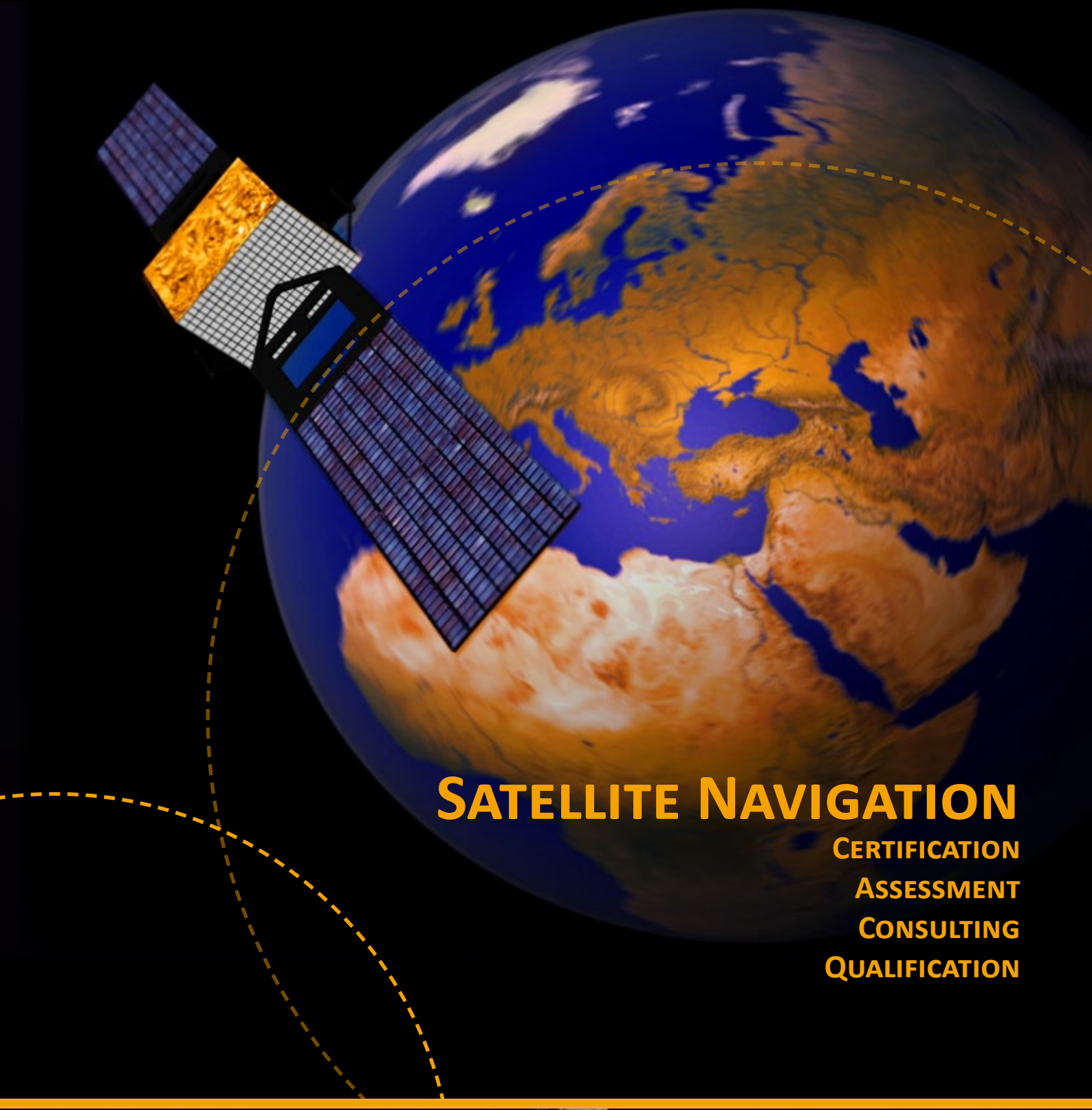
GAUSS

GNSS
Center for Safety Critical
Applications, Certifications and Services

www.gauss-portal.com

**One-stop Solutions
for Your SatNav Applications**



Satellite Navigation

Certification
Assessment
Consulting
Qualification

GPS + Galileo + GLONASS + Compass + EGNOS + GPS + Galileo + GLONASS + Compass + EGNOS

Motivation

Das GNSS Zentrum für sicherheitskritische Anwendungen, Zertifizierungen und Dienstleistungen, GAUSS, steht für den in Deutschland führenden Dienstleister für die Zertifizierung von Satellitennavigations- und Ortungsanwendungen. Benannt nach dem berühmten Braunschweiger Mathematiker Carl Friedrich Gauß (1777-1855) und angesiedelt an Europas zweitgrößtem Forschungsflughafen in Braunschweig, profitiert es von dem dort ansässigen Know-how. Der Standort Forschungsflughafen ist ein innovatives Cluster für Wirtschaft und Wissenschaft, das Forschungseinrichtungen und Hightech-Firmen zu einem Kompetenzzentrum für Forschung, Produktentwicklung und Dienstleistung vereint.

