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**DRONE IT YOURSELF!
ON THE DECENTRING OF ‘DRONE STORIES’**

Maximilian Jablonowski

Living In a ‘Drone Culture’?

In the first shot, there is a kitchen table with different stuff on it. The text overlay explains this to be the ‘ingredients’. The camera zooms in on what seems to be the most important ingredient: several bars of chocolate. The next shot shows a young woman signified as ‘chef’ dancing around in the kitchen and being busy with pots. She is melting chocolate and filling it, not in a cake-pan but in a casting mould for the first chocolate quadcopter. The short YouTube video comes with a description that praises the advantages of the ‘new way of building copters. No drilling, milling or cutting required anymore’ (Chocolate Copter 2014). And as a further advantage it adds that ‘you always have something to nibble with you... when you get hungry during flight sessions’. In the second half of the video, both functions of the chocolate copter – flying and feeding – are depicted.

Drones are widely perceived as complex technical systems employing professional infrastructures, cutting-edge engineering knowledge, and vast financial resources. Military systems such as the Reaper, the Predator, or the Global Hawk convey the popular iconic images of UAS technology. Where then does the chocolate copter fit amongst these images? Could this widget seriously be referred to as a drone? Starting from this example and the questions it raises, I will analyse the phenomenon of amateur drone use at the sociotechnical intersection of model flight cultures, Do It Yourself cultures, and military and intelligence drone uses.

Within the last year media coverage on actual and potential *civil* drone uses appears to have increased. At least in the German-speaking media landscape Amazon’s media stunt *Prime Air* can be considered as the first discursive event of civil drone use and the starting point of this shift in media perception. Yet in spite of this

shift, social sciences and cultural studies still primarily focus on military and intelligence uses of drones. This occurs for good reasons, since drones might be ‘the most important weapons development since the atomic bomb’ (Singer, 2009: 10) and could well be considered as ‘the signature device of the form of contemporary power’ (Noys, 2014: 2). Designations such as ‘Drone Age’ (Anderson, 2012) or ‘drone culture’ ascribe an *époque* making and world changing power to drones. There is still a lot of research to be done to fully grasp how this technological innovation will influence societies and their power relations in the near future. As a way to critically analyse and contest the power of drones, Benjamin Noys proposes the notion of ‘drone metaphysics’. This metaphysics is bound up in theological metaphors such as ‘angels of death’; it ‘ascribes agency and activity that flatters the drone as object and elides the intricate meshing with human labour’ (Noys, 2014: 4).

But there are also other sorts of drones. A short search on the Internet digs up countless construction plans and videos of self-made drones by hobbyists. Some of them are designed for envisioned commercial purposes (of particular popularity is fast food delivery); some simply serve the pleasure of tinkering. Could these Do-It-Yourself drones really be compared to the feared ‘angels of death’? What can the metaphysical metaphors tell us about Do-It-Yourself drones, which already carry in their name the human labour that has to be invested in their existence? Do they share the seemingly unearthly and inhumane power that such metaphors conjure up in the Reapers and Predators? Or are the Reaper and the chocolate copter completely distinct phenomena?

In cultural anthropology’s perspective on technology there is no technology as such. It has to be analysed as embedded in lifeworlds that are both shaped by technology and shaping technologies’ uses and meanings. The German anthropologists of science and technology, Stefan Beck and Gertraud Koch, propose the corresponding notions of, firstly, ‘object potential’, denoting the practices technology enables and thereby the possible ways in which the very materiality of technological objects shapes our lifeworlds, and secondly, ‘contexts of use’ and ‘potential uses’, denoting the various ways that people put technological objects to use in their everyday lives, uses that are both intended and unintended by the engineers (Koch, 2005: 31-32; Beck, 1997: 246). Depending on its contexts of use the same piece of technology can perform a very different function and thus take on a wide range of meanings. That is why I think it is pivotal to have a close look at the ambiguous ways

drone technology is taking part in everyday lifeworlds to further an understanding of what it means to enter the 'Drone Age' or to live in a 'drone culture'.

