

DLR Virtual Product House (VPH)

Virtual Integration and Test Center @ ECOMAT Bremen

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A large, curved image of the Earth from space, showing the blue oceans, white clouds, and green landmasses. The curve of the horizon is visible at the top of the image.

Wissen für Morgen

Contents

1. DLR Aeronautics Program Strategy on

- Digitalisation of Aeronautics
- Virtual (i.e. simulation-based) Certification

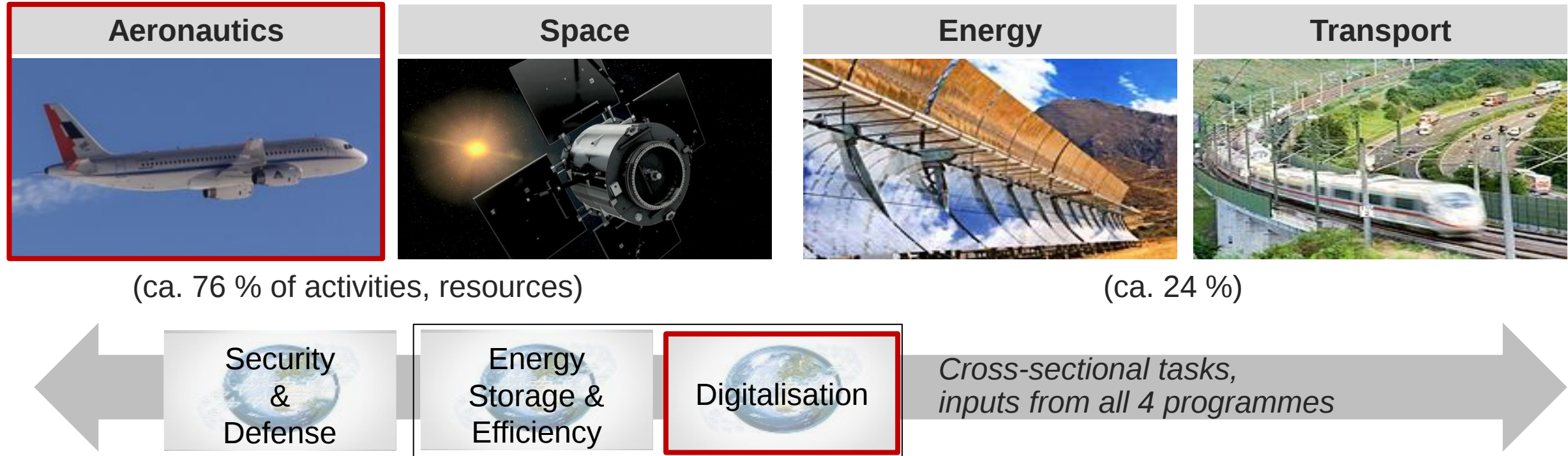
2. DLR Virtual Product House (VPH)

- Overview and Objectives
- VPH Start-up Project: „Multifunctional Moveables“



DLR Strategy on „Digitalisation of Aeronautics“

DLR Research Programs & Cross-Sectional Tasks



DLR key figures:

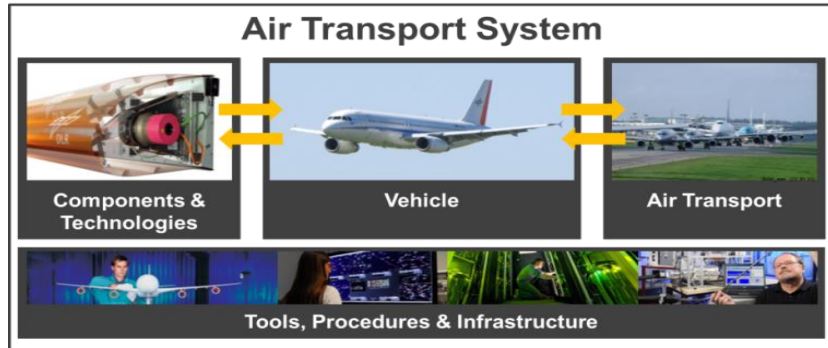
- **8.650 Employees** in 47 Institutes at 26 DLR sites
- Member of the **Helmholtz-Association HGF** (19 establishments)
- **Offices** in Paris, Brussels, Washington, Tokyo; stations in Inuvik & O'Higgins, solar research in Almeria