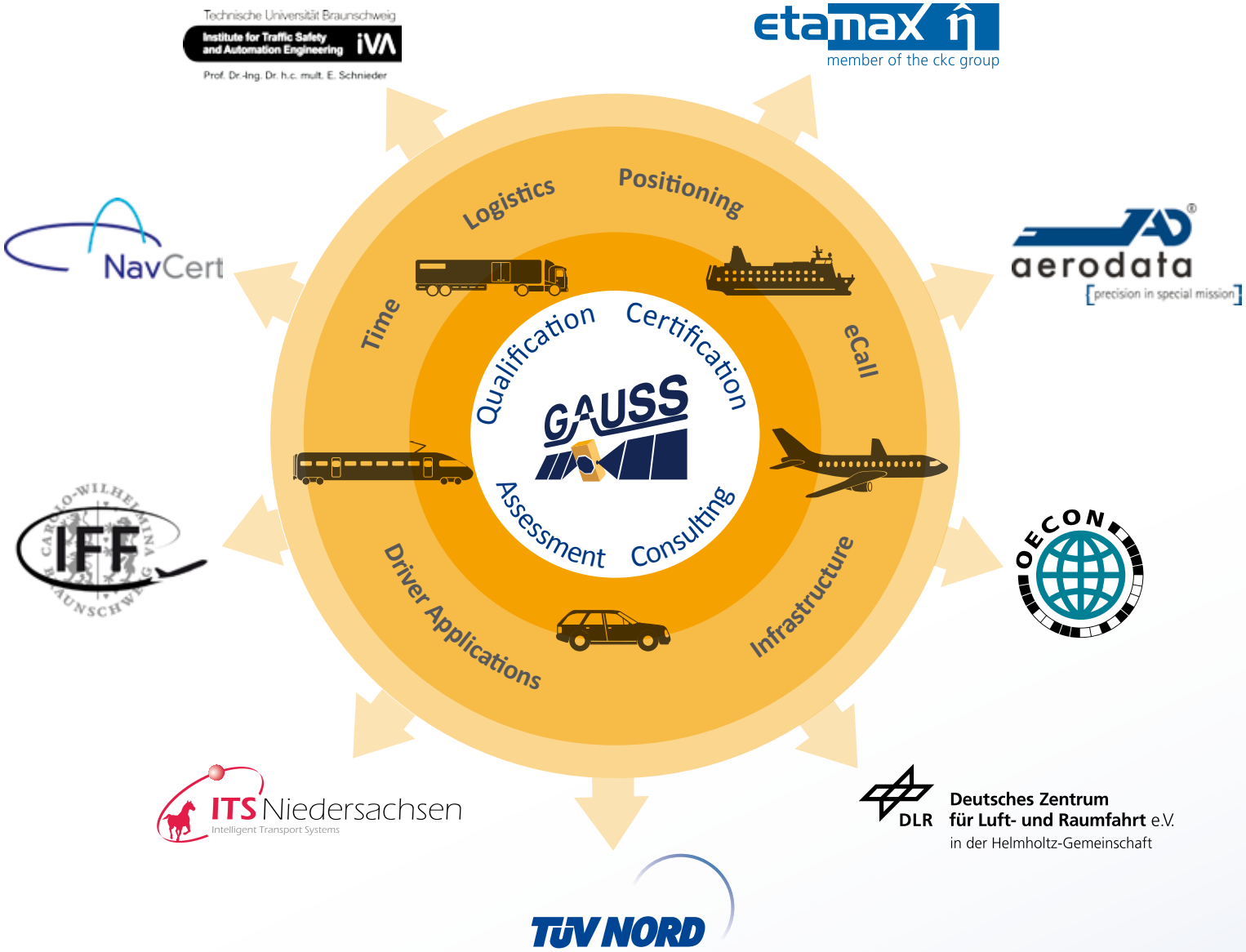
Unter dem Namen GAUSS arbeiten seit 2006 insgesamt neun Institutionen gemeinsam an dem in dieser Broschüre vorgestellten Dienstleistungspaket. Das Kerngeschäft von GAUSS ist dabei die Prüfung und Zertifizierung von Produkten aus dem Umfeld von Navigation und Ortung: angefangen bei der Beratung über Zertifizierungs- und Zulassungsumsetzungen bis hin zur Weiterbildung und Qualifizierung, um Kunden ganzheitliche Lösungen für ihre Aufgaben und Anforderungen bei der Zertifizierung von Satellitennavigation anzubieten. Eine Zertifizierung ist besonders für sicherheitskritische Anwendungen eine Voraussetzung, um einen sicheren Betrieb gewährleisten zu können und die Einhaltung der dafür existierenden Vorschriften und Standards zu bestätigen. Kunden sind jedoch nicht nur aus Sicherheitsaspekten an einer Zertifizierung interessiert, sondern auch wegen einer möglichen Verbesserung häufig genutzter Prozesse und einer damit verbundenen Kostenreduzierung.

Die von der ITS Niedersachsen GmbH geführte GAUSS-Geschäftsstelle ist dabei das Sprachrohr zum Kunden und stimmt mit ihm und den Partnern individuelle Lösungen aus einer Hand ab. Durch dieses gemeinsame Handeln können die Kunden von GAUSS von einem hohen Qualitätsstandard profitieren. Dabei kann GAUSS bereits auf eine Reihe erfolgreich durchgeführter Arbeiten / Zertifizierungen blicken. Ein Beispiel dafür ist das Projekt GALCERT, das den ersten offiziellen Schritt zu einer Zertifizierung von Galileo darstellt. GALCERT beschäftigte sich zwischen 2006 und 2008 mit einer Reihe von vorbereitenden Aufgaben im Bereich der Galileo-System-Zertifizierung. Es wurde ein umfassendes Zertifizierungskonzept für alle Nutzer und Einsatzgebiete entwickelt, welches die verschiedenen bestehenden Normen, die den Zertifizierungsprozess von Galileo definieren, umfasst.

GAUSS beschäftigt sich neben den reinen Zertifizierungsdienstleistungen auch mit Projekten, Events und Networking. So richtet GAUSS gemeinsam mit der Deutschen Gesellschaft für Ortung und Navigation die bedeutendste Fachveranstaltung zur Zertifizierung von Satellitennavigation, die CERGAL, aus. Seit 2005 veranstaltet GAUSS diese Konferenz, die sich insbesondere auf die europäischen Satellitensysteme Galileo und EGNOS und deren Anwendungen und Zertifizierungen konzentriert und dabei Wissenschaft und Wirtschaft gleichermaßen ein Forum bietet.

The GNSS Center for safety critical applications, certifications and services; called GAUSS, stands for the leading provider for certification of satellite navigation and positioning applications in Germany. Named after the famous mathematician from Braunschweig Carl Friedrich Gauß (1777-1855) and residing at the second largest research airport across Europe at Braunschweig it benefits from the available know-how. The research airport Braunschweig is an innovative economy and science cluster which combines scientific research and high-tech companies to a competence center for research, product development and services.

Since 2006, 9 interacting institutions are working on the service package that is introduced in this booklet. The core business of GAUSS is testing and certification of products in the field of navigation and positioning: beginning with consulting, certification and approvals, up to further education and qualification, to offer integrated solutions on certification of satellite navigation which meet customer demands. Especially for safety critical applications certification is a precondition to ensure a safe operation and to certify the compliance of existing rules and standards. Customers are not only interested in cer-



tification because of the safety aspects; there is also a possible improvement of often used processes and an associated reduction in costs.

The GAUSS office, led by ITS Niedersachsen GmbH, is the voice to the customer and coordinates individual all-in-solutions with him and the partners. Because of these interacting processes the customers of GAUSS are able to benefit from a high quality standard. GAUSS can already look back on a successfully realised series of certifications. One example is the project GALCERT, which represents the first official step towards a certification of Galileo. Between 2006 and 2008, GALCERT dealt with a series of preparatory tasks related to the Galileo system certification. A comprehensive certification concept for all users and fields of application was developed, which contains the different existing standards that define the certification process of Galileo.

In addition to certification services, GAUSS also deals with projects, events and networking. GAUSS and the German Institute of Navigation (Deutsche Gesellschaft für Ortung und Navigation) are hosting together the most important expert conference of certification of satellite navigation, CERGAL. Since 2005, GAUSS hosts this conference which concentrates on the European satellite systems Galileo and EGNOS and its applications and certifications. This gives both, science and economy, a forum.

