THE RAE 5 METRE PRESSURISED LOW SPEED WIND TUNNEL

Addendum to Paper No B 3-05

A. Spence, D.S. Woodward, M.T. Caiger,
A.J. Sadler, R.W. Jeffery
Royal Aircraft Establishment
Farnborough, Hampshire, England

In the main paper, which appears in Volume 1 of the Proceedings, it was indicated that Section V11 reviewed the position reached in June 1978 when the paper was completed, and that it was intended to issue an addendum to update the position at the time of the Congress.

VII A. Current Position at the End of August 1978

Since the first paper was written, some further measurements of the velocity distribution and turbulence levels in the working section have been made. A second series of tests on the 1/13 scale A300B2 model has been completed, this time with high lift devices in the take-off configuration.

Access Arrangements

The automatic sequencer which controls the sequence of steps required to obtain access to the working section is working reliably.

Model Mountings and Balances

The mechanical balance has been assembled into its cart in one of the rigging bays. Following cabling, completion of the drive and control of the yaw turntable and site calibration, the balance is expected to be ready for use for model tests in the latter half of November.

Flow Uniformity

In the first paper, it was stated that difficulty had arisen in measuring the spatial distribution of static pressure owing to boundary layer transition close to the slots of the pilot-static heads at the high unit Reynolds numbers in this tunnel. By interchanging heads and selecting the best ones, the results shown in Fig 22 have been obtained. The pressure heads were still misbehaving in the top 20 per cent of the Reynolds number range and the results shown are typical of the lower part of the range. They must still be regarded as somewhat provisional and further work is needed to achieve calibration accuracy particularly at the high Reynolds numbers. The provisional variation shown is about $\pm\frac{1}{4}$ per cent on kinetic pressure.

Turbulence Measurements

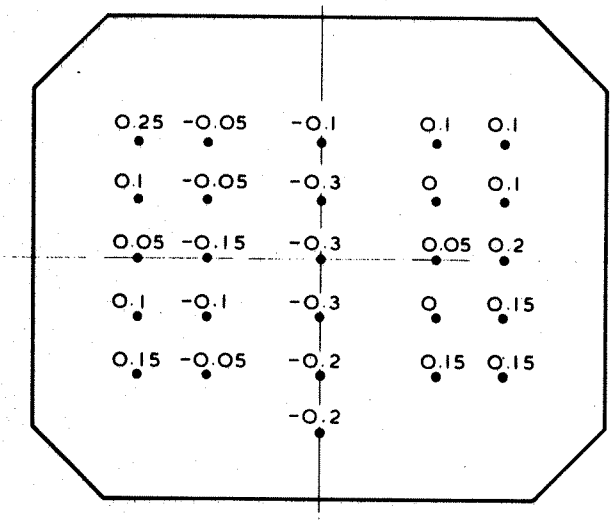
The results of a more comprehensive set of measurements using the DISA miniature X-probe hot wires are shown in Fig 23. To date only the rms levels are available and the analysis to give spectra has not yet been done. The results show that the general levels are as anticipated, 0.1 per cent longitudinal turbulence and 0.2 per cent lateral with a small increase as unit Reynolds number is increased. The higher values, including those reported in the main paper, appear to be in local wakes from a set of platinum resistance thermometers in the settling chamber, which will be removed.

Tests of 1/13 Scale Model of A300B2

Some provisional and uncorrected results from the recent short series of tests with high lift devices in the take-off setting are shown in Figs 24 and 25. After some initial de-bugging, the strain gauge balance package worked very well and was displaying and recording angles of incidence derived from accelerometers installed in the model. Fig 24 shows the variation of the maximum lift coefficient of the model without tailplane and clearly demonstrates the importance of both Mach number and Reynolds number on the results. The pressure measurement package enabled over 200,000 pressure measurements to be taken and a typical sample on-line print-out is shown in Fig 25. This is at one spanwise station at one incidence with a historical record from a lower incidence for comparison. These pressure measurements together with video-recordings of tuft patterns will yield a very comprehensive understanding of the stalling behaviour of the model.

General Position

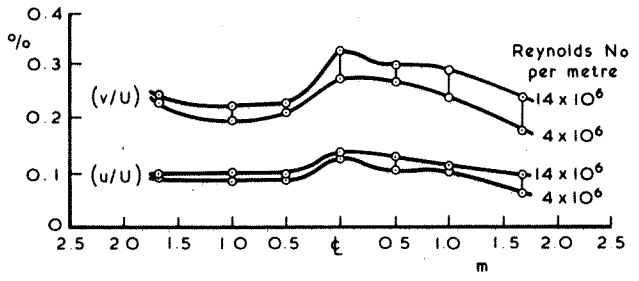
The tunnel is now shut down so that contractors can complete various items of work including drive and control of carts and working section rotation, and final preparation of the mechanical balance for use. It is expected that all this work will be completed by the end of November and that the tunnel will then be ready to launch into a full programme of work.



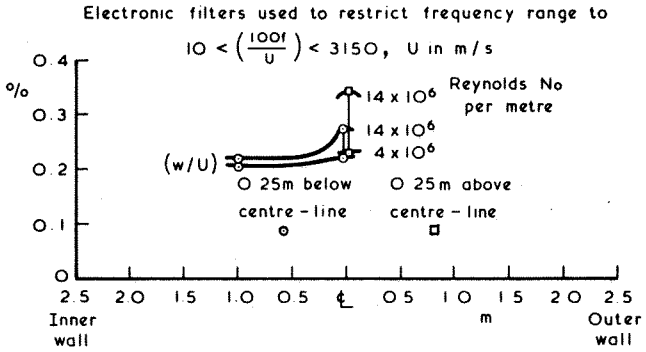
View looking upstream

Figures are deviations from mean of measured values of kinetic pressure in tunnel working section expressed as percