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Combat Drones – Killing Drones

A Plea against Flying Robots

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Medium altitude, long endurance drones are becoming a component of regular air forces. However, the extent to which manned aircraft are being replaced by such "MALE UAVs" (MALE = Medium Altitude, Long Endurance, UAV = Unmanned Aerial Vehicle) remains unclear. At present Germany is faced with determining with what means the Luftwaffe should be equipped in the medium term (up to 2020) and long-term (post-2020). Beyond military considerations, there are cooperation and industrial policy issues to be taken into account, since no one individual state in Europe can or wants to provide the financial means to develop a national MALE UAV model. Although European industry has already launched research and development projects, their governments are by no means on board. Likewise it is also unclear whether drones are to be armed in future. Discussion has been continuing for some time as to how far targeted killings are responsible and permissible. In contrast, no fundamental debate has so far taken place about what the ethical consequences are of the trend towards automated combat. Such a debate is now overdue and urgent, as the momentum of technological development conceals the danger that human beings may abdicate moral responsibility in decisions over the use of force.

In the meantime, MALE UAVs are being used in many countries by armed forces and intelligence services, by Germany, France, Great Britain, the USA and Israel amongst others. These drones are being continually updated; their deployment spectrum is growing and their vulnerability diminishing. For the most part so far, they are still being used for reconnaissance purposes, but they are increasingly developing into weapons platforms. Thanks to technical advances they can fulfil both roles in an ever more effective manner. However, it is questionable to what extent the deployment of such armed systems is defensible from legal and ethical points of view. The drone war the CIA is waging outside the United States for the targeted killing of suspected terrorists is one example of these issues.

Like some of the other European governments – amongst them the British, French and Italian governments – the German government is also considering making MALE-UAVs a permanent part of its air force. Manned and unmanned systems can then

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be allocated flexibly to both the tasks of "reconnaissance" and "airborne support" However, if drones were used for the second function, the conduct of warfare would be embarking on a slippery slope that – because of technology – necessarily ends in the automatic deployment of lethal means. This would leave one fundamental condition for an ethically justifiable action unmet: its accountability back to a responsible protagonist. For this reason there needs to be a public debate, asking whether embarking upon the use of armed drones is permissible or whether one should not consciously renounce this weapon.

Plans: Drones in the Bundeswehr

MALE-UAVs are at present the most advanced of the (unmanned) remotely-controlled aerial systems with fixed wings. These are aircraft with wing spans of more than 15 metres and an in-service time of more than 15 hours. They are designed with maximum range and endurance in mind rather than payload and speed. The manufacturers dominating the market are the US General Atomics company (with its "MQ-1 Predator" and "MQ-9 Reaper" models) as well as Israel Aerospace Industries, IAI ("Heron 1", "Heron TP").

In Afghanistan the Bundeswehr deploys – in addition to some smaller, "tactical" drones – the Israeli "Heron", which has been leased from IAI in a joint venture with Rheinmetall Defence. However the leasing contract comes to an end in October 2014, which is why a follow-up solution is under discussion. In the summer of 2012, defence minister Thomas de Maizière and representatives of the Bundeswehr repeatedly spoke up for the procurement of armed surveillance drones. Although the "Heron" platform – which is only used for reconnaissance purposes – has proved its worth to the German armed forces, its deployment does at the same time give rise to the wish to be able to react immediately to identifiable crisis situations on the ground with a weapon, instead of having to restrict oneself to "looking on". Some people think that there is no fundamental reason to object to the procurement of a relevantly equipped drone, since a weapon is always to be regarded as "ethically neutral". Others have strong objections to this.

Apparently, plans have been mooted to procure an already available combat drone as an interim solution and, in parallel with this, to develop a European drone by 2020. Such thinking does not, however, answer the question as to which concrete deployment scenarios the Bundeswehr would plausibly be involved in for the use of armed surveillance drones. Information on this is provided neither by a May 2011 report of the Bundestag's Office for Assessing the Consequences of Technology, nor the German government's answer to a passing query from the Green Party. In its April 2012 statement the government only indicates that for armed UAV systems, "the most likely tasking [...] would be in the field of international conflict prevention and crisis management". In another answer to a parliamentary question from Die Linke (a parliamentary party), the government concretized in January 2013, that armed UAV would offer an enduring capability to protect ground forces in rapidly changing security environments and persistently threaten enemy forces in an unpredictable manner. This is formulated against the background of the highly specialised Afghanistan- scenario that is too narrow to be able to serve as a criterion for the necessity of any procurement. Moreover, such terms of reference are hardly fit to serve as a catalyst for ethical debate.