GALILEO

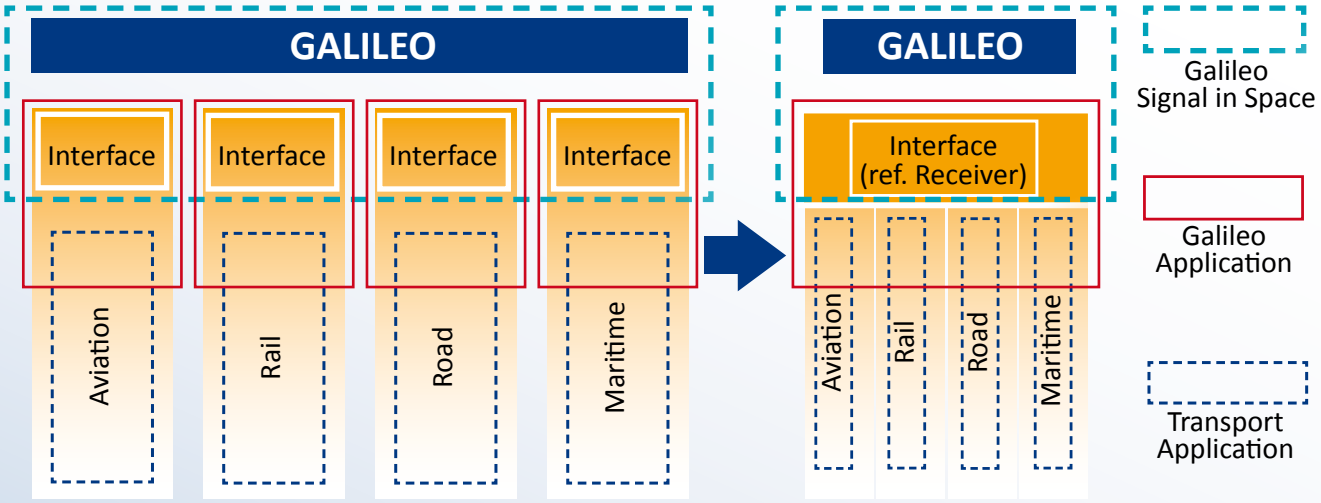
Safety critical services and systems will be applied in a number of domains, e.g. aviation, maritime, railway and road. The development of the Galileo system is expected to bring significant socio-economic benefits to citizens who make use of the services provided. Many public transport applications will be heavily dependent on the Safety of Life service. The variety of transport sectors addressed, which includes Aviation, Maritime, Rail and Road, will necessitate a truly multi-modal approach.
The Galileo High Level MRD (Mission Requirements Document) recognises this important issue and defines the process by which public safety is assured
This high level requirement is carried through to the Galileo Mission Requirements Document which states that – "A certification scheme shall be implemented that covers both the validation of Galileo signals in space against the SRD (Galileo System Requirement Document) requirements and the Galileo services against the present MRD requirements." And that -"The certification shall be achieved through the implementation of an independent and impartial certification body."
Safety Critical Users of Galileo will use the Safety of Life Signal in Space which will be supported by other information on Galileo supplied by the appropriate Service Centre. Any safety operation has to be considered in its entirety and safety is assured by establishing, to the satisfaction of the relevant authorities, that the appropriate safety standards have been met. In addition, the certification procedures exist both, for civil as well as for governmental applications.

In order to establish a comprehensive overall certification process for all users and all elements of their operations a multi-modal / multi-level approach has been taken (see figure below). All three layers

- Galileo System and Signal in Space,
- Galileo Interface to the user, reference receiver, etc.
- and application

should have common methods of verification for all user domains. This consolidated approach will be the most cost effective and will enable the Galileo Operator to market services to the largest possible number of users. The related certification procedures will be harmonised with the Galileo development processes using common materials as much as possible.

GAUSS is involved in the Galileo programme since 2006. Due to the active involvement GAUSS is looking back on a significant track record and has gained broad and extensive knowledge and understanding of the Galileo programme. The certification activities enabled GAUSS to develop a good understanding of the overall system and receive detailed insights in the requirements of applications in all domains.
Further significant know-how and relations with authorities and industry in the Galileo programme were build-up within GAUSS to develop certification schemes to enable the growth of the downstream market of Galileo and EGNOS.



Multi-Modal – Multi-Level Approach

CERTIFICATION

Description

A certification is a precondition for products in terms of safety critical applications, devices or systems. But on the way to get a certificate, there are many things, which must be considered. During the certification activities, processes will be improved, conformity to existing standards, regulations or other requirements is proven and it is taken care that the verified solution is working under certain conditions in the right way. For all necessary services needed during the certification process, GAUSS will be the single point of contact.
To ensure that certifications are done correctly, a dedicated process has been developed. At present, a basic certification process consists of four phases which are described as follows:

Phase I: Agreement verification, product test, factory inspection
The product or service which is to be certified has to be identified. According to the testing and certification regulation, it must be analysed as to whether the product can be certified at all. If yes, a dedicated test plan has to be developed concerning test items, test methodologies and test tools to make sure that the object is fully tested as per the requirements identified. Furthermore, a factory inspection will take place to see if all quality standards necessary for manufacturing are met.

Phase II: Review of test reports and results
The test reports and results are reviewed by an independent examiner, who has not been involved in the tests so far to follow the 4-eyes-principle to check that all tests and reports have been done correctly.

Phase III: Technical evaluation of test results
A technical certifier controls the achieved results again. This time, the main focus is not only concentrated on the result itself. Additional to that, he has a closer look at the test methods employed and test tools used, to judge whether they are adequate with respect to the expected results. This means that the results of the tests are checked in terms of their plausibility according to experiences in that specific area.

Phase IV: Formal evaluation of test results and release of certificate
The certification authorities have a look at all created documents to ensure that all formalities are respected and afterwards, awards the certificate. This means that the certification authorities confirm the fulfillment of the requirements of proven standards and directives and confirm that the product is designed, manufactured and working correctly.

Benefit for the customer

The benefits are certified applications, devices or systems developed in line with effective requirements and standards and also shorter development cycles due to early involvement of technical experts in the development and certification process.

Target Groups

- Manufacturers of GNSS applications, devices, systems or components
- Service providers for GNSS solutions

Generic Process of Certification

Assessment

Description

Assessments must be done in several areas in particular for safety critical applications. This has to be performed before a component, service or product can be certified or brought into market. Tests are indispensable for correct functionality of products and their features.

Every newly developed hardware or software has to be tested for proper functionality. GAUSS provides different test levels for every development stage. Parts or components of a complex system can be tested according to their specifications during and after the development. The same applies for complete systems, software modules or finished software packages.

Furthermore, the development of products and services for safety critical purposes needs to follow certain rules. These often concern quality management. But also other techniques beyond the Quality Management System have to be taken into account. GAUSS conducts assessments to clarify whether all requirements are fulfilled and whether the used processes have potential for optimisation. In this way GAUSS improves development processes regarding time and cost and checks if these processes are handled according to existing standards.

