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The German interagency approach to SSA

Ladies and Gentlemen,

Please let me first take the opportunity to thank you for having me here at this excellent conference. I really appreciate this unique opportunity to present the German Interagency approach to SSA on behalf of the Federal Ministry of Defence and the Federal Ministry of Economic Affairs and Energy. As this is my very first trip to Japan, I am also overwhelmed by new impressions beyond the scope of this conference. Being a first timer to this conference, I would like to introduce myself:

I am Lieutenant Colonel Karsten Auras from the German Air Force Headquarters in Berlin. My work in the Headquarters' Concept development branch is focused on joint space concepts. I have been working on space concepts in several staff positions since 2008 – including the fundamentals for the German Space Situational Awareness Center. My current tasks include drafting the next Bundeswehr Joint Space Concept.

We have already heard some excellent lectures on the importance of the space domain for civil and military applications and the urgency of international cooperation in order to preserve its sustained usability.

The establishment of international SSA cooperation will be a decisive factor in the preservation and sustainability of the space domain. As you are all well aware, this involves both civil and military actors. It requires scientific and operational resources ranging from sensors, networks and data centers to specialized analysis capabilities and SSA Centers to generate end user services like collision avoidance or reentry predictions. In my presentation, I would like to give you an insight into the German interagency approach to SSA. I would like to start with an overview of the governmental actors and their respective roles and responsibilities in Germany.

Within the German federal government, the Federal Ministry of Economic Affairs and Energy has the lead for space affairs. In this function, the Federal Ministry of Economic Affairs and Energy coordinated the process of establishing the space strategy of the German federal government. Besides that, each ministry is responsible for space applications in its domain of

responsibility. The execution of the national space program and the German representation in the European Space Agency ESA are delegated to the DLR Space Administration – a separate unit within the DLR organization – on the basis of the Law governing the transfer of responsibilities for space activities.

The Federal Ministry of Defence focuses on the military use of space based assets, products and services for security and defence applications. It currently owns five SAR reconnaissance satellites and two communications satellites and is a user of complementary third party systems and services for navigation, communication and earth observation under a host of MoUs and contracts. Through the procurement of satellites and their commissioning from 2007-2009, the Bundeswehr became a space actor. For these satellites, the mode of operation was split into payload tasking and operations – a military task – and flight dynamics and overall mission control, which today is conducted by contractors. Additionally, the Air Force laid the foundation for the German Space Situational Awareness Center which I will cover later in my presentation.

For the European GALILEO and COPERNICUS satellite programs and their civil and commercial applications, the Federal Ministry of Transport and Digital Infrastructure and the Federal Ministry of the Interior act as national stakeholders.

Against the background of the involved actors and levels, let me show you the hierarchy of relevant documents that define the interagency approach to SSA in Germany. The top level document is the German Federal government's Space Strategy, issued by the Federal Ministry of Economic Affairs and Energy. The space strategy – dated from 2010 – understands space as an essential instrument for the achievement of economic, scientific, political and social goals. It explicitly states the relevance of space and the importance of key technologies and national system competence for civil and military security aspects in a prominent way. The strategy calls for a cooperative approach that – especially in Security and Defence related programs – exploits possible synergistic effects and develops strategically important competences in key technologies. This approach not only makes best use of the available scientific, technological and industrial capabilities and expertise, it also helps to realize state of the art projects in times of scarce budgets. Through the alignment of

civil and military research activities and the coordination of military operational requirements with civil technology development work strands, both sides benefit equally.

Within the Defence sector, there is a host of policy, strategy and concept documents. For Space, the main document is the Joint Concept for Space (2015) which has been commissioned by the Federal Ministry of Defence. This document defines the capabilities, aims and ambitions for military space. The drafting process has been finished; the document will be submitted for ministerial consideration by end of March 2015. For military space based applications, it is complemented by Joint Concepts for Intelligence, Communications and Information Systems and Geo-Information. The innovation with this new Joint Space Concept is the fact, that it acknowledges space as an operational domain of its own, equally important as the sea, air, land and information domain. Space support to operations has become an indispensable military function and as such, it requires the establishment of situational awareness and of the necessary command and control functions for the space domain.