Review: Deployment in War

Unmanned and remotely-controlled aerial systems have been deployed since the beginning of the 90s, above all for the surveillance of deployment areas and the reconnaissance of targets, both places and people. They are used in particular if the targets to be monitored are small and mobile, causing the usual strategic recon-

naissance (with satellites or radar) to be ineffective.

Conflicts with a high percentage of irregular combatants in dynamic, small groups have markedly driven up the deployment of reconnaissance drones. In this they have functioned with their sensors and, where applicable, light precision armament, as air support for ground troops. Present-day MALE drones do not, however, have any protection of their own and can only be operated in closed air space. In the 2011 Libyan war, the USA also deployed armed drones of the "MQ-9 Reaper" type to hunt military and political officials of the later toppled Gaddafi regime. Since the end of the 90s drones have thus developed from pure reconnaissance means into a tool of personalised, "surgical" warfare.

This trend was set by Israel's way of proceeding after the eruption of the second Intifada in the year 2000, when drones were also used against the commanders of the Palestinian resistance in the autonomous areas. As late as summer 2001 the US administration was describing such operations as illegitimate. But after the attacks of September 11, it was the American intelligence services above all who discovered armed drones as proven means for the war on terror. Due to their great operating range they can have terrorist suspects under surveillance while still in their supposed safe havens and, if necessary, attack them.

Since the mid-2000s the USA has been using such deployments in the Afghan-Pakistani border region, in Pakistan's Waziristan and also in Yemen and in Somalia. The operations – about which there was no official confirmation on Washington's part up to April 2012 – are aimed at supposed members of the Taliban, of al-Qa'ida and terror groups in their orbit. Functionaries identified in the terror networks are sought, monitored and killed in a targeted fashion. In addition, the USA is carrying out so-called "signature strikes", which are aimed at persons whose identifiable conduct fits a terrorist template, but who are not identified individually. The legality of these strikes is extremely questionable.

Criticism of the Use of Armed Drones

From the outset, the use of armed surveillance drones has encountered criticism. So far this relates above all to targeted killings in the war on terror, less on the consequences of the upcoming automatisation of weapons systems. For this reason too, arguments based on international law and policy dominate the debate.

For some years the academic community in particular has been discussing the legality of targeted killings and the drawing up of so-called "kill lists". A trigger for this was the action of the American intelligence services in Pakistan. In selecting targets, the Obama administration refers to the right of self-defence. They say it also permits persons who appear to be supporters in terrorist activities against the USA to be attacked. This far-ranging interpretation of the right to self-defence is however – also independently of drone deployment – disputed, in particular when the persons targeted are not currently taking part in violent operations. Such targets do not become legitimate simply through the selective targeting of military weapons – that is, by the fact that civilians are protected thanks to the precision of the attack. The technological capability to avoid collateral damage does not yet justify the use of force.

The question is not, however, whether according to international humanitarian law armed drones in principle infringe the principle of discrimination (that is, the necessary differentiation between combatants and civilians) or the dictate of proportionality. On the contrary – as drones are in the air for significant periods of time over the area of operations, it is theoretically much easier for them to differentiate between civilians and military personnel. A decision must be made about the legitimacy of an attack in each individual case. If precision weapons are used (such as laser-

guided bombs or air-to-ground Hellfire missiles), the principle of the proportionality of weapons deployments must also be taken into account. Within the framework of existing armaments control systems there are, however, no restrictions on unmanned armed platforms.

