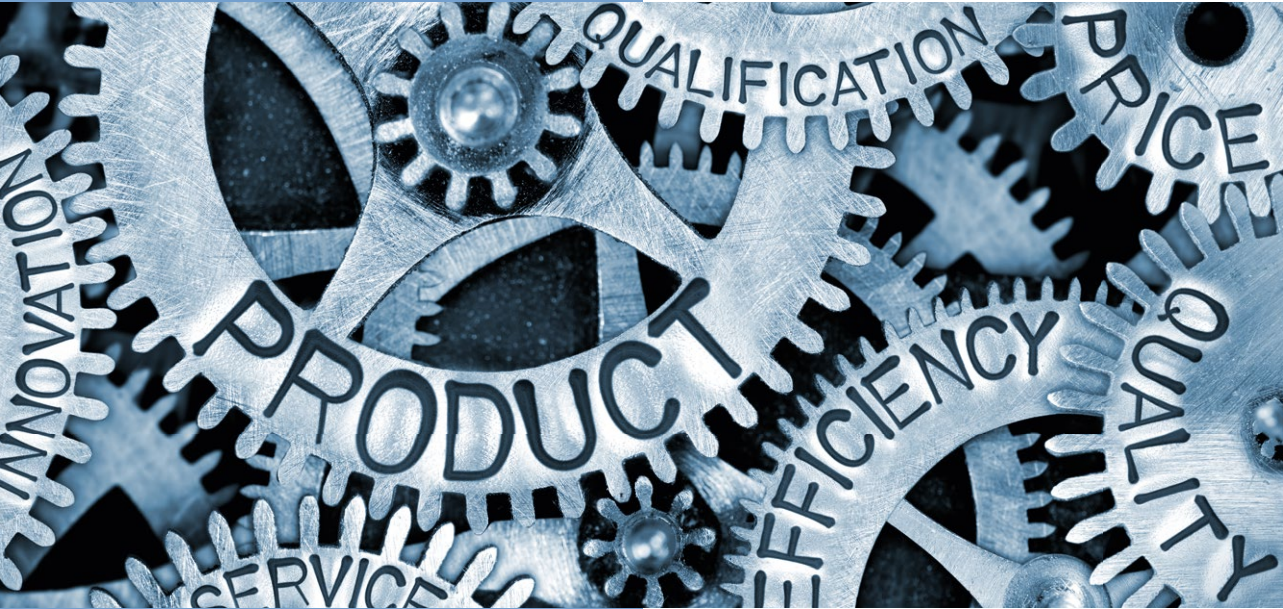


Analysis. Testing. Qualification.