On the civil side, the DLR Space Administration as our official partner in interagency cooperation has established an office within its strategy division dedicated to security policy aspects of space. They have been involved in the drafting of the Bundeswehr Joint Space Concept and they intend to produce an according set of strategy papers focused on future cooperation efforts in the main areas of civil research and development activities.

Two tangible outcomes of this cooperation are the agreements signed by the Federal Ministry of Economic Affairs and Energy and the Federal Ministry of Defence for the interagency cooperation in the national Satellite Communications mission “Heinrich Hertz” and the German Space Situational Awareness Center.

Based on previous studies and concepts, the Air force stood up the nucleus for German Space Situational Awareness Center GSSAC in 2009 at Uedem, collocated with the existing national Air Operations Center. In 2011, the DLR Space Administration and the Air Force entered into a joint venture, implementing a dedicated cooperation agreement between the Federal

Ministry of Economic Affairs and Energy and the Federal Ministry of Defence upon the building of a national SSA Center. This serves as an example for interagency cooperation under the umbrella of the German Space Strategy.

The GSSAC is an interagency organization, formed by DLR and Air Force entities. The German Air Force's Air Operations Command provides the infrastructure, IT equipment and a staff of 38, while the DLR Space Administration's SSA division brings in additional IT equipment for development and testing and a staff of currently 5. Until 2014, GSSAC activities were focused on the development of prototype SSA services and products, data processing workflows and procedures, and the establishment and extension of national and international cooperation. In 2011 already, GSSAC began to provide operational Collision avoidance support to the SAR-Lupe operators. With the development of the follow-on system SARah, these refined supporting services will become an integral part of satellite operations. Other prototype services focused on space weather and GPS availability and precision. SSA Products have been tested in cooperation with military users like aircrews in the fighter weapons training program. For several reentry monitoring campaigns, GSSAC served as the single point of contact for federal agencies. Predictions, assessments and status reports have been provided to the Federal Office for Civil Protection and Disaster Assistance's coordination center, an interagency organization under the Federal Ministry of the Interior.

One underlying aim of the pilot phase was to gather operational and functional requirements for the transition to routine operations from 2015 on. Based on the results and evaluation of the pilot phase, a statement of requirements for a GSSAC Upgrade 1 has been submitted. This GSSAC Upgrade 1 will provide the necessary interfaces and system integration, data processing functions and analysis capability to incrementally achieve Full Operational Capability by 2020.

A decisive factor for operational SSA is the ensured availability of suitable data sources. These sources comprise dedicated or contributing sensors for space surveillance and tracking, for reconnaissance and identification of space objects and for the monitoring of environmental factors or "space weather". The existing sensors in Germany are owned and operated by civil research establishments such as the Fraunhofer FHR's TIRA Radar. The use of these

scientific or experimental sensors is closely linked to the specific expertise of highly specialized researchers in these institutions. Our goal is to make these resources available for SSA operations (without interfering with their scientific activities too much). This is necessarily a matter of compromise and requires a Service level agreement with a product catalog, planning procedures and the allocation of budget, staff and time for the SSA mission.

One of the most important projects is the development of the capability to generate, process, analyze, populate, update and maintain an SST database. Such an object catalog is the backbone of SSA operations. The development of this end-to-end capability requires a coordinated program of work, covering many different aspects. Such a program will be set up by the DLR Space Administration, beginning with the commissioning of the German Experimental Space Surveillance and Tracking Radar GESTRA in 2015.

This radar will serve as a scientific development platform, generating sample data for the development of the processing chain and catalog functions, as well as providing SST data for operational purposes to GSSAC. It is expected to become available in 2017, just in time for the introduction of the GSSAC Upgrade 1. Dedicated GNSS reference stations, complementary use of optical and radar surveillance and tracking data provided by civil and military partners as well as interfaces for third party data complete the 2020+ SSA system target architecture.

