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Drones for German Foreign and Security Policy?

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Boosting Situational Awareness

The use of drones[1] of various sizes has led to a paradigm shift in military aviation all over the world. Drones do not only complement the capabilities of manned aircraft, they also increase efficiency, save costs and improve safety. In 2000, the U.S. Armed Forces only had about 50 drones; in October 2009, they already had more than 6,800. Drones have long since busted the traditional military straitjacket. Technological trends such as automation, digitization and miniaturization significantly increase the range of their current uses – from disaster control, protection of major events and critical infrastructure up to counter-terrorism. They also give rise to many new, unusual applications, which cannot be entirely foreseen, such as the monitoring of oil and gas pipelines, of migration movements, the protection and monitoring of the transport of dangerous goods.

Drones do not need a pilot on board. They are controlled automatically via a program or from the ground via radio signals or satellite communications. Drones can be used in military and civilian areas: for monitoring, scouting and reconnaissance, as target drones or equipped with weapons in combat missions. Possible payloads include sensors, communication facilities, medicines and weapons. Drones are available in different sizes, from only a few millimetres to the size of a commercial aircraft with a span of 40 meters. Above all, drones change the perception of decision-makers. Their superior technology is boosting situational awareness to levels not known before and provides an overview of the situation even in difficult terrain and complex environments and facilitates the observation of crises and conflicts around the globe.

[1] With regard to the systematical integration of drones, *Unmanned Aircraft System* (UAS) is now the most widely used term. In expert circles, the abbreviation UAV for *Unmanned Aerial Vehicle* is also used. Remote-controlled drones are called RPV *(Remotely Piloted Vehicle)*.

Drones sharpen the view and enable a look behind the scenes and, if necessary, the intervention where danger arises and injustice occurs. Drones help decision-makers to gain a deep situational picture more quickly, which can be used as a basis to make better decisions and act faster.

The history of drones dates back to September 1916 when the *Sperry Gyroscope Company* proved[2] that an aircraft of the type *Curtiss N-9* was able to fly autonomously without a pilot. Drones were already deployed marginally during the two world wars. However, their breakthrough did not come until the Vietnam War (1964-1975) when the *Ryan Firebee* of the U.S. Armed Forces proved successful in over 3400 missions in battlefield reconnaissance, thus demonstrating the suitability for service use of drones. Their consistent deployment by the Israeli Air Force since the early 1970s has also sustainably promoted their development. This is why the U.S. and Israel are leaders in the development of drones.

Drones are sub-systems of a complex network of ground-, sea-, air- and space-based sensor and C2 information systems including the relevant software for their planning, analysis and operation as well as the training of the operating staff. Their use requires a large number of further supporting sub-systems such as personnel, infrastructure and communication systems, operational concepts and documentation. Particularly the progressive computerization and extension of processor capacity in microelectronics has spurred the dynamic development in the last decade. The dimensions and weights of the various sensor packages (TV, photo and infrared cameras, radar systems, etc.) are continuously miniaturized and perfected. Thanks to improved communication and data transfer possibilities, reconnaissance objects can be pursued, observed, verified as a target in real time and, if necessary, be engaged.

Germany is not at the forefront of progress in this area – as in many others – but is gradually positioning itself correspondingly under the pressure of the concrete operational requirements. The operational experience gained in Afghanistan, Iraq and in Kosovo as well as in the worldwide fight against terrorism shows the huge possibilities of drones and their capability to provide timely, effective and low-risk reconnaissance and to accurately engage targets throughout the world – especially in places where the enemy believes itself to be unobserved and safe.

Operational Spectrum

The operational spectrum of drones is broad and is developing very dynamically. Their modular structure enables not only area-wide reconnaissance and monitoring but also the responsive use of weapons as well as information operations against the command and control network of a potential enemy. Equipped with state-of-the-art sensors of all kinds, they are readily available and may be deployed for extended periods of time. Unlike terrestrial sensors, they can precisely monitor vast areas and transmit reconnaissance data in real time or near-real time to situation centres of the various operational forces.
As far as drones are specialized for the use of weapons or other resources, they can be targeted directly or indirectly against objects on the ground, in the air, above and under water, in the near-earth space and in the information space. They transport, for example, electronic jamming devices for electronic warfare[3] both at a short distance and from a safe distance.

[2] The development of an accurate, three-dimensional motion sensor by the Sperry Gyroscope Company made targeted, unmanned flying possible.
[3] This refers to electronic jamming measures in various frequency ranges, e.g. spot jamming of a location, a carrier frequency telephone or telecontrol link, a weapon system, intercept control system or radar guidance.

