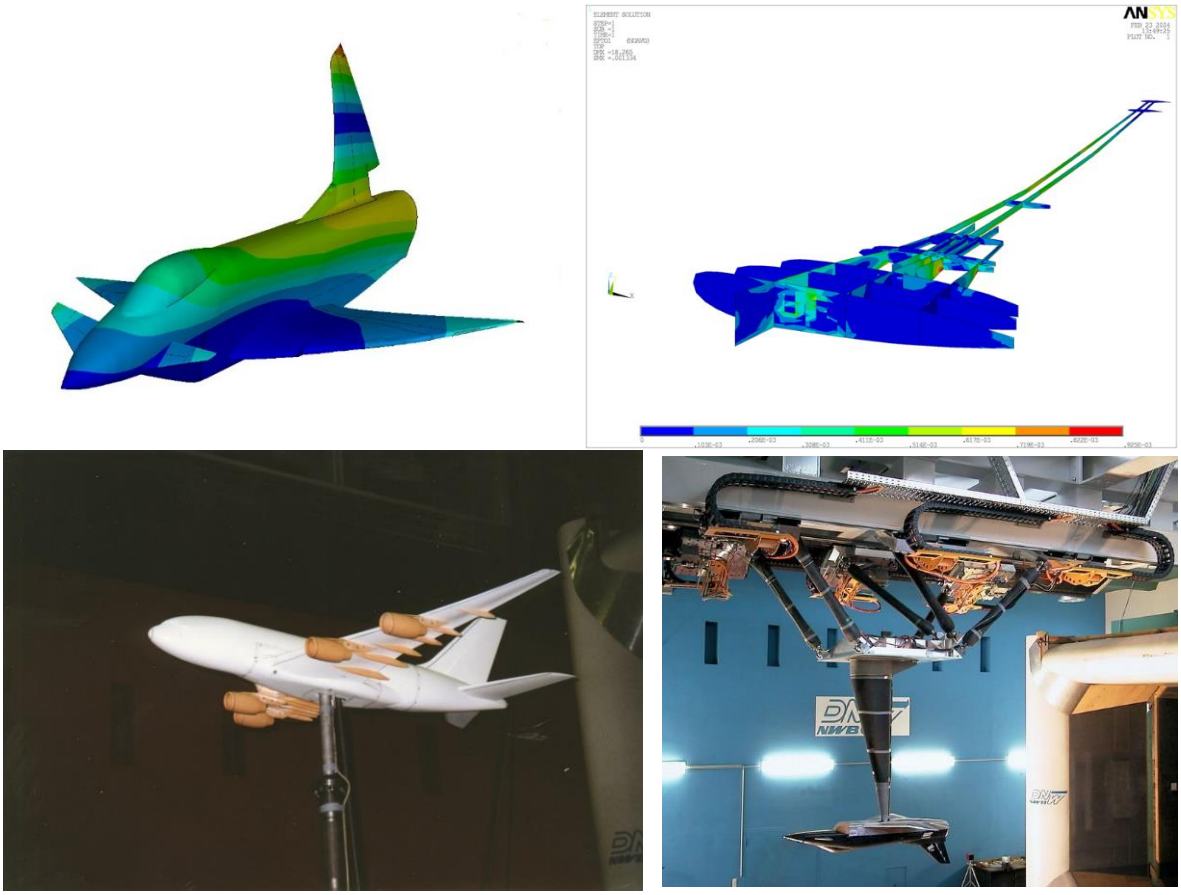
Wind Tunnel Models

Wind tunnels are highly complex test facilities and enable experimental investigations of aerodynamic designs. Special requirements must be met in terms of the accuracy of the model geometry in order to be able to transfer the experimental results of the frequently scaled test objects to the original design. In addition to purely aerodynamic investigations, models are increasingly being developed that also reproduce the influence of elastic deformations of the structure and are even similar with regard to natural modes of vibration.

Composite wind tunnel models are a particular specialty of our company. Here, we meet specific requirements for static and dynamic stiffnesses and eigenmodes. Over the past 20 years, a large number of wind tunnel models have been designed and built. As a result, Leichtwerk AG has built up extensive experience with models for all kinds of wind tunnels, from laminar wind tunnels to cryogenic wind tunnels.