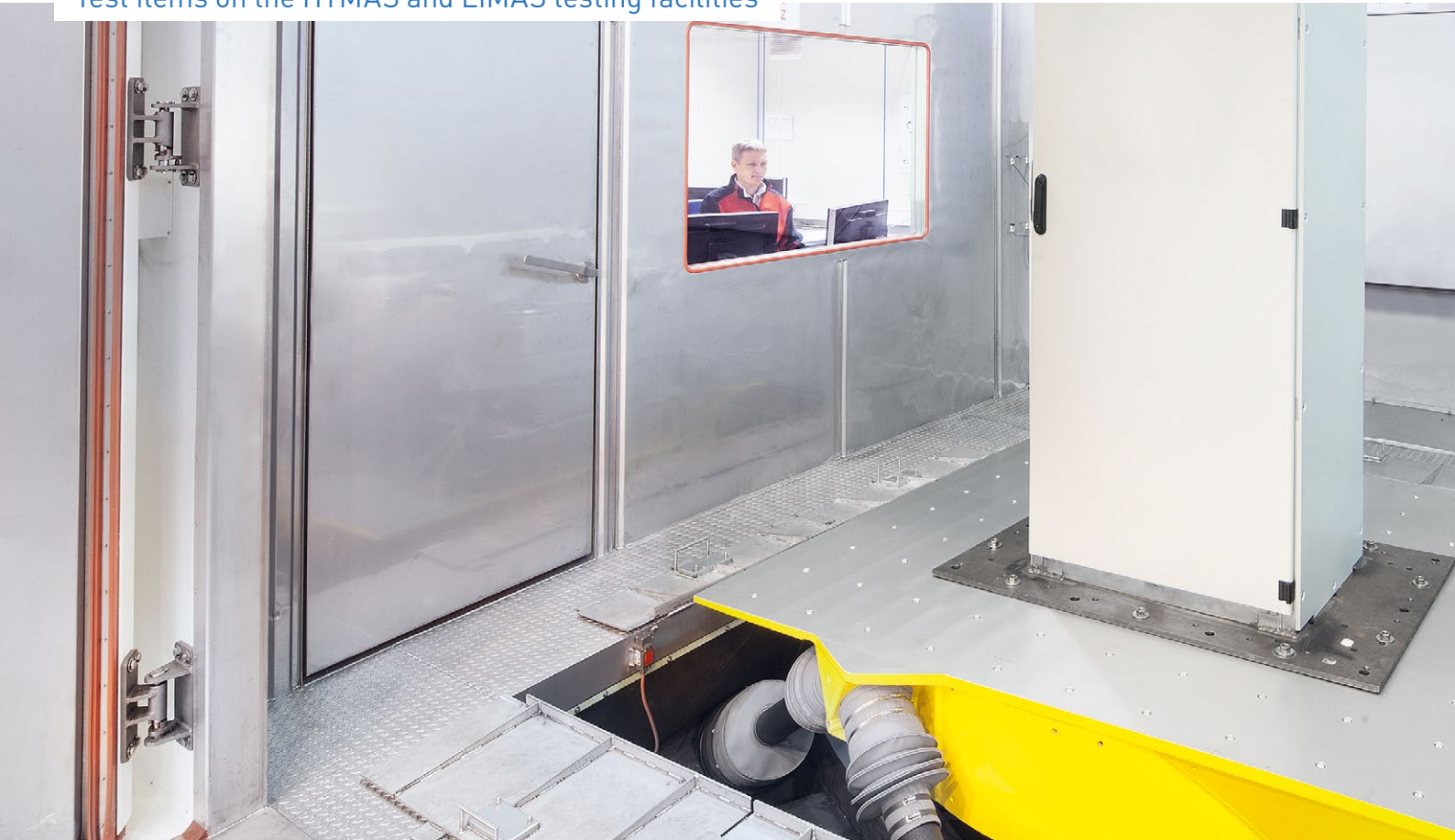
**Product qualification**

LABG Product qualification

Analysis, testing and qualification.



Test items on the HYMAS and LIMAS testing facilities





## Product qualification

Technical products are subjected to a wide variety of environmental influences that affect their functionality, durability, quality and reliability. From both a technical and an economic point of view, they must therefore be designed and constructed in a manner which ensures that they can withstand the anticipated environmental stresses and can reliably perform the tasks for which they were designed.

In our diverse test facilities for environmental simulation, we qualify objects of all sizes, from small components right up to complete systems. Independent from manufacturers, we rely on the expertise of our staff, on modern testing facilities and on our comprehensive range of services as the guarantee of our renowned high standards.

Individual consulting and testing must be learned. Experts know that there is no substitute for experience when it comes to testing. Nothing just happens at the proverbial push of a button. The ability to carry out comprehensive testing, generate reliable measurements and results and to implement these in corresponding actions requires a high degree of technical knowledge and experience using a wide variety of testing facilities and equipment. Our customers benefit from our many years of experience in testing and analyses, primarily gained from sophisticated applications in aerospace.



Mechanical tests

No reason to tremble.