They can also provide current meteorological or topographic information at short notice. Because of their small size and the resulting low detectability they are especially suitable for the covert support for special forces or isolated detachments over long distances even in difficult terrain.

Drones can be used as carriers of communications relay systems to increase the range of terrestrial communication and C2 assets during the mission. Thus local, regional and global command and control support systems can be quickly established and operated, especially in regions without any IT infrastructure. This makes it possible, for instance, to support missions of special forces in a timely manner and with a high data transmission rate. It is also possible to set up an IT network in theatre without the need for terrestrial network nodes by solely using drones as remote-controlled and remote-maintained network nodes.

The fact that drones are flown without a pilot on board offers several advantages. Drones do not get tired and can operate for several days. The risk of loss is limited to the device. Expensive training as well as life support equipment, space for the aircrew, etc. are not required. This saves cost, improves performance and provides room for fuel and payloads, which opens up enhanced and completely new deployment possibilities.

Of course, the advantages of drones entail increased requirements in data transmission rates, IT security, operational concepts and training. The integration in controlled airspace is the basic prerequisite to use them according to their purpose. This objective is intended to be achieved by 2015 at international level, among others, by NATO and the European Defence Agency. The huge potential of drones can only be converted to enhanced capabilities by analyzing the “overall system” with its multiple interdependencies and interfaces. In asymmetric, network-enabled operations, drones do not act alone but together with a complex team. The demand for situational information is insatiable. Especially full-motion videos are much sought-after. Military decision-makers want to be and stay fully informed of the drone mission at all times during an operation. However, near-real-time situation monitoring and contributions to the combat assessment are the key to success not only for military missions. It is likely that political leaders will develop similar requirements in situations of crisis and disaster, too.

The example of HERON 1 illustrates the central role of drones for the modern command and control process. In the national reconnaissance architecture, this drone is used in theatre together with other reconnaissance means. It complements, in near-real time, the performance of airborne imaging reconnaissance tasks in the depth of the theatre of operations and thus contributes to full situational awareness in network-enabled operations of the armed forces. In addition, HERON 1 provides high-resolution images to expand the geo-referenced 3D terrain database.

Particularly in networked systems, on the basis of a joint interoperable information and communication network across command levels, drones can develop their capabilities to the full. The network-enabled operations of the armed forces can benefit considerably from unmanned aircraft systems so that they are becoming essential pillars of reconnaissance missions of the Army and the Air Force. This has triggered a development at the German Armed Forces that is quite impressive even at international level.

There are also similar developments in the Navy. A general need for MALE systems has already been identified. In the near future a *Vertical Take Off and Landing* (VTOL) component is to take over tasks in the operational-tactical picture compilation. This

component facilitates target acquisition and post-strike reconnaissance operations, in particular when tracking mobile objects or identifying objects without their active involvement[4]. Consequently, above all, the effectiveness of naval warfare assets is enhanced in the operational system of systems. On this basis, long-range anti-ship missiles, for example, can be employed up to their maximum intercept range. This capability also serves to support boarding teams, to reconnoitre sea lines of communication in the littoral area, to provide images for search and rescue missions and to generate geo-referenced images. The German Navy has tested the Camcopter S-100 by the Austrian manufacturer Schiebel for this purpose and intends to procure it in the near future for use on the class 130 corvettes, the latest class of surface ships in the service of the German Navy, which have been designed and built to complement fast patrol boats.

There is one crucial factor that is often overlooked: it is not sufficient to have only drones in one's inventory. Appropriate operational concepts, adequate transmission bandwidths, satellite links for data transfer as well as powerful planning and analysis capabilities must also be provided. The inherent advantages in terms of time and quality can only be converted to decision and effectiveness advantages if drones can be used synergistically in the network system by systematically – and partly automatically – analyzing, evaluating, consolidating their findings and providing them to decision-makers.

This challenge also applies to other users because the majority of the above-mentioned applications for the Armed Forces can be adapted to the purposes of other departments and even non-governmental organizations and commercial uses. Accordingly, the potential operational spectrum of drones is increasing in the entire security sector. In the foreseeable future, one focus will even be on civilian applications, especially in the emerging task areas of Homeland Security. Thus, drones can considerably improve, for instance, the performance of security forces and first responders, i.e. forces that are the first ones on the scene in the event of an emergency or disaster – the police, fire brigade, rescue services, etc. The U.S. Federal Aviation Administration expects that particularly the versatile and flexible mini drones, which offer the advantage of low cost and simple operating systems, will show the strongest growth.

