

VPH Partner Landscape

The Virtual Product House as an integration platform is based on interdisciplinary engineering and software teams and a flexible partner network.

As such, several DLR institutes with expertise in **various disciplines** (for example, aerodynamics, structures, systems, software and simulation) work together at the VPH in Bremen in a collaborative way. The activities of the VPH are also closely linked to the research topics of the **newly founded DLR institutes** and are embedded into DLR's strategy for the 'digitalisation of aeronautics'.

A key objective and strength of the VPH is its close cooperation with the aviation industry. The following **industry partners** are participating in the VPH start-up project:

- Airbus Operations (Bremen)
- Liebherr Aerospace
- IABG
- FFT Produktionssysteme

The VPH also cooperates with universities (for example, the University of Bremen), certification authorities (for example, EASA) and the software industry to address the ambitious goals for virtual certification.



DLR at a glance

The German Aerospace Center (DLR) is the national aeronautics and space research centre of the Federal Republic of Germany. Its extensive research and development work in aeronautics, space, energy, transport, security and digitalisation is integrated into national and international cooperative ventures. In addition to its own research, as Germany's space agency, DLR has been given responsibility by the federal government for the planning and implementation of the German space programme. DLR is also the umbrella organisation for the nation's largest project management agency.

DLR has approximately 8200 employees at 25 locations in Germany: Cologne (headquarters), Augsburg, Berlin, Bonn, Braunschweig, Bremen, Bremerhaven, Cochstedt, Cottbus, Dresden, Goettingen, Hamburg, Hannover, Jena, Juelich, Lampoldshausen, Neustrelitz, Oberpfaffenhofen, Oldenburg, Rhein-Sieg-Kreis, Stade, Stuttgart, Trauen, Ulm and Weilheim. DLR also has offices in Brussels, Paris, Tokyo and Washington D.C.

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Linder Höhe, 51147 Cologne

Contact:

Dr.-Ing. Kristof Risse
Phone: +49 (0) 162 344 2951
E-Mail kristof.risse@dlr.de

DLR.de/en

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Virtual Product House

Integration & Test Centre for Virtual Certification



The Virtual Product House

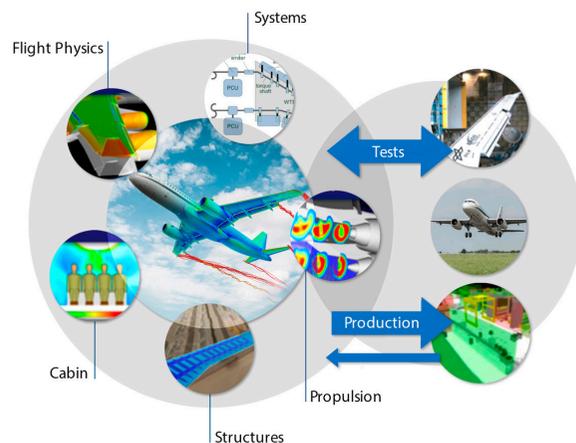
With the **Virtual Product House (VPH) in Bremen**, DLR is pursuing the goal of closely cooperating with industry partners, the scientific community and public authorities to implement an integration and test centre for the virtual simulation and certification of components and technologies, as well as their integration into the overall aircraft. The VPH is funded through a start-up project by the State of Bremen and the European Regional Development Fund (ERDF).

Embedding of the VPH into DLR's Strategy for the 'Digitalisation of Aeronautics'

The VPH is – in addition to the four recently-founded DLR institutes – a key element in the **digitalisation strategy** of the **DLR aeronautics programme**. It is intended to serve as a dynamic and flexible network platform, where various DLR institutes work together with partners to pursue the ambitious goals of virtual design, testing and certification.

The DLR **virtual certification strategy** aims to reduce the duration and cost of certification tests by using complementary virtual (that is, simulation-based) flight and ground tests, leading up to a complete virtual certification process as a long-term goal.

This long-term vision is part of the **virtual product** as one of the **guiding concepts** of the DLR aeronautics programme. It intends to virtually represent the aircraft with all its characteristics over the entire lifecycle. Therefore, a multiphysics, multiscale and multifidelity approach is required to closely link design and flight physics capabilities with virtual testing, production and operations.



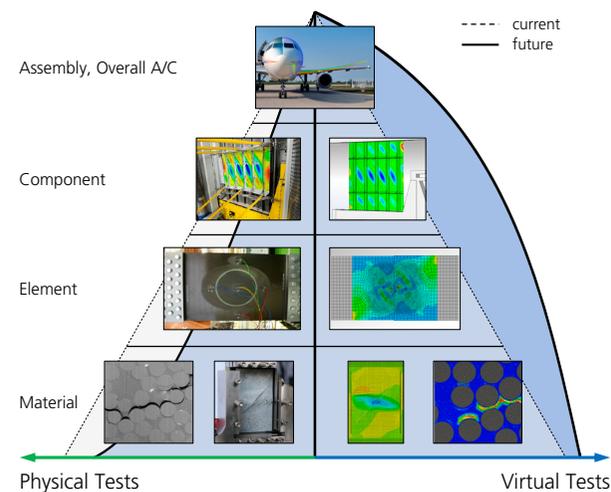
VPH Start-up Project – Intelligent Wing and Multifunctional Movables

The VPH start-up project concentrates on the use case of multifunctional movables for an intelligent aircraft wing. The key **work packages** of the start-up project are:

- Virtual (aircraft/wing/movables) design
- Virtual (systems & structural) testing and certification
- Virtual production and manufacturing
- Software engineering and integration

The VPH start-up project thus intends to link existing wing and movables design methods (developed jointly by DLR and Airbus) with DLR and industry partners' capabilities on high-performance computing, virtual testing and virtual production. This integrated approach allows rapid determination of the **impact of design changes** (for example, the geometry of a movable or type of kinematics) on manufacturability, success and quantitative results of virtual test procedures and finally, on the (virtual) certification of the component.

With this specific use case, the VPH serves as a **platform and test facility** for DLR and industry partners to identify, solve and integrate key aspects of digital aircraft design and virtual certification. To enable validated results and industrial applicability of the selected use cases, the contents of the start-up project are **harmonised with** the internal **roadmaps** and activities of the industry partners.



Common Source and Working Environment

The ambitious common goals for moving towards virtual design, testing and certification require close cooperation and integration of capabilities between industry and research partners. At present, many methods, tools and processes are implemented independently and not usable by other partners.

Therefore, the VPH aims to establish a **common-source environment** that integrates the simulation capabilities of the various partners and allows them to cooperate virtually via streamlined interfaces, without disclosing any intellectual property.

DLR software and aeronautical research institutes cooperate with university partners to develop this common-source architecture during the VPH start-up project. Further important **software engineering tasks** for the VPH are:

- Model-based and distributed simulation
- Multi-fidelity design and high-performance computing
- Software engineering for virtual certification

In addition to the common and protected simulation approach, the VPH concept includes a **flexible working environment** based on workshop, plateau and concurrent engineering principles for efficient cooperation between the various partners.