Correspondingly, I will focus on the intersection of drone use with practices of model flight and DIY maker cultures. I will first analyse two examples of experimental drone use in maker culture lifeworlds, after which I will discuss two exemplary interpretations of the phenomenon of amateur drone use. Drawing on John Law's terminology of 'fractionality' and 'aircraft stories', I will propose a way to theorize the connection of military, commercial, and amateur drone uses. In the following section I will flesh out the theoretical considerations based on an exemplary analysis of a narrative interview from my ethnographic research on civil drone use. In the final section I will argue how this view on the practices of 'drone it yourself' could contribute to a critical understanding of how an overall notion of drone culture takes on concrete shape in everyday life.

Creating Drones Out of Nothing?

To begin I will return to the example of the chocolate copter. Although the realization of this project requires serious knowledge in unmanned aerial systems it can also be interpreted as parodic and subversive in its symbolic reframing of drones. The creation process of the 'drone' starts in the kitchen, a place usually associated with dull household appliances, not with geeky robotics technology. So the chocolate copter is symbolically marked as 'domestic drone use'. This reading is further emphasized by the text overlay referring to the components as ingredients. Similar chocolate ornaments within the frame take on the role of roundels or other military insignia. Plus, the air of masculine heroism, military technology and, especially, military aircraft usually assumes is reversed here since it is a young woman constructing and operating the drone. In the end she even destroys it by eating its skids (see *Chocolate Copter*, 2014). The video depicts the complete construction process of the chocolate copter and thus renders the necessary human labour visible. Moreover this work is shown as pleasurable and dance-like. There is no single moment where the young woman loses the control over the technology. She is depicted as a skilled tinkerer and quad copter pilot interpreting the object potential of the technology in her own creative way.

There are several projects similar to this that present drones without any metaphysical surplus. Take, for example, the project by Dutch interaction designer Jasper van Loenen from which I borrowed the title of this article, 'Drone It Yourself'. In his Design School graduation project van Loenen (2013a) uses 3D printed parts together with some ready-to-buy electronic components for propulsion, remote control, and auto piloting 'to turn any object into a drone, simply by attaching four motors and a control unit – no technical know-how needed'. The related video shows how a bike wheel, a computer keyboard, and an old cord telephone are transformed into drones simply by clamping some components to them. Other than the chocolate copter, these DIY drones do not even need minimal skills in tinkering and modelling.

It is interesting to note that van Loenen believes the term 'drone' in need of further qualification. On his homepage he writes: 'Technically this would be an Unmanned Aerial Vehicle (UAV), not a drone, but drone seems to be the term most used these days' (van Loenen, 2013a). Asked in an interview about his inspiration for the project he stated:

When I was building a regular quadcopter, I noticed how many people refer to any flying machine without a pilot inside as a 'drone'. Because the most well-known drones are those you see in the news, a lot of these people see them all as dangerous devices. ... I believe technology isn't good or bad; it depends on what you do with it. So with my kit, you decide what kind of machine it is. The kit itself does nothing but provide the means needed to make something fly. (Weinhoffer, 2013)

Van Loenen understands his project as freeing the drone from its image as a dangerous and deadly device. He strongly emphasizes the contexts of use by employing a notion of technology as neutral, with its character entirely defined by its practices of use. To give others the possibility to 'decide what kind of machine' they would like to have, he uploaded the files to 3D print the parts and offers a step by step construction manual online (van Loenen 2013c).

The do-it-yourself part of this project is an invitation to other tinkerers to use their creativity to explore which everyday objects could also be transformed into drones. The drone ceases to be a

black box; its possible uses and its object potential seem to be the same. Indeed both examples, the chocolate copter and van Loenen's DIY drones, emphasize the possible uses of drones and deemphasize their object potential. This is a typical way of perceiving technology in modeller and tinkerer cultures, which I will demonstrate with the example that follows.