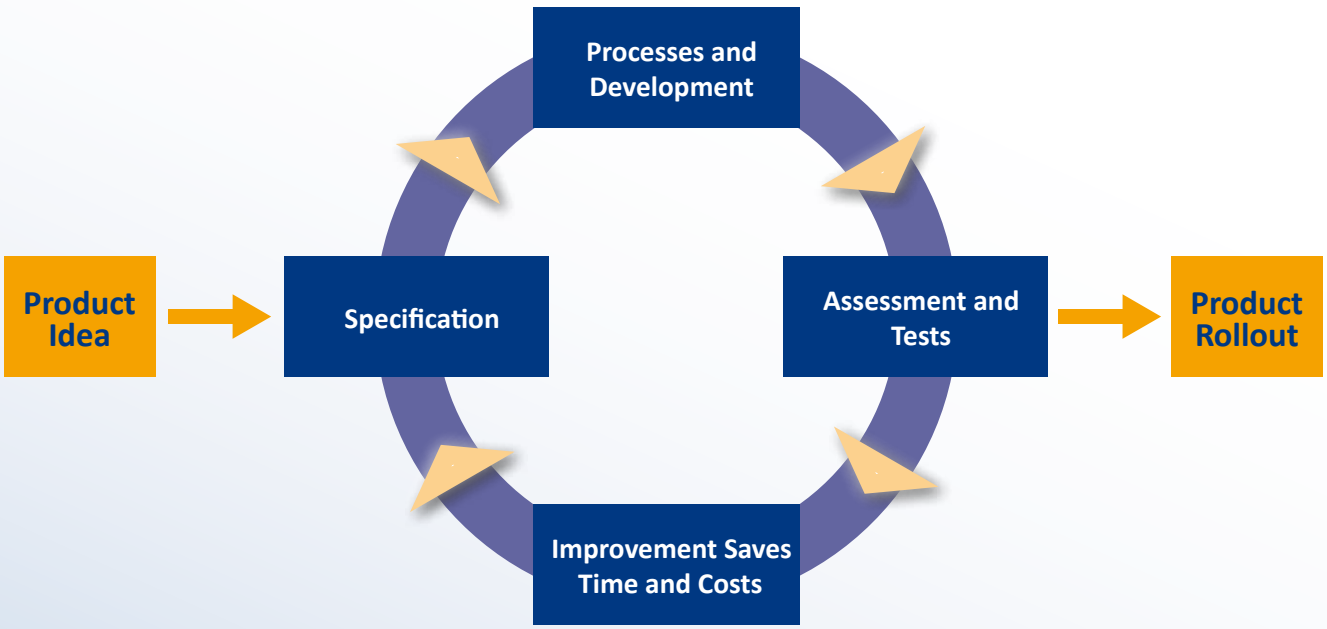
You see, GAUSS will be YOUR partner for tests, assessments and audits in the fields of navigating, locating or positioning. GAUSS has experts on board for all kinds of products dealing with GNSS in all traffic domains.

Benefit for the customer

Audits are an opportunity to improve development by looking at established processes and revealing ways of improving parts of these. Concerning tests and assessments, maximum independency from the development is guaranteed and detailed test reports will provide information for further improvements or compliance with specifications and requirements.

Target Groups

- Manufacturers of GNSS applications, devices, systems or components
- Service providers for GNSS solutions



Assessment in the Product Development Circle

Consulting

Description

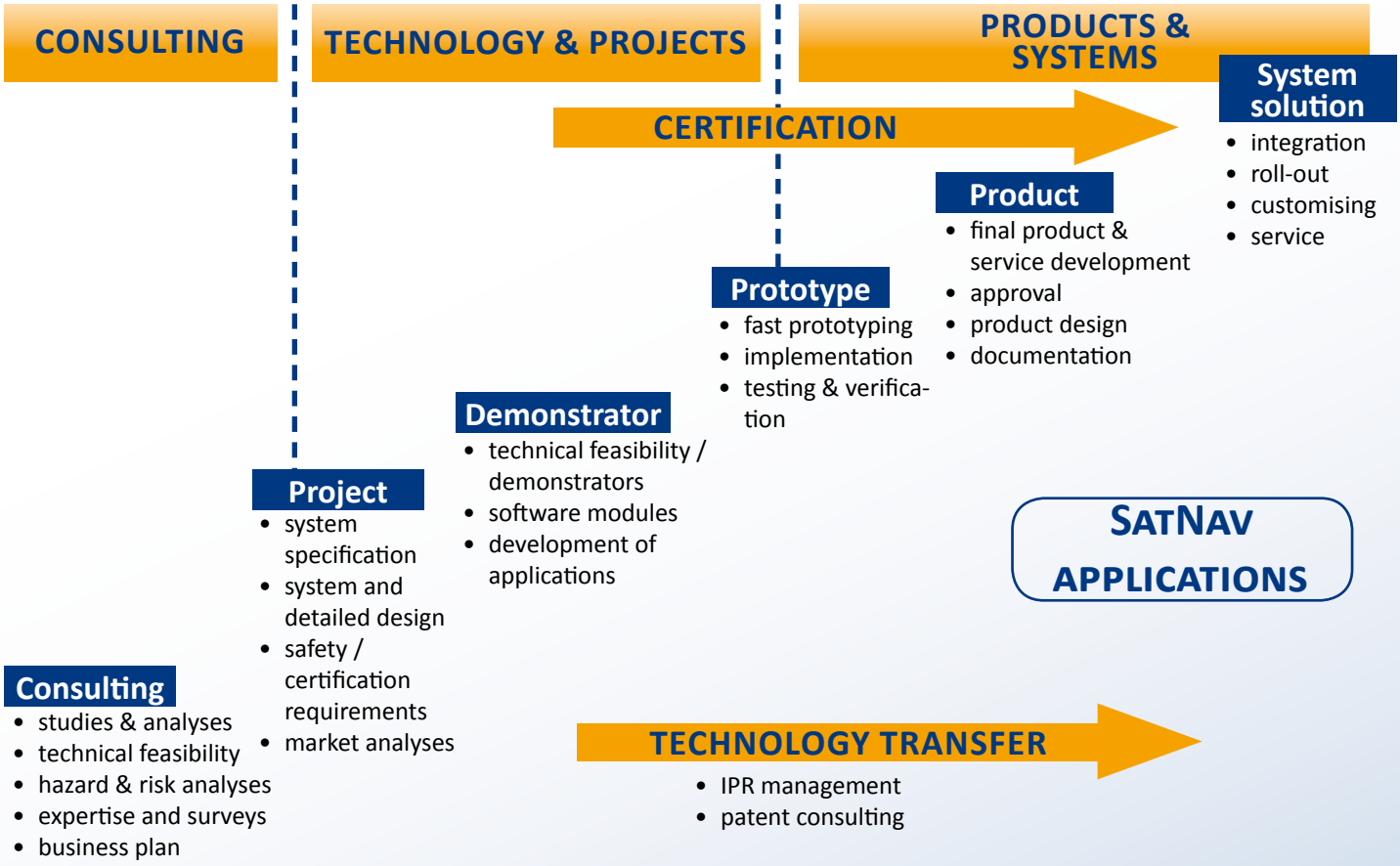
The success of every enterprise results from a summation of single decisions which are based on existing knowledge. It is essential that knowledge is not regarded as information, data, or trends that have to be evaluated and weighed regularly. Thereby the individual focus, which might be highly limited by individual experiences, is obstructing a capacious point of view.
That is why it is essential to sustain the position of your own enterprise by external consulting, especially in the high-tech-sector, for growing the business and to avoid falling behind the competitors. This includes the evolution of innovations, the development of new products, exploring new markets, identifying new target groups and searching for new solutions.
GAUSS helps its clients to cope with this challenge. Many years of field experience together with new approaches to science and practical experience in consulting guarantee the maximum success beyond the status quo. The GAUSS consultants develop individual solutions for positioning and navigation applications as well as for their licensing and certification with the client. Alongside technological consultancy, business analysis is firmly included in the process.

Benefit for the customer

GAUSS includes a large network of GNSS experts from industry and research, so the GAUSS consultants can offer a wide range of topics regarding GNSS, from basic facts and knowledge about Galileo or GPS to more particular subjects like software development for GNSS applications.

Target Groups

- Manufacturers of GNSS applications, devices, systems or components
- Service providers for GNSS solutions
- System Integrators for GNSS based environments



Consulting leads the way from the idea to the product

Range of Services

Qualification

Description
Permanent qualification and further education are essential in the young and fast moving fields of positioning and certification of satellite navigation. This applies to both, new techniques and new products. In technology-intensive industries, knowledge and further education of the employees are an important value of the company. If you want to lead the way and open new markets, you have to own highly qualified and motivated employees. Qualification is the key to be a successful leader in satellite navigation.

