



UAV DACH - German Language Working Group

By Bernhard Freiherr von Bothmer, Chairman

An Initiative for Integration of Unmanned Aircraft Systems (UAS) into Civil Managed Airspace

UAV DACH was set up in 2000, with support from UVS International. The primary objective of UAV DACH is to represent Austrian, Dutch, German & Swiss interests from UAS industry. It contributes to the development of operational requirements, concepts & procedures for national & international UAS flights in controlled airspace, GAT and cross-border flights. The members of UAV DACH are: Austria: Schiebel; Germany: Autoflug, Diehl BGT Defence, DFS, DLR, EADS, EMT, ESG, EuroHawk, IABG, OBH System, Rheinmetall Defence, Stemme UMS; Netherlands: ADSE, NLR; Switzerland: RUAG Aerospace, Swiss UAV (see following 3 pages for activity descriptions). UAV DACH carries its work out in the following subgroups:

Subgroup Certification and Qualification

The group works in close connection with the authorities for example in the Armed Forces and EASA in the following fields:

- Development of future Airworthiness Requirements for UAS as a function of UAS *Autonomy*
- Contribution to European/NATO efforts and initiatives for certification of UAS
- Close cooperation with the German Bundeswehr Technical and Airworthiness Center for Aircraft (WTD 61)
- Discussion and promotion of spectrum requirements for Communication, Command & Control of UAS
- Support of the German Network Agency (BNetzA) for WRC2011

Subgroup Experiment

The group will demonstrate civil applications for UAS for different potential users such as coastal and border control, forest fire control, surveillance of public areas and pollution control, or gas high pressure pipeline observation, as well as identify through trials the possible safety objectives and requirements.

Subgroup Sense & Avoid (S&A)

Since several years this subgroup collects, analyses and assesses information and data available in the field of S&A capabilities for UAS applications such as existing regulations with relevance to S&A, S&A functionalities/technologies and related issues like human factors and data links. With the aim to better use this aggregation of information, the subgroup designed a concept for the development of a Sense & Avoid Expert (SAvE) system. When SAvE is functional, it should provide a kind of interactive knowledge base & retrieval system, which could support the system engineering process for a generic S&A system for UAS. Furthermore, members of this subgroup participate in different international working groups such as EUROCAEWG 73, NATO NIAG SG 134 to actively support the process of creating S&A regulations for UAS.

Air Law

This group consists of members of the German MoD, Bundeswehr Technical and Airworthiness Center for Aircraft (WTD 61), German BMI (federal police), VC (Cockpit association), German CAA (LBA), Technical University Berlin (lead), BDLI (German aerospace industries association) etc.. The group will make an adaption of the German air law to UAS and present this to the German Ministry of Transportation

Starting in 2000 the following subjects have already been worked on by temporary task forces:

- a. Examination of regulations relevant under aviation law;
- b. Participation in the JAA/EUROCONTROL Task Force on UAVs;
- c. Licensing of civil UAS pilots, sense and avoid tests and comments to the USAR, as well as FINAS papers.

From 2005 to 2008 comments were formulated on:

- certification policy of EASA, A-NPA-16-2005 as well as RSP in 2006;
- EUROCONTROL UAV OAT;
- Preparations for WRC 2007/11 in respect to the UAS Datalink for command and Control;
- Support of NATO-FINAS (Flight in non-segregated Airspace);
- Cooperation with the UAS Germany (MoT, DLR, DFS) and BDLI (German aerospace industries association),
- LTF 1550 (Special Regulations for Airworthiness Verification of UAS),

and conferences were organized at Airtec UAV World in Frankfurt/Main and the ILA 2008 in Berlin.

UAV DACH itself and/or its members have identified the following prerequisites & activities for future civil use of UAS:

- Allocation of adequate frequency spectrum for Command and Control;
- Establishment of feasible certification routes for UAS manufacturers;
- Development of procedures for integration of UAS into civil airspace;
- Work in the all subgroups of EUROCAE WG 73;
- Work in EDA Qualification SG UAS;
- Support ICAO UAS Study Group in 2 of the 3 groups;
- Participation in EU supported INOU project;
- Support the national preparation of WRC 2011;
- Lead of NATO NIAG Sense & Avoid Study group.

UAV DACH contributes to the German legislative process by contributing opinions and position papers to the German authorities, which will help to unify the necessary safety standards for the national and pan-European use of civil UAS.

Herewith follows a number of short reviews of several of the German UAV DACH member companies and organizations.