Aircraft seats on the 200 kN Shaker



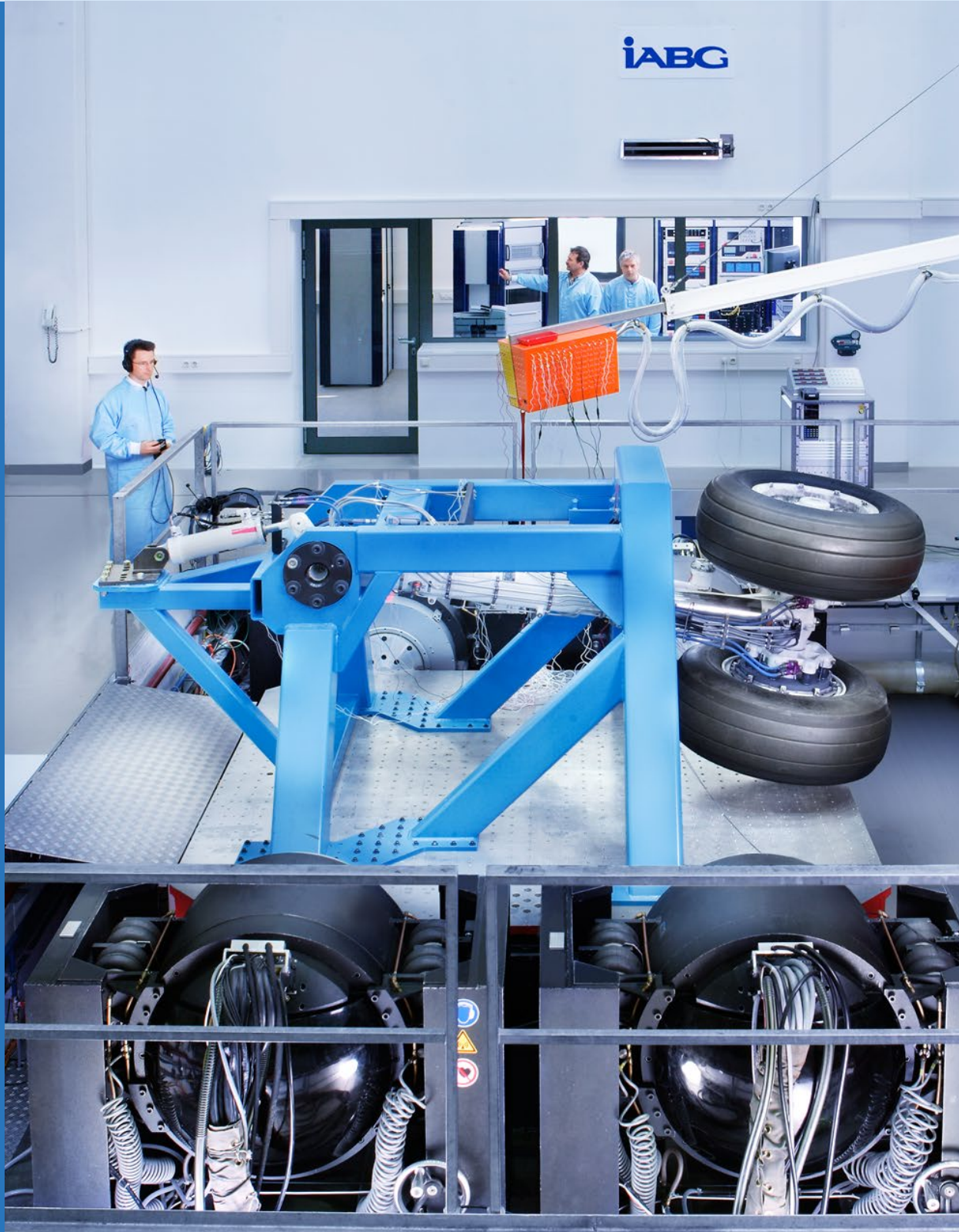
## Mechanical tests

Every technical product is subjected to shaking, vibrations or shocks during its service life – if not when operating, then en route to its point of destination. In order to function reliably, every individual component and every machine must be able to withstand these types of mechanical stresses undamagedly.

However, how high are these stresses in reality? How must a product be designed in order to withstand these stresses without becoming overdimensioned and thus unnecessarily expensive? The diverse nature of real-world stresses hence also requires – in addition to a sound knowledge of the load assumptions, of the design and optimisation issues, of the materials selected and so on – extensive testing experience in order to qualify products in a realistic manner.

We provide an in-depth advice to our customers and offer our knowledge at an early stage of their product development. Our tailor-made test series help us to detect and expose hidden weak points and provide developers and design engineers with the data and information needed to validate mathematical simulation models and optimise their products.

# Mechanical tests

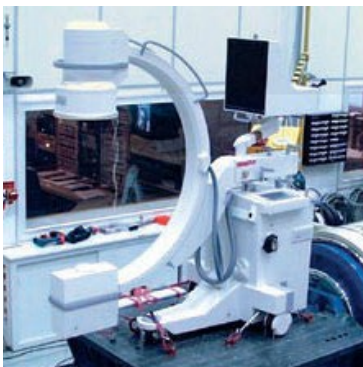


Landing gear on the 300 kN shaker



Pothole simulation  
at a wheel

X-ray equipment on the  
200 kN shaker



## Vibration/Shock

From production to packaging/transportation and, in particular, during operation at their places of use – products are subjected to mechanical stresses throughout their service life. They have to withstand shocks, vibrations and impacts without any impairment to their operability.

