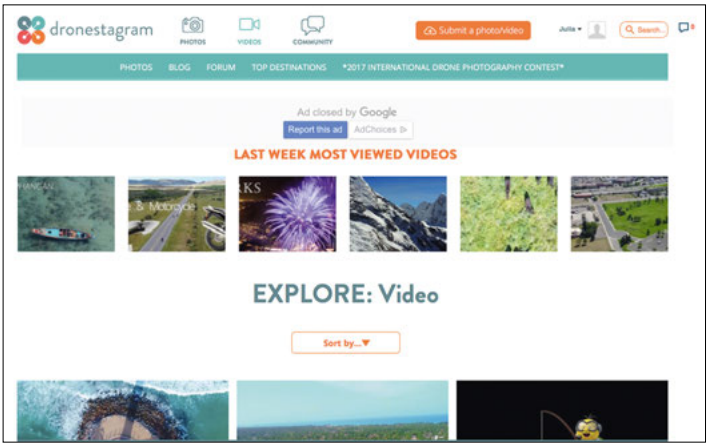

Figure 5: On Dronestagram drone pilots can upload, tag, and share their aerial pictures and videos. (screenshot)

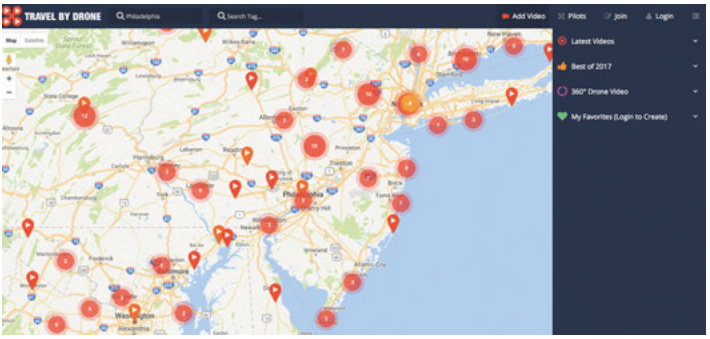

Figure 6: Travel By Drone features drone-generated images based on geolocation. (screenshot)

Next to this 'delayed' sharing of aerial views, some drone pilots have the option to live-stream their footage onto Facebook for instance. The Chinese drone manu-

facturer and market leader DJI integrated a few live broadcast platforms, such as Facebook Live, into its Go mobile app, which functions as the control interface between device, camera, and controller. This feature allows live-streaming onto Facebook from the DJI Phantom 4 and later models. With the options to share the imagery publicly, to friends only, or privately, the pilot thus provides live footage of the respective time and place. Particularly through this function, I learn that my drone ethnography can and needs to occur both offline and online. One afternoon, one of the drone pilots and I are unable to meet up. By coincidence, I later see that he is live with his drone video on Facebook and I am able to virtually 'participate' in his drone practice. The aerial visuals of suburban rooftops in the soft afternoon sunlight are combined with the sound of breathing and quiet mumbling: The video feed of the drone camera is linked to the audio feed of the smartphone, which he is using as the controller screen. The audio transmission is 'on' by default and allows pilots to communicate directly with their live audience (provided they are aware of this default setting). At least one of my interviewees is making active use of this functionality, creating live drone diaries about what he is recording and why. Moreover, audience members can comment on the feed, which will show on the pilot's screen and allow for reciprocity (Goldman 2016). This virtual interactive component which happens simultaneously to the flying and recording may likewise influence the respective drone practice. When pilot Diego goes live with his drone on Facebook for three minutes, several spectators comment in real-time below the video ("It's cloudy tonight," "That's where I live"). During the footage, Diego is audible saying to his companion "I just went live on Facebook and everyone is lovin' it, bro." His comment indicates his awareness of and even attention to the Facebook audience responses while operating the drone. In another live-stream with seemingly no physical companion, he directly addresses his virtual spectators by explaining "And this is my little town where I live" along with highlighting certain landmarks his drone passes. The drone practice and specifically the pilot's performance thus have the potential to be shaped by the presence of virtual bystanders and their comments. Opportunities for influential interplay of virtual and physical components surface in the consideration of the (audio)-visual and communicative relations in the drone assemblage and its reaching into the digital sphere.