A Myth of Creation

In an article in *Wired*, Chris Anderson – former editor in chief of the magazine, and founder of the 3D robotics company and online community *DIY Drones* – delivers a personal account of how he 'accidentally kickstarted the domestic drone boom'. This could be read as a 'creation myth' – not only because he refers to his own essay as the 'garage-creation myth' every industry needs to cultivate (Anderson, 2012).¹

In his creation myth, Anderson describes how he constructed the first LEGO drone on a 'geeky weekend with the kids'. Thus he considers drones as 'the first technology in history where the toy industry and hobbyists are beating the military-industrial complex at its own game', because these drones 'can do everything that military drones can, aside from blow up stuff'. He compares the drones' stage of development with the early personal computers which also started as a toy for geeks and then changed society: 'Just as the 1970s saw the birth and rise of the personal computer, this decade will see the ascendance of the personal drone. We're entering the Drone Age'. This is possible because creative (and, in Anderson's case, business-minded) tinkerers are using existing technology in new and unexpected ways. Interestingly, for Anderson, it is not the technology of military drones that enables tinkerers to do this, but 'the smartphone industry, which relies on the same components – sensors, optics, batteries, and embedded processors'. He thus sees the amateur drones as 'essentially a fleet of flying smartphones'. Correspondingly he conceptualizes the amateur drone community's hold on the technology as an appropriation from below in order to 'demilitarize and democratize [the drones] so they can find their full potential'. Anderson thereby employs a neutral understanding of technology, and strongly emphasizes its contexts of use: 'There will be good uses and bad ones, but the same is true of any tool, from a crowbar to an ultrasound machine. Ultimately the way society best figures out how to think about a powerful new technology is to set it free and watch where it flies'.

Joanne McNeill and Ingrid Burrington give, in reaction to Anderson, a completely different story of the drones' origin. They do not view the drone as a blank page waiting for someone to paint on it. On the contrary, they place great emphasis upon the object potential common to all drones. Even though they admit 'that not every drone carries a missile', they argue that 'all drones carry the burden that comes with being an instrument of tremendous power' (McNeill & Burrington, 2014: 57). They locate the drones' power exactly in the very components which lead Anderson to conceptualize the personal drones simply as flying smartphones: 'The camera and sensors are a barrier between forces of power and the people or landscapes being surveilled – something both commercial UAS and military application have in common' (57). For them, it is 'not merely the Hellfire missile that makes drones so powerful. It is the vantage point they offer, it is the data they collect from that vantage point, and it is the power afforded by that data' (59). Thus, they strongly disagree with Anderson's account of hobbyists beating the military-industrial complex and, by contrast, see these hobbyists 'benefiting from it; [the military-industrial complex] has been a key supporter of hobbyists' drones and the larger DIY "maker" subculture in tech productions' (59). In fact, they see an 'overlap between maker culture and the military-industrial complex' (58-59) since 'most boys-with-toys hacker spaces' are 'intimidating and exclusionary' (60).

Both Anderson and McNeill & Burrington offer stories of the drones' origin. Since origins are believed to strongly determine the course of future development, it makes a huge difference if the drones' main characteristics stem from smartphones or surveillance satellites. Anderson's story allows him to emphasize the tinkerer's agency and creativity, McNeill's and Burrington's story on the other hand focuses on how the drones' material features constrain the tinkerer's possibility to give them a new direction. What Anderson considers to be an emancipatory appropriation from below, McNeill and Burrington see as two sides of the same coin – an economic and technological inseparability.

It is impossible to tell which story of origin is correct since both simply emphasize different aspects of the drones' reality. They tell stories of different drones, but somehow they are also the same. These examples – from the chocolate copter to Anderson's contested myth of creation – reveal that *there is no drone as such*. On the contrary, research on projects like the chocolate copter or van Loenen's DIY drones reveals that there are many drones. That is

why I think these projects have to be interpreted as more or less explicit attempts to *decentre drones as objects of technoscience*.