Our comprehensive mechanical tests enable us to provide information concerning the stability under load, operational reliability and service life of products. Standards such as MIL-STD-810, RCTA/DO-160, IEC EN 60068 or IEC EN 60721 as well as various manufacturers' norms are also applied here. In many cases, we provide customers with in-depth advice and then design the individual test programmes to meet their own specifications. Our laboratory simulations and expert analyses ensure that the correct steps to guarantee the functional efficiency of sensitive products over the long-term are introduced at an early stage in the development process.

## Safe even if the earth quakes

Machinery that is used in areas prone to earthquakes must be designed to withstand extremely high mechanical stresses. Our multi-axis servo-hydraulic earthquake test stand allows us to simulate these types of shocks. We have used it to provide evidence of safety required for the approval of numerous power plant components and switch board plants.

## Our services

- Vibrations using sine, random, sine on random, and transient tests
- Shock and drop test to simulate pulse-type shocks Simulations of pyro shocks
- Measurements of dynamic responses such as acceleration, expansion, force
- Combined temperature and vibration tests
- Support during the operation and/or test item monitoring during test implementation upon request
- Consultancy for preparation and optimization of vibration and shock load profiles

## Our testing facilities

- 7 electro-dynamic vibrators for vertical and horizontal operation of various useful areas and characteristics
  - Force vector 36 – 300 kN
  - Test item mass up to 10,000 kg
  - Vibration displacement up to 3 inches
- Hydraulic multi-axis vibration test stand
  - Random, sine
  - Test item mass up to 10,000 kg
- Shock test facilities with acceleration up to 10,000 m/s<sup>2</sup> and up to 200,000 m/s<sup>2</sup>

## Mechanical tests



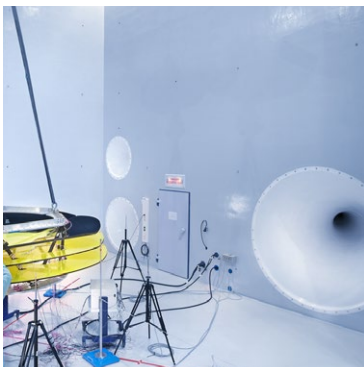
Determination of acoustic transfer functions





Sound power  
determination

Acoustic noise test



## Acoustics

Another type of vibratory environment is created by noise produced by engines in aviation or when aircraft components are exposed to airflow. Sound pressure waves which are created in a gaseous medium (air) impinge on the surface of components and exert dynamic load effects.

### A deafening noise when starting

Manufacturers need the security of knowing that their test specimen can withstand particular sonic loads and will not fail prematurely as a result of sonic fatigue. These kinds of tests are extremely important for aerospace applications, where extreme sound pressures occur, but where maximum weight reduction is also critical for the success of the mission. For this reason, substructures of aircraft and many other components, such as electronic devices, are subjected to comprehensive qualification procedures at our sound laboratory. In order to generate sound pressures of the required intensity, we use a large reverberation chamber with excellent acoustic properties as well as a progressive wave tube for sound pressures of up to 170 dB.

### It's nice when the engine purrs

Acoustics also play an important role in the development process in the automobile industry. In order to meet the highest requirements in terms of ride comfort, vehicle noise should possess a pleasant, sometimes distinctive, but never a disruptive tonality and should never rise above a specific level. Our engineers assist well-known automobile manufacturers in the *acoustic engineering* of their vehicles. Sound intensity measurements complete our range of acoustic tests.