GAUSS offers several kinds of professional trainings for interested individual people and whole business companies, which are all under the topic of satellite navigation, certification and safety critical positioning and navigation applications.

Training
GAUSS offers regularly trainings for small groups in German or English. They can be booked as events in school institutions or as in-house solutions. The trainings are given by competent and experienced instructors and contain precise solutions for the individual requirements of the customers. Working in small groups guarantees high value and positive measurable results.

Know-how is the basis of success

Workshops
These workshops take place exclusively upon agreement. They are considered more as a collective process for developing results rather than a one-way form of teaching. They are established as an interface for the offer of GAUSS consultancy and often form an important part of it.

Conferences
Since a couple of years, the GAUSS conferences POSITIONs and CERGAL (in cooperation with DGON) have been successfully established on the market. The conferences are setting the focus on the European satellite systems Galileo and EGNOS and their applications and certification. Top class speakers from the fields of economic and science are giving their impulses and identifying trends of the whole line of business.

Benefit for the customer
The customers are able to choose between the different offers for professional trainings arranged by GAUSS to find their perfect education solution. All speakers and teachers are experts in their specific field.
During trainings or workshops, it is possible to work in an intensive and target-oriented way in small groups on current topics. The benefit of participants of company-wide events is the opportunity to make new contacts and do networking. These new contacts can be ideally used later for new projects.

Target Groups
- Business companies / units with focus on satellite navigation, safety critical positioning and navigation applications
- Suppliers
- Providers
- Public and governmental institutions
- Logistic companies
- Security business
- Vehicle manufacturers

Infrastructure

At the **Research Airport** of Braunschweig, the second largest one of Europe, numerous well-known institutions, institutes and companies have formed a great cluster of competence for aviation- and transport-safety and also air traffic management. The cluster consists of the **German Aerospace Center** (Deutsches Zentrum für Luft- und Raumfahrt, DLR), the **Federal Aviation Authority** (Luftfahrtbundesamt, LBA), several institutes of the **Braunschweig University of Technology**, the **Automotive Research Centre Niedersachsen** (Niedersächsisches Forschungszentrum Fahrzeugtechnik, NFF) and the campus Research Airport. For that reason, many small and medium-sized enterprises that also deal with these topics or support such activities have joined this specific environment of business and science.

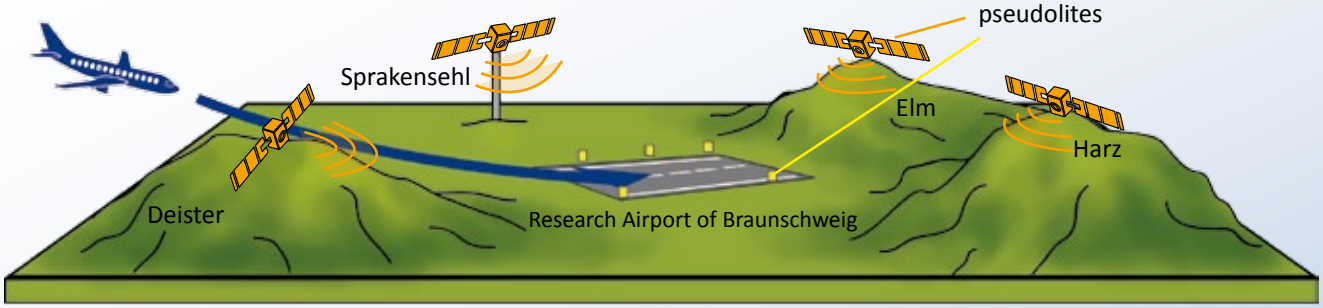
A unique feature at the Research Airport is the installation of the **aviationGATE**, one of several Galileo test and development environments in Germany (GATEs). They are used to test applications under real-life operating conditions. It is being built by the GAUSS-member, the **Institute of Flight Guidance (IFF) at TU Braunschweig** as part of the funded project „UniTaS IV“. Measuring 5.500 square kilometres in extent and up to 100 kilometres across, **aviationGATE** enables planes to receive genuine Galileo signals by pseudolites. The users are able to picture and test all kinds of requirements of positioning and navigation in the three phases of flight cruising, take off, landing and also navigation on the airfield. One advantage of testing in **aviationGATE** is the focus on scientific flights, because there is only a small amount of commercial flights in Braunschweig. On the other hand, the Research Airport has all the typical parts of infrastructure, so that testing under real conditions of bigger airports is possible.

Furthermore, two different simulators are available for test measurements under certain conditions. On the one hand, at NavCert the **GSS8000 GNSS Simulator** from Spirent can be used for mostly all kinds of tests, as it supports multi-system, multi constellation GNSS testing. The

The intermodal test vehicle RailDriVE®

GSS8000 system comprises a controller computer running Spirent's simulation software SimGEN, and a signal generator configurable to meet specific test needs.
On the other hand the IFF is currently setting up a **Galileo Labrotary** which will provide amongst others a rich set of soft- and hardware simulation tools including an inhouse developed software receiver and serveral hardware signal generators. That environment will provide a great basis for any kind of GNSS simulation and testing.

In addition also other infrastructure facilities are located at Braunschweig. The partners of GAUSS have a number of unique research vehicles. One of them is **FASCar®**, a test vehicle for the evaluation of novel, active driver-assistance systems with a focus on haptic driver assistance. Another one is **RailDriVE®**, which is a vehicle to test new positioning systems and also a mobile laboratory for the testing of various sensor combinations. It is a half van, half railcar hybrid which has the capability to both drive to the test site, and deploy train wheels to run on tracks. In the field of aviation, the **Dornier 228-101** can be used as a universal flying research platform. In the field of aviation, two Dorniers, a 228-101 (D-CODE) and a 128-6 (D-IBUF), universal flying experiment platforms, can be used for a wide range of experiments.



aviationGATE

AeroPhone

Overview

Avionics and communication systems to be installed in fixed wing aircraft or helicopters must be certified according to aviation laws. The certification requirements both, for hardware and software depend on the criticality of the respective unit and its application.

An airborne satellite communication (SatCom) system to be used for voice and data transmission must be certified accordingly. In this particular case, the criticality is determined by the nature of voice and data communication, for example, if Air Traffic Control (ATC) related information is received / transmitted or not.

