



# Update

## Second Joint Workshop



EWA was formed to assist in the development of close working links between the members of the European aerospace industry. An Initial Joint Workshop was held at ONERA, Toulouse during October 2004 to support this aim. The event proved to be successful and it was decided to organise another similar event. The well-attended EWA Second Joint Workshop was held at BAE SYSTEMS, Farnborough, UK on 20 - 21 March 2006.

EWA members gave presentations on a large number of the tasks that are currently being undertaken. These included advanced model manufacture, acoustic measurements within wind tunnels, model

deformation measurements, current status of force balance technology and wind tunnel correction methods.

It is planned that EWA will organise a range of workshops and presentations to demonstrate the capabilities of advanced testing techniques. Presentations were given that described the events that have already taken place; Pressure Sensitive Paint (PSP) at the DNW HST (Feb 2005), Particle Image Velocimetry (PIV) at ONERA Lille (Feb 2005), Model Deformation Measurement (MDM) at ETW (Oct 2005) and Doppler Global Velocimetry (DGV) at the ONERA F2 wind tunnel (Nov 2005). The presentations clearly displayed the

success and benefits gained from the workshops.

It is becoming increasingly important that wind tunnel testing and CFD activities are employed to support each other. Two papers were given which described work on this topic. The need for advanced measurement techniques to provide the experimental data necessary for validation of CFD routines was clearly displayed. EWA has organised workshops to promote activity on this subject. The latest was held at FOI, Stockholm during June 2006 and the event will be reported in the next issue of the EWA Newsletter.

There were several invited speakers and guests present at the

workshop. They gave presentations about advanced measurement techniques, e.g. PIV and acquiring unsteady surface pressure measurements using PSP. They promoted many discussions between interested parties and assisted in the development of links with people and organisations outside the EWA network.

The workshop was a very successful event and it has been agreed that a 3rd Joint Workshop will be held in September 2007.

Copies of the presentations given at the workshop are available on the EWA web site.



Delegates outside Park Centre

# Particle Image Velocimetry Presentation and Workshop

**ONERA  
Lille, 23rd February 2005**

Particle Image Velocimetry (PIV) is a powerful non-intrusive test technique that allows the rapid measurement of the instantaneous flow field velocities across a plane.

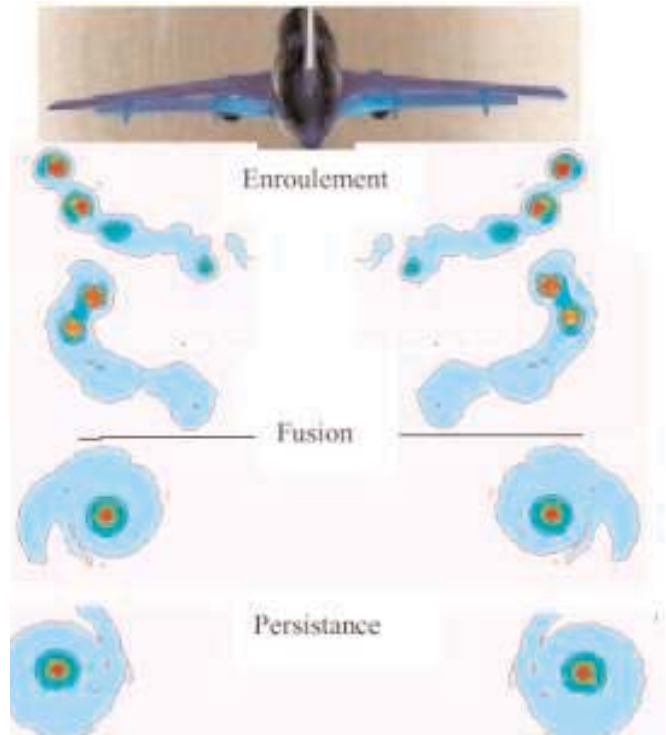
A workshop was organised to demonstrate the capability of the method to EWA members. It was held at ONERA - Lille on 23rd February 2005 and was attended by 40 delegates.

PIV provides the opportunity to obtain quantitative results to improve the understanding of complicated flow fields. An important example is the investigation of the development and control of wake vortices behind large aircraft in landing configurations. This topic was chosen as the theme of the workshop. ONERA have developed a catapult rig to allow the use of a free-flight model in these tests in order to provide the correct representation of the flow field around the aircraft, as shown in the photograph below. The PIV system provided the instantaneous velocity vector fields and associated vorticity distribution immediately after the completion of the test run. Typical results are shown below. The demonstration was undertaken by ONERA and DLR.

