

Use of Outer Space and its Significance for National Security Provisions

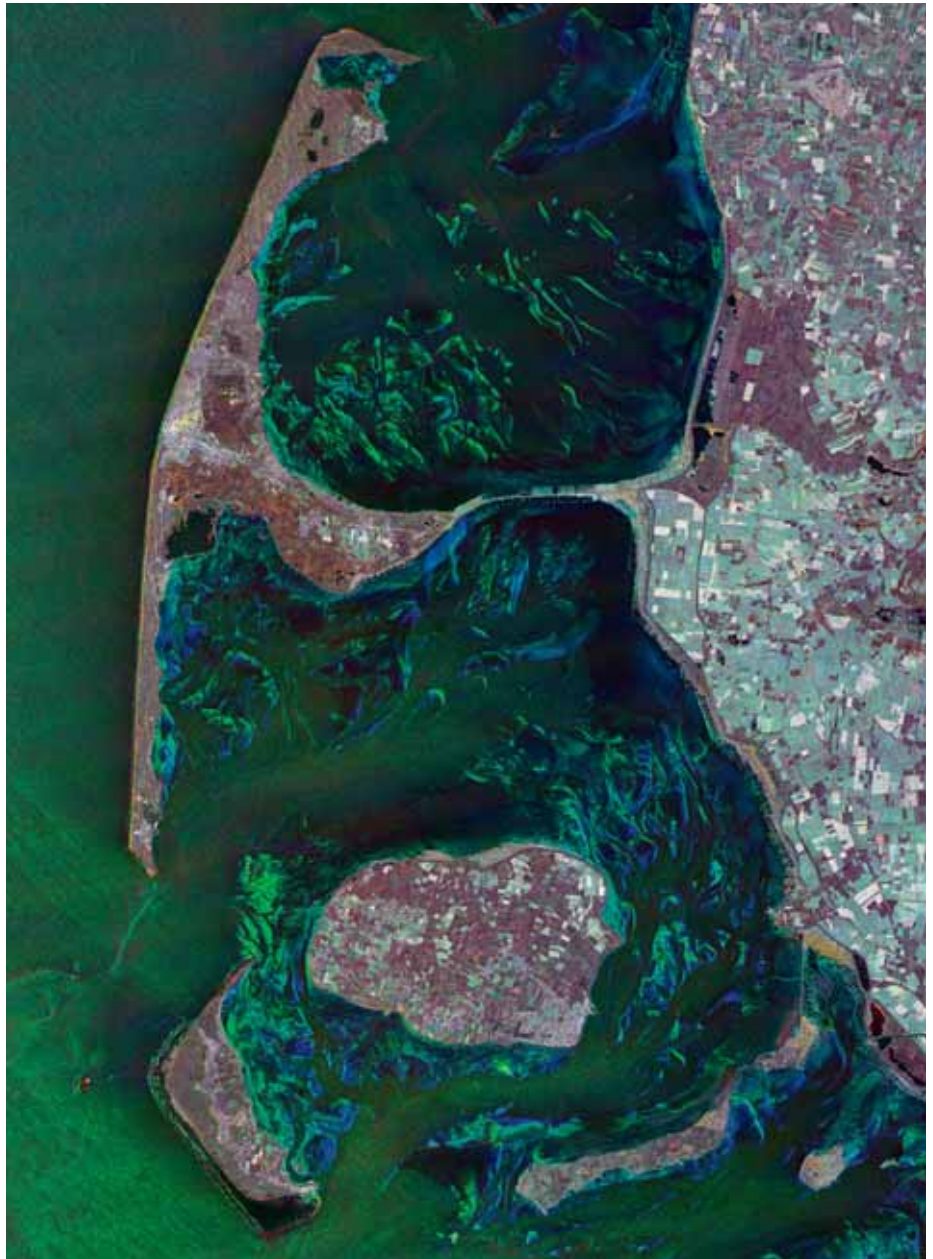
Karsten Struß/
Per Weiler

Since the foundation of the Federal Republic of Germany the focus of German aerospace activities has essentially been geared to the scientific use of space systems. In 1948 already, a small group of scientists and space enthusiasts founded the "Space Aviation Study Group" which became absorbed by the "Society for Space Research" in 1949. This society made it its task to rehabilitate rocket research and its peaceful use in Germany. Accordingly, the first German "Azur" satellite, launched under the project management of the then "German Commission for Space Research", served research purposes only.