DLR Strategy on „Digitalisation of Aeronautics“

Future Topics within the DLR Aeronautics Program

„Classic Aviation“

... remains our basis



PLUS

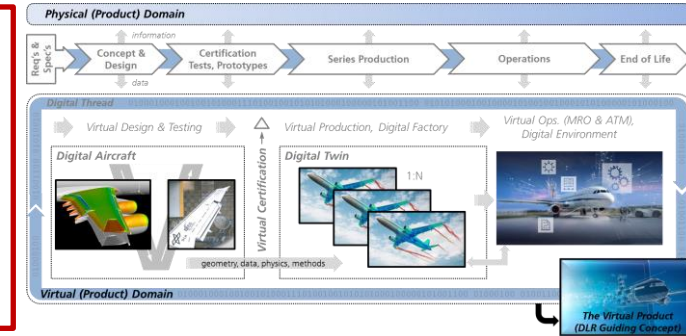
Topics: Continuous Improvement, Support of Industry, Academia, Society

Plus: 1g Wing, Cabin Design, MRO, ...

Massive Digitalisation

Topics: Digital Twin / Digital Thread, Virtual Certification, ...

New Partners, e.g. SAP



Unmanned Systems (Vehicle & UTM)

Topics: Certification, UAS Test Centre, Applications, Missions, Support of Startups

