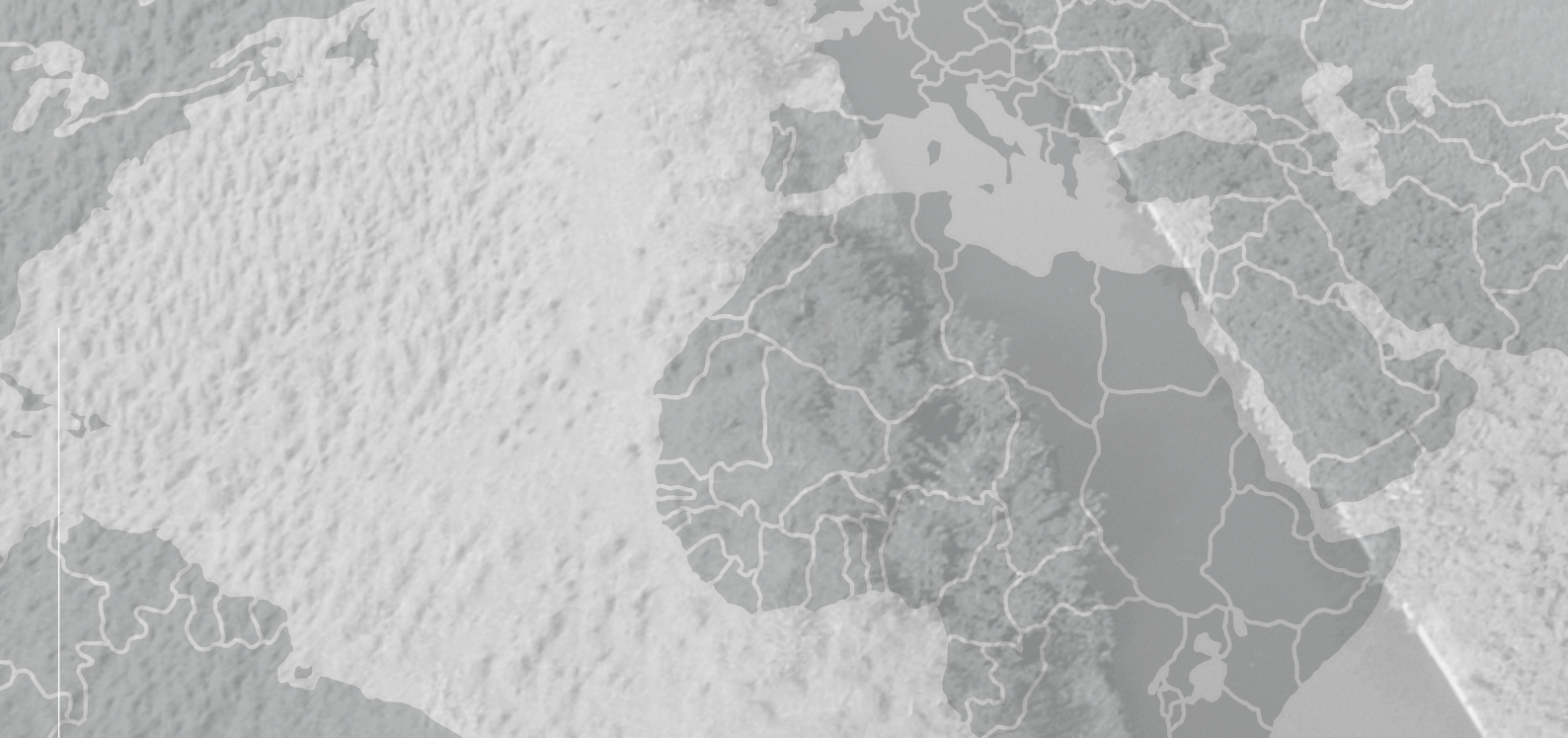


SGS

AEROSPACE

SERVICES



SGS – WHEN YOU NEED TO BE SURE

FOR MANUFACTURERS, SUPPLIERS AND OPERATORS

Aviation is one of the most exciting industries in the world – and also one of the safest, guaranteed by the highest standards of quality, durability and reliability. Every company in the supply chain bases its products and services on these requirements, from manufacturers, to suppliers, maintenance, contractors, as well as airline companies themselves. There can be no compromises, no negligence. A strict approach is required in order to avoid unforeseeable consequences. Supervisory authorities, such as the German Luftfahrt-Bundesamt (LBA) and the European Aviation Safety Agency (EASA), regulate the market with stringent certification standards to ensure the highest possible levels of safety.

Increasing demands are being placed on quality in workmanship and assembly, on components and modules and on the development of innovative materials. Aircraft should be more environmentally friendly, more fuel efficient, be able to fly longer, and be less expensive to maintain. At the same time, however, competitive and cost pressures are growing. Airlines cannot simply pass on the higher prices for raw materials, fuel, and infrastructure to passengers. Consequently, efficiency must improve in all areas.

