ESWIRP: European Strategic Wind tunnels Improved Research Potential

Since the dawn of aviation, ground tests have been crucial to understand the physics of flight and for the investigation of flight characteristics of future flying vehicles. Wind tunnels are one of the most commonly used tools for simulating flight physics phenomena on the ground. Wind tunnel testing is a key part of aeronautic research and testing. While other technologies are becoming more and more important – computational fluid dynamics, for example – wind tunnels are still the backbone of research. The EU-funded ESWIRP project will bring together wind tunnel facilities across Europe to optimise research infrastructures and improve their performance.

EUROPEAN RESEARCH TAKES OFF

Wind tunnel testing has evolved a great deal since the 1950s. Today wind tunnels are highly sophisticated machines used for high-productivity testing of compressibility effects, flow physics and noise emissions. Moreover, wind tunnel facilities have become specialised with the ONERA-S1MA transonic wind tunnel, the DNW-LLF subsonic wind tunnel and the pressurised cryogenic facility ETW. Such specialisation has been spurred on by increasingly strict aerodynamic requirements and larger and larger scale models as well as the fact that physical constraints of simulation parameters are limiting.

To boost European research in wind tunnels, it is imperative that these three facilities work together, combining their respective specialisations. For this cooperation to be as fruitful as possible the data exchanged between them must be high quality and accurate and high productivity needs to be ensured in order to reduce the cost of data collection. Nevertheless, investment is needed to keep machinery and technology up to date and ensure that facilities remain relevant on the global wind aerospace research scene.

The ESWIRP project is working to reinforce wind tunnel research through the development of generic and specific mathematical models for improving flow quality in the three partner wind tunnels. It is also planned that once research has been completed, more of the aeronautics community can be involved with and aware of the upgrade of research characteristics. The project will also facilitate communication and exchanges between research centres as well as training activities so interested parties can benefit from the improvements of the wind tunnels.

SEVENTH FRAMEWORK PROGRAMME

EUROPEAN COMMISSION

OPTIMISING THE MATHS

A key element of ESWIRP is the development of mathematical models that will create more realistic test scenarios. As such, researchers will take into consideration the existing tunnel geometry and aim to create the most realistic representation of the physical phenomena in the flow. Basic thermodynamic behaviour, including temperature exchanges, pressure loss, mass flow equation, will be considered at different points along the circuit. Furthermore, the main driver of the facility – the compressor or fan – will be simulated as will the tunnel characteristic essential to flow behaviour, leading to the most accurate models and test results possible. Eventually these models will be applied to existing facilities to see how performance is enhanced.

This is the first time that mathematic modelling will create a standard for wind tunnels. As such, the project partners are defining the handling of wind tunnels and describing the requirements for operating conditions for the first time. This will also allow European operations to increase transparency towards others and users from research and development communities. Finally, mathematical models will prove invaluable for the design of future evolutions for each member facility of the project.

ESWIRP will increase the capacity of the three strategic European wind tunnel facilities. The research completed over the course of the project will have effects far outlasting the life of the project and these facilities will offer better quality, range and value to the research community. The project will also serve to reinforce Europe's position as a global leader in wind tunnel research.

Project acronym: ESWIRP

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EU project officer: Maria Douka

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Partners:
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