New Partners, e.g. EASA, DHL



Electric Flight

Topics: Certification, Demonstration, Enabling Technologies, Design

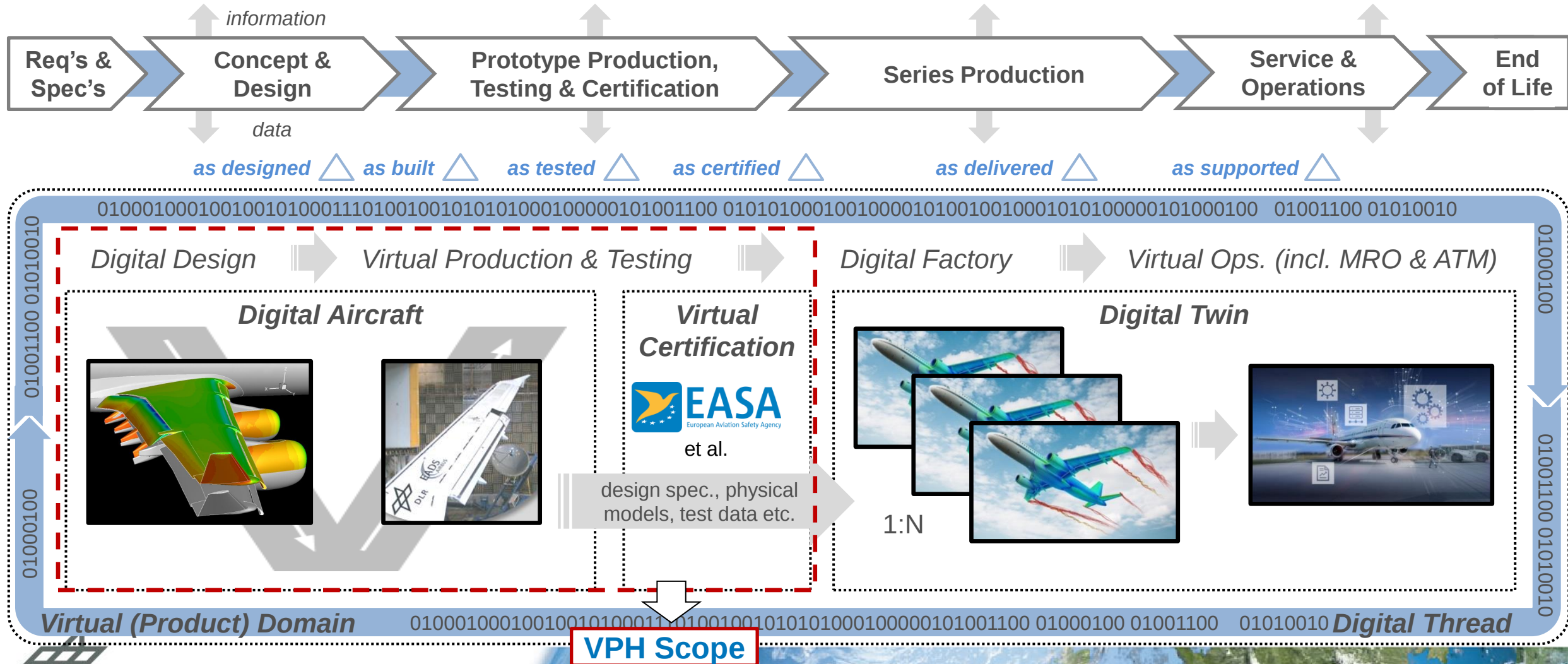
New Partners, e.g. Siemens



DLR Strategy on „Digitalisation of Aeronautics“

DLR Definitions and interconnection of roadmaps

Physical (Product) Domain



DLR Strategy on „Digitalisation of Aeronautics“

Virtual (i.e. simulation-based) Certification

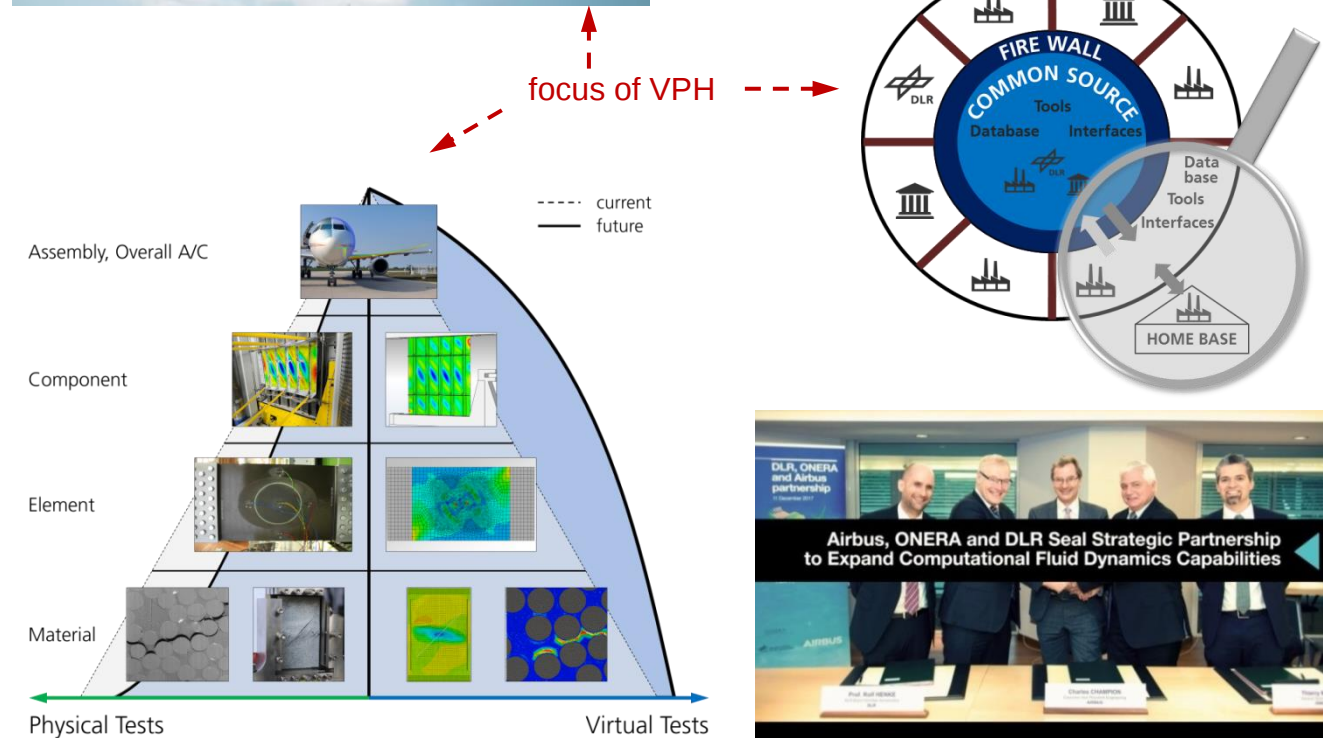
“Virtual Certification” or

Certification by Simulation/Analysis:

- Increased usage of simulation/virtual testing methods for certification-relevant tests
- Complementary/hybrid approach of physical testing and virtual (flight/ground/rig) testing
- Objective: time & cost savings, risk mitigation