Meanwhile, a large number of research projects were successfully carried out; but objective and purpose of the use of outer space changed at the same time. Apart from research applications, commercial use of outer space increased more and more. Here, the main effort was initially with telecommunications. In 1974 already, a German satellite was launched for the transmission of television and radio programs, telephone conversations, telex and other data. The more economically interesting commercial use became the more companies went into the space business. Thus, private use of outer space had increased so much within just a few years that in 1996 there were more private than state activities noted for the first time. This has meanwhile resulted in the fact that new business segments have turned up in the field of outer space utilization, e.g. the area of satellite image data for commercial distribution. Since 2007, the German Aerospace Center in tandem with the Infoterra Company has been operating the TerraSAR-X satellite, which provides high-resolution radar image data.

But not only the commercial applications have changed the use of outer space in Germany. With the "SAR Lupe" satellite system the Bundeswehr is now operating its first organic space-based reconnaissance system. The SATCOM Bw Stage 2 communication satellites will add an additional application for improving the command and control capability in the armed forces.

By this diversification in the use of outer space it becomes obvious that nearly all state and social domains are adopting space applications today or are dependent on them in wide areas. Television and telephoning via satellite has become a most natural thing for instance.



Picture of the Isle of Sylt by the Satellite TerraSAR-X in October 2007.

Picture: DLR

And most of the radio and television programs received via cable are also fed into base stations via satellite. With its satellites the commercial satellite operator "Eutelsat" supplies approximately 84 million satellite and cable connections and accesses today, and a modern Intelsat communication satellite is capable of transmitting more than 70,000 phone calls at the same time. In Europe alone the market for satellite communications is estimated at about 45 billion euros per year. Reliable weather forecasts without respective satellites would be wellnigh impossible. Logistic fleet management has

gained in quality by satellite-based navigation and hardly anyone who has once enjoyed this service wants to miss the conveniences of a navigation system in his own private vehicle any longer.

In Germany the Federal Ministry of Economics and Technology has assumed the task of coordinating and pooling all civilian space activities jointly with the German Aerospace Center's space agency. These activities were last summarized in the German Space Program of 2001 (the first German Space Program for almost 20 years was approved by the Federal