These findings fall under the category of cyber-social relations in the hobby drone assemblage more generally. As aforementioned, when pilots share their aerial images on personal websites, social networking profiles, and drone-specific groups, their creations generate comments, feedback, and scrutiny. Consumer drones have made the sky accessible to hobbyists in new ways. The visuals obtained are insightful and often breathtaking. Sharing those images with the respective cyber-social networks functions as another way to make those vistas available to a wider audience. In the drone-specific groups I follow, members convey respect and admiration to the producers of the shots. Similarly, problematic drone practice is identified and discussed, such as flying too close to architecture, over people

or traffic, at night, and so forth. In at least one case, a drone pilot was arrested after Internet users reported serious misconduct in the video of a plane landing (McKirdy/Wang 2017). Two main conclusions can be drawn from those observations: First, next to the suggested "low profile" that operators seek in the physical space of the hobby drone practice, many pilots appear to manage a "high profile" in the virtual sphere with respect to the real-time or delayed sharing of their images. A pilot's desire for the hobby's visibility can thus significantly differ in offline and online environments. This move could also be viewed as a risk-and-return-process towards higher social capital in the larger context of contemporary digital culture. Second, the cyber-social relations, similar to the social relations, can function as a modifying force to the drone practice as the simultaneous or subsequent feedback of others may influence the pilot's conduct.

Geomedia and Cybermobilities

In the endeavour to understand contemporary consumer drone practices as a mobile assemblage of physical and virtual movements and human and non-human actors, two concepts are theoretically relevant: Scott McQuire's (2016) "geomedia" and Peter Adey and Paul Bevan's' (2006) "cybermobilities." The two frameworks help consider the complex workings of consumer drones and their recreational uses in the sense that drone systems function as geomedia and enable different cybermobilities. "Geomedia is a concept that crystallizes at the intersection of four related trajectories: convergence, ubiquity, location-awareness and real-time feedback" (McQuire 2016: 2). The initial findings of the hobby practices bring to light how consumer drones lie at this intersection of the four trajectories. First, convergence applies as different media merge in the drone assemblage (e. g. drone video and pilot audio in the live-stream). Location-awareness is relevant regarding the close attention pilots need to pay to atmospheric, geographic, mobile, and social relations for a safe practice in the physical space. The relevance of real-time feedback surfaces in the multiple signals, sensors, and connections between drone and pilot as well as the Internet. McQuire (2016: 4–5) also speaks of "novel experiences of social simultaneity" and "new forms of recursive communication and coordination between the diverse actors even as events unfold," which suitably describe the interactive drone live-stream. The concept of ubiquity of consumer drones as geomedia, lastly, may become increasingly relevant with the proliferation of consumer drones and the respective analog and digital infrastructures. McQuire clarifies further that "It is this paradoxical conjunction of connection and disconnection – of placement and displacement, of the articulation or jointing of the local and global, of media and immediacy – that I am wanting to grasp with the concept of geomedia" (2016: 6). As consumer drones span spatial and cyber-spatial relations, they exemplify such paradoxical conjunctions in a mobile assemblage.

The concept of "cybermobilities" helps describe the "connected movement that inhabits and inscribes both virtual and physical space simultaneously" (Adey/Bevan 2006: 57). The hobby drone practice is defined by multiple mobilities and immobilities ranging from the agile flight of the drone and comparative stillness of the pilot, to movement of signals and data between a multitude of human and non-human communicators in physical and virtual spheres. The term "cybermobilities" helps illuminate the multiplicity of spatial and cyber-spatial movements with different atmospheric, geographic, mobile, social, visual, and cyber-social relations which shape the drone assemblage. Physical "low profiles" and virtual "high profiles" of pilots suggest that the "connected movement" that "inhabits and inscribes both virtual and physical space simultaneously" can be influenced by contrasting forces since pilots, physical bystanders, and virtual audiences may have distinct interests regarding the drone practice. The way many drone hobbyists navigate offline and online environments, sometimes simultaneously, also has methodological implications for ethnographic research on the trend. Its study thus far required a similarly mobile assemblage of physical and virtual modes of analysis. Next to the physical "co-present immersion" (Laurier 2002) in which "the researcher moves within modes of movement and employs a range of observation and recording techniques" (Urry 2007: 40), I have been complementing the fieldwork with a virtual, if not 'cyber-mobile' co-presence through what may be termed Facebook-Live drone cyber-ethnography.