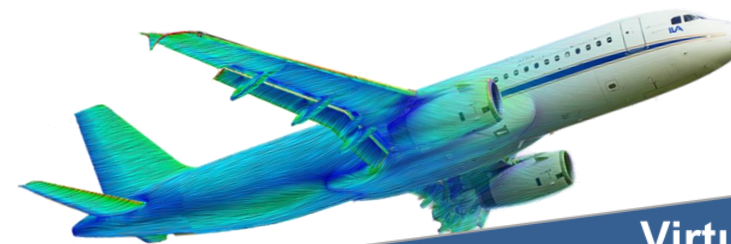
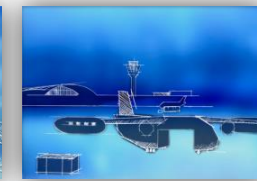
DLR Activities on Virtual Certification:

- Virtual Product House (VPH)
- SimBaCon & further projects & activities
- Stronger cooperation with EASA: MoC, “liaison officer”, VPH advisory board
- DLR is active member in AIAA Community of Interest “Certification by Analysis”
- Stronger coop. with software industry (SAP)



DLR Strategy on „Digitalisation of Aeronautics“

New Institutes & Virtual Product House (VPH)



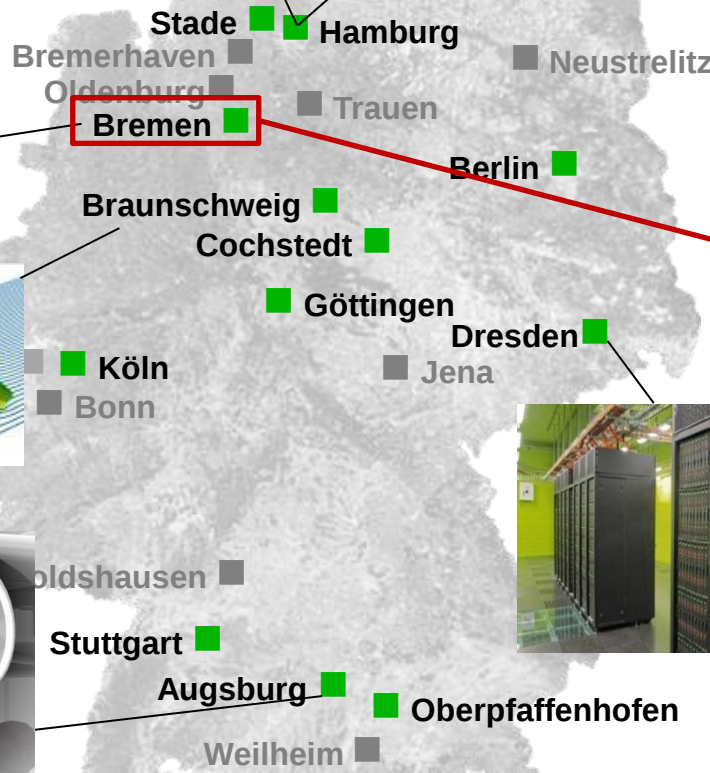
Guiding Concept 6:
The Virtual Product

Virtual Product

New Institutes

Existing Institutes

Vehicle		Operations		
Airframe Virtual Product House VPH (Project)	Engine Institute of Test and Simulation for Gas Turbines	Institute of System Architectures in Aeronautics Institute of Maintenance, Repair and Overhaul		
		Software und Hardware Institute of Software Methods for Product Virtualisation		
Instit. of Aerodynamics & Flow Technology	Institute of Materials Research	Institute of Propulsion Technology	Institute of Flight Systems	Institute of Air Transport and Airport Research
Institute of Aeroelasticity	Institute of Structures and Design	Instit. of Combustion Technology	Institute of Flight Guidance	Air Transportation Systems
Institute of Composite Structures & Adaptive Systems	Instit. of Engineering Thermodynamics	Simulation and Software Technology	Institute of Technical Physics	Flight Experiments
Institute of System Dynamics and Control	Institute of Robotics and Mechatronics	Institute of System Dynamics and Control	Space Operations and Astronaut Training	Central Workshops



26 DLR Sites (12 Sites with Major Activities in Aeronautics)



The DLR Virtual Product House (VPH)

