



## Network of Excellence

2004 – 2010



## Publishable Final Activity Report

29.06.2010

### Background

The dialogue between several European wind tunnel operators and research organisations regarding the concept of a Network of Excellence (NoE) around wind tunnel activities started in December 2002. This initiative was the result of the policy of the European Commission to integrate and strengthen the European Research Area in Aeronautics and Space under the auspices of the 6<sup>th</sup> Framework Programme. The NoE is one of the legal instruments for which the EC may allocate funds. The plan for the NoE European Windtunnel Association has been based on the view that building formal long-term relationships between wind tunnel operators and research organisations would provide direct technical and scientific synergy effects and competitiveness improvements for all associated partners in the European Community. The plan for EWA was submitted to the EC in 2004. Its intention has been to combine the skills and research capacities of 14 member organisations from 8 European countries. These include 3 industrial organisations, 3 commercial wind tunnel operators, 7 research organisations and one organisation for post-doctoral education. The European Windtunnel Association officially started on 1 April 2004, had a duration of five years plus an extension phase of 12 months and ended on 31.3.2010.



<http://www.eu-ewa.aero/>

### Partners

#### Partners name

#### Country Code

|                                                         |    |
|---------------------------------------------------------|----|
| Deutsches Zentrum für Luft- und Raumfahrt e. V.         | DE |
| German – Dutch Wind Tunnels                             | NL |
| Office National d'Etudes et de Recherches Aérospatiales | FR |
| Stichting Nationaal Lucht- en Ruimtevaartlaboratorium   | NL |
| Centro Italiano Ricerche Aerospaziali S.C.p.A.          | IT |
| Swedish Defence Research Agency                         | SW |
| Airbus Operations GmbH                                  | DE |
| Aircraft Research Association Limited                   | UK |
| European Transonic Windtunnel GmbH                      | DE |
| BAE Systems (Operations) Limited                        | UK |
| QinetiQ Limited                                         | UK |
| Výzkumný a zkušební letecký ústav, a.s.                 | CZ |
| Airbus UK Limited                                       | UK |
| Von Karman Institute for Fluid Dynamics                 | BE |

### Objectives

The goal of the European Windtunnel Association is to form a Network of Excellence for aeronautical applications and related advanced measuring technologies with a management structure and a joint programme of activities. In a four-step progressive approach (*Preparation, Harmonisation, Implementation, Presentation of Integration*) over a period of five years it will integrate and strengthen European aeronautical research by building lasting relationships and interdependencies between the major European wind tunnels for aeronautical applications and developers of advanced measuring technologies for aeronautical applications. Thus, EWA will be able to provide research institutes and the aerospace industry with a comprehensive and harmonised set of better and extended services with full coverage of their possible needs. The network will also establish close links to leading European universities in the field of aeronautics in order to provide a fast transfer of new ideas. The benefits achieved by the co-operation activities will be disseminated to industrial end users inside and outside of the association by means of exchange of personnel, workshops and presentations of advanced measurement technologies performed in industrial wind tunnels.

### Work performed and achieved results

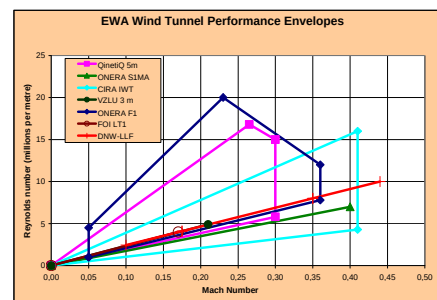
The EWA Network of Excellence project went live in April 2004. The project has been organized in four phases (*Preparation, Harmonization, Implementation, Presentation of Integration*) plus an *Extension* phase. The work of EWA comprises integration activities, activities related to advanced wind tunnel testing, spreading of excellence and management activities.

#### Management achievements

A robust and efficient management comprising a Management Board, a Technical and Scientific Board, Work Package Managers, Task managers, Working Groups and a Co-ordinator has been established. An EWA internal website with a knowledge database containing the address details of all partners, working groups, points of contact, working documents, reports and deliverables has been set up to facilitate the every day work and to provide easy access to all relevant documents. The legal framework for performing exchange of personnel, joint use of equipment etc. has been prepared.

#### Business relations and legal aspects achievements

After having prepared a Terms of Reference document, a task group on legal aspects was formed to consider a number of legal issues. These issues have been identified in connection with the day-to-day implementation of activities within EWA, such as copyrights, publications and personal data protection. The group also dealt with the legal structure for exchanges of personnel between the partners and the non-disclosure statements of individual researchers. Template agreements on the mutual use of equipment and a review of the terms and conditions for contracts on wind tunnel measurements have also been generated. In the second part of the project, the major legal task has been to provide the documents required for the establishment of the Trade Association.