DFS (Deutsche Flugsicherung GmbH) is a state-owned company under private law providing air navigation services all over Germany, which is one of the densest airspaces in Europe. Presently the DFS is operating four air traffic control centres and all 17 international airports. In total ca. 5100 employees are working for the DFS of whom 1700 are controllers. Since 1994, DFS has been responsible for regional military air traffic control in peacetime – the first air navigation services organisation in Europe to have this responsibility. DFS tasks include the provision of operational and technical air navigation services, planning and testing in the area of procedures and equipment and being actively engaged in the development of European Aviation Strategies (e.g. FABEC). DFS research and development division focuses on all areas of R&D required keeping DFS systems and procedures at the leading edge. The division has sophisticated,

state of the art ATC simulation systems (real- and fast-time simulators) for the development, validation and prototyping of new systems, concepts and functions. Besides providing expert support to various ICAO and industry standardisation panels and working groups, DFS has a strong history of participation in European projects in the 4th, 5th and 6th Framework Programme as well as TEN-T and TACIS Programmes. DFS is engaged in UAS research for many years, e.g. the WASLA/HALE and VUSIL projects including real-time simulations and flight trials. The DFS is also performing safety assessments for the EUROHAWK integration within German airspace, being the project coordinator for the INOUI project (Innovative Operational UAS Integration) of the European Commission Research Program (DG TREN) and part of ICAO UAS Study Group (UAS SG).

Already in the year 2000 the national German UAV demonstration project WASLA-HALE (Weitreichendes Abbildendes Signalerfassendes Luftgestütztes Aufklärungssystem – High Altitude Long Endurance) started to address the issues of intergrating UAS into non-segregated air space. The project consisted of 3 phases and was sponsored by the German Federal Ministry of Defence. The project was carried out by a consortium of DLR, DFS, ESG, EADS and WTD61. The main objective of the project was to develop procedures and techniques



for the integration of UAVs into civil controlled airspace and to validate them in simulation and flight trials. After a short definition phase, the main activities of the second phase (2001~2004) comprised procedure development (with focus on emergency procedures like data link loss), their validation in ATC simulations, and the development and flight testing of a UAV evaluation platform based on DLR's research aircraft ATTAS. The third phase (2006~2008) focused on «See and Avoid» aspects. For the flight trials, DLR's test aircraft ATTAS equipped with a radar sensor served as a UAV demonstrator, and two other DLR test aircraft, a Dornier Do 228 and a DR-400 served as intruders to the ATTAS aircraft. In the first flight trials, all data coming from the radar sensor have been recorded and processed offline. The developed algorithms showed very promising results. The real target could have been separated from ghost targets, the trajectory of the intruder was predicted with sufficient accuracy and the avoidance algorithm gave correct avoidance advisories. The second flight campaign successfully demonstrated automated avoid manoeuvres based on the developed sense and avoid algorithms.

The approach of Military Air Systems (MAS), a business unit of **EADS Defence & Security (DS)**, for Unmanned Aircraft VSystems (UAS), is a global one: background-knowledge of key-technologies (e.g. aircraft design, precise navigation, flight-software architecture, standardized interfaces, mission planning, etc. from decades of successful experience with manned air systems) used and adapted for meeting the requirements of unmanned air systems operations leads to overall UAS solutions. Via their joint venture **EuroHawk GmbH**, MAS and its US partner

Northrop Grumman are developing a high-altitude reconnaissance system for SIGINT (SIGnals INTelligence) tasks, modified and specially equipped to national requirements of the German customer. This is based on the Global Hawk high-altitude UAS produced by Northrop Grumman and is equipped with a technically advanced SIGINT mission system from EADS. «Advanced UAV» is a European programme to fulfil the requirements placed by the France, Germany and Spain for future unmanned long endurance theater surveillance missions. The novel aspect of this approach is a modular design and the integration of the unmanned aircraft system into a network-enabled operations scenario.



SIDM (Système Intérimaire de Drone MALE) is a Medium Altitude Long Endurance (MALE) UAS – named Harfan by the customer - developed for the French Air Force. SIDM/ Harfan – based on the IAI (Israel Aerospace Industries) Eagle 1 platform – is a latest-generation system in the medium-altitude long-endurance (MALE) category of UAS and is dedicated to reconnaissance and tracking operations in the depth of the battlefield.

The tactical DRAC (Drone de Renseignement Au Contact) system is destined for front line army units with the aim of multiplying their intelligence and reconnaissance capabilities. DRAC system is based on the Tracker UAS, developed in partnership between MAS and SurveyCopter, which is providing the aircraft and the cameras. MAS has specially developed a ground station as well as a high-speed secure data link, which gives the system a genuine long-range capability, even in severe weather conditions.