Everyone in the supply chain is thus being forced to supply aircraft parts and to build and operate aircraft at increasingly lower prices – while quality requirements are continuously increasing. In their contribution towards value-adding, every company wants to reduce costs, minimise risks and prevent production downtime.

The best way for you to achieve these goals is to work with the strongest partner in the areas of quality assurance and quality management: the world's leading inspection, verification, testing and certification company – SGS. We have more than 1,500 offices and laboratories on all continents and a workforce of nearly 75,000 employees. We offer a full range of quality management services, covering everything from analysis to certification. We know the requirements of the market and we also know what our customers in the aerospace industry want. From airframe to jet engine, we can test every single part of an aircraft intensively and non-destructively.

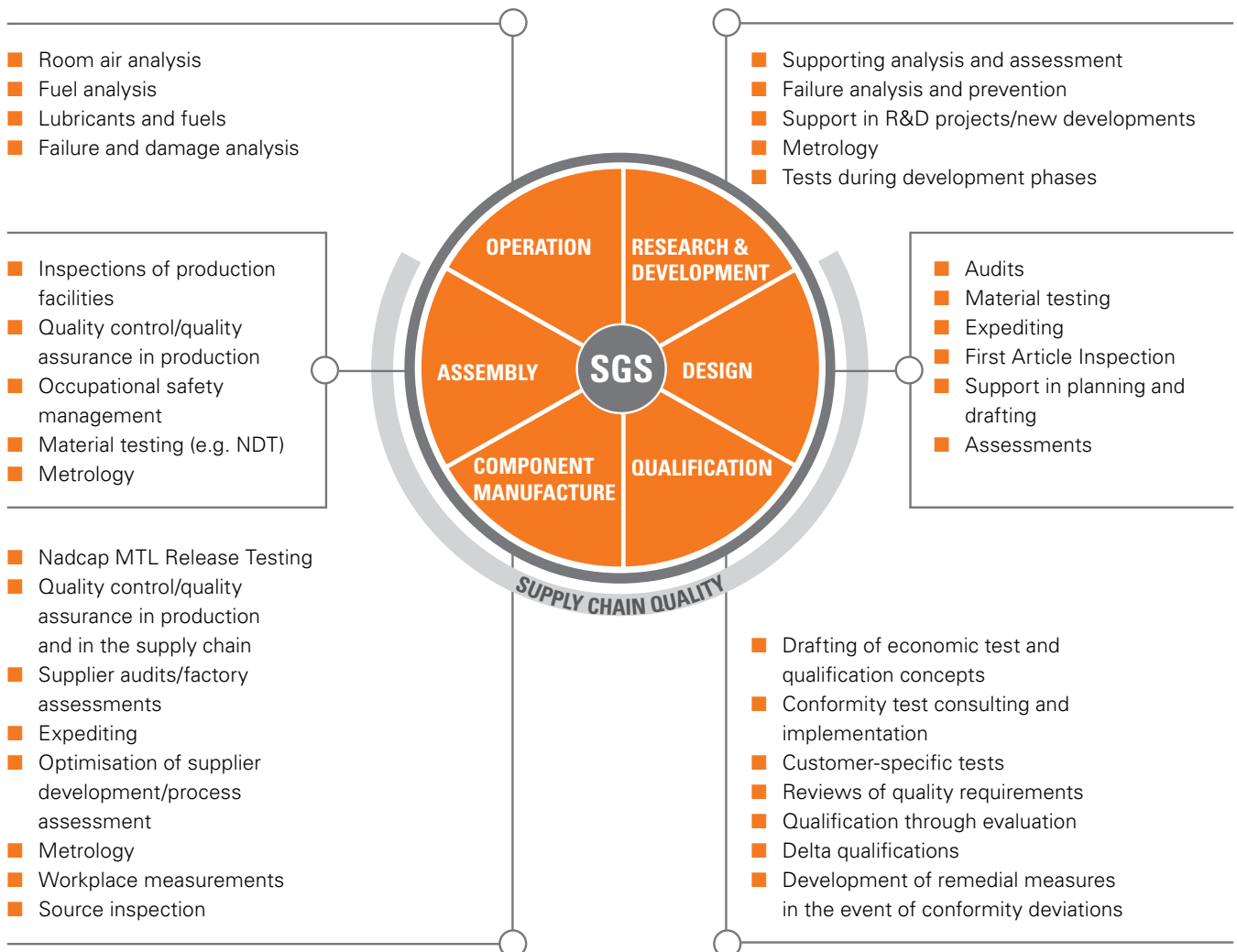
SGS is certified according to AS/EN 9100 and Nadcap MTL Release Testing. You can also rely on our support when it comes to Organisation Approvals for Design (DOA), Production (POA) and Maintenance (MOA). We coordinate national and international projects, check your suppliers' production methods, ensure that you meet your schedules and provide you with technical personnel.