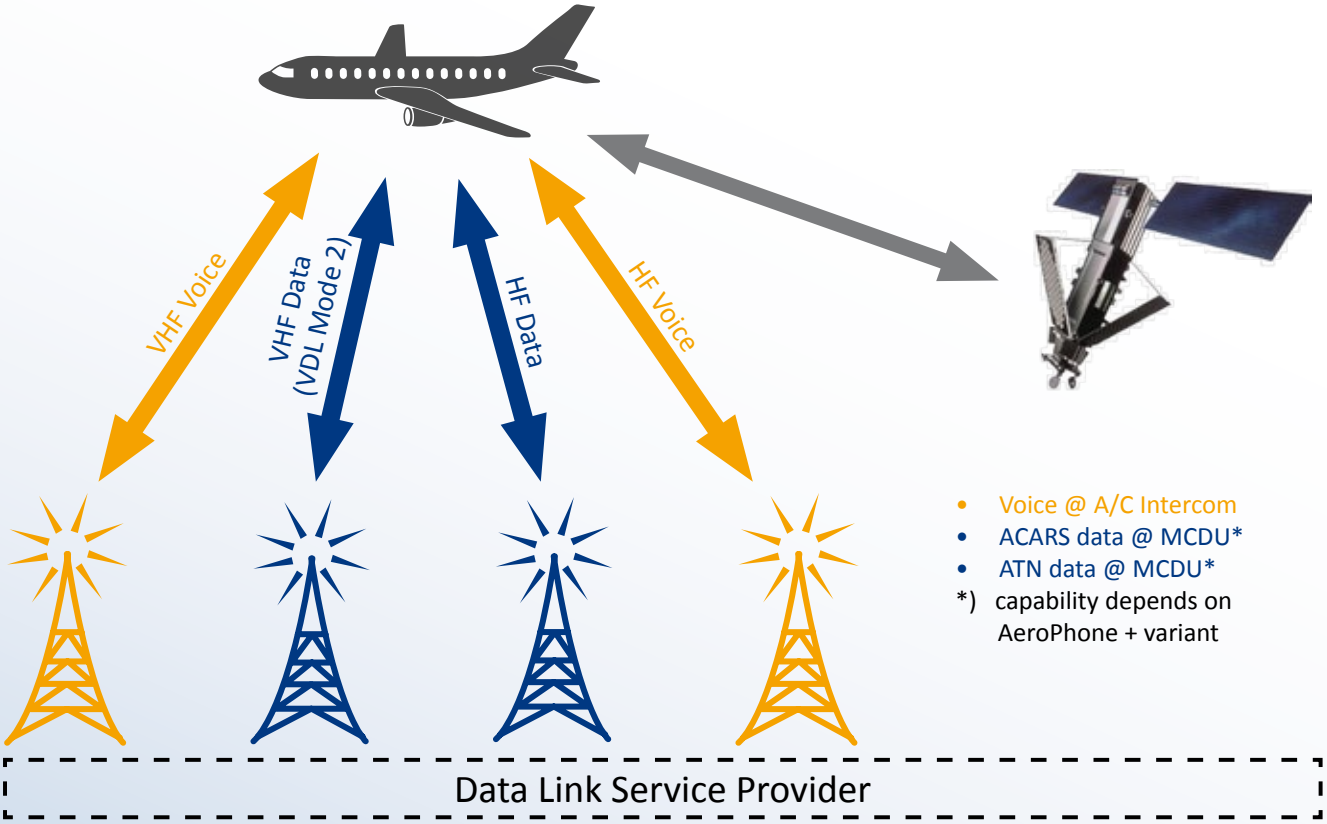
Aerodata AG as a part of the GAUSS initiative has developed a SatCom system called AeroPhone® using the services of the IRIDIUM satellite network and providing a single channel for voice and data communication. This system is currently certified according to LBA-NTS-22.

In order to improve the capabilities of the system, an upgrade programme shall implement a 2nd channel as well as ACARS (Aircraft Communications Addressing and Reporting System) data and ATN (Aeronautical Telecommunication Network) data transmission. In addition, interfaces to a MCDU (Multifunction Control Display Unit) will be implemented. With the new data services the level of criticality is increasing and qualification and certification become more complex. The new system will be certified according to ETSO (European Technical Standard Order) 2C514.

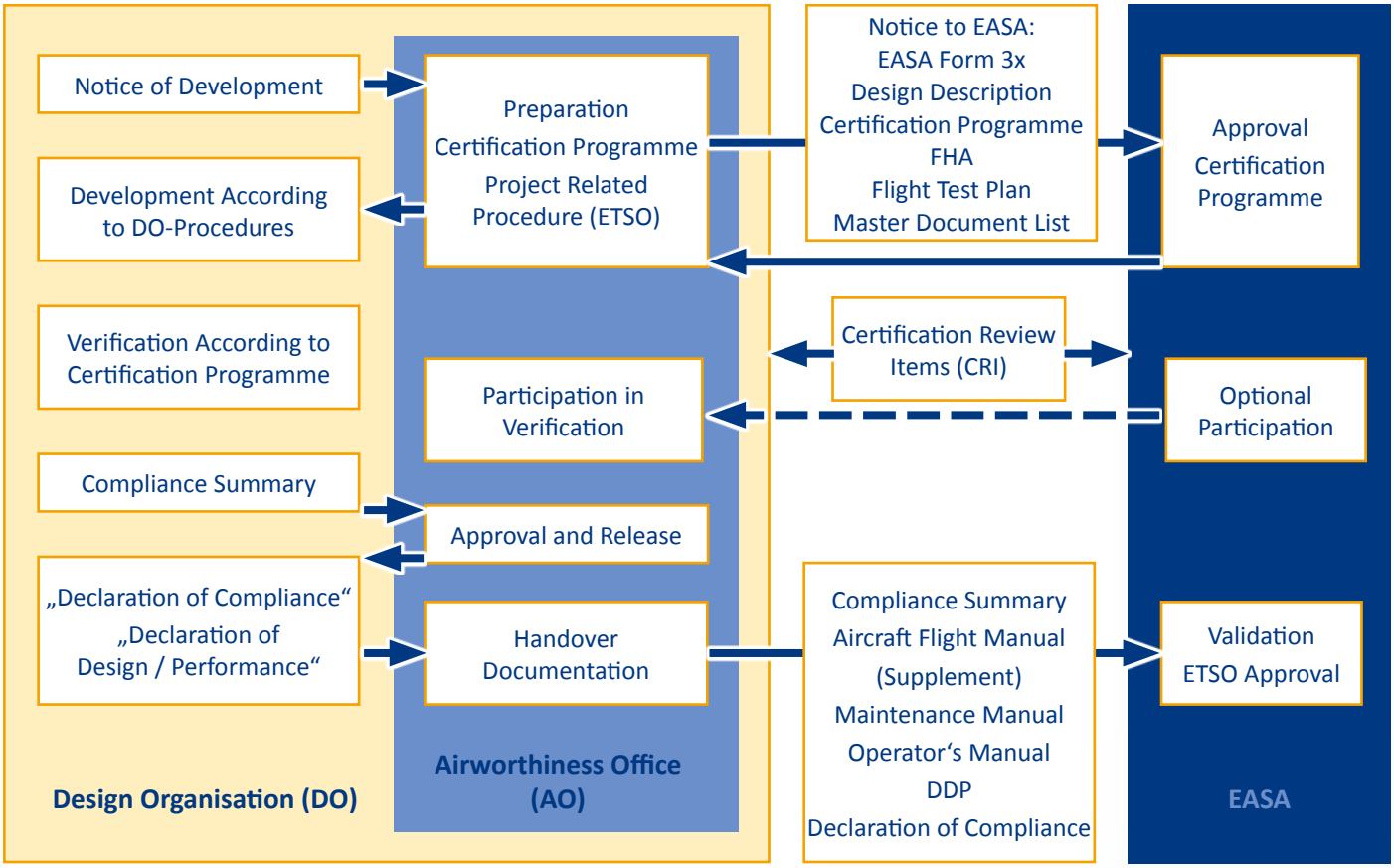
Approach

The certification of the enhanced system (AeroPhone+) will be performed in two steps. The first step is a version of the product without ACARS and ATN capabilities, the second step includes these capabilities. The certification and qualification will be according to the following rules and procedures:

- Airworthiness approval according ETSO-2C514
- RTCA / DO-160F & EUROCAE ED 14F environmental qualification
- RTCA / DO-178B & EUROCAE ED12B software standard
- RTCA / DO-254 & EUROCAE ED80 hardware standard
- ARINC Standards (429, 739, 741, etc.)