Networked Security

The German government addresses the interconnected foreign and security policy challenges on a multinational and inter-ministerial basis with the Concept of Networked Security, which was presented to the German public in 2006 with the government's white paper on German security policy and the future of the Bundeswehr. Future success in foreign and security policy will to a large extent depend on the capability to network security tools with each other and with international partners. For this reason, the new NATO strategy adapted in Lisbon in 2010 is based on a networked approach which is called *Comprehensive Approach* within NATO. The European Union also follows this course through the further development of its security strategy.

Drones help decision-makers to gain a full situational understanding and to make quick, precise and sound decisions, both now and even more so in the future. With their help, many foreign and security policy issues can be monitored and prepared quickly and appropriately for the decision-making process independently and in their interactions, such as

[4] It is used in addition to the cooperative (Identification Friend Foe) procedures for the positive identification of their own assets.

- international and national armed conflicts as well as regional destabilization processes caused by state failures;
- nuclear non-proliferation, uncontrolled production and proliferation of weapons as well as destruction of weapons;
- help for people in dire need as a result of natural disasters, epidemics, armed conflicts or unrest;
- threats to trade routes as well as raw materials and energy supply,
- risks for the critical infrastructure, in particular for information and supply networks through cyber threats;
- national large-scale emergency situations, also against the background of social and ecological changes, climate change and environmental protection;
- risk of chemical, biological, radiological and nuclear (CBRN) incidents.

Inter-ministerial situational awareness requires an overview of this diversity of issues of different granularities. A joint role- and mission-based situation picture is indispensable for quick decisions and lasting effects, for example, for the effective cooperation of operators of critical infrastructures, the relevant departments of the public administration and domain-specific experts. It supports the resolution of contemporary and future-related security issues and improves the national risk management system. In all the fields mentioned above, drones can make important contributions to Networked Security by performing reconnaissance, monitoring or verification operations as responsive, highly mobile, flexible, modular and customizable elements of a complex system of systems with space-, air- and ground-based sensors and communication facilities.

Despite all the reductions in other functional areas of civilian and military security, drones are therefore actively promoted at national and international level. Germany's plans have already been outlined above. The strategic operational concept for drones within NATO clearly states that drones are of special importance within NATO in the entire spectrum of possible applications. Their development and use are consistently pushed ahead via a milestone plan. In the European Union, drones have also been on the agenda of the Common Foreign and Security Policy for a long time. Since May 2007, the European Defence Agency (EDA) has been working hard on the integration of drones into the European civilian airspace as evidenced by various initiatives. In February 2009 at the annual EDA conference, it signed contracts for two parallel feasibility studies with two syndicates on the issue *"Satellite Services for the Integration of Unmanned Aircraft Systems into European Airspace"* together with the European Space Agency (ESA). The studies are meant to analyze the feasibility of a demonstration mission scheduled to take place in the period 2010/2011. They are based on the intention to master the upcoming technological challenges for the integration of drones into general air traffic by 2015.

Booming Market

The market for drones is booming. In the U.S. alone, more than 155 drones are currently being developed and produced in about 50 companies, universities and government institutions. Their dynamic development is further intensified by the fact that the security market is undergoing radical changes. Terrorism, piracy, industrial espionage, failing states and other new threats are leading to a growing demand for new security solutions all over the world. The convergence of markets for safety, security and defence products is opening up additional prospects of development. Smaller medium-sized firms have also discovered the production

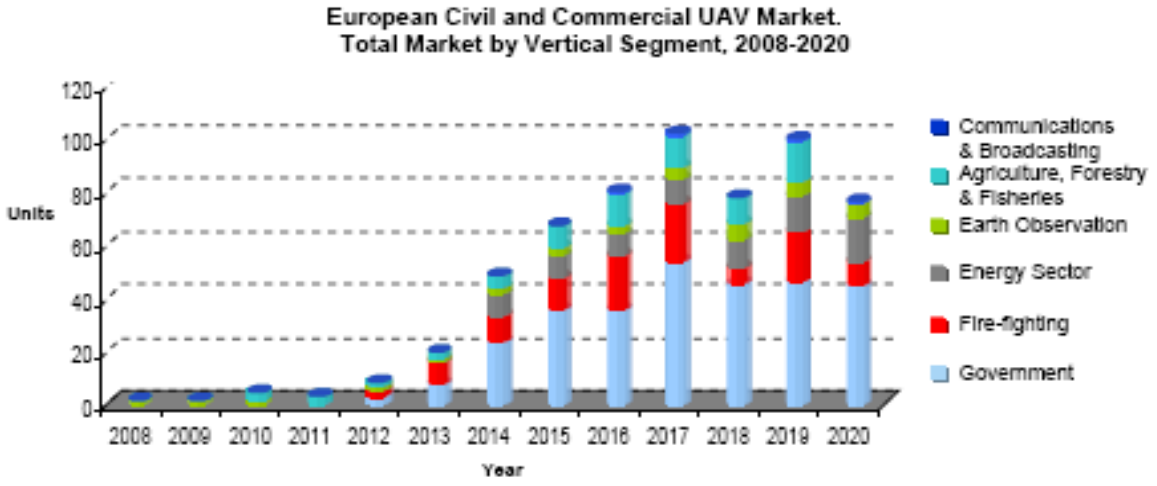
of drones as a profitable business. Analysts estimate the worldwide cost of procuring drones at four to five billion U.S. dollars in 2010.

The procurement volumes for the military drones market in the period from 2008 to 2016 are expected to be as follows:

- Up to 600 tactical UAS
- Up to 200 MALE UAS
- 5 HALE UAS
- Around 10,000 mini UAS

with the total value being approx. eight billion Euros. The forecast for the civilian market is similar. The military and civilian drones markets are highly interdependent; they are full of technological developments which affect both markets equally. Accordingly, the European Commission and the EDA consider themselves to be obliged to observe, support and promote the development of dual-use drones.

The Civil UAS Market



Source: European Commission - ENTR/2007/065. Study Analysing the Current Activities in the Field of UAV. Frost & Sullivan, 10th November 2008

The military threats, which have been dominant so far in the security area and the resulting classic products of the defence industry, are increasingly replaced or supplemented by a new product and service market to solve the problems of civilian security policy. While it was originally (in the U.S., Russia, France, Great Britain, etc.) the task of highly paid research and development activities in the military sector to develop new technologies exclusively for military scenarios, the range of new technological developments required for civil protection and for the safety of critical infrastructures is now growing rapidly. The possibilities of use of technologies that were developed exclusively for classic military tasks used to be delayed and only marginal in most cases. But now the extension of development activities for the “security and protection of civilian facilities and institutions” has led to a much wider range of cross-industry uses (so-called spin-off effects).

The completely new and much more complex crisis and danger scenarios give rise to a security industry which is comparable to the automotive industry with regard to their structural network and their significance. Potential recipients and users of these new security products and services are, firstly, civilian institutions such as the police, fire brigade and rescue services and, secondly, the military which works more and more closely together with these institutions in the event of accidents, natural disasters, terrorist attacks as well as international missions. Thirdly, private companies are also among the customers. The dynamically growing demand for new products and services can be seen from the activities in export countries where, besides classic military tasks, the protection and creation of infrastructures for stabilizing the political situation on site or of new branches of industry are coming more and more to the fore. This entails many consequences and activities in view of the development of international standards, international research cooperation and technology export regulations, export promotion and international measures against proliferation.

Outlook

On 17 March 2010, HERON 1, the first unmanned aircraft system of the German Air Force arrived in Afghanistan. Shortly afterwards, the manned Tornado reconnaissance aircraft were replaced. The great advantage of the drone HERON 1 over the Tornado reconnaissance aircraft is that it records not only individual images but also videos, infrared and radar data. Whether buildings, vehicles or humans – soldiers can thus detect, identify, observe and pursue their targets more easily.

In just a few years' time, drones will be part of everyday life in German foreign and security policy. In the concept of Networked Security, they will serve different purposes: They will assist criminal police officers in the search for evidence and first responders in disaster control, support the fire brigade and the agency for technical aid in fire-fighting and in flooding control, accompany development workers in inhospitable terrain, supply food and medicine to people in distress in the mountains, support the construction progress of large-scale pipeline projects, conduct security tasks for civilian and military purposes, and above all shape the overview and understanding of decision-makers in critical situations.

The pace of development is determined by technological and financial, statutory and cultural as well as rational and emotional aspects. The further development of sensors, weapons, data processing and system platforms will enable drones to perform coordinated formation flights and to identify, assess and, if necessary, engage targets autonomously. In the medium term, human pilots will appreciate the cooperation with automatic pilots. In the long term, however, dangerous missions are likely to be conducted only by unmanned systems.

What effects does this have on foreign and security policy, crisis and conflict management? The advantages of drones are obvious: operational flexibility, long endurance in theatre, lower costs and risks as well as the opportunity to have a constant look behind the scenes. However, drones do not only change the perception of decision-makers. Most of all, they will change the requirements for training, organizational structures and procedures and the technological equipment of those people using their capabilities. German foreign and security policy will further develop significantly against this background – it will become more comprehensive, technology-oriented and action-based.

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Remarks:

Opinions expressed in this contribution are those of the author.

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