Structurally and aerodynamically similar models were built, for example, for X31 and various Airbus configurations such as A340, A380, A400 built. This included novel designs such as blended wing body configurations. The models are structurally complex as in large aircraft construction. This allows us to design requirements for contour accuracy under load, elastic properties and also bending-torsional couplings as desired. The integration of adjustable flaps and propulsion systems is also included.

The design procedures follow the guidelines of our aircraft design organization, therefore we are accredited e.g. by DNW as a supplier of complex models. For quality assurance of negative molds and finished models we have a coordinate measuring arm.



Various wind tunnel models, eigenmodes of the X31, wing structure BWB, A380, DNW-NWB

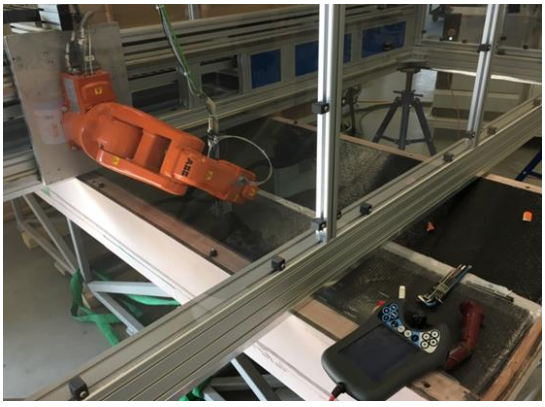
We always calculate the contour of the surface under load and perform an analysis of the permissible waviness for laminar flow experiments. For aeroelastic investigations, we can perform ground vibration tests in addition to structural analysis.

Our largest wind tunnel model to date was a full-scale vertical tail plane of the A320 for DNW's LLF for an experiment to verify active laminar flow control by boundary layer suction.

Static aeroelasticity, e.g. load reduction in terms of bending-torsional couplings is a standard we have applied for specific swept wind tunnel configurations as well as for large aircraft.

We integrate measurement technology and sensors as required; for pressure measurement bores, we have specially developed a mobile robot arm on a linear axis that can precisely place bores with a diameter of 0.3mm in a complex negative shape normal to the surface.

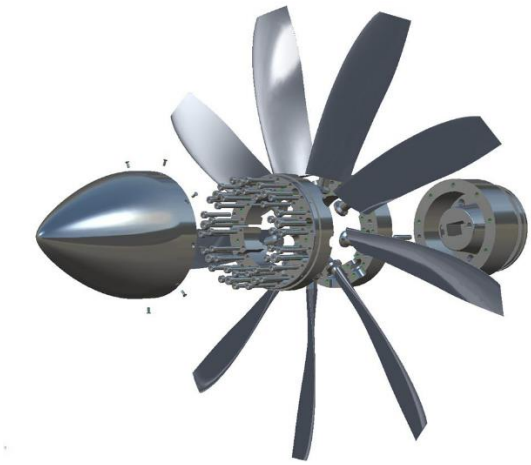
A320 Vertical Tail Plane

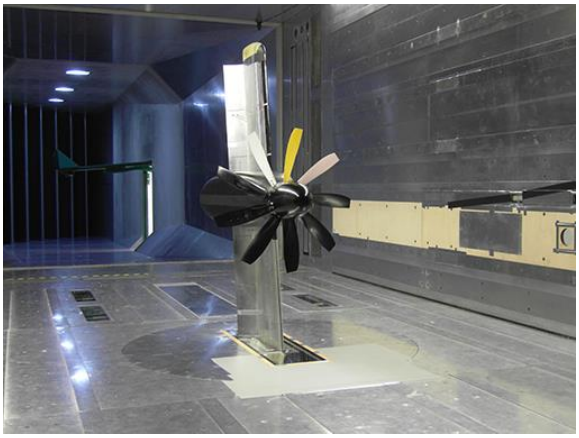


Robot arm for pressure measurement taps and 2D wind tunnel model

For composites under cryogenic conditions, we have experience with models for the DNW-KKK, but also from the development of cryogenic liquid hydrogen tanks.

The design, construction and building of metrologically equipped rotors (propellers and helicopter rotors) up to installation in the wind tunnel complete our portfolio of wind tunnel models.





High-RPM Propeller, similar to A400M