ATN Communication Concept



Certification Process for Aviation Domain

Finally, an EASA STC (Supplemental Type Certificate) is necessary for aircraft integration. This STC has to be developed for any aircraft which shall use the new AeroPhone® system.

During the certification, the safety critical items have to be analyzed e.g. by applying a Functional Hazard Assessment (FHA). It is a safety assessment technique defined in SAE ARP4761. An FHA is a systematic, comprehensive examination of functions to identify and classify failure conditions of those functions according to their severity.

The underlying method of the FHA is relatively straightforward:

- From a suitable representation, select functions in turn
- Define purpose and behaviour of function
- Consider hypothetical failure modes, e.g. ‘Loss of function’, ‘Function provided when not required’, ‘Incorrect operation of function (high, low …)’
- Determine effects
- Determine, record (and justify) associated risk factors (i.e. severity and probability budget)

Results

The result of the certification process will be an airworthiness approval for an enhanced SatCom system that also provides certified ACARS and ATN capabilities according to the relevant standards. This example is typical for the certification of safety critical avionic systems and can be used as a baseline for the certification of e.g. future GNSS receivers and systems for aviation.

Benefit for the Customer

The described baseline procedure will be used also for customers developing their own avionics products and not being in organisational position of carrying out the certification on their own. The related existing certification experiences of Aerodata and those currently established in the GAUSS initiative as well as the respective test and qualification procedures can be easily applied for other projects.

GATE

Overview

GATE (Galileo Test and Development Environments in Germany) is a real-world development and test environment to prepare for the challenges of the future Galileo / GPS navigation markets. Consisting of 6, and in future 8, virtual Galileo satellites located on top of several mountains around the GATE test area in Berchtesgaden, a well suited topology is available to support different testing objectives. GATE closes the gap between laboratory based constellation simulations and the real-world Galileo system, with its initial 18 satellites constellation planned to be available in 2014.

GATE offers to manufacturers of equipment already today the possibility of experimenting with various different signal conditions in a flexible testbed. Especially the possibility of providing the receiver producers with a signal environment for navigation (simultaneous reception of at least 4 satellite signals) and integrity applications (5 signals) on the ground, even before the full Galileo satellite constellation will be available, furnishes manufacturers with strategic advantages in developing their devices and for the subsequent commercial marketing. As a real-world development and testing environment it is essential that the established system fulfils the requirements for test and development facilities to assure manufacturers and scientific institutions a high reliability.

NavCert GmbH as part of the GAUSS initiative will authorise GATE as test and development laboratory for TÜV SÜD AG.

GATE pseudolite station in Berchtesgaden

Approach

The test and development infrastructure of GATE will be certified in two ways. First a technical certification will be performed. This certification will focus on the technical requirements derived from the Galileo signal description (Galileo Open Service Signal in Space Interface Control Document, OS SIS ICD) and the European Coorporation for Space Standardisation (ECSS) standards. This part is important to verify that the Galileo signal created by the GATE transmit segment is compliant to the signal described in the ICD in terms of design, availability and accuracy. Furthermore it will be checked that the development of GATE was done according to basic technical and management guidelines as described in the ECSS standards. For the realisation of this certification a technical requirement document was developed based on the mentioned reference documents (Galileo OS SIS ICD and ECSS). After that the requirements were used to create the test plan for the certification. Right now the certification of the technical part of GATE has already started by certifying the NavX-NCS Galileo signal simulator developed by IFEN GmbH. This simulator is part of the GATE laboratory test platform to perform first indoor test cases.

The second step of the authorisation is the operational certification of GATE. This certification bases mainly on the ISO/IEC 17025 “General requirements for the competence of testing and calibration laboratories”. The goal of this part of the authorisation is to ensure that all processes of the test and development infrastructure have a high quality standard (higher than ISO 9001). With the compliance to the ISO/IEC 17025 the results of tests performed by GATE will be well documented, validated, reproducible and reliable.

Results

The authorisation of GATE is in progress. The requirements and test plans are developed and ready to use.A first certification of one part of the system, the GATE laboratory test platform, was already finished.

Benefit for the customer

Customers of NavCert GmbH as well as customer of GATE will profit from the authorisation of GATE. The customers of GATE have an independent proof that the created signal of GATE really fulfils the requirements specified in the Galileo design documents.

Customers of NavCert can profit from the gained knowledge and developed test procedure for Galileo test environments. These experiences will be used for further authorisation of real-world test infrastructures, signal analysis laboratories and many more. Furthermore with the authorisation of GATE NavCert has access to a certified test infrastructure which can perform independent tests for Galileo signals. This will extend the spectrum of certifications which can be provided to the customers.

Aerodata AG is a modern, technology-oriented company, providing its customers with an inimitable service in aviation. The company focuses on the development of highly-specialised, complex aeronautical engineering system solutions for air traffic organisations, aircraft manufacturers, operators of special mission aircraft and helicopters as well as renowned system and avionics manufacturers.
Aerodata is able to provide expertise in:
Real time data processing, sensor fusion, satellite based navigation, system integration and aircraft modification.

Based on its unique know how and competence in design, production and aircraft integration, maintenance and operation Aerodata offers:

- Flight Inspection Systems and Flight Inspection Services
- Special Mission Systems for fixed wing aircraft and helicopters
- Supply and Integration of Avionics and Navigation Systems
- Modification and Operation of Special Mission Aircraft
- Aircraft Maintenance

aerodata
precision in special mission

Aerodata AG

Hermann-Blenk-Straße 34-36
38108 Braunschweig
Phone: +49 531 2359-0

www.aerodata.de

DLR is Germany´s national research center for aeronautics and space. Its extensive research and development work in Aeronautics, Space, Transportation and Energy is integrated into national and international cooperative ventures. As Germany´s space agency, DLR has been given responsibility for the forward planning and the implementation of the German space program by the German federal government as well as for the international representation of German interests. Furthermore, Germany's largest project-management agency is also part of DLR.

Approximately 6,500 people are employed in DLR´s 29 institutes and facilities at thirteen locations in Germany: Cologne (headquarters), Berlin, Bonn, Braunschweig, Bremen, Goettingen, Hamburg, Lampoldshausen, Neustrelitz, Oberpfaffenhofen, Stuttgart, Trauen and Weilheim. DLR also operates offices in Brussels, Paris, and Washington D.C.

DLR Deutsches Zentrum für Luft- und Raumfahrt e.V.
in der Helmholtz-Gemeinschaft

Deutsches Zentrum für Luft- und Raumfahrt, Institut für Verkehrssystemtechnik

Lilienthalplatz 7
38108 Braunschweig
Phone: +49 531 295-3401

www.dlr.de/ts

The main scopes of etamax space GmbH are safety critical software and systems. Our slogan "safety wherever you go" is the promise we give to our international customers from many different domains. As engineering service provider and independent partner we support you through the entire development process. Starting with requirements engineering and hazard analysis we manage your verification, validation and test activities and make your product ready for accreditation.