There are a number of research establishments, academia and industry in Germany that represent a long-standing experience and also highly specialized expertise in space related research and operations. GSSAC reaches back to those for very specific analytic questions or event driven requests. Re-entry monitoring campaigns like the ones for Phobos-Grunt, UARS and the German ROSAT Satellite provide good examples. In the case of the German ROSAT Satellite, the company HTG was able to support the analysis with a simulation model of the spacecraft's expected fragmentation upon re-entry. Contributions like radar tracking and ISAR imaging provided by the Fraunhofer FHR institute with their TIRA allow for a verification of the propagated re-entry path and enable a "visual" inspection of the integrity of the spacecraft. For damage assessment and Debris Cloud modelling after suspected impacts on spacecraft,

expertise is available at the Fraunhofer EMI institute and Technical University of Braunschweig. Beyond current SSA operations, the cooperation with these experts ranges from consultation in GSSAC operator training, study and development work in support of national capability building and in order to support future SSA projects. This also includes the preparation and the establishment of information exchanges and standard procedures with spacecraft operators that rely on GSSAC support for collision avoidance and maneuver planning in the future.

The DLR Space Administration's new SSA division will establish a coordination function for a dedicated SSA program and budget, which will help to streamline research and development efforts in the field of SSA.

Events like this conference help to highlight, that international cooperation is essential for SSA. Space – as a global common – requires global initiatives for safety of flight, responsible use and sustainability. Laid out on the slide, the GSSAC's interagency construct allows for international cooperation and data exchange on both military and civil channels, implementing data policy rule sets according to bilateral and international agreements.

As an example for bilateral military cooperation, I would like to refer to the cooperation between GSSAC and the US Joint Space Operations Center. Since a German team took part in the US-led Schriever Wargame in 2012, bilateral cooperation has been continuously expanded. Today, VTCs, Orbital Data Requests, and Data exchange procedures are being established. Participation in upcoming SSA Table Top Exercises and future Wargames are being planned, making GSSAC the future national Point of Contact for Combined Space Operations. From a German military perspective, the establishment of a network of existing military SSA Centers will be the backbone for operational SSA, as it also allows sharing sensitive or classified information. Today, US data sharing is the foundation for almost any operational SSA procedures – civil and military.

Germany, together with France and other countries, has actively supported the initiative of the European Commission to set up a Space Surveillance and Tracking Support Program. This SST Support Program addresses the needs at European level with a system operated by individual Member States at national

level, retaining control over SSA Sensors and Centers. The basic concept has been discussed since more than two years. In mid-2014 the European Parliament and the European Council have adopted the Decision establishing an SST-Support Program. With this program we are trying to implement a completely new concept at European level. Currently, a small number of member states are preparing to set up the required structures. The main idea is to build on existing capabilities – SST sensors and Space Situational Awareness Centers owned and operated by these EU member states. This new approach requires a common understanding including initial distribution and coordination of tasks, the agenda and the main efforts for the first three years as well as a layout of the mechanisms to provide operational SSA services and information to EU Member states via a "front desk" function. We think of SSA as a 100% civil and 100% military mission that calls for close civil-military cooperation. While the Federal Ministry of Economic Affairs and Energy has the lead in this endeavor, the Federal Ministry of Defence fully supports the effort. Therefore DLR Space Administration – as the designated national entity – can also rely on GSSAC's available military capabilities and capacities to this end.

As you can see, Germanys approach is based on interagency and international cooperation. To set up an operational German SSA system, we try to combine both civil scientific expertise and military 24/7 operations capabilities. Additionally, we build on bilateral exchange and international mutual support with our partners and allies.

To sum up, I would like to highlight the three main priorities for the future:

We strive to achieve FOC for GSSAC including the experimental use of the GESTRA Radar for 2020. We want to establish a fully functional Command and Control cycle for Bundeswehr space assets, ranging from long term plans to current operations. Therefore, we will start to build up a military Satellite Control capability for the next generation of Bundeswehr satellites.

Ladies and Gentlemen, this concludes my presentation. I would like to personally thank Mr. Yoshitomi-san for inviting and supporting me on behalf of the Japan Space Forum. I am honored to be given the opportunity to speak at this inspiring conference in front of such an expert audience. Thank you very much for your attention.