## Our services

- Simulation of acoustic loads of up to 156 dB (OASPL)
- Sound resistance tests in a high-energy channel up to 170 dB (OASPL)
- Measurement of sound pressure distribution, absorption and transmission
- Measurements of sound pressure level and acoustic power in accordance with ISO 3740 and following or other standards

## Our testing facilities

- Reverberation chamber with a test volume of 1,378 m<sup>3</sup>, sound generation from 30 to 10,000 Hz, maximum 156 dB (OASPL)
- Progressive wave tube (1.2 m x 0.8 m), sound generation from 50 to 10,000 Hz, maximum 170 dB (OASPL)
- Mobile facilities for measuring body noise and airborne noise

## Mechanical tests



L-adapter for the determination of the centre of gravity and the moment of inertia



Modal analysis of a car body

Investigations on the ride comfort at a local train



## Modal analysis

Our modal analyses are typically targeted on the experimental verification of mathematical dynamic models. In this context the modal characteristics (natural frequencies, damping, mode shape and modal mass) are being experimentally determined with high accuracy.

We possess a variety of powerful testing facilities designed to carry out modal analysis tests: These range from large multichannel measuring systems to various classes of compact mobile installations, from mains-independent measuring and analysis systems to contact-free laser measuring systems. Our experience is drawn primarily from a large number of challenging aerospace projects, such as payload testing for the space shuttle or for the Ariane launch vehicle, but also from modal tests on rail vehicles and automobile components. In order to be integrally at our customers' service we use synergies to other areas of competence within the company such as the numeric simulation. We are hence not only testing facility, but also developing partner and problem solver.

## Critical mass is what matters

Precise data relating to mass properties, e.g. in multi-body simulations, is often an essential ingredient when a model is being adjusted. For this reason, our portfolio of services includes precise determination of the mass, centre of gravity and mass moment of inertia as well as the static and dynamic balancing of products.

## Our testing facilities

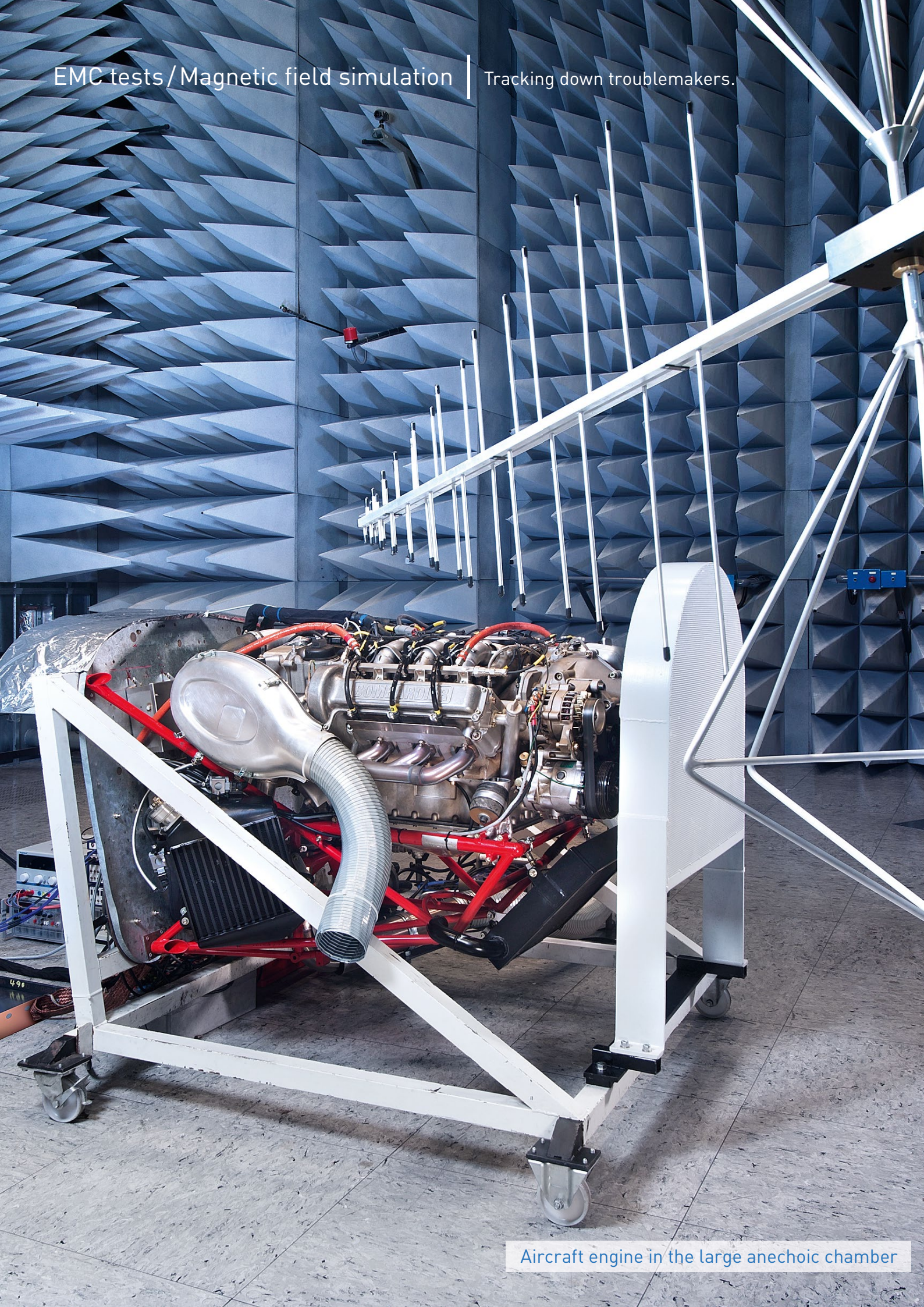
- Determination of modal characteristics
- Determination of critical frequencies
- Optimisation of the vibration behaviour of mechanical constructions based on tests
- Experimental verification and updating of numerical simulation models

