European Transonic Windtunnel GmbH
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News

von Karman Medal Awarded to ETW

The International Council of Aeronautical Sciences awarded the von Karman medal for exceptional contribution in the field of international collaboration to ETW at their 1994 congress in Anaheim, California. The von Karman Lecture entitled "The European Transonic Windtunnel ETW - A Breakthrough in International Test Facilities" was presented by Dr. H. A. Hertrich of the German Ministry for Research and Technology (BMFT). Dr. Hertrich had been associated with the project from its inception until late in 1994. His co-authors were X. Bouis of France, J. A. van der Bliek from the Netherlands and G. L. Harris from the United Kingdom.

The von Karman Medal Presented to ETW

ETW at Paris Air Show

ETW will be exhibiting at the 41st Paris Airshow at Le Bourget from 11th to 18th June 1995. ETW together with ONERA, the French parent institute of ETW, and AEREA will be represented on a common stand in Hall 2. AEREA is the international co-operation of seven major European research institutes, CIRA of Italy, DLR of Germany, DRA of the United Kingdom, FFA of Sweden, INTA of Spain, NLR of the Netherlands, and ONERA of France. For those who would like to get acquainted with the latest developments at ETW a visit is highly recommended.

Second Customer

Aerospatiale Avions of Toulouse will be the second customer of ETW. An initial preparation phase at the end of last year was performed in the Cart Rigging Areas and in the Variable Temperature Check-out Rooms, where for test simulation and check-out of the overall test set-up the complete temperature range of the test programme was achieved down to 130 K. The model of the A340 Airbus is currently dedicated for force and moment measurements and is equipped with a remotely operated horizontal tailplane. Currently the test set-up is prepared for the planned wind tunnel test campaign.

Similar to the first customer this test as well is conducted under a co-operation agreement with ETW to enable the client to explore ETW's capabilities. For the first time the customer will also gain experience with the first infrared transition detection system which will be used during this campaign.

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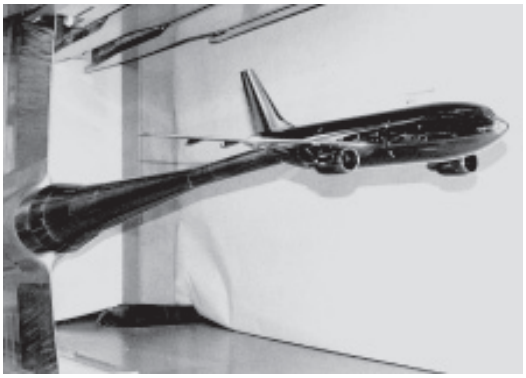
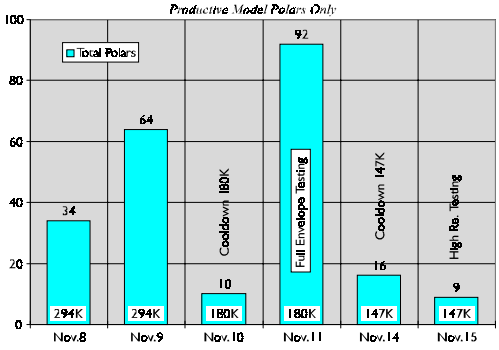
ETW Status and Prospects

According to plan, 1994 ended with the first test for Deutsche Aerospace Airbus, as from 1st January 1995 renamed Daimler-Benz Aerospace Airbus. The model, a 1/30 scale version of an Airbus A310 was tested with a rear sting support on Model Cart 2 using Balance 001. Further test campaigns are planned later this year with different sting-balance combinations. In addition, two more test campaigns were conducted with ETW's F4 reference model to demonstrate satisfactory operation under both ambient and cryogenic conditions. The test campaigns were used to compare the effect of different sampling rates in both pitch-pause and continuous traverse mode on the force and moment coefficients. Differing traverse rates were also evaluated.Over a period of six days 225 polars were taken including two cooldowns to 180K and 147K. The maximum chord Reynolds number attained during these tests was 21 x 10^6.



Daimler-Benz Airbus A310 Model



Achieved Productivity

For 1995 more calibration and initial client tests are scheduled with models provided by Aerospatiale, British Aerospace Airbus, Daimler-Benz Aerospace Military Aircraft, Dassault Aviation, and Fokker. After completion of the final commissioning of the modified Liquid Nitrogen Injection System, presently scheduled for October 1995, ETW will be able to offer an expanded envelope to its clients. This, depending on model characteristics, may result in chord Reynolds numbers up to 50 x 10^6 on full span models at Mach 0.8. 1995 will also see the procurement of a fourth internal balance with a normal force range of 30kN and an external half model balance of 50kN. Delivery of these is scheduled for late 1995 and early 1997, respectively. The use of turbine powered engine simulators in cryogenic conditions is also being studied in association with the half model capability.