Objectives and Scope of Start-up Project

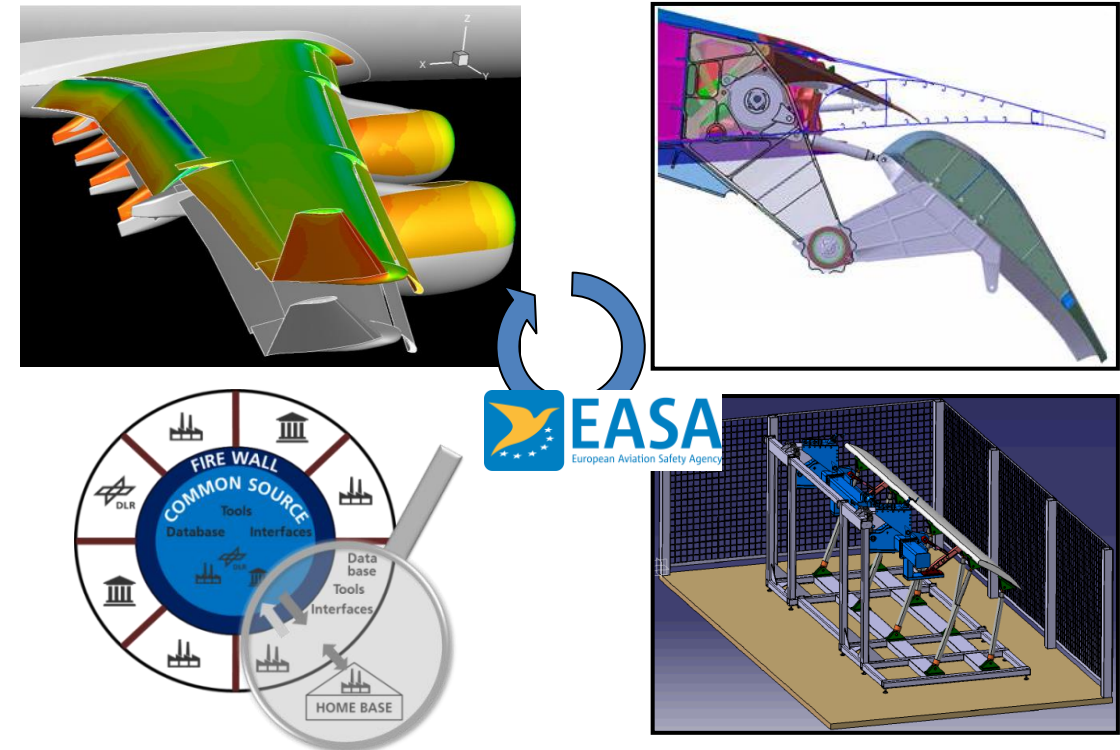
VPH Overview

- **Main goal:** „Virtual Certification”
- Test & integration center and **plateau research**
- 7 contributing **DLR institutes** from 5 sites
- Cooperation with **industry, universities & authorities**
- 2019/06: **VPH opening ceremony** + entry into ECOMAT



VPH Start-Up Project: Intelligent Wing & Movable

- Duration: **2018-2021**; funded via Bremen + EFRE
- **Partners:** DLR (lead), Airbus, Liebherr, IABG, FFT, Bremen Univ.; EASA & SAP to join, others invited !
- **Virtual Design** → **Production** → **Testing** → **Certification**



The DLR Virtual Product House (VPH)

Start-up Project „Multifunctional Movables“: Digital Design and Virtual Aircraft

Content & objectives:

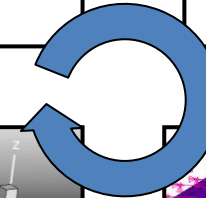
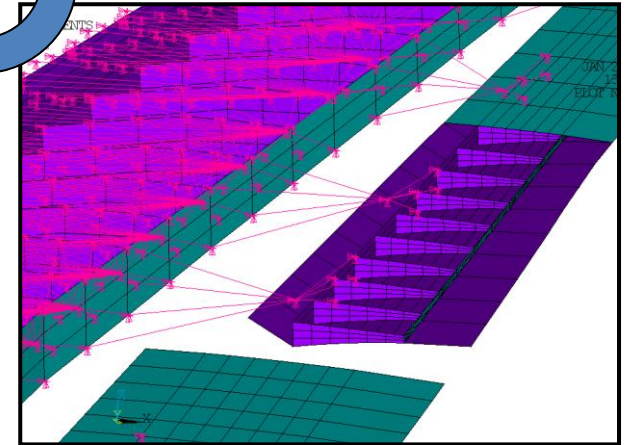
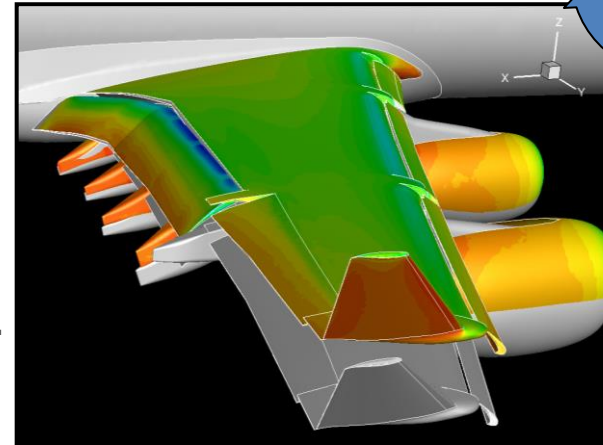
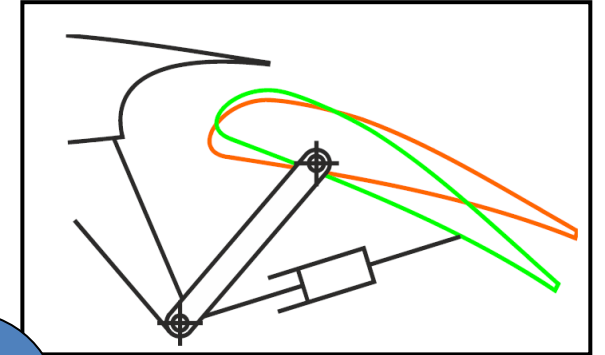
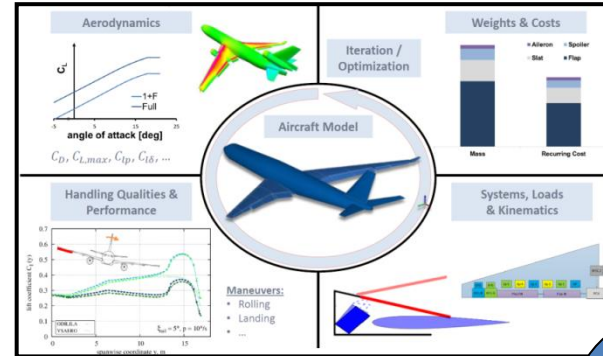
- Model-based, **integrated wing/movables design**
- **Link OAD methods +w. detailed component design + HiFi analysis capabilities** (across disciplines, aero, structures, systems etc.)

Industrial benefit:

- Faster integration and **assessment of complex technologies** and new concepts
- **Optimization w.r.t. min fuel, COC, RC, etc.**

Linked partner activities:

- DLR (e.g. Victoria, 1g wing) + LuFo projects etc.
- Airbus R&T, FPO, Eng. centers, DDMS, ...
- Liebherr component design



Virtual Design

Virtual Production

Virtual Testing

Virtual
Certification



The DLR Virtual Product House (VPH)

Start-up Project „Multifunctional Movables“: Virtual Manufacturing & Production

Content & objectives:

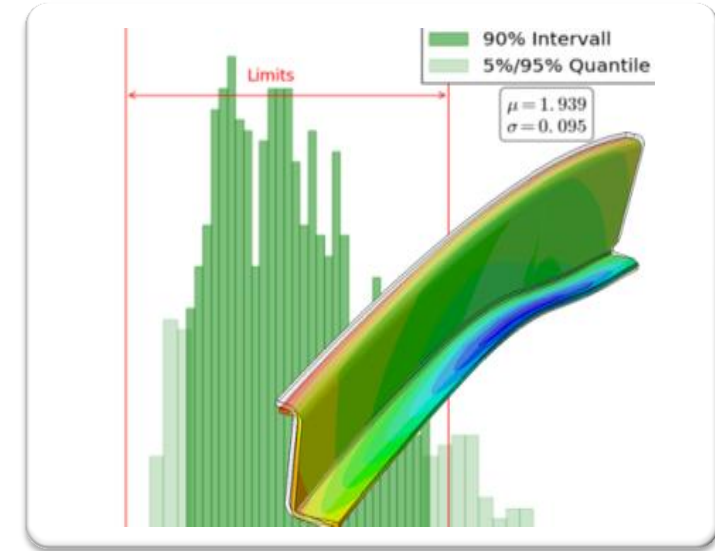
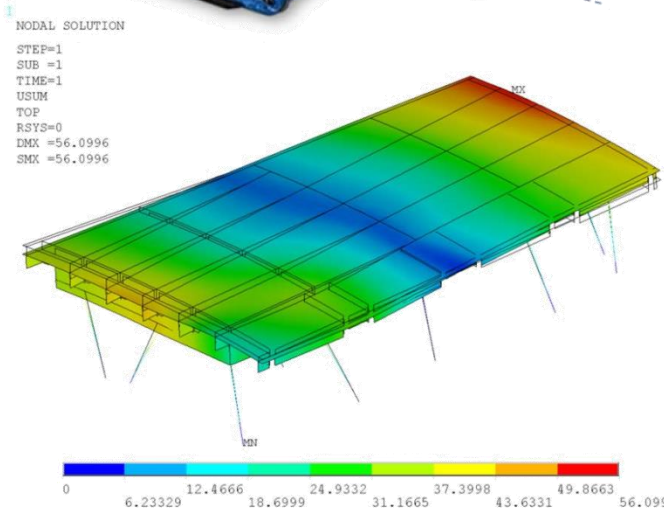
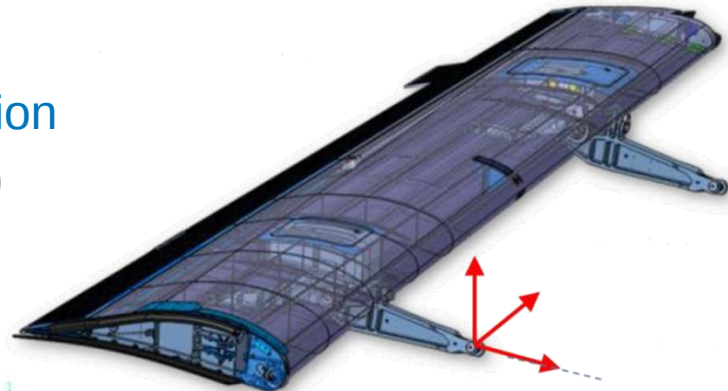
- Virtual manufacturing, assembly, production
- Link to virtual design and testing (WP1/2)

Industrial benefit:

- Time and cost reduction via early production assembly planning
- Towards high production rate & low manufacturing costs

Linked partner activities:

- HighDigitPro 4.0 (LuFo V-3 project)
- Airbus Factory of the Future

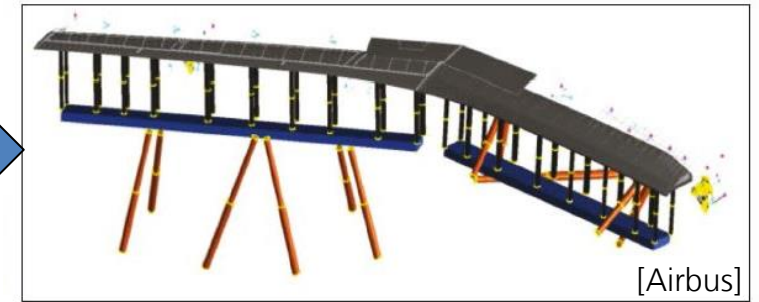
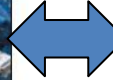


The DLR Virtual Product House (VPH)

Start-up Project „Multifunctional Moveables“: Virtual (Systems & Structural) Testing

Contents & Goals:

- Virtual Systems/Structural Testing (e.g. actuator jam, skew detection, wing/moveable under aero load)
- Modularity, scalability (design → tests)