Decentring Drones

The notion of decentring technological objects derives from John Law's study *Aircraft Stories*, where he analyses the failed design process of the British military aircraft TSR2. In his historical analysis of the TSR2's planning he came to the conclusion that there has not been one single aircraft but several different and partially contradicting visions and expectations of it. To theorize this heterogeneity of 'aircrafts' he borrows, from mathematics, the metaphor of 'fractionality'. 'In mathematics fractals are lines that occupy more than one dimension but less than two In this way of thinking, a fractionally coherent subject or object is one that balances between plurality and singularity. It is *more than one, but less than many*' (Law, 2002: 3). This thought is common with regard to subjects, but for objects it seems very unfamiliar. Fractionally coherent objects 'are both singular and multiple, both one and many. Both/and' (4).

Following Law, I also want to conceptualize the drone as a fractionally coherent object 'that balances between plurality and singularity'. As a technological innovation drones are – at least for the majority of the people in western societies – not yet 'experienced technology' (Hengartner, 2004: 46) but 'technology as concept' (49). There certainly is a dominant concept mediated by representations of military drones in popular culture. This dominant concept also shapes the perception of the object potential of civil drones despite their different contexts of use (e.g. following McNeill and Burrington, the powerful vantage point). But many differing visions of this technological innovation continue to circulate. Thus the drone is constituted by different realities depending on the ways the object, its uses or its representations take on meaning in different lifeworlds and thus makes it a 'real social and cultural phenomenon' (Koch, 2005: 33), even though it is not physically present in most lifeworlds. Employing the metaphor of 'fractionality' helps to avoid a false juxtaposition between a techno-deterministic view focusing on the object potential and a context-oriented view solely focusing on the ways the drones are used.

To argue the above is not simply to offer a theoretical consideration valid for historical studies of technological design processes: the

argument also affects actual lifeworlds. In the next section I will illustrate this point by drawing on narrative interviews from my continuing ethnographic research on amateur drone cultures and civil drone use.

Drone Stories

Law named his aforementioned study *Aircraft Stories*. He thus uses a narrative approach to conceptualize the different accounts from which he derives the ‘fractals’ finally constituting the reality/realities of the aircraft(s) under debate. In the same vein, I want to talk of ‘drone stories’. These ‘drone stories’ are heterogeneous and plural, constituting as they do the drone as a fractionally coherent object. I will show that even in a single interview with just one person, there are different drones coming to reality.

I interviewed Mark Schneider, a long-term amateur modeller and model aircraft pilot in his early thirties working in the creative industries.² From the beginning, Mark made it very clear that he could only account for his version of personal drones and model flight, since ‘it is difficult to say what model flight actually is. It is an absolutely huge field, which, somehow, yes, where somebody always develops something new’. At the time of the interview, the novelty of the moment was first-person view flight with multi rotor devices. This means a live video link streams footage from the on-board camera to the video goggles the pilot wears. The pilot can literally see through the eyes of the drone. The interview soon arrived at the small controversy concerning what can actually be called a ‘drone’. Mark argued that

we don't want it to be called drone, because...
because... because it simply is no drone, it is a
model aircraft. Legally they are regarded as model
aircrafts, the insurance views them as that. We are
scale modellers, we have model flight insurance
and that's why it is a model aircraft.

His first ‘drone story’ is a legal story. Mark argues that his copter is no drone because it is legally considered a model aircraft. Though it is capable of out-of-sight flight due to its sensor arrays and its long-range remote control capacity, he very strongly emphasizes that he does not use it in a different way than his other model airplanes and points out the importance of reasonable use within legal

frameworks. Here the drone is an object of legal dispute. The still unfolding legal discourse on drones shapes, to a large degree, how Mark realizes the object potential of his tricopter/drone in actual uses.

Nonetheless he uses this legal argument to separate his own tricopter from drones, in the course of the interview he keeps on naming it and other multicopters drones. Thus he searches for another distinction within the category 'drone'. This becomes a strategy of pluralizing drones. He says:

We as modellers of course don't have any weaponry on our devices, we want, um, we strive to, um, use it without endangering or harming anybody in any way. We do not aim at filming somebody specifically, we just want to enjoy the view, well, so, it is, it is, um, how to put it right? What is the distinction? The distinction is that, I believe, the purpose simply is completely different; I think the main point is that we have a completely different aim. Our aim is neither to collect information nor to earn money, nor... any, any other purposes one could think of, it is just an end in itself.