User Guide Issued

In February this year the User Guide to ETW was published. The guide gives prospective users of the ETW, an introduction to the facility, an insight into its capabilities, the procedures employed and the services offered. The intention being that it will enable the prospective user to assess the tunnel performance against his programme requirements. Copies of the guide are available to anyone considering undertaking high Reynolds number testing. Contact Hans van Ditshuizen at ETW. (fax: +49 2203 609270).

News in Brief

Two contracts have recently been placed with the Technical University, Darmstadt, for a copper/beryllium balance and a combat aircraft balance.

A contract has been placed with ARA, Bedford, UK, for a half model balance and turntable.

After a number of start-up problems the Balance Calibration Machine of ETW is now fully operational.

The drawing office has now installed the CATIA CAD system. This along with the Autocad and Intergraph systems enables the designers to work on, or assist others in the preparation of their test assemblies for ETW.

Visitors to ETW

Recent visitors to ETW included:

Dr. Jun Hua, Professor at NPU, Xian, China.

Mrs. Pamela Keane, Executive Officer for Legislative Affairs, NASA HQ. Washington.

Dr. Fred Schmitz, Division Chief, NASA Ames.

Prof. Changhai Zhou, Director of CARDC, Sichuan, China

Prof. Jiagi Zhou, Exec. Vice President, CAE, Beijing, China.

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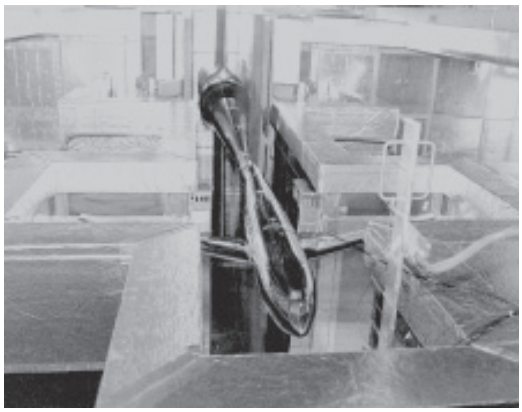
Cold Model, Warm Hands

To achieve the high productivity capability of ETW it is essential to undertake quick configuration changes on a model between runs. ETW has been designed for the rapid transfer of the complete model cart and test assembly from the cryogenic, gaseous nitrogen environment of the tunnel to the air environment of one of two special bays. During the transfer, the model and cart are maintained at cryogenic conditions. Once in the bay the cold model cart is zoned off by a series of doors that isolate the cart and sector assembly from a room in which the model and sting are now contained, the Quick Change Room (QCR). When the doors are closed, the QCR is warmed up to near ambient temperature conditions. Surrounding the model and sting in the QCR is a simple, open topped, cold box to which cold dry air at tunnel temperature is continuously circulated. The stratification between the cold air in the model box and the ambient temperature air of the room is so strong that virtually no mixing at the interface takes place. This allows simple rigging work to be carried out on a cold model by operators working at, or close to, normal room temperatures.



Reference Model in the Cold Box

Within these areas it is essential to maintain the air at very dry conditions, typically lower than a dew point of -60°C, to prevent any chance of condensation forming frost on the models. It is for this reason that a positive flow of cold dry air is maintained over the model.

The model riggers entering the QCR are also required to take precautions to reduce the amount of moisture that they normally emit. This can vary dependant on circumstances, from a simple face mask and cold suit, to a full vapour suit.

ETW has also identified, and subsequently developed, techniques to apply fillers at cryogenic temperatures. A number of types of filler materials are being used, the selection of which is dependant upon the test programme. One type is for a quick application over a limited temperature range matched to the test envelope; another type is a semi-permanent filler which works over the full temperature range.

Application of Filler to Cold Commissioning Model

Client Confidentiality a Priority

Discussions with prospective clients have highlighted the need to ensure the strictest confidentiality of their test data. ETW, being dedicated to protect all client data from disclosure and misuse, will ensure this through personnel, physical, logical and procedural measures. Based on DEC/VAX-VMS hardware and software the ETW data systems have been developed in a way which ensures both the strictest confidentiality of test results and the flexibility and "comfort" that most clients require in industrial wind tunnels.