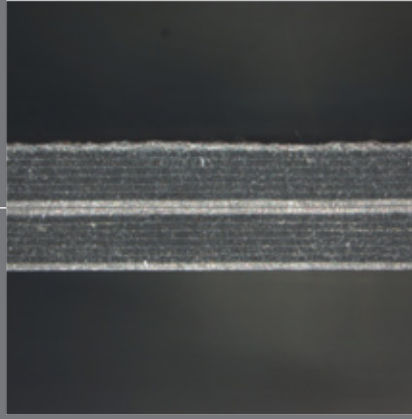
OUR EXPERTS ARE THERE FOR YOU AT EVERY STEP IN THE SUPPLY CHAIN.



SGS – THE PARTNER OF THE AEROSPACE INDUSTRY

SERVICES THROUGHOUT THE ENTIRE SUPPLY CHAIN





AIRFRAME

THE SAFETY OF AN AIRCRAFT FUSELAGE DEPENDS MAINLY ON ONE FACTOR: STRUCTURAL INTEGRITY.

Many materials are combined and these must be fabricated perfectly to guarantee that the airframe is stable and able to withstand inservice loads.

SGS ensures the quality of aircraft fuselages, wings, frames and spars through non-destructive testing.

OUR SERVICES INCLUDE THE FOLLOWING NON-DESTRUCTIVE TESTS

- Radiographic testing
- Ultrasonic testing
- Dye/liquid penetrant testing
- Magnetic particle testing
- Visual inspection
- Mechanical-technological testing
- Eddy-current testing
- Leak testing

We can provide you with highly qualified inspectors for more than 10 different processes and standards. As a testing laboratory and inspection body, we are accredited according to the relevant DIN EN regulations, we certify subcontractors according to the rules of Safety Certificate Contractors and we test on Level 3 pursuant to DIN EN 4179.

