ETW has recently completed a series of half model commissioning and calibration tests and is now able to offer this system to customers for production and development testing over the complete operational envelope. This marks a significant milestone in the expansion of the testing capabilities at ETW, providing the ability to test at low speed and high speed conditions over a wide range of Reynolds numbers up to flight conditions.

In June 1999 ETW started the first half model commissioning and calibration activities in the tunnel. First experiences were gained with this new technique in the following months by using two different models in the commissioning, calibration and validation phases of the half model concept. DaimlerChrysler Aerospace Airbus provided the model shown here for the purposes of validating the ETW half model system against their existing low speed database. This model is equipped with adjustable slats and flaps to enable representation of various high lift configurations together with a clean configuration suitable for testing at conditions throughout the entire envelope. During this initial validation series the model was tested at incidences up to and beyond maximum lift at low speed for a substantial Reynolds number range. The model was also tested at high speed over a range of incidences up to buffet onset at flight Reynolds numbers.

The ability to test over such an extensive range of conditions is unique within Europe. The data quality obtained to date has been demonstrated to be similar to full model data and this, in itself, is a significant achievement at such an early stage in the development of the half model system. The lessons learnt from these early tests have helped to further develop the system, to establish appropriate techniques that can be used to acquire high quality test results, and to achieve levels of productivity compatible with commercial operation.
Aerospatiale Matra A340 Model

Fin Sting and Pressure Plotted Wing Tests

Two different configurations of an A340 model of Aerospatiale Matra were used in tests during 1999. In June, a co-operative fin sting test campaign was successfully completed. The test assembly is presented in figure 1.

The November test campaign with a pressure plotted wing assembly also used the technique of model coating for further infra-red images through the complete operating envelope of ETW. A special coating technique for pressure tapped wings was effectively applied and figure 2 presents a zoomed-in view of one row of pressure taps (Ø=0.1 mm) on the upper wing surface.

During test preparation, ETW devised a special sealing system for the fin sting assembly, which was successfully adapted for the cryogenic test conditions and to the demanding requirements on accurate drag measurements. Valuable experience was gained with model coatings and their influence on the aerodynamic data.

The November test campaign with a pressure plotted wing assembly also used the technique of model coating for further infra-red images through the complete operating envelope of ETW. A special coating technique for pressure tapped wings was effectively applied and figure 2 presents a zoomed-in view of one row of pressure taps (Ø=0.1 mm) on the upper wing surface.

During test preparation, ETW devised a special sealing system for the fin sting assembly, which was successfully adapted for the cryogenic test conditions and to the demanding requirements on accurate drag measurements. Valuable experience was gained with model coatings and their influence on the aerodynamic data.

The November test campaign with a pressure plotted wing assembly also used the technique of model coating for further infra-red images through the complete operating envelope of ETW. A special coating technique for pressure tapped wings was effectively applied and figure 2 presents a zoomed-in view of one row of pressure taps (Ø=0.1 mm) on the upper wing surface.

Two different configurations of an A340 model of Aerospatiale Matra were used in tests during 1999. In June, a co-operative fin sting test campaign was successfully completed. The test assembly is presented in figure 1.

The November test campaign with a pressure plotted wing assembly also used the technique of model coating for further infra-red images through the complete operating envelope of ETW. A special coating technique for pressure tapped wings was effectively applied and figure 2 presents a zoomed-in view of one row of pressure taps (Ø=0.1 mm) on the upper wing surface.

Aerospa
Aerospatiale Matra A340 Model
Fin Sting and Pressure Plotted Wing Tests

Two different configurations of an A340 model of Aerospatiale Matra were used in tests during 1999. In June, a co-operative fin sting test campaign was successfully completed. The test assembly is presented in Figure 1.

During test preparation, ETW devised a special sealing system for the fin sting assembly, which was successfully adapted for the cryogenic test conditions and to the demanding requirements on accurate drag measurements. Valuable experience was gained with model coatings and their influence on the aerodynamic data.

The November test campaign with a pressure plotted wing assembly also used the technique of model coating for further infra-red images through the complete operating envelope of ETW.

In total more than 300 infra-red images were taken with two standard IR-cameras of the wing upper and lower surfaces, the horizontal tailplanes and the fin. The test conditions were varied from ambient temperatures down to about 220K, which is the limit for the standard IR-cameras, and up to 450 kPa in total pressure.

The specially developed CRYSTAL IR-camera was then successfully used for the low temperature range down to 120 K resulting in chord Reynolds numbers up to 37 Mio. The tests were completed to the Client’s satisfaction and the excellent results were presented to Airbus Industry in February 2000.

On 1 January 2000, Members of the ETW Supervisory Board were:

France
ICA Xavier Bouis, Director, Large Technical Facilities, ONERA, Châtillon
ICA André Brémard, General Directorate of Armament, DGA/DSP, Paris
ICA Hervé Morallon, General Directorate of Civil Aviation, DGAC/DPAC, Paris

Great Britain
Dr. David E. Mowbray, Assistant Director, Civil & International Programmes, DERA, Farnborough
Dr. Raymond C. Kingcombe, Deputy Director, Tech. Partnership, Aeroesp. & Defence Technology, DTI, London

Germany
Prof. Dr.-Ing. Heinz Körner, Director, Institute for Design Aerodynamics, DLR, Braunschweig
Dr. Hans-Martin Spilker, Superior Counsellor, Federal Ministry for Education and Research, Bonn

The Netherlands
Dr. ir. Bernardus M. Spee, Director General, NLR, Amsterdam
Ir. Henk N. Wolterswinkel, Deputy Director General, Dutch Civil Aviation Authority, Den Haag
ETW has recently completed a series of half model commissioning and calibration tests and is now able to offer this system to customers for production and development testing over the complete operational envelope. This marks a significant milestone in the expansion of the testing capabilities at ETW, providing the ability to test at low speed and high speed conditions over a wide range of Reynolds numbers up to flight conditions.

In June 1999 ETW started the first half model commissioning and calibration activities in the tunnel. First experiences were gained with this new technique in the following months by using two different models in the commissioning, calibration and validation phases of the half model concept.

DaimlerChrysler Aerospace Airbus provided the model shown here for the purposes of validating the ETW half model system against their existing low speed database. This model is equipped with adjustable slats and flaps to enable representation of various high lift configurations together with a clean configuration suitable for testing at conditions throughout the entire envelope. During this initial validation series the model was tested at incidences up to and beyond maximum lift at low speed for a substantial Reynolds number range. The model was also tested at high speed over a range of incidences up to buffet onset at flight Reynolds numbers.

The ability to test over such an extensive range of conditions is unique within Europe. The data quality obtained to date has been demonstrated to be similar to full model data and, in itself, is a significant achievement at such an early stage in the development of the half model concept. The lessons learnt from these early tests have helped to further develop the system, to establish appropriate techniques that can be used to acquire high quality test results, and to achieve levels of productivity compatible with commercial operation.

A thermally conditioned balance was selected for the ETW half model system primarily for reasons of minimising development risks, but also with a view to achieving high levels of productivity. The essential aspect of this concept is the ability to condition the balance to a uniform temperature and then to control