## Our services

- Mobile test facilities featuring up to 12 simultaneously controllable excitation channels and up to 1,000 measurement channels
- Smaller mobile test stands featuring 4 excitation channels and up to 44 measurement channels
- 26 vibration exciters for various performance ranges with maximum forces of between 10 N and 7,000 N
- Stepped sine, random, transient signal impulse and time-signal acquisition operating modes in the range 0.3 to 30,000 Hz
- Precision facilities for determining mass characteristics for masses ranging from a few kilograms up to appr. 6,000 kg

EMC tests / Magnetic field simulation

Tracking down troublemakers.



Aircraft engine in the large anechoic chamber



© Photo by courtesy of BRP-Rotax GmbH & Co. KG.

## EMC tests / Magnetic field simulation

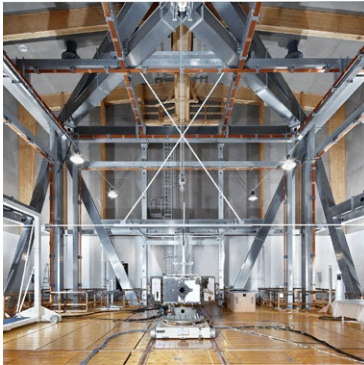
Electromagnetic compatibility (EMC) ensures that electrical and electronic devices, systems and components function correctly when they interact with one another. Especially strict standards are applied for EMC tests of devices with safety-relevant functions, for example in medical engineering or aeronautics.

EMC is an issue affecting all industries and all markets on an international scale. Every sector has hence incorporated corresponding requirements into the product qualification process. Once successfully tested, this ensures that the products are sufficiently resistant to interference and that any interference that they themselves emit does not exceed the permitted limits. Both of these conditions together reduce the mutual interaction between products to a level that guarantees the functionality of a system in all operating conditions on-site.

Whether product-supporting measurements or qualification testing to other specifications – we deliver the expertise and the technical facilities to guarantee precise measurement of the EMC characteristics of a test item. Our laboratory is accredited by the German Accreditation Council (DAR) in accordance with ISO 17025 and certified in accordance with EN 9100.



Gear box in the small anechoic chamber



Reaction wheel in the magnetic test facility

Fan during radiated emission test



## EMC tests

We have at our disposal the most modern measurement equipment and facilities to measure EMC-relevant parameters such as radiated electrical and magnetic fields or conducted signals in the form of high frequency currents and voltages. In addition to our anechoic chambers for testing systems and components, we also have a HIRF facility for generating high intensity electromagnetic fields, which play an important role in the civil and military aviation testing (HIRF: High Intensity Radiated Fields). Another special feature is our ability to simulate the effects of induced lightning.

Experience, expertise and service are the decisive factors when it comes to creating challenging testing environments. To gain reliable data for our customers Airbus and Boeing about the Airbus A380 and the Boeing B787, we used our programmable electric power supply to create a variable aircraft power distribution network using operating frequencies between 360 and 1,000 Hz. From conductor boards to automatic gear boxes in vehicles, from smoke detectors right up to the widest variety of aircraft components and applications used in military technology such as drones – our experience is based on numerous projects and objects of all sizes and from all industrial sectors.