Carbon-fibre reinforced plastics (composites) are among the most important materials used in modern aircraft manufacturing. SGS inspects the construction, analyses the material behaviour during the fabrication process, checks the geometry of CFR plastic bonded parts, and measures components after the hardening process or after mechanical processing. We control all of the aspects that are relevant to quality – from the individual manufacturing component to entire production facilities.

Failure and damage analysis is primarily a preventive quality assurance method. We develop testing methods to exclude potential faults, even in production process. With CFR plastic components, we investigate bonding faults, fractures or delamination using the latest 3-D computer tomography, as well as optical and scanning electron microscopes. We carry out on-site potential measurements to check for electro-corrosion caused by penetrating moisture. Right from the outset, it is important to characterise all of the materials in terms of their chemical composition, for example in resins or fibre materials. Let us analyse your materials.

Aluminium is another focus of our tests: brazed joints, welding seams, bonds, rivets, metal cladding, investigations of casting faults and deep-drawn materials, fracture analysis and corrosion – every analysis and every investigation is aimed at detecting potential damage before or during assembly in order to guarantee the structural integrity of the airframe.



CABIN

A WORKPLACE AND ALSO A SHOWCASE. SAFETY, COMFORT AND ECOLOGY FOR THE CREW AND THE PASSENGERS.

Aircraft cabins are constructed from many different components and materials. All of these components and materials have one overriding objective: the health of the passengers and crew. A high-quality cabin also creates an ambience in which passengers feel comfortable and at ease.

At SGS, we test your **aircraft cabin materials**, such as yarns and textiles, leather and artificial leather, plastics, and foamed materials. For example, we analyse VOC (hazardous substances), the fogging effect according to DIN regulations, and flammability pursuant to the relevant safety regulations of the FMVSS. We are also able to make reliable statements regarding the effects of material ageing even under the influence of moisture. For complete seats, we offer durability tests, baggy-saggy tests and, of course, emission tests according to VDA.

The **quality of the cabin air** is extremely important for the well-being and health of the crew and passengers. We help you meet all of the relevant requirements in terms of air quality. Within the scope of VOC screenings, we identify residues of solvents, paints and adhesives, and determine other volatile organic compounds in test chamber investigations. These include substances such as TCP from engine oils. We investigate the sources of microbial emitted organic compounds, formaldehydes and other aldehydes, polycyclic and aromatic hydrocarbons, and flame retardants contained, for example, in polymers, such as cable sheaths, insulation materials and carpets. Transformers, joint seals, and ceiling cladding can contain polychlorinated biphenyls.

Our **comprehensively equipped laboratories** for electronics and materialography are on hand for every test and every demand placed on our analyses, including surface analyses based on TOF-SIMS, XPS, AES and GDOES.

In **failure and damage analysis**, we test the failure of plastic components at fracture and inspect the quality of surface coatings on different substrates.

OUR MOTTO ALSO APPLIES TO THE AIRCRAFT CABIN: PREVENTION IS BETTER THAN DETERMINING THE CAUSES OF DAMAGE.



SYSTEM, ELECTRONICS AND ENGINE

CORE SYSTEMS – THOROUGHLY PUT THROUGH THEIR PACES

Every aircraft pilot must be able to rely on the systems, the electricals and the electronics on board. At all times. This also applies to the machines and engines, as well as their fuels and lubricants. At SGS, we can make an important contribution towards guaranteeing the absolute reliability of the systems, on-board electronics and machines.

For **complex technical areas**, our customers can rely on the expertise of a multidisciplinary team of experts in electrical engineering and physics, aerospace engineering, materials engineering, chemistry and mechanical engineering. They contribute their specialist knowledge of components, materials, products and processes to the investigations of assemblies and systems. We can also support you during research, design and technical aspects of components and modules.