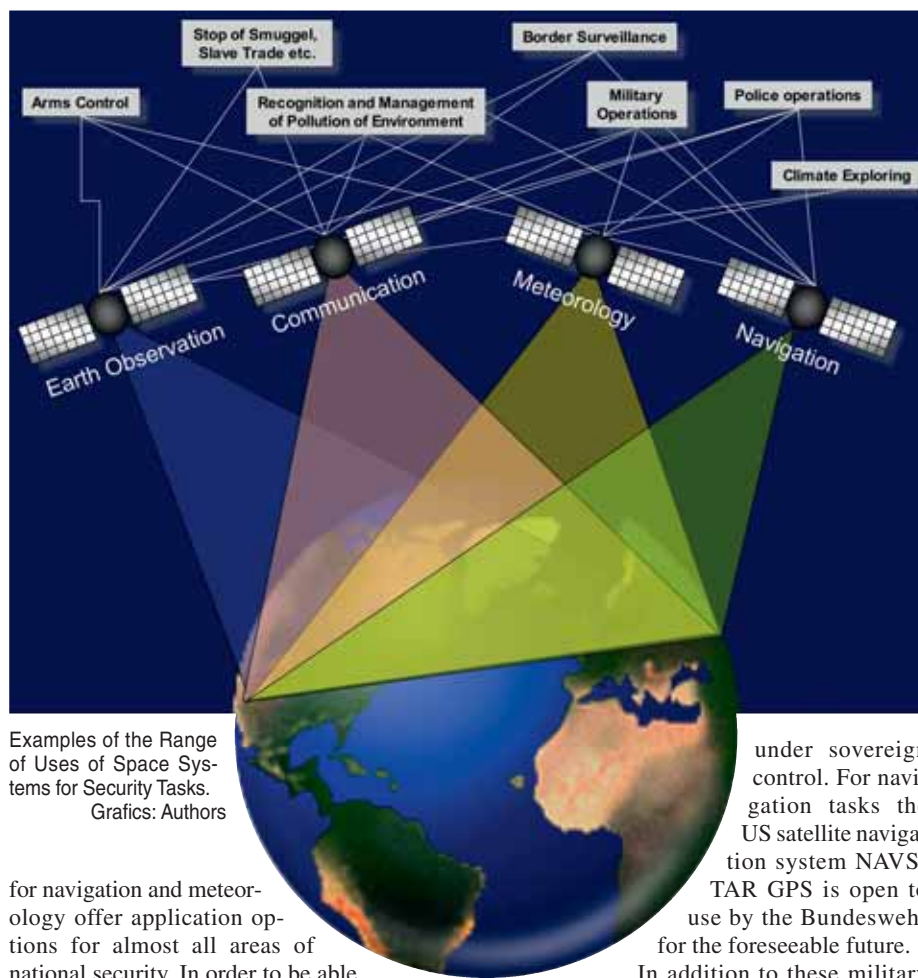
Government on 16 May 2001). The use of outer space for internal and external security was not yet taken into consideration at that point in time, however.

Use of Outer Space and Networked Security

The Bundeswehr has declared itself willing to not only internally use the services of its satellite systems, but, if required, to make them also available to other ministries within the scope of official interdepartmental assistance. An efficient, coordinated contribution of space-based systems to the security of Germany and its citizens calls — at least in the medium term — for a more fundamental conceptual approach, however. It thus seems to be necessary to examine what kind of contribution space-based systems can actually make to improve Germany's security and in which way such contribution can be effectively and efficiently realized.

Today, the security of the Federal Republic of Germany is facing new and increasingly complex challenges. Coping with them necessitates the use of a broad and coordinated range of instruments for taking diplomatic, economic, development aid policy, police, and military measures. In this context, security can only be guaranteed on the basis of a holistic approach based on security policy structures and a uniform national and global comprehension of security. Networked security can thus be defined as a unitary approach to security provision in which all relevant actors for crisis prevention or management are organically, procedurally and technically linked with each other in a suitable way in order to guard against crisis-prone developments by coordinated objective setting and course of action as well as the pooling of different capabilities and proficiencies or to resolve them conjointly when they occur. Here, the goal is the improvement of the national security (i.e. the internal and external security) by enhanced coordination and cooperation of all responsible actors. In such an integrated approach all parties involved could project their requirements and contribute their respective capabilities; and new capabilities could be jointly built, if necessary. Constraints by limited resources in individual areas are thus possible to be resolved and/or reduced by joint use of resources.

The consideration of using outer space for the purpose of national security provision is governed by the thought that, according to the extended security concept, security for Germany and its citizens can no longer be guaranteed by military means alone. For the systematic buildup and extension of capabilities in strengthening an approach of networked security, space-based systems can indeed make an increasingly important contribution. Space-based systems for earth observation (inter alia for intelligence and reconnaissance) and communications as well as



Examples of the Range of Uses of Space Systems for Security Tasks.
Graphics: Authors

for navigation and meteorology offer application options for almost all areas of national security. In order to be able to use the information and services which these systems can provide to the actors more efficiently and/or to be able to build up new capabilities and systems by a joint use of resources it is imperative to thoroughly coordinate the requirements and resources of all governmental actors involved.