## Magnetic field simulation

Magnetic fields play an important role for the attitude control of satellites, or in the misalignment of compasses used in aviation. Our unique installation for simulating magnetic fields allows us to create and measure magnetic fields extremely accurately.

## Our services EMC measurements

- Measurement of emissions/testing of susceptibility up to 40GHz > 2,000V/m
- Simulation of induced lightning (LEMP) and of nuclear electromagnetic pulses (NEMP)
- Simulation and characteristics of electrical aircraft power distribution systems
- 3 shielded anechoic chambers for system and component tests

## Magnetic field measurements

- Compensation of the earth's magnetic field and simulation of variable artificial constant and alternating fields
- Magnetic cleanliness testing and measurement of magnetic moments
- Compass Safe Distance Test
- Semiconductor chip testing with field intensities up to 800KA/m

Climate simulation

You may rely on our forecast.



Dashboards in the solar simulation facility





## Climate simulation

Technical products must be able to withstand the widest variety of environmental conditions. Whether in the arctic cold of Siberia, the tropical heat of Africa or on a dusty road across the Sahara – the electronic systems as well as all other components of a vehicle have to perform reliably, even under extreme conditions, and for the desired service life. In our laboratory, we reproduce real environmental conditions in order to examine the effects on the relevant test item.

We check to see if products and their packaging can withstand the environmental conditions they are supposed to. As a basis, we either use the relevant international standards or specifications provided by the customer. A well elaborated specification ensures that a product has undergone the adequate amount of testing for the respective place of use and purpose. Although a too high set-up test level mostly leads to increased quality, this may not be the objective from a commercial point of view. This is where good judgement must be exercised in the consultation process.

The sooner our expertise is incorporated, the better. For this reason, we offer ongoing development testing in addition to the conventional type of approval tests. As an independent testing laboratory, IABG guarantees to maintain the highest standards of confidentiality.

# Climate simulation



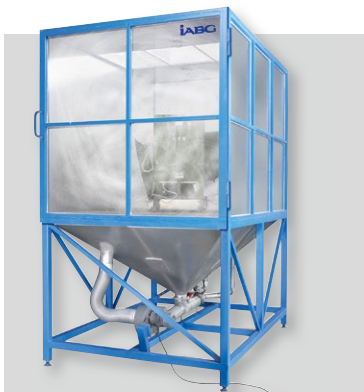
Temperature / humidity test on an emergency exit door



Corrosion test at a turbine

Cold start test on a car

Dust test chamber



## Cold

Can cables that have been stored for years in a polar region still be used? Or has their quality suffered due to the extremely low temperatures? A combination of climate tests and mechanical material testing enabled us to solve the problem for our customer.

## Corrosion

Reliability was the key criterion for a well reputed manufacturer of bank cards. Using our salt mist test, we were able to confirm that the contacts on the chip function smoothly, even in areas where the air contains high levels of salt.

## Dust

Is sand and dust affecting a product? IABG is performing sand and dust Tests even on HV-batteries for electrical vehicles.

These are three individual examples, a cross-section of our numerous environmental simulation tests. What sets us apart is the variety of our test facilities of all sizes. Six of them are large enough to accommodate both people and vehicles.

Challenges are our speciality. The development of customised specific testing facilities and the formulation and execution of special tests, also beyond the scope of conventional standards and standardisation is another of our key areas of expertise. One example: The *splash test* was specified by a customer and implemented into a test apparatus by our experts. IABG is able to perform *humidity and icing tests* in combination with altitude effects according to RTCA/DO 160 G. This service is almost unique for European test labs.

## Our testing facilities

- High altitude chamber – up to 3.800m above zero – up to 200 km/h
- Climate, temperature and altitude chambers for vehicles
- Solar radiation unit
- Salt fog chambers
- 10 temperature and climatic test chambers (200l up to 1500l)
- Pressure vessels for low, overpressure tests and rapid pressure changes
- Dust test chamber up to 12m<sup>3</sup>
- Splash water cabinet
- Temperature shock unit



**AUTOMOTIVE**



**INFOCOM**



**MOBILITY, ENERGY & ENVIRONMENT**



**AERONAUTICS**



**SPACE**



**DEFENCE & SECURITY**

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More information about product qualification:

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