Summary

Since the ethnographic work on the practices of drone hobbyists is still in its early stages, this article needs to be viewed as an initial analytical assessment with more research left to be done. The main initial finding is that a more holistic understanding of the "unmanned aircraft system" and its contemporary recreational uses should include the critical consideration of the heterogeneous relations that merge aviation with visual and digital culture. To the ethnographic eye, the hobby drone practice presents itself as a mobile assemblage of physical and virtual movements as well as human and non-human actors. In the spatial situating of the hobby drone practice, I pointed to relevant atmospheric, geographic, mobile, and social relations. In the cyber-spatial situating of the hobby drone practice, I briefly discussed noteworthy (audio)-visual and cyber-social relations. Consumer drones can thus be approached as "geomedia" (McQuire 2016) particularly regarding their convergence with other media formats, location-awareness, and real-time feedback functionalities. Moreover, consumer drones enable "cybermobilities" (Adey/Bevan 2006) constitutive for the hobby drone practice, with different performative qualities in offline and online environments. These two theoretical frameworks help illuminate the processes of mediation and movement that the physical and virtual consumer drone practice opens up. Ultimately, the assemblage-approach to

consumer drones as geomedia affording cybermobilities brings together aviation-related and socio-cultural concerns relevant in the context of consumer drones as digital communication technology and visual production tool.

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References

Adey, Peter/Bevan, Paul (2006): "Between the Physical and the Virtual: Connected Mobilities?" In: John Urry/Mimi Sheller (eds.), Mobile Technologies of the City, London, New York: Routledge, pp. 44–60.

"Airspace Restrictions", (https://www.faa.gov/uas/where_to_fly/airspace_restrictions/).

Bartsch, Ron/Coyne, James/Gray, Katherine (2016): Drones in Society: Exploring the Strange New World of Unmanned Aircraft, London, New York: Routledge.

Choi-Fitzpatrick, Austin/Chavarria, Dana/Cychosz, Elizabeth/Dingens, John Paul/Duffey, Michael/Koebel, Katherine/Siriphanh, Sirisack/Tulen, Merlyn Yurika/Watanabe, Heath/Juskauskas, Tautvydas/Holland John/Almquist, Lars (2016): Up in the Air: A Global Estimate of Non-Violent Drone Use 2009–2015 (http://digital.sandiego.edu/cgi/viewcontent.cgi?article=1000&context=gdl2016report).

Custers, Bart (ed.) (2016): "Drones Here, There and Everywhere Introduction and Overview." In: The Future of Drone Use, The Hague: T.M.C. Asser Press, pp. 3–20.

"Drone Operation and Certification Regulations – 14 CFR 107", June 21, 2016 (http://usdronelaw.com/the-law/operation-and-certification-laws/drone-operation-and-certification-regulations-14-cfr-107/).

Goldman, Joshua (2016): "This Is What It's like to Live Stream from a DJI Drone to Facebook." In: CNET May 24 (https://www.cnet.com/news/dji-drones-now-let-you-facebook-live-from-the-sky/).

Grand View Research, Inc. (2016): "Consumer Drone Market Size to Reach $4.19 Billion by 2024: Grand View Research, Inc." In: PR Newswire May 10 (http://www.prnewswire.com/news-releases/consumer-drone-market-size-to-reach-419-billion-by-2024-grand-view-research-inc-578762831.html).

Huerta, Michael (2017): "Speech – 'Drones: A Story of Revolution and Evolution'", Federal Aviation Administration (https://www.faa.gov/news/speeches/news_story.cfm?newsId=21316).

Laurier, Eric (2002): "Notes on Dividing the Attention of a Car Driver." In: Team Ethno Online (http://www.teamethno-online.org.uk).

McKirdy, Euan/Wang, Serenitie (2017): "Drone Operator Detained for Flying near Plane in China." In: CNN January 17 (http://www.cnn.com/2017/01/17/asia/china-drone-passenger-plane-near-miss/index.html).

McQuire, Scott (2016): Geomedia: Networked Cities and the Future of Public Space, Cambridge: Polity.

Rabley, Peter (2015): "Foreword." In: Drones and Aerial Observation: New Technologies for Property Rights, Human Rights, and Global Development – A Primer (http://drones.newamerica.org/primer/01-Primer-Foreword.pdf).

"Recreational Users | Know Before You Fly", 2017 (http://knowbeforeyoufly.org/for-recreational-users/).

Urry, John (2007): Mobilities, Malden: Polity.