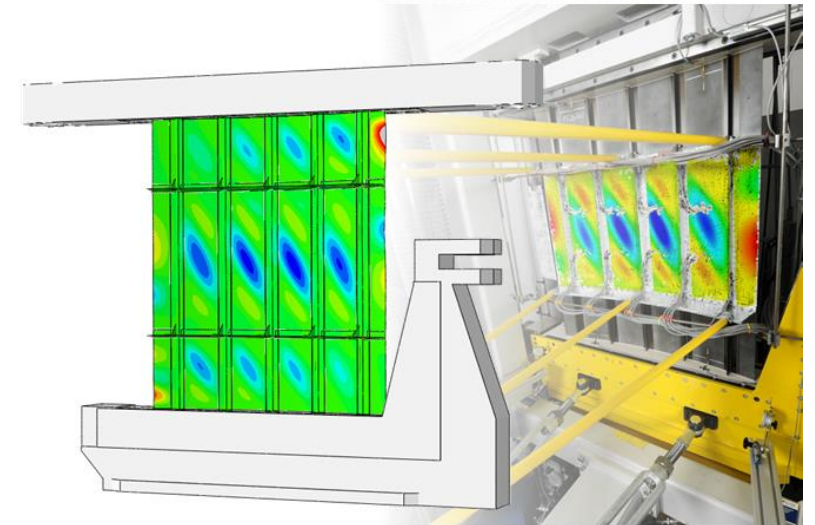
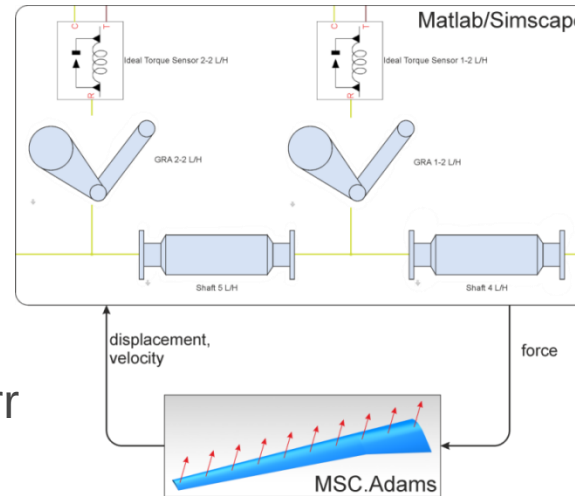


Industrial Benefit:

- Reduced costs for rigs and tests

Linked Partner Activities:

- Component design & testing @ Airbus
- Component design & testing @ Liebherr
- Systems testing @ FFT
- Structural testing @IABG



Virtual Design

Virtual Production

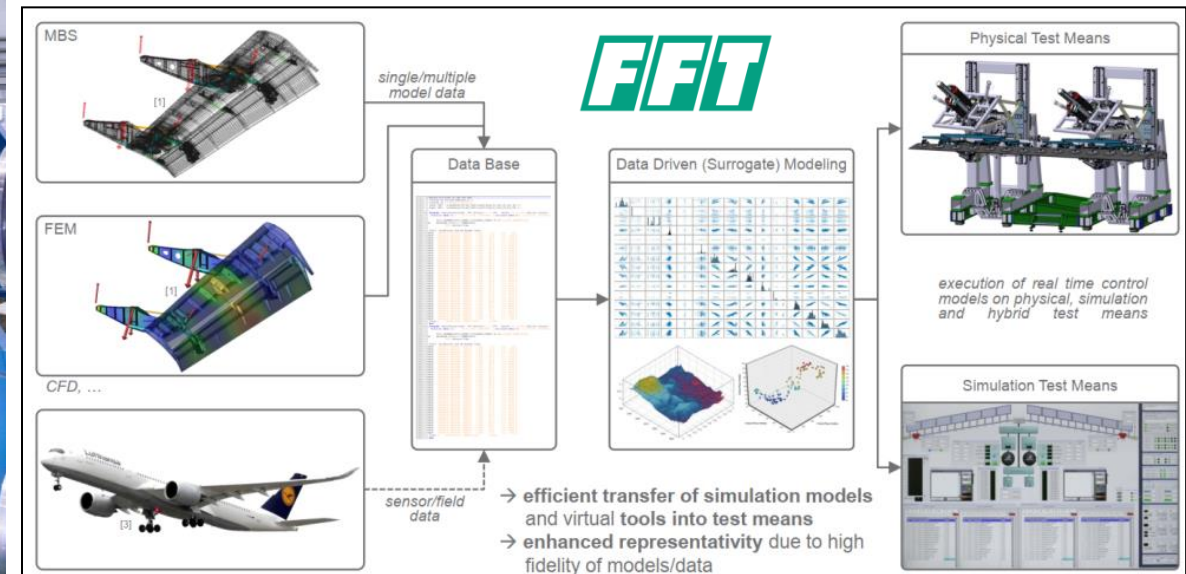
Virtual Testing

Virtual
Certification



The DLR Virtual Product House (VPH)

Start-up Project „Multifunctional Moveables“: (Selected) Industrial Partner Activities on Virtual Testing



Virtual Design

Virtual Production

Virtual Testing

Virtual
Certification



Thank you



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