

## Consulting Military Space

More than 10 years ago **SAR-Lupe** (Lupe: German for Magnifying Glass), the first German military radar satellite system for world-wide space-based reconnaissance for the Bundeswehr (German Armed Forces) went into operation. Within the scope of **SatComBw** the Bundeswehr operates a satellite-based system to provide communication services for their forces on deployed missions. In mid-2010 the two COMSATBw satellites in orbit completed the SatComBw2 system.

In mid-2013 the follow-on programme **SARah** was launched to have the second-generation space-based reconnaissance system operational at the end of the SAR-Lupe life-time.

Topics such as **Space Situational Awareness (SSA)** or **protection of spacecraft** are playing an increasingly important role in the design of military space assets for the Bundeswehr in the future.

As manufacturer-neutral enterprise we support the Bundeswehr in the **space domain**. We hereby use the wide-scale of expertise we have gained over many decades.

IABG has been involved in the area of space-based reconnaissance and SatComBw since the mid-1990s. We have been qualifying satellites, components and sub-systems to prove their space-worthiness for over 50 years. During the last decades hardly any major German or European space project was carried out without IABG's support.

Our military customer therefore profits from our comprehensive experience in civil and military space. Today we also provide consulting support to various customers during the concept and realisation phase of *dual use* communication satellite systems.



Source: OHB System AG



**iABG**  
TerraSAR-X<sup>1</sup> S/C in the  
Acoustic Noise Facility

<sup>1</sup> This project has been funded on behalf of the German Aerospace Establishment (DLR) by the German Federal Ministry of Education and Research; promotional reference GR 0870/03. The result has not been influenced by the German Aerospace Centre.

## Project Monitoring

Efficient project monitoring during the development and realisation phase of space projects is one of the basic building blocks for the later success of the mission. Therefore IABG performed in the space-based reconnaissance programmes SAR-Lupe, E-SGA (European Satellite-based Reconnaissance) and SARah various controlling tasks to support the customer during his project management. We continuously monitor the development process during reviews and inspections; we participate in test campaigns and support acceptance tests.

In addition IABG supports the customer relevant quality management and conformity tests respectively in accordance with dedicated ECSS- and AQAP standards<sup>1</sup>. Within the project SAR-Lupe IABG was also involved with the issue of **frequency coordination** and provided the project specific **IT security accreditation documents**.

## Controlling Tool

For all these projects an interactive software-based controlling tool was developed operating in a SINA VPN<sup>2</sup> environment and connecting all project participants. The main objective is to inform continuously the customer about the status of the project. The correlation of all contract specific requirements with the product tree of the contractor guarantees that areas with development problems are quickly identified and visualised.

This provides the customer with an immediate reaction capability. In addition, this tool contains the complete project documentation. This system is able – with minor adaptations – to be used for other procurement programmes and projects as well.

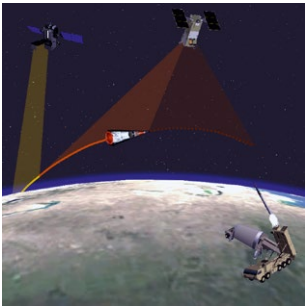
## System Analysis

In parallel to the activities in the area of space-based reconnaissance, engineering tasks and assessments of satellite systems are performed on behalf of public sector customers. Our main topics cover, e.g.:

- Satellite Bus
- Payload Accommodation
- Data Links (Telemetry & Command, Payload Data Downlinks)
- Payload Technologies (e.g. Optical/Radar Sensors, Communication Payloads)
- User Control and Ground Segment (e.g. Exploitation, Dissemination of Payload Data)
- Simulation of appropriate Constellations
- Orbit Propagation
- Selection of Launcher Systems
- Life Cycle Costs (LCC)

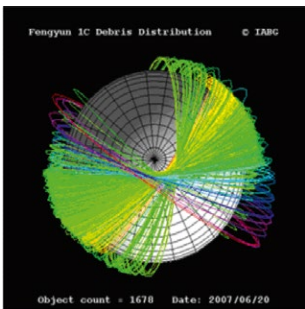
<sup>1</sup> European Cooperation for Space Standardisation; Allied Quality Assurance Publication

<sup>2</sup> Secure Intra-Network Architecture, Virtual Private Network



## Missile Defence

In the area of a future missile defence architecture IABG is assessing the elements necessary to provide an efficient sensor network for the tracking of and defence against ballistic missiles. The necessary space-based components should cover two aspects of early warning – one for boost phase tracking and the other one for mid-course tracking of ballistic missiles – to provide in-time information for suitable counter-measures. In this context IABG analyses the feasibility of satellites by performing investigations of different alternative constellations, the performance of dedicated on-board sensors and their integration into the overall missile defence architecture.