Here Mark defines *his* drone as a means to fly without any other purpose. Following the German sociologist Andreas Reckwitz' definition of creative practices as activities that do 'not subordinate themselves to purposive-rational action, but gather momentum of their own and realize themselves rather independently' (2014: 27), Mark's approach to amateur drone use can be interpreted as a creative activity *par excellence*. In this story the drone is a means of creativity and personal expression. This differentiates it from the military or commercial drones, which Mark sees under the rule of 'purposive-rational action'.

But in both ways it is the context of use that defines the drone. The materiality of the drone is completely subordinated to the agency of the pilot. This argument is similar to van Loenen's and Anderson's notion of technology as neutral. But in contrast to Anderson, Mark even precludes commercial use from his drone story. The only purpose is flying and enjoying the view. This is an aesthetic argument. The drone is a tool to produce a certain sensory quality.

Thus Mark believes model flight to be ‘something like a cultural property by now’.

But there is another sentiment Mark is also expressing: ‘Every time the copter takes off I am surprised that it actually flies. It is just, um, it is fascinating that it, that... you get a feeling of control over this object that moves through the air like a bird’. The fascination with flight is connected to a feeling of control. The drone is also a device that has the potential to give power to its user. The following quotation emphasizes this sentiment even more strongly:

It is somehow, that... you have the feeling... for me it is somewhat an extension of my body, it is something like my Iron Man suit, I can use it or... yes, partially wear it. So, I put on the specs and on a sudden, I am able to move about in a space where I normally can't be. I can't easily lift up my body in the air, and this makes it possible, it is a self purpose, just because I like it, just because I find it exciting.

The immersive quality of FPV-flight described here refers to a power located in the object. This impression is close to McNeill's and Burrington's conception of drones as ‘an instrument of tremendous power’ (2014: 57) deriving from the ‘vantage point they offer’ (59). Furthermore the Iron Man suit is an allusion to the masculine power McNeill and Burrington ascribe to the ‘intimidating and exclusionary’ ‘boys-with-toys hacker spaces’ (60). Indeed, the very notion of ‘Do-It-Yourself’ is historically linked to masculinity since ‘building things for pleasure became part of the masculine repertoire in the twentieth century’ (Gelber, 1997: 75). Thus even the corresponding notion of creativity can be legitimately criticized as ‘an echo of a grand narrative of cultural resistance, with military (and masculine) metaphors of guerrilla warfare, raids, appropriation, seizing territories, etc.’ (Löfgren, 2000: 159).

But Mark gives a completely different meaning to the feeling of power and strongly rejects any connection to military power. The feeling of power is both the source and effect of the pleasure of flying as self-purpose. In any case, the connection to military or surveillance drone uses is always present as a dominant concept: ‘Media of course likes to focus on this because it is spectacular, probably, like we are surrounded by drones constantly filming, but this is nonsense’. Even though Mark thinks something like an

‘everyman drone’ will emerge since the devices will become cheaper and easier to fly, he separates this development from the progress of military devices: ‘Well, we are not at all gaining from any military drones, it’s not that we get the stuff cheaper or something like this since the military uses it. That is absolutely not the case.’ Instead of the ‘overlap between maker culture and the military-industrial complex’ (McNeill & Burrington, 2014: 58-59), he describes an independent development of amateur UAVs that is driven by a wish to solve technical problems in a creative and cooperative way as an end in itself.

The Swedish cultural anthropologist Orvar Löfgren (2000: 158) points out that creativity is often used in popular and academic discourses as a ‘counter-argument’ against the accusation of passivity and uncritical reproduction of dominant cultures. Creativity is an ambiguous concept and this is particularly the case with regard to the amateur drone community. It is situated between the hegemonic discourses of technoscience with its conception of masculine power, and a ‘creative ethos of production’ (Reckwitz, 2014: 29) that seeks to emancipate itself from the dominant representations, practices and institutions of technoscience.