EMT, a medium-sized enterprise, was established in 1978 by Dipl.-Ing. Hartmut Euer, and for more than thirty years has been designing, manufacturing & supporting innovative systems for armed forces. Quite a few of our products led to economically sustainable results and made our business a leading-edge manufacturer in special fields such as unmanned airborne reconnaissance. Our portfolio encompasses a growing family of UAS ranging from micro and mini UAS to larger tactical systems. Several countries employ our unmanned aircraft systems on a worldwide scale. EMT's guiding theme is uncompromising technical product reliability. The modular design of our systems allows not only the easy exchange of different payloads, such as optical sensors, radar sensors (SAR) or data link relay systems, just to name but a few, or the integration of the ground station in hardened vehicles and cabins of different sizes supporting the drone systems' quick reaction deployment using helicopters, but also the simple addition of MUSECO, a VTOL platform, to the LUNA unmanned aircraft system. The Bundeswehr refers to our LUNA drone system as a success story and states: «This medium-sized business is an extremely cost-effective and reliable partner of the Bundeswehr and is quickly adjusting to our requirements. The tasks of the Bundeswehr, such as the participation in worldwide peace-keeping UN-missions, are being optimally supported by products of this firm. These multi-purpose reconnaissance drone systems enable the Bundeswehr to conduct their reconnaissance tasks



for instance in Afghanistan or Kosovo from the air without endangering the lives of their troops».

Since more than four decades the company **ESG Elektroniksystem- und Logistik-GmbH** is a specialist for the development, integration and operation of complex electronics and IT systems. Customised solutions in the field of aviation and aerospace for the German armed forces, the armed forces of other nations, public authorities and industrial companies all over Europe have been among its focal activities. ESG supports its customers during the entire life cycle of its aircraft. The company is a neutral technology and process consultant for studies and concepts and system comparisons, it takes over product support tasks for customers, and supports the operational reliability of systems through special training courses. The in-house development and integration of new avionics systems plays a major role. The systems are efficiently, economically developed and assessed in advanced simulations as well as in flight tests. In this context ESG has gained significant expertise in the development of technologies and procedures for the integration of UAS in controlled and non-controlled airspace.



ESG is a design organisation according to EASA Part 21J and a certified contractor of Bundeswehr aircraft systems and equipment.

IABG GmbH is a leading European services company focused on advanced applications of science and technology. We develop concepts, implement these and operate simulation and test facilities. About 1.000 experienced and motivated employees offer our customers solutions in the business areas Automotive, InfoCom, Transport & Environment, Aeronautics, Space and Defence & Security. IABG's customers are from the public sector at federal, state and EU levels as well as from technology-oriented companies. IABG is a management and employee owned company and, therefore, can provide an independent consultation



service to the government and to other companies. In the field of Unmanned Aircraft Systems (UAS) IABG is experienced in the analysis and evaluation of UAS, support of certification and integration of UAS into civil airspace and operational aspects and communication systems. To provide state-of-the-art services IABG has developed mission, communication and sensor planning tools and an UAS simulation testbed according to STANAG 4586 with hardware-in-the-loop and HLA/DIS capability. It covers simulation models for air vehicles (3DOF to 6DOF models for fixed and rotary wing platforms), datalink systems, sensors etc. With the modern operator consoles operational tasks and man-machine-interface aspects can be addressed.

Rheinmetall Defence is already the highly regarded supplier of a wide variety of defence systems including fire control, reconnaissance, training and simulation, C3I and Unmanned Aircraft Systems (UAS). From the beginning the company specialised in tactical UAS and their integration into network enabled operations. Within Europe, Rheinmetall Defence is one of the few companies to have fully developed UAS. As a system supplier Rheinmetall Defence is also involved in the fields of Simulation and Training. The successful licensing of the first civil UAS pilots is only one proof of competence within this market segment. A well known system out of the portfolio is the small tactical reconnaissance system for target acquisition (Kleinfluggerät zur Zielortung, KZO) which was developed since year 2000 for the Artillery of the German Bundeswehr. The system is under delivery and will be deployed to German missions abroad. With its secured real-time data link range of 120 km and its capability of highly precise target acquisition, recognition and identification the system will close a capability gap in protection, intelligence and reconnaissance. The KZO is also one main component in the German programme of a combined system of reconnaissance and pinpoint engagement in the depth of the operational zone (Wirkmittel zur abstandsfähigen Bekämpfung von Einzel- und Punktzielen, WABEP). This system combines the sensor for target acquisition and battle damage assessment



with a loitering ammunition to engage precisely, quickly and adaptable to the mission against high payoff targets. Additionally to the Rheinmetall Defence competence in system development and integration, qualification and testing, Rheinmetall has a certification as aircraft manufacturer and maintenance facility. Long-term experience with international procurement processes, logistics, repair and servicing are offered to the customer.

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