The deployment of armed drones does, however, have repercussions on the nature of the conflict itself. The attacking side prefers the anonymity of drone strikes to the classic use of force because it fears an escalation of the conflict and finding itself entangled in foreign disputes. In turn, the side affected will adopt even more asymmetric retaliation, given its technological inferiority. Supporters of drones emphasize that such platforms are precisely the right means for democracies to wage war, as self-endangerment and possible collateral damage can be minimised through precision weapons. That military force can be used more effectively and more cost-efficiently through drones does, however, provoke the question as to whether this causes the threshold for the use of weapons also to sink. In principle the remote-control of armed platforms enables and promotes the implication of civilians – such as intelligence services personnel or industry representatives – in the killing of those involved in the conflict. They could be held even directly responsible for a corresponding decision to attack, even though they are not part of the regular armed forces and do not possess a combatant status under international law of conflict (LOC). If drones are deployed directly by intelligence services, this would also lead to a legal grey zone as regards the definition of regular combatants and the legitimisation of non-military violence.

En Route to Robots

Remotely-controlled aerial systems with weaponry only signify an interim stage en route to more decision-making autonomy for weapons systems. In the continued development of unmanned platforms several technological trends can be observed at present.

Miniaturisation of components and systems: Driven by tinier and tinier and ever more capable processors, even the smallest of aerial vehicles can fly and react independently and in a stable manner. Only rechargeable battery technology still places tight restrictions on the flying time of these mostly electrically-operated systems.

Platform automatisation and autonomisation: Unmanned aerial systems are becoming increasingly autonomous in their movement. This is attributable to the increasing computing capacity of processors (with almost the same power consumption), the miniaturisation of sensors (for location, acceleration, optoelectronics, GPS etc.) and modern algorithms, for example to reduce the complexity of sensor data in depicting the environment. Today drones can already produce the ideal orbit to monitor a specific target themselves and to self-adjust for weather conditions. Likewise, if the radio connection is lost, they can independently return to a previously defined point and land (autopilot). The next generation of reconnaissance drones will possess sensor technology with which several targets can be kept under surveillance at the same time. This requires the course to be adjusted to optimal surveillance conditions at the ground station in real time. The development of faster flying drones does, however, mean that this automatisation will in future no longer be implemented on the ground but on board, so that the platform can react immediately to changing conditions. This is because long signal routes via satellites increase processing time. Once UAVs assume tasks from currently still manned combat aircraft, for example, achieving air supremacy and air policing – piloting remotely will no longer be possible. This trend is a step on from the present-day "joystick" process (manual remote-operation) to autonomous task management, in which only the framework conditions are defined by a human operator. As the complexity of operation will no longer

be manageable by humans in real time, only the confirmation or rejection of a solution suggested by the machine will remain the human's job. Under these conditions real decision-making autonomy on the part of the human – even with regard to target selection – would no longer be a given.

Increase in sensors and automatisation of the sensor data processing: Already, manned and unmanned platforms are from generation to generation being equipped with more sensors. High resolution cameras are either being complemented by similarly high resolution video cameras or being replaced by multi-spectrum sensors (in particular infrared). To these are added "synthetic aperture radar" systems (SAR), which can see through cloud cover and tree canopies. The number of sensors is only restricted by the load limit and the electrical power of the power generators on board. The companies carrying out development are improving both capabilities with each new drone generation. In so doing, they are aiming to accommodate several sets of sensor packs on board so that different targets can be monitored at the same time. Even today, surveillance drones are producing more data than one person or even whole teams can evaluate in real time. These issues have long been known in the field of security technology, in particular that of civil surveillance technology. Companies and research institutes worldwide are working on developing algorithms that can automatically evaluate the digital imagery from surveillance cameras. This should make it possible to identify specific persons in crowds or to identify "suspicious" behaviour. Surveillance authorities in the USA and Great Britain are already deploying such processes to monitor public spaces. These developments will also be made use of in the evaluation of drone sensor data in order to manage the copious amount of information. So far the programmes concerned are comparatively computer-intensive for modern hardware architecture and relatively error-ridden as well. Automated evaluation of the sensor data is, however, indispensable if the desired progress is to be achieved – if human beings do not put the brakes on for reasons other than technology.

The trend toward automatisation and autonomisation of flying platforms, likewise data evaluation, is also changing the role of the human protagonist. If until now he has adopted a position within the decision-making process of being "in the loop", he will thereafter become a mere observer and confirmer of an approach determined by machines "on the loop". This can already be said of reconnaissance systems which are being deployed linked in with weapons on other platforms. The data, on which the machines' decisions are based, are here too so comprehensive and complex that they cannot be absorbed by people in real time. In principle, however, the dynamics of flight systems and operational processes require instantaneous decisions, increasingly so with UAVs. These issues will become even more acute when weapons are deployed by UAVs, whether in the form of correspondingly equipped drones or by the special unmanned combat aircraft of the future.