The PIV demonstration was supported by the presentation of papers in which the authors described their work on the investigation of vortex wakes.

The workshop provided all participants with a valuable demonstration of the use of PIV to acquire instantaneous velocity vector fields which can be used to assist in the understanding of complex flow fields.

Further information about this workshop is available on the EWA web site.



Characterization of the Wake Vortex of a Model with Flaps



Photograph of the catapulted model

# Spotlight on ARA

ARA, the Aircraft Research Association, was established as an independent company in January 1952 by fourteen firms in the British aircraft and aero-engine industry. Its primary mission was to design, build and operate a large transonic wind tunnel to meet the future development needs of U.K industry. The tunnel was officially opened four years later and began commercial testing in 1957.

Over the past 50 years, using only surpluses from the contract work it has undertaken, ARA has extended its facilities to include; additional wind tunnel test capabilities and specialised rigs, design and manufacture of wind tunnel models and a team skilled in the development and application of computational fluid dynamics (CFD) codes.

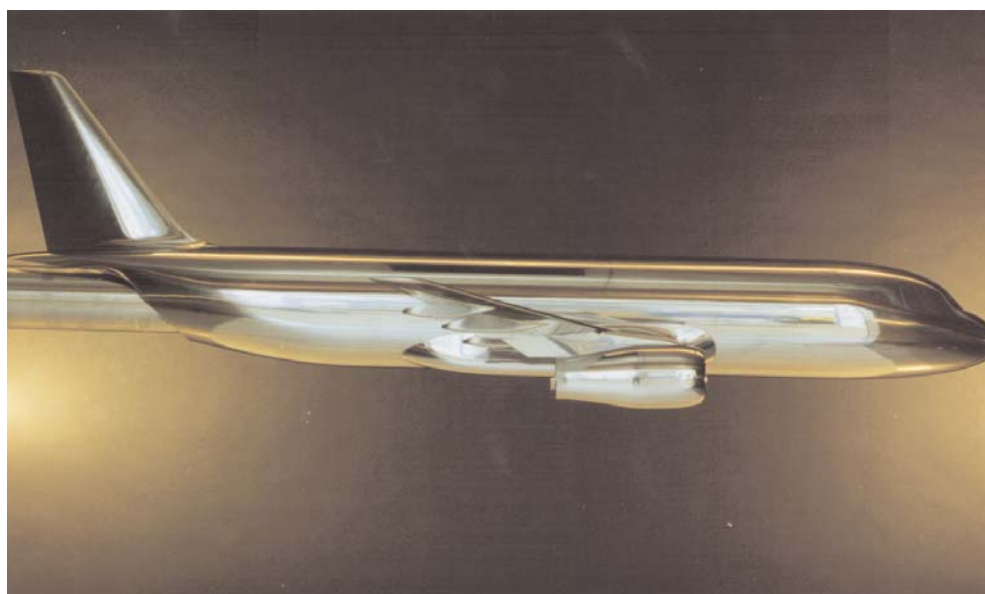
ARA has played a significant role in many high profile projects throughout the last 50 years. These include Concorde, Harrier, Tornado, Eurofighter, the Airbus A300 through to the A380 and A350, and the Joint Strike Fighter. ARA's record of technical excellence, flexibility to meet customers demanding objectives and accuracy and efficiency of data acquisition has established ARA as a centre of excellence in high speed aerodynamics, and with it a large International customer base.

Today, ARA is playing a significant role in helping to shape the emerging EWA organisation. Dennis Stanniland, Chief Aerodynamicist, was Chairman of the Technical and Scientific Board of EWA for the year ending March 2006, Colin Forsey, Head of Computing, leads EWA Work Package 1 on Integrating Activities and ARA staff are actively involved in almost every task in all work packages and have promoted the EWA vision at several International conferences.

---

For more information on ARA,  
please visit our website at  
<http://www.ara.co.uk>

---



# Partners



FOI, the Swedish Defence Research Agency, is an assignment-funded authority under the Ministry of Defence.

The agency's broad span of competence and expertise is applied for the benefit of all sectors of society. The core activities are research, method and technology development and studies relating to defence, security and safety applications. FOI is represented by the Division of Systems Technology under which aerodynamic testing and research in the field of aeronautics is organised.

**Staff:**

FOI has 1250 employees of which 900 are researchers. The aeronautical field occupies approximately 100 persons.