Mark certainly uses creativity as a counter-argument against the connection of amateur drones with military drones. But it is not only the ‘how’, the way it is built, it is also important ‘what’ is built. With regard to models of Predator or Reaper drones he expresses harsh criticism:

This is so redundant! Really, nobody needs that. So, first, I believe it doesn’t fly very well in model size, cos it has so strung-out and thin wings and so on, and then it is, yes, just, it just fosters this connection, when some people are flying around with a Predator model, that simply is counterproductive, I believe.

We then had a discussion in how far a model of a Predator or a Reaper is different from the models of World War II aircrafts Mark uses. His criterion for distinguishing these different types of models is again based on aesthetics: ‘World War II aircrafts are simply beautiful old-timer aircrafts, I can’t fend off this impression’. But he admits that it is hard to draw a clear line between these models, that ‘it is actually the same, flying a model of a drone or a model of a modern jet fighter ... yes, you’re right, that is basically the same’. His

argument certainly tends to reproduce the widespread aestheticizing gaze on military technology, although he seems to have an ambiguous perspective towards his own perception. But it also shows that he cannot apply his view of model flight as a quasi-aesthetic purpose to all models. For Mark, the models of military drones cannot be aestheticized. Predators cannot be ‘simply beautiful aircrafts’, their sheer appearance is too obviously connected to a purpose Mark rejects.³ Here even the model of a drone is close to the metaphysical ‘angel of death’. Despite being just a model it holds something of the unearthly power of its non-model counterparts. For Mark this power is not to be confused with the self-referential feeling of power he experiences while flying with his drone.

Conclusion

In the analysis of the interview I have shown that there are many possible drone stories. I only touched upon some of these; they deal with legal issues, creativity and aesthetics, power, and also military drone use. The latter is certainly a very important part of all stories. It is in a way the dominant narrative to which all the other drone stories have to relate in negotiating the drone as a technological (that is, a cultural) object. There is probably no civil use of drones that can avoid some relation to the military use. Thus there is a serious striving among amateur UAV tinkerers to preclude this topic from representations of civil drone uses. For example the ‘mission statement’ of Chris Anderson’s online community *DIY Drones* bans discussions of military drones from the website’s forum: ‘This is not the place to discuss your views on the wisdom of military use of UAVs, any nation’s foreign policy, your feelings about war, or anything else that is inclined to turn into a political debate’ (Anderson, 2008). Despite these attempts to increase the distance between the different contexts of use (and thereby also depoliticize the distinction), military and intelligence drone use remains the leading way drones are present in the mediated lives of most people.

To speak in Law’s terminology the military use of drones is a strong force attempting to render the drone as singular. With the help of my other examples I attempted to show that the drone is in fact not singular but plural: ‘Both/and’ (Law, 2002: 4). The drone is *both a powerful and a playful device*. This seeming contradiction cannot be one-sidedly solved since both are constitutive parts of the cultural meaning of drones. I think this ambivalence of the drone can help to

understand how the ‘desire for the drone’ (Noys, 2014: 4), as a metaphysical device both fascinating and fearful, is located in actual lifeworlds. Both of these sentiments are central to the cultural configuration one could name ‘drone age’ or ‘drone culture’. To dislodge this connection would depoliticize the tension between the different objects and practices that constitute the drone as a seemingly singular and centred object.

Thus I do not think that acknowledging the heterogeneity and plurality of drone stories necessarily downplays the ethically and politically questionable uses of military drone technology. On the contrary, I believe that decentring the drone as ‘signature device of our time’ – by re-telling the differing and contradictory drone stories circulating in media, science, popular culture, and everyday lifeworlds – can contribute to a critical project of understanding and thereby contesting the apparent future trajectory of drones.

Notes

1. All quotes in this section with no other reference are taken from Anderson, 2012.
2. The name has been changed for privacy. The interview took place on Oct 31, 2014 in Munich and was originally conducted in German. I have translated the relevant passages, meaning that most idiomatic everyday German wording and phrasing has been lost. However, since I do not use the interview for linguistic analysis, I do not consider this particularly problematic, especially because the content has not been altered. All quotes in this section with no other reference are taken from the interview.
3. Mark’s personal perception is particularly interesting with regard to the discursive strategies trying to give drones ‘a strategic *veil of science fiction cool*’ Maradin (2013: 78) makes out in US Air Force’s TV commercials. This mismatch emphasises that even the highest effort to encode a message does not automatically determine how people decode them, especially regarding such symbolically laden signifiers as the drone. The techno-aesthetics of the drone remains ambiguous.