## Space Debris

Within the scope of **Space Situational Awareness (SSA)** IABG is analysing the hazard potential caused by space debris, which is threatening active satellites and their dedicated payloads. Special collision investigations are performed to be used as an assessment basis for risk analysis. At present the distribution and quantity of space debris in earth observation relevant orbits has dramatically increased having consequences in the operation of individual systems and requiring effective space situational awareness.

The ASAT (Anti-Satellite) test in 2007 and the in-orbit collision of two satellites in 2009 have increased the amount of space debris in LEO (Low Earth Orbit) by more than 30%. The Bundeswehr is operating satellites in these critical low earth orbits – this is the reason why the Bundeswehr established the German Space Situational Awareness Centre in mid-2009. IABG supported this initiative in the years before with studies and conceptual contributions.



## Satellite Communication / Satellite Navigation

Within the area of satellite communication IABG has a comprehensive experience in **management and engineering**. We are supporting our customers in the public and private domain with feasibility studies, system design and integrated procurement management (set-up of ITT documents, tender evaluation, cost benefit trade-offs, contract negotiations and supplier monitoring) for the space segment, the user ground and control segment. The frequency coordination of orbit positions, the conceptual design of PPP models (Public Private Partnership) and the integration into terrestrial systems are our key capabilities.

In the international environment we are actively involved in the **realisation of new Satcom systems** like GovSatCom and innovative applications – our focus is on the dual-use and security relevant services. The operation of **teleport facilities** and the provisioning of satellite services in C, Ku and Ka band complete the service portfolio of IABG in the area of satellite communication.



Last not least IABG is engaged in the area of **satellite navigation**, specifically in Galileo Public Regulated Service (PRS). Within various national and international projects IABG is focusing on user requirement analysis, security concepts and certification, test & validation and user-specific implementation of PRS into existing and future systems/applications in the domains of defence, Public Safety and critical infrastructures.

In a project on combined GPS PPS (Precise Positioning Service) and Galileo PRS the technical advantages of a combined PPS and PRS were successfully analysed with respect to robustness, availability, accuracy and operational and security-related aspects. Regarding IT security IABG is also involved in the development of Galileo PRS receivers.



AUTOMOTIVE



INFOCOM



MOBILITY, ENERGY & ENVIRONMENT



AERONAUTICS



SPACE

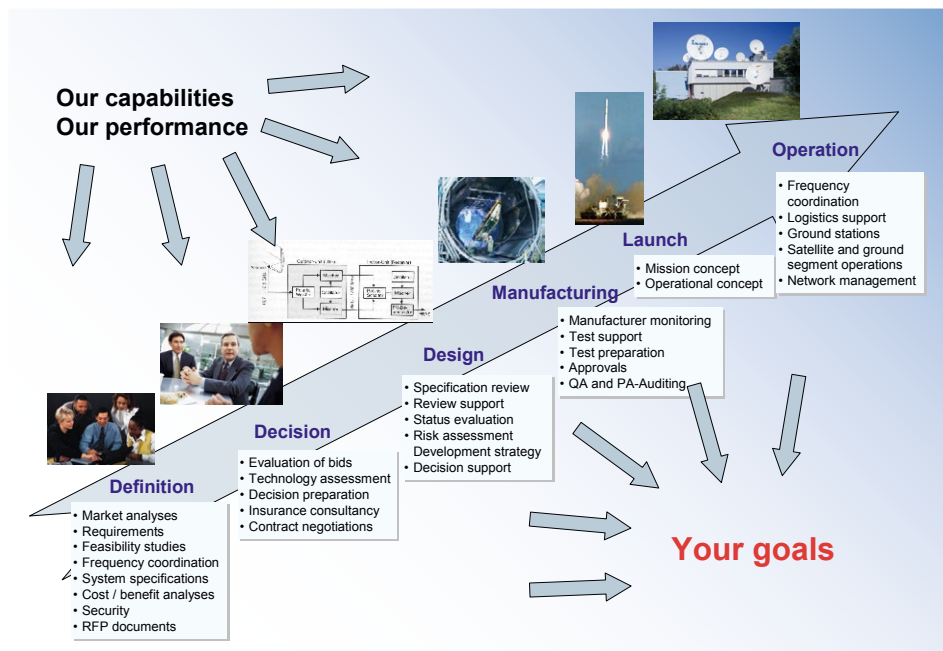


DEFENCE & SECURITY

## Space Consulting

Contrary to corresponding defence material, military, Governmental (and civil) space-based systems are subject to an exchange/renewal cycle of about 10 to 15 years as for example on-board resources for attitude and orbit control are limited.

IABG provides significant contribution to the success of such projects from the definition to the operational phase.



## Our service portfolio

- Requirements Analysis
- System Analyses
- Technology and System Assessment
- Systems Engineering
- Programme Consulting
- Project Management
- Risk Analysis and Risk Management
- Quality Assurance / Quality Management
- Product Assurance
- Manufacturer Monitoring
- Security Planning

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