Example of wind tunnel data contained in the Capabilities Matrix (Low-speed Reynolds number plot)

In order to develop the cooperation between partners, a 'Capabilities Matrix' has been collated and then used to produce a 'Willingness Matrix'. An analysis of market needs focused on short to medium term market needs, identifying aspects which have the strongest influence on our current testing service business. The Capabilities Matrix has been expanded with a capabilities matrix for non-EWA wind tunnels to assess international competition. The partner business practices have been explored in detail, with the aim of identifying topics for future harmonisation and integration (within the EWA TA). A list of topics describing Wind Tunnel Facility Investments has been generated and a 'Wind tunnel technology road map and analysis of the innovation in the field' has also been prepared.

#### Scientific and technical achievements

The activities related to advanced windtunnel testing have focused on the development and technical evaluation of measurement techniques and facilities. The most prominent intent has been to develop and harmonise wind tunnel test techniques and standards in order to facilitate the execution of commercial and/or co-operative test programmes and the exchange of wind tunnel data.



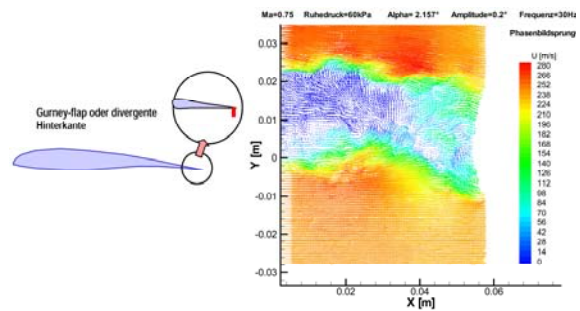
Pressure Plotting: Innovative technology: main body and elevator covered with copper

For wind tunnel testing new concepts for model manufacture, such as remote controlled models, pressure plotting models and model component balances have been developed. New advanced measurement techniques play an important role to increase the quality of data to be delivered by modern industrial wind tunnels. In this area several activities of internal cooperation on surface measurement, flow field measurement and sound field measurement took place, which have been disseminated to the outside of EWA by demonstration activities. This opened the possibility to establish new contacts and to discuss training methods for future closer co-operation.

## EWA Publishable Final Activity Report

Moreover a number of benchmarking activities on advanced measurement techniques (PSP, PIV and model deformation measurement techniques) have been organized. The results have been presented in demonstrations and workshops as well.

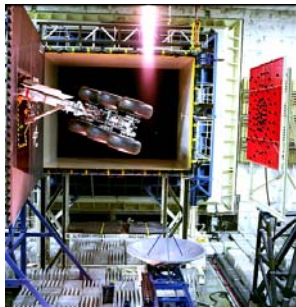
The interaction between experimental techniques (wind tunnels) and the increasing capabilities of numerical methods is also of high importance for the future development of wind tunnel testing. Thus, in order to support the cooperation between experimentalists and developers of numerical codes a several workshops on CFD, and experiments in aerodynamics have been organized as well.



Instantaneous velocity vector map of the wake behind an oscillating airfoil with Gurney-flap (PIV technique)

### Integration

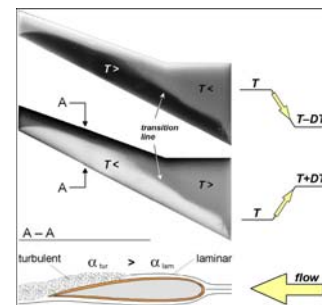
After much discussion in the EWA Management Board, the legal instrument of a trade association has been chosen for the integration of the EWA partners following the conclusion of the NoE. The statutes of a EWA Trade Association (TA) have been developed, and were finally established under Dutch law in March 2008.



Noise source location: A six wheel landing gear in the DNW-LLF 8 x 6 m<sup>2</sup> Open Test Section

The required legal documents have been signed by DLR, DNW, NLR, CIRA, ARA, ETW, QinetiQ, VZLU and BAE in April 2008. From the 1st of July 2008, Sjöland & Thyselius Aerodynamic Research Centre has taken over the FOI wind tunnel facilities in Bromma, including the staff. In 2009 Airbus UK and AIRBUS DE joined the TA, but with one single legal entity to reflect the transnational nature of the company. In 2010 VKI did join the EWA TA. ONERA, as owner of the majority of the European wind tunnels decided not to join the TA, but indicated it would reconsider its position.