It can be foreseen that, with coming generations of armed unmanned aerial systems, humans will merely stand at the end of a chain of options pre-selected by machine, whose origins he cannot penetrate. In addition the weapons (not the weapons platforms) will take electronically guided decisions in consultation with the respective platforms fractions of seconds before impact, in which humans will no longer be able to intervene due to their relatively long reaction time. It is for instance conceivable that the weapon makes a facial identification of the target whilst in the air. Human beings as decision-makers with ethics and morality are therefore abdicating responsibility and a robot cannot be held responsible. So far, neither computers nor algorithms exist, which can reproduce behaviour constituted from knowledge, experience and morals, as

characteristic of human beings, in the form of an ethical mechanised agent.

The technological development of UAVs is inevitably advancing along the path of automatisation. The German government is now faced with the question of how far it wants to go along this path. In the sense of preventive arms control a ban on the development, procurement and deployment of autonomously acting weapons platforms could be conceivable. Since it could be difficult at a later point in time to push through the disarmament of autonomously acting UAVs, the separation of platform and weaponry seems to make sense in this present-day technological phase. The resulting capability limitations should be consciously accepted, bearing in mind the legal and ethical consequence of future weapons deployment by robotic platforms.

Market and Industry Interests

The use of MALE UAVs is not only being discussed in Germany. France and Great Britain in particular are facing medium- and long-term procurement decisions. In this all three countries want to keep open the option of a European home development for the time post-2020. Great Britain has in fact procured ten armed drones of the American MQ-9 type, which are being deployed in Afghanistan. At the same time, however, in collaboration with France, the British government is planning to develop its own MALE drone within the framework of the "Telemos" project. On the industry side, BAE Systems, the British armament and aerospace concern, and Dassault Aviation, the French aircraft manufacturer, are taking part in this.

There is, however, no consensus amongst the potential users on weaponry, size and design of a future European MALE UAV, not to mention on harmonised requirements. As no firm partners have committed themselves, the role of industry is still very unclear, in particular after the failed fusion of BAE and EADS. Germany and France did in fact make a non-binding declaration of intent in September 2012 that they were desirous of collaborating in the development of a European MALE UAV. However an agreement on a joint interim solution has not yet been reached. Under pressure of the financial crisis, France will not be able to produce the means to finance two parallel bilateral development programmes with Great Britain and Germany.

So far the market has been marginal for civilian variants of the UAV. In the main, small and micro-systems are deployed in the public and private business sector, such as for the monitoring of demonstrations at Castor Transport (nuclear waste transportation), to check plant installations in the chemical industry or for fertilising agricultural land. However there are prognoses that civilian demand will expand considerably. Non-military market potential is arising above all from the technological developments in MALE UAVs. In the non-commercial area such drones could, for example, be of assistance to state protagonists in combating the drugs' trade in border regions. Here too one would profit from the long operating time of these platforms and the associated cost-efficiency. As they also enjoy a clearly expanded operating range, MALE drones can monitor larger areas than the usual small systems. It would also be conceivable for them to support the Red Cross, for instance, in catastrophe scenarios. As regards a commercial usage, above all one thinks of the search for mineral resources and the monitoring of infrastructure. Thus, for example, drones could be used to inspect pipeline and rail networks for damage.

Small and micro-drones already require a flight permit in Germany (as also in most of the other EU states). For most operational purposes, this can be obtained without difficulty. Small drones operate below the regulated air space and are controlled by visual contact. In contrast MALE UAVs can only operate in areas which are closed to normal air traffic, as they are currently not permitted in regulated air space. It has therefore not been possible until now to

use such systems commercially. Military systems are only flown in EU air corridors which have been closed especially on a temporary basis. However, in the near future the EU wants to create the legal prerequisites for integrating unmanned systems into regular air traffic. For this, first of all, technologies have to be developed which compensate for the missing pilot in the cockpit. This requires in particular the capability of avoiding other air traffic on sight (sense and avoid) and, if necessary, to fly without radio and data traffic (autonomy). In this context the EU is drawing up a standardised permit process for the airworthiness of drones. It is planned to safeguard the integration of UAVs through a new air traffic management system with corresponding guidelines. The requirement for a civil use of drones is promoting this development. Although military systems also have to be licensed, the temporary establishment of closed air space corridors is at present sufficient, due to their low numbers.