We also design and develop GNSS applications up to marketability. An example is G-WaLe, a GNSS-based system for measuring the water level in rivers and flood affected areas. Entrust etamax to improve your product's safety.

etamax
member of the ckc group

etamax space GmbH

Frankfurter Straße 3d
38122 Braunschweig
Phone: +49 531 866688-0

www.etamax.de

GAUSS Partners

ITS Niedersachsen GmbH

Hermann-Blenk-Straße 17
38108 Braunschweig
Phone: +49 531 35630-86

www.its-nds.de

ITS Niedersachsen (former Gesamtzentrum für Verkehr Braunschweig) was founded in 1997 to promote cooperation between commercial and scientific organisations and companies in the field of transport and telematics. It is located at the Braunschweig Research Airport. ITS Niedersachsen is supported by more than 100 member institutions, mainly research facilities and small and medium-sized enterprises.

As a centre of competence, ITS Niedersachsen encourages the networking of its members, mediates contacts, and arranges project-related consortia. The efforts focus on maintaining and intensifying scientific know-how transfer, organising symposia and in-house training, supporting the procurement and realisation of national and European funded projects in the region, and managing public relations to promote and position its members on the market. The network is still open for partners, who have special know-how in the field of standardisation und certification of satellite navigation applications.

NavCert GmbH

Hermann-Blenk-Straße 22
38108 Braunschweig
Phone: +49 531 35479-490

www.navcert.de

NavCert offers support regarding the development and the marketing of products and services of positioning and navigation systems.
Whether you develop GNSS components, receivers, or applications – we offer advice and support for your specific project design and ongoing projects, we take care of the complex and time-consuming steps in the development process and handle them in a seamlessly coordinated and established approach.
We assist you in

- improving the cost-effectiveness of your company
- safeguarding the reliability and quality of your products
- efficiently fulfilling all requirements

Our full-service offer in this field extends throughout all stages of your development and production processes.
It is the mission and objective of NavCert to improve performance, reliability, and integrity of safety related commercial and safety critical applications within GNSS.

OECON Products & Services GmbH

Hermann-Blenk-Straße 22
38108 Braunschweig
Phone: +49 531 35444-10

www.oecon-line.de

OECON has been a successful service provider for telematics, applications in aviation and mobile positioning for more than 16 years. Our business areas are Automotive, Logistics and Personal Mobility Applications. OECON is a leading system architect for business models or research and development with a GNSS based technical background in the fields of communication, positioning and system design. We understand your process chains.

As leading partner for mobile positioning technologies our system competence includes technology fields in the areas of:

- Satellite positioning systems GPS / GLONASS / Galileo
- Positioning within mobile networks (GSM / UMTS)
- Positioning systems in wireless radio networks (RFID / Bluetooth / WLAN)
- Server-augmented hybrid positioning systems
- GNSS receivers for high accuracy and regulated services

The Institute of Flight Guidance (IFF) of the TU Braunschweig is led by Prof. Dr.-Ing. Peter Hecker and employs a staff of 40 people. Its scientific activities focus on the simulation and modeling of dynamic systems (sensors, vehicles, human operators as well as atmospheric effects like wind shear, turbulence and wake vortices), cockpit display technologies and air traffic management issues, integrated satellite based navigation systems (including augmentation systems for high integrity safety critical applications), in-flight measurement technology (e.g. high precision positioning and attitude determination, airflow and atmospheric data).

The Institute operates two research aircraft: a Dornier Do-128 and a Cessna C-172 Experimental, both equipped with extensive avionics, experimental sensors and actuators. The Institute is significantly involved in research and development programs with industrial partners and acts as technical consultant to the German Ministry of Transport, the ICAO, EASA and ESA in the field of satellite navigation and certification issues.

TU Braunschweig
Institut für Flugführung

Hermann-Blenk-Straße 27
38108 Braunschweig
Phone: +49 531 391-9802

www.tu-braunschweig.de/iff

The Institute for Traffic Safety and Automation Engineering (iVA) is composed of 20 scientists led by Professor Eckehard Schnieder. Three main domains are covered by the thematic orientation of the institute: Traffic Safety and Automation, Vehicle Safety and Automation, Systemics and Cooperative Systems.

One of the main topics of interest is research into methods, means of description and tools for investigating operational aspects such as risk acceptance and risk assessment as well as on technology-related aspects of dependability (e.g. reliability, availability, maintainability and the safety of rail and road traffic systems). All these aspects are analysed in relation to the system function, structure and behavior.

Practical project work focuses on application fields of satellite based navigation within the domain of surface transportation.

Technische Universität Braunschweig
Institute for Traffic Safety and Automation Engineering iVA
Prof. Dr.-Ing. Dr. h.c. mult. E. Schnieder

TU Braunschweig
Institut für Verkehrssicherheit und Automatisierungstechnik

Langer Kamp 8
38106 Braunschweig
Phone: +49 531 391-3317

www.iva.ing.tu-bs.de

With over 8.600 employees, TÜV NORD GROUP is one of leading technical service providers in Germany. Thanks to the technical competence and a broad service portfolio from consulting, testing, inspection to certification, TÜV NORD possesses a leading market position.

Comprehensive testing and certification according to national and international guidelines and standards are the main focuses of our services. The testing and evaluation of safety-related hardware and software as well as their applications in areas like functional safety and aviation are merely (only) one of the core competences out of our wide-ranging services. Moreover, TÜV NORD CERT is also the first organization all over Europe accredited for the audit of Air Navigation Service Providers (ANSPs).

TÜV NORD Group enjoys therefore a unique know-how in innovative business fields and is, with this accreditation, one of the leading service providers for verification of flight safety services according to current European standards.

TÜV NORD

TÜV NORD CERT GmbH

Am TÜV 1
30519 Hannover
Phone: +49 201 825-5002

www.tuev-nord-cert.de

For further information please visit: www.gauss-portal.com

Contact

Harry Evers
Managing Director
Phone: +49 531 35630-89

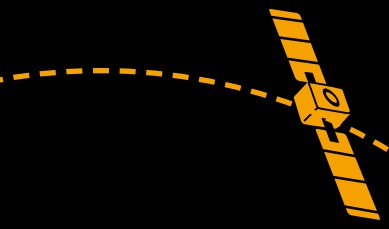
Michael Nitsche
Project Manager
Phone: +49 531 35630-86

Ronald Peters
Project Manager
Phone: +49 531 35630-88

Imprint

ITS Niedersachsen GmbH
Hermann-Blenk-Straße 17
38108 Braunschweig
Germany

GAUSS was funded by the state of Niedersachsen (W3-80012254)
GAUSS Basisprojekt was funded by the European Union (EFRE-RWB)
and the state of Niedersachsen (W3-80017974)



Graphics: GAUSS partners

The satellite navigation system Galileo is a joint initiative of the European Commission and the European Space Agency.

GPS + Galileo + GLONASS + Compass + EGNOS + GPS + Galileo + GLONASS + Compass + EGNOS