**Facilities:**

The most recent acquisition is the Turbomachinery Compressor Research Facility. This facility will primarily be used for research on gas turbine intermediate compressor components. Tests within the EC programmes AIDA and VITAL are planned.

The newest among the wind tunnels is T1500 which was commissioned in 1989. It is a transonic high

Reynolds number facility. It is continually being upgraded and among the possibilities for simulation are a two-sting rig for store release testing, rigs for forced and free oscillation tests, an ejector for air inlet testing and compressed air for jet plume simulation. Non intrusive field measurement techniques including PIV and PSP are available. A trisonic variable Reynolds and Mach number facility TVM500 is primarily intended for investigations where high Reynolds number and continuously variable Mach number and/or stagnation pressure during the run is important, for instance flutter and air intake research. The tunnel is also well suited for missile testing.

A hypersonic wind tunnel HYP500 has been used for testing by the ESA programmes Hermes and Sänger. In recent years the facility has been modified in order to allow rocket nozzle testing. Ariane 5's Vulcain nozzle has been studied at over-expanded conditions and resulting sideloads.

An important part of the aerodynamic testing is designing,



The New Turbomachinery Compressor Research Facility

manufacturing, instrumentation and calibration of wind tunnel balances. The in-house capabilities include taking the responsibility for all the parts.

**Computational Physics**

A growing part of the research is performed through participation in research projects in the EU Research Framework Programme or in GARTEUR. Research areas include unsteady aerodynamics, transition prediction, optimization and aeroelasticity. The in-house CFD flow solver Edge is used in research programmes as well as in industrial applications, both by research institutes and by industry. For aeroelastic calculations Edge is coupled to the in-house FEM code Stripe

**History**

In 1940 the national authority FFA, the Aeronautical Research Institute, was founded including a first wind tunnel. The purpose of the new institute was to support the aeronautical industry. Over the years FFA supplied the needs of the Swedish armed forces and aviation authorities as well as commercial companies both in Sweden and abroad for aeronautical expertise in the context of acquisition, certification and maintenance of aviation materiel. In 2001 FFA and FOA merged into one new agency FOI.

For more information on FFA, please visit our website at [www.foi.se](http://www.foi.se)

## Other Partners

Name	Country Code
Airbus Deutschland GmbH	DE
Airbus UK Limited	UK
Aircraft Research Association Limited	UK
BAE Systems (Operations) Limited	UK
Centro Italiano Ricerche Aerospaziali S.C.p.A.	IT
DLR - Deutsches Zentrum für Luft- und Raumfahrt	DE
DNW - German Dutch Wind Tunnels	NL
European Transonic Windtunnel GmbH	DE
Office National d'Etudes et de Recherches Aéropatiales	FR
QinetiQ Limited	UK
Stichting Nationaal Lucht- en Ruimtevaartlaboratorium	NL
Swedish Defence Research Agency	SW
Vyzkumny a Zkusebni Letecký Ústav, A.S.	CZ
Von Karman Institute for Fluid Dynamics	BE

<b>Project Management Board</b>		
Chairman: Georg Eitelberg		DNW
Maurice Bazin		ONERA
Axel Flaig		Airbus DE/UK
Dennis Stanniland		ARA
Brian Cleator		BAE SYSTEMS
Ludovico Vecchione		CIRA
Horst Hüners		DLR
Lionel Baranes		ETW
Monica Dahlén		FOI
Fred Abbink		NLR
David Dunford		QinetiQ
Mario Carbonaro		VKI
Milan Holl		VZLU
<b>Project Technical and Scientific Board</b>		
Chairman: Jean-Marc Bousquet		ONERA
Deputy Chairman: Joost Kooi		DNW
Dennis Stanniland		ARA
Anton de Bruin		NLR
Francesco Fusco		CIRA
Bengt Hultqvist		FOI
Jürgen Kompenhans		DLR
Zdenek Patek		VZLU
David Hurst		BAE SYSTEMS
Ian Price		Airbus DE/UK
Jürgen Quest		ETW
Andrew Rae		QinetiQ
Cem Asma		VKI
<b>Project Co-Ordinator</b>		
<b>Dr. Jürgen Kompenhans</b>		
Tel: +49 551 709 2460, Fax: +49 551 709 2830, e-mail: Juergen.Kompenhans@dlr.de		
<b>Project Administration</b>		
<b>Oliver Fries</b>		
Tel: +49 551 709 2268, Fax: +49 0551 709 2174, e-mail: Oliver.Fries@dlr.de		