EU governments and European industry must ask themselves whether the technological capability to develop and produce MALE-UAVs should be developed and maintained in Europe. Does the EU need one or several system integrators, i.e. large enterprises that can cover the entire value chain for the UAV product? If the answer to this question is no, then the users are placing themselves for the medium-term in a position of dependency on American or Israeli platforms, even if individual components (for example, the sensor technology) can be manufactured in Europe. If the answer is yes then the question begs itself as to whether there is to be a coordinated process within the EU. Without coordination, there would be a danger of national subsidy by individual states increasing costs, raising licensing efforts and restricting competitiveness on the global market. In all likelihood, it is also true that only military systems would then be developed, only permitting small numbers to be manufactured, hardly allowing for exports.

If, in contrast, the most significant EU states can agree to a coordinated process for development and procurement, then volume would increase and European air space licences would only have to be obtained for one system.

At the same time, the partners in the consortium would pool their efforts; economic considerations would contribute to the consolidation of effort. One design, that places the UAV's surveillance function before the armament capability, would enhance both the civil market potential and export chances at one and the same time. For this to work, however, the participating states would have to consolidate their need and agree joint requirements.

Recommendations for a German and European "Drone Policy"

In this situation it seems sensible to look at three courses of further action on MALE UAVs. These are closely connected and should be discussed at parliamentary and government levels and in the public arena.

- Continued use of the "Heron" system leased so far. As France also uses a modified version of this drone and is contemplating extending the use of the system, in the medium-term bilateral cooperation between Germany and France based on the "Heron" platform appears obvious, which would also be supported by industry in both countries.
- Refraining from a headlong rush into an armament-capable or even armed US system such as "MQ-1 Predator" or "MQ-9 Reaper. This would admittedly mean an "off the shelf" purchase which could be correspondingly cost-effective. Such a decision would, however, prejudice one route in future, which would pre-empt the necessary ethical debate about the accountability or justification of armed drones.
- Introduction of targeted cooperation between Great Britain, France and Germany with the aim, in the long-term – that is for the period post-2020 – of devel-

oping a European reconnaissance and surveillance MALE-UAV. In the EU efforts should be made anyway (with the support of the Commission as well) to integrate UAVs into the regulated air space. In this way the prerequisite will also be created for MALE-UAVs to be used as civil and militarily-deployable instruments of a comprehensive security policy. The military need alone would not come anywhere close to exhausting the market potential of airborne surveillance systems. Rather, such a one-sided use would only bring with it low production volumes with correspondingly high costs.

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Further Reading

German Bundestag, Office for Assessing the Consequences of Technology
Stand und Perspektiven der militärischen Nutzung unbemannter Systeme
[Status and perspectives of the military use of unmanned systems]
May 2011

International Human Rights and Conflict Resolution Clinic at Stanford Law School/ Global Justice Clinic at NYU School of Law
Living under Drones:
Death, Injury and Trauma to Civilians from US Drone Practices in Pakistan
September 2012

Peter Rudolf and Christian Schaller
Targeted Killing –
Zur völkerrechtlichen, ethischen und strategischen Problematik gezielten Tötens in der Terrorismus- und Aufstandsbekämpfung
[On the Issues in International Law, Ethics and Strategy of Targeted Killing in the War on Terror and Insurgency]
Januar 2012 (SWP-Studie 1/2012)

Niklas Schörnig
"Stell Dir vor, keiner geht hin, und es ist trotzdem Krieg" ... Gefahren der Robotisierung der Streitkräfte
["Just imagine no one goes off to war and yet it's still war...". Risks of the Robotisation of the Armed Forces]
in: Margret Johannsen, Bruno Schoch, Corinna Hauswedel, Tobias Debiel, and Christiane Fröhlich (Pub.), Friedensgutachten 2011, Münster 2011, pp. 355–375