

## **DLR GfR mbH – Galileo Constellation Operations at the Galileo Control Center in Oberpfaffenhofen and Provision of Navigation Services**

DLR Gesellschaft für Raumfahrtanwendungen mbH, in short DLR GfR mbH is a company that provides reliable and safe services for the aerospace industry. DLR GfR mbH is a 100% subsidiary of the German Aerospace Centre, DLR e.V. The company is operating and maintaining the European satellite navigation system Galileo from the Galileo Control Centre in Oberpfaffenhofen. For this purpose, DLR GfR mbH has implemented a technical infrastructure that ensures 99,99% availability. DLR GfR mbH is a 50% shareholder of the Spaceopal joint venture founded in 2009, which was awarded the Galileo Service Operations Contracts (GSOp) with the European GNSS Agency (GSA) in December 2016. The other 50% shareholder of the joint venture is the Italian company Telespazio S.p.A., which operates the second Galileo Control Centre in Fucino, Italy.



Galileo Control Centre in Oberpfaffenhofen © DLR GfR mbH

The Galileo Operations services at Oberpfaffenhofen comprise the routine operations and maintenance of currently 18 constellation satellites as well as the related ground segment infrastructure, which is being executed on a 24/7 basis. Detailed activity planning is required in order to satisfy all needs of operations and maintenance activities. This constitutes one of the major challenges in the Galileo project besides the fact that the Galileo Navigation System is still undergoing final deployment. Nevertheless, Initial Galileo Services were declared by the European Commission on 15/12/2016. The Initial Service declaration is a very important step towards the establishment of the full operational capability of the Galileo System and demonstrates the significant progress made by Galileo to the User. The transition from a pure Deployment contract under the European Space Agency into a Service Operations contract (GSOp – Galileo Service Operator) on 01/07/2017 marked another big step forward in the Galileo history. The Service Operations contract is now handled by the GSA on behalf of the European Commission and its Prime Subcontractor Spaceopal. ESA continues to be responsible for deployment and evolution of the infrastructure while the GSA acts as Service Provider. For DLR GfR mbH, this also means a push forward to a much more commercial and service-driven way of running space operations. Keeping the demands of the system deployment and evolution and the service provision balanced is key to the success of the entire programme. The service provision now also drives the operations processes and standards in terms of operational products preparation, their validation and execution. The new processes established with the GSA enabling to interleave service operation with deployment/evolution activities will ensure the stability and reliability of the Galileo Service - all of this to the utmost satisfaction of the world wide distributed user community.



Final Galileo Constellation © ESA – P. Carril

Besides operating the Galileo satellite constellation from the Galileo Control Centre in Oberpfaffenhofen, DLR GfR is furthermore specialised in the provision of GNSS-based navigation services. The specifically designed Navigation Services Department is expanding its know-how in different sectors for future safe and secure infrastructures, in order to be prepared for the mobility challenges in the next few years. The different sectors are Space Traffic Management, Drone Traffic, Air Traffic and Ground Traffic Management.

Commercial Space Traffic will develop into a global multi-billion-Euro market. The need for a safe, efficient and globally (co)operating Space Traffic Management (STM) system will arise. On behalf of ESA, DLR GfR has therefore conducted a roadmap study on the implementation possibilities of a European STM within the next two decades taking into consideration an evolving Air Traffic Management system. This has added valuable new ideas and aspects to the European STM landscape. Please find the link to Ralph Tüllmann's study Roadmap towards a European Space Traffic Management on our homepage: [www.dlr-gfr.de](http://www.dlr-gfr.de)

The Drone Protection Services aims at protecting airports, event organisers, private companies and critical infrastructures against severe accidents, reputational damage and the malicious theft of confidential data. The wide variety of protection systems launched on the market can make it a time consuming task to select the best solution with the best value for money. As a manufacturer-independent company, DLR GfR is in an ideal position to guide its customers towards the establishment of a customised drone protection solution, perfectly matching the specific protection requirements.

In aviation, the use of GNSS signals for en-route navigation and precision landings will gradually replace conventional navigation aids. Complementing Satellite Based Augmentation Systems (SBAS), the Ground Based Augmentation Systems (GBAS) will enable precise approach and landing also down to the lowest visibility conditions (CAT-III), making it a viable successor to the Instrument Landing System (ILS). With its unique background as the German operator of the European Galileo navigation satellites and a certified Air Navigation Service Provider (ANSP), DLR GfR is the perfect partner during all phases of GBAS planning, implementation and operation.

New vehicles will require a safe and secure infrastructure and therefore the Navigation Service Department offers a manufacture-independent measurement of signal quality. Global Navigation Satellite Systems (GNSS) has heavily influenced the modern technology and we have come to rely more and more on GNSS signals for various products and services. GNSS signals from space are very weak in signal power, and can easily be disrupted by a growing number of threats. This can have major consequences in critical infrastructure. Our solutions include a portable GNSS threat monitoring system, equipped with reliable high grade hardware and software, which allows short term and long term monitoring of the local GNSS interference environment. We support our national and international customers from the public sector and the world of business in air navigation, airport operations, communications and relevant technologies based on GNSS.

In our team of engineers and business economists we are able to bundle years of expertise as the Galileo Constellation Operator together with state of the art know-how as a certified Air Navigation Service Provider. This unique combination of competencies allows us to provide high-level consultancy for air and space usage.