ETW has three dedicated, independent data processing computer systems, one for each User Room. The client is allocated one of these for his sole use whilst at the facility. For an ongoing test, data acquisition, data processing and data display is on a separate dedicated network segment in a restricted area. Where network or other data lines leave this restricted area, logical filters and network bridges ensure that no access to the system is possible from outside and no client data is electrically conducted on such lines. Where patching of network interconnections is possible, the patching is as transparent as possible and can be subject to inspection by clients and security staff. Connections are mainly by fibre/optic cables to avoid interception through radiation. The VAX Virtual Memory System (VMS) operating systems security is used to authenticise users and to restrict access to all computers. For critical cases, complete physical separation and electromagnetic shielding of the data processing system is possible.

Client test data is stored on separate and removable disks or tapes in each User Room which can be physically removed from the system and kept in safe custody.

Personnel are made and kept aware of security requirements and are obligated to security and confidentiality.

Test Technique Development

Model Attitude Measurement

In order to measure the angle of attack of the model to the highest possible accuracy, ETW has specified an optical system to complement the classical gravity sensing servo accelerometer. This technique of measurement utilises a Corner Cube, which has a very fine grating on its outer surface, to be installed in an insert mounted in the fuselage at the centre of rotation of the model. When illuminated by a collimated monochromatic light a Moiré pattern is created at the focal plane of the collimating lens. It is this that contains the angle information.

It is possible, by using two wavelengths of monochromatic light and 8 detectors, to obtain a readout with a resolution of 0.001 degree and an accuracy of 0.01 degree. Laboratory tests have proven these results. The system will be installed for use in the tunnel in the first half of 1995.

Model Deformation Measurement

It is anticipated that the models in ETW will deform quite considerably when subjected to the high dynamic pressures the facility is capable of. Estimates for wing bending for a typical transport type aircraft could be, as in other tunnels, as much as 40 mm at the wing tip and up to 2 degrees of wing twist at mid span at the high pressures.

In order to measure these deformations ETW has specified and put out for tender a Model Deformation System.

This system is based upon the Moiré interferometry technique, where a grating, which is projected on to the surface of the wing is viewed and captured by a CCD camera. This information can then be down loaded to a computer where a full analysis can be made. It is anticipated that the accuracies of bending and twist can be measured to 1 mm and 0.003 degree respectively.

Boundary Layer Transition Position

The Infrared Radiometer Technique has been established at ETW. The first set of special insulation housings has been installed and the AGEMA 1000 infrared camera will be used for the next test campaign with a clients model. A second camera can be installed on request of the client for additional flow field observations of the model nose, horizontal tailplanes or the fin. The design for a future infrared radiometer for low temperature ranges down to 100K has been finished and the manufacture of the components has started.

Personnel

Dr. Gerhard Hefer

Dr. Hefer holds a diploma in Aeronautical Engineering from the Technical University of Berlin and a doctor's degree from the Technical University of Braunschweig. His professional career is characterised by a variety of aerodynamic subjects mainly in the high speed region covering transonic, supersonic and hypersonic flows. In the 1980's she was responsible for the design, construction and operation of the Cryogenic Ludwieg Tube wind tunnel at Gottingen (KRG). Before joining ETW, he was Head of the Section for Rarefied/Real Gases of DLR Gottingen.

Since the 1950's, Dr. Hefer has a private pilot license and continues flying as an instructor.

Supervisory Board Changes

Ministerialrat Dr.-Ing. H. A. Hertrich for many years Director of Department 513 "Luftfahrtforschung und - Technik, Hyperschalltechnologie" of the German Ministry for Research and Technology BMFT, and since 5th January 1978 one of the founders and member of the Steering Committee, later the Supervisory Board of ETW, has taken up new duties at the restructured BMBF as of 15th September. Dr. Hertrich will be replaced by Dr. phil. nat. H. Diehl. The aeronautical world, and ETW in particular loses with Dr. Hertrich a strong supporter for the development of new technologies and facilities. We wish both gentlemen success in their new careers and are looking forward to the co-operation with Dr. Diehl.

Mr. J. van Houwelingen, former Secretary of Defence of the Netherlands and Chairman of the Board of NLR and ETW Supervisory Board member has resigned from his duties on the ETW Board to take up the position of Mayor of Haarlemmermeer, the community that includes Amsterdam Schiphol airport. Dr. J. Blum, Vice Chairman of the Board of DLR has also resigned from the ETW Supervisory Board. Successors for both gentlemen will be found in 1995.