We **focus on the electrical and electronic components** that are used in the aerospace industry. As part of this, we analyse control equipment, sensors, actuators, PCBs and plug-in connections for electromagnetic compatibility (EMC), subject them to mechanical or climatic stress tests and carry out failure analyses. Our laboratories are accredited to perform tests according to national and international standards such as RTCA/DO-160, MIL-STD-461 and MIL-STD-810.

Material compatibility tests provide you with the certainty of knowing if and how long certain materials can withstand specific conditions and environments. We store test pieces – especially plastics – in oils and fuels. With the subsequent tests, we are able to provide reliable results on tensile strength and weight changes with pendulum impact, bending or other mechanical stresses.

NADCAP – RELEASE TESTING

As part of a global cooperation programme, the major aerospace manufacturers have introduced Nadcap as an all-encompassing instrument to ensure compliance with their quality standards.

As an independent certification body, the Performance Review Institute (PRI), has successfully audited the SGS facility in Dortmund so that it may be available to you as a qualified partner in aerospace equipment manufacturing for Nadcap approval tests in Germany.

On the basis of the Nadcap certification within the scope of Materials Testing Laboratories (MTL), SGS carries out metallographic examinations and hardness tests on high-performance materials in engines, structural components and landing gear according to the following Nadcap test codes

- L General Metallography
- L1 Microhardness
- L2 Surface layer alloy depletion
- L5 Surface layer microhardness
- L8 Alpha Case:
Kneaded titanium alloys
- L10 Surface layer carburisation/
decarburisation
- L11 Metallography (Other) n LS
Surface Conditions
- XL Macrostructures
- M3 Vickers Hardness





QUALITY CONSULTANCY

SUPPLY CHAIN MANAGEMENT, CERTIFICATION AND TRAINING – IN THE INTEREST OF EFFICIENCY AND PERFORMANCE

SGS defines and supports integrated end-to-end process solutions.

WITH OUR INTEGRATED SERVICES,

quality management, project management, supply chain quality, certification; and training, you can benefit from our experts sound knowledge, our global network, and the multidisciplinary experience of the world leader in quality-related services.

In the field of **quality management**, we collaborate with you to prepare the certification process and audits according to your specific requirements or the current standards. We can compile the quality and test plans for you and check the results.

In **project management**, we coordinate your projects and act as an interface between you and your suppliers. We compile expert opinions, monitor deadlines and processes, and handle the expediting with our on-site representatives. But above all, our employees are where they are needed, ensuring that your suppliers deliver the quality that you need for your products.

We see **supply chain quality** as our key task. By conducting capacity and capability assessments throughout the

entire supply chain, we check whether your suppliers meet the necessary conditions for production, the expert knowledge and the technical capabilities to fulfil your particular aerospace requirements. We have worldwide expediting skills, as well as comprehensive knowledge to further develop your suppliers and to ensure an integrated collaboration.

To assess the performance along the supply chain, we introduce a set of KPIs linked to the major deliverables. With first article and source inspections at your suppliers, we investigate the specified and on-time quality of the delivered components and modules. Process audits provide you with data on the quality and continuity of your supplier's relevant business processes.

In terms of **certification**, we are the world leader. We have issued more than 100,000 certificates for 80,000 customers in more than 70 countries – more than any other company in the world. As an important and internationally required standard in the aerospace industry, AS/EN 9100 is the benchmark for manufacturing, servicing, and maintenance companies. The standard is based on ISO 9001 and includes specific aerospace factors. Of course, we can

also support you with certificates for the common managerial, environmental, occupational safety and IT standards.

We can **train** your staff professionally and competently, especially in the areas of quality and process management, and in many other areas related to quality.

Our objective is to ensure your success in the aerospace industry. With our process solutions, you will improve the efficiency and profitability of your company, fulfil the demands of your customers, and guarantee the reliability of your suppliers. You play your role in ensuring the safety of passengers and crew on board.

WHEN YOU NEED TO BE SURE, COUNT ON SGS.

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**SGS IS THE WORLD'S LEADING
INSPECTION, VERIFICATION, TESTING
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