As a NoE, EWA has been dedicated to developing closer working relationships and procedures and means for communication and reporting. An inventory of capabilities and the compilation of a willingness matrix have lead to the identification of future needs, market expectations and technology requirements perceived by the EWA partners to satisfy customers' future needs. Standard procedures for exchanging model geometry data and for balance calibration terminology have also been developed. With respect to the future work of the EWA TA, business practices have been assessed in order to identify topics for future harmonisation and integration. An overview on wind tunnel facility developments has also been prepared.



Principle of transition detection by temperature step method for Temperature Sensitive Paint (TSP)

### Networking, standards, training and human resources achievements

EWA has established an extensive knowledgebase accessible via its website. This site contains comprehensive information about the EWA partnership (address data, professional skills of individual persons etc.). In addition there is extensive technical information about wind tunnels, wind tunnel test sections, balances and measurement techniques accessible by the all EWA partners. Training activities and the short term exchange of personnel have been carried out, primarily between wind tunnel staff and experts on measurement techniques.

The promotion of gender equality within the network, and human relationships among the partners across Europe was also of major concern. Dedicated workshops for wind tunnel staff and project and test engineers have been organised. The role of female engineers within the working conditions of wind tunnels has been discussed and special school-lab courses on fluid mechanics, especially for female students and their teachers, have taken place.



Participants of DLR\_School\_Lab course organized by EWA



### Dissemination achievements

The Spreading of Excellence activities has been one of the key objectives of EWA. The results obtained from this co-operative network have been turned into a common benefit for partners of the network and the European industry. Promotion of advanced measurement technologies has taken place through workshops and presentations of these techniques in industrial wind tunnels. These have included Pressure Sensitive Paint, Particle Image Velocimetry, Doppler Global Velocimetry, and Model Deformation Measurement Techniques. Interaction between specialists on CFD and experiments have been accompanied by learning activities in international courses on Pressure Sensitive Paint, experimental aeroacoustics, dynamic wind tunnel testing etc.



EWA knowledgebase: Facilities

Most activities have been organised in close cooperation with university partners, with presentations of measurement techniques in wind tunnels primarily addressing the European aeronautical industry. General dissemination of the results of the work of EWA has been carried out via various methods, including a EWA stand and seminar at the 2008 Testing Expo, and also via regular Newsletters.

### Impact

One major outcome of the EWA Network as Excellence as a whole, has been to integrate and strengthen European Aeronautical Research by building lasting relationships and inter-dependencies between the major European wind tunnel operators and developers of advanced measuring technologies. This partnership, which will continue as EWA Trade Association, will be able to offer to researchers and the global aerospace industry a harmonised and extended set of services. EWA has also enabled researchers to bring new experimental techniques into operation in industrial wind tunnels much faster than in the past, thus giving an important advantage in the competition for the global wind tunnel testing market.



Close-up of the EWA Stand at Aerospace '08 Expo with the ETW model prominently displayed

### Publishable results of the final plan for using and disseminating the knowledge

At the end of the project the EWA partners identified 56 items as exploitable knowledge. The publishable list of dissemination activities comprises a public website, newsletters, exhibition activities and technical and scientific publications. Besides the establishment of the Trade Association and dedicated internal and external websites for its future work, a number of bi- or trilateral cooperation agreements related to model workshops, measurement techniques (low speed and cryogenic flows, acoustic microphone array technique etc), standards and benchmarking have been arranged.

## EWA Publishable Final Activity Report

### Contact details

Coordinator:

Organisation:

Deutsches Zentrum für Luft- und Raumfahrt e. V. (DLR)  
Institute of Aerodynamics and Flow Technology  
Bunsenstrasse 10  
D - 37073 Göttingen

Contact:

Tel.

Fax:

E-mail:

Dr. Jürgen Kompenhans  
+ 49 551 709 2460  
+ 49 551 709 2830  
juergen.kompenhans@dlr.de

Administration:

Tel.

Fax:

E-mail:

Nicole Harmening  
+49 531 295 2572  
+49 531 295-2180  
nicole.harmening@dlr.de

Tel.

Fax:

E-mail:

Kerstin Carl  
+49 5505 999 371  
+49 5505 505 615  
kerstin.carl@dlr.de

EC Officer:

Tel:

Fax:

E-mail:

Dr.-Ing. Dietrich Knoerzer  
+ 32 2 29 61 607  
+ 32 2 29 66 757  
dietrich.knoerzer@ec.europa.eu

Website:

Network of Excellence  
European Windtunnel  
Association (EWA)  
Trade Association  
European Windtunnel  
Association (EWA)

<http://www.eu-ewa.aero/>

<http://www.ewa.aero/>