Benefits of Space-based Systems to Security Policy

Space-based systems can provide valuable contributions to an early detection of crises, to conflict management, disaster relief, development aid, environmental protection, and to supervising borders and thus to the national security. However, from the government side only the Bundeswehr is presently operating satellite systems for security tasks and/or has initiated the procurement of such systems. With the SAR-Lupe system the Bundeswehr has an efficient system for imaging reconnaissance/earth observation based on radar technology. In the field of command and control and command support both the Bundeswehr and other actors of the German government are presently still dependent on the support by commercial purveyors of services or on that by partners and allies. Only with the SATCOM Bw Stage 2 will Germany be able to use a first own satellite communication system

under sovereign control. For navigation tasks the US satellite navigation system NAVSTAR GPS is open to use by the Bundeswehr for the foreseeable future.

In addition to these military systems that are operated under exclusive national sovereignty, the civilian systems build up with national funds are also considered to be used for national security provision. Apart from the field of communication satellites the aforementioned civilian TerraSAR-X earth observation satellite should be stated here in the first place. However, the government side can use data provided by this satellite free of charge for scientific purposes only. Use of these data for security tasks requires state institutions to purchase these data. The same goes for the RapidEye system by which five optical earth observation satellites of the RapidEye Company can be aimed at any point of the earth every day as of mid 2008.

In addition, more capabilities are presently being build up on multilateral/supranational level. The Galileo navigation system is being realized in a European pool as a civilian navigation system, which will offer growing independence from the US GPS for the states involved. Global Monitoring for Environment and Security (GMES) is an initiative of the European Commission and the European Space Agency (ESA) with the goal of building a European network for the collection and evaluation of environmental data. Several satellites are being used for meteorological applications and climate research, which are mostly operated in a European combine or by and/or jointly with the USA.

Buildup and Extension of Capabilities

Today already it becomes apparent that for the Bundeswehr alone the available systems and those in the process of construction will not meet the future demand for image data and transmission capacities. The predicted demand of the Bundeswehr for satellite image data is thus estimated to nearly quadruple the present capacity of the SAR-Lupe system. The SAR-Lupe system provides presently only radar image data. Access to complementarily required optical image data is possible only by cooperation with other European partners. In the field of satellite communications, Network Centric Warfare (NCW), telemedicine, and the employment of unmanned aerial vehicles (UAVs) will require transmission capacities in future which will exceed the spectrum available with the SATCOM Bw Stage 2 system many times over. Moreover, there are additional capability gaps that have not been closed yet at all, e.g. the capabilities to conduct Combat Search and Rescue Operations. Here, the Bundeswehr is currently still using an open and not encrypted civilian alert system. Space-based missile early warning might also be required as an additional capability in future. Furthermore it appears that an own capability for space surveillance and reconnaissance gains increasingly in significance. The satellite kills by China in 2007 and by the USA in 2008 inter alia demonstrated this. Thus, a dramatic increase in space scrap was noted in the case of the Chinese shoot-down of a satellite, which might endanger the use of the outer space for years to come. In the case of the US satellite shoot-down there was, according to official statements, an imminent danger of a wide-area contamination of the crash site with the highly toxic hydrazine fuel. Whereas the effects of the Chinese shoot-down may limit the use of outer space, the imminent crash of the US satellite represented a concrete hazard and imperilment of the own population and territory.

Other ministries and departments are also increasingly relying on data and services of space-based systems. Here, the supply with earth observation data is in great demand, but the use of satellite communications is also getting more and more significant. Like in the military field the requirements for space-based services will continue to grow even more in future. Other areas such as the navigation or the already mentioned capability for space surveillance and reconnaissance will be added to this.