References

- Anderson, C. (2008) 'The DIY Drones Mission (aka The Five Rules)', 4 January. Available at:
<http://diydrones.com/profiles/blog/show?id=705844:BlogPost:17789>. Accessed 15 December 2014.
- Anderson, C. (2012) 'How I accidentally Kickstarted the Domestic Drone Boom', *Wired Magazine* 22 June. Available at:
http://www.wired.com/2012/06/ff_drones/all/. Accessed 10 May 2014.
- Beck, S. (1997) *Umgang mit Technik: Kulturelle Praxen und kulturwissenschaftliche Forschungskonzepte*. Berlin: Akademie Verlag.
- Chocolate Copter (2014) 'First Chocolate Quadcopter – delicious!!!', 1 June. Available at:
<https://www.youtube.com/watch?v=e6lRbiHswho>. Accessed 22 June 2014.
- FAA (1981) 'Advisory Circular 91-57. Model Aircraft Operating Standard', Available at:
https://www.faa.gov/documentLibrary/media/Advisory_Circular/91-57.pdf. Accessed 14 December 2014.
- Gelber, S.M. (1997) 'Do-It-Yourself: Constructing, Repairing and Maintaining Domestic Masculinity', *American Quarterly* 49 (1): 66-112.
- Hengartner, T. (2004) 'Zur Kultürllichkeit von Technik: Ansätze kulturwissenschaftlicher Technikforschung', in Swiss Academy of Humanities and Social Sciences (ed.), *Technikforschung: Zwischen Reflexion und Dokumentation*. Berne: ASSH/SAGW.
- Koch, G. (2005) *Zur Kulturalität der Technikgenese: Praxen, Policies und Wissenskulturen der künstlichen Intelligenz*. St. Ingbert: Röhrig Universitätsverlag.
- Law, J. (2002) *Aircraft Stories: Decentering the Object in Technoscience*. Durham and London: Duke University Press.
- Löfgren, O. (2000) 'The Cult of Creativity', in Institut für Europäische Ethnologie der Universität Wien (ed.), *Volkskultur und*

Moderne: Europäische Ethnologie zur Jahrtausendwende. Vienna: Institut für Europäische Ethnologie.

Maradin III, N.R. (2013) 'Militainment and mechatronics: Occultatio and the veil of science fiction cool in United States Air force advertisements', *Ethics in Information Technology* 15: 77-86.

McNeil, J. & Burrington, I. (2014) 'Droneism', *Dissent* 61 (2): 57-60.

Noys, B. (2015) 'Drone Metaphysics' *Culture Machine* 16.

Reckwitz, A. (2014) 'Creativity as Dispositif', in H. Knoblauch et al. (eds.), *Culture, Communication, and Creativity: Reframing the Relationship of Media, Knowledge, and Innovation in Society*. Frankfurt: Peter Lang.

Singer, P.W. (2009) *Wired for War: the Robotics Revolution and Conflict in the 21st Century*. New York and London: Penguin Books.

van Loenen, J. (2013a) 'DIY (Drone It Yourself)', <http://jaspervanloenen.com/diy/>. Accessed 15 December 2014.

van Loenen, J. (2013b) 'DIY (Drone It Yourself) v1.0', <http://vimeo.com/68841788>. Accessed 15 December 2014.

van Loenen (2013c) 'DIY (Drone IT Yourself) Kit v1.0', <http://www.instructables.com/id/DIY-Drone-It-Yourself-Kit-v10/?ALLSTEPS>. Accessed 15 December 2014.

Weinhoffer, E. (2013) 'Turn Everyday Objects into Drones', *Make* July 10. Available at: <http://makezine.com/2013/07/10/turn-everyday-objects-into-drones/>. Accessed 15 December 2014.