There are several options to eliminate the described deficiencies: For the time being, one can

continue on national level to bank on commercial purveyors; to develop and operate systems in either public-private partnerships (analogously to the COSMO-SkyMed earth observation satellite system in Italy) or in a purely public way; here it will be essential, however, to act in an interministerial/interdepartmental manner wherever possible. Increased bilateral or multilateral cooperation with existing systems are alternatively or additionally suitable to close capacity and capability gaps. The MUSIS (Multinational Space-based Imaging System) Project can be stated as an example here. With this system Germany, France, Italy, Spain, Belgium, and Greece want to meet their "common military requirements for a European comprehensive system of imaging satellite-based reconnaissance for security and defense purposes"

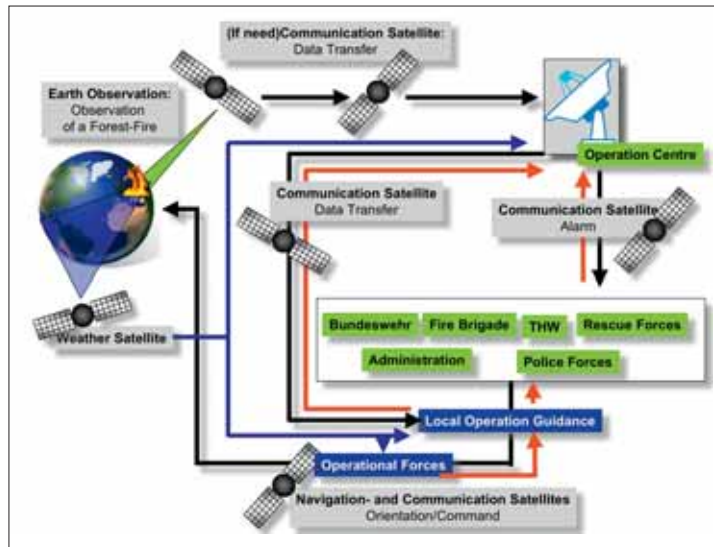


Diagram — Example of Support by Space-based Systems in Fighting Wildfires.

in future (Joint Declaration of Intent of the Chiefs of Defense of 2001/2002). Another option is the buildup of new systems within a European framework. The GMES and GALILEO projects which are both financed by the EU ought to be mentioned here as examples. In the field of military satellite-based communications there are already respective collaborations such as the current German leasing of capacities of the French SYRACUSE satellite.

Possible Further Course of Action

In order to meet the requirements of all ministries/departments for space-based systems and services as efficiently as possible on national level — thereby using synergies wherever possible and nevertheless being able to satisfy the specific requirements of the individual ministries/departments — it seems to be necessary for the time being to determine and coordinate the requirements of the individual ministries/departments for space-based systems and/or services. Purely national solutions will, for reasons of funding, be realizable only in in-

dividual cases, however. But national systems are and will be required in future as well in order to be able to guarantee quick access at any time and to ensure that the sensitivity of the generated and/or communicated data will be heeded. Regarding this, the multinational cooperation, too, is set limits in some areas, especially when it is about the access control and sensitivity of data. The realization of the significance of outer space and the potential use of space-based systems for a joint comprehension of the security situation is gradually gaining ground within the Federal Government. But even if demand and requirements for space-based systems and services are going to be coordinated in interministerial/interdepartmental working groups in a project-related way, the cooperation can be improved even more. The necessity that space projects be jointly managed by taking account of the different technical responsibilities of individual federal ministries despite partly opposing interests and by considering the relevance of these activities for national security provisions was hitherto recognized in isolated cases only. An overriding demand analysis covering the total spectrum of space applications is presently being made just as little as an interministerial/interdepartmental coordination and pooling of the resources and an integration in networked security structures. Optimizing the potential benefit of space-based systems for national security provisions would require a concerted orientation of space-related measures towards this

goal. For that purpose, it seems to be necessary to bank on already existing structures and/or to establish adequate new coordination facilities and instruments.

Such a process could be given a push by the establishment of a ministerial/departamental circle in which expertise in security policy as well as expert knowledge in space aviation/engineering come together. Primary task of this body would be to coordinate the buildup of space-based capabilities and to create structures for the assignment to central agencies of the executive — e.g. the Federal Office for Population Protection and Disaster Relief, the Federal Office for the Protection of the Constitution, the Federal Intelligence Service, the Federal Police or the state-specific disaster relief organizations as well as the command authorities of the Bundeswehr — in order to thus benefit on an interministerial/ interdepartmental basis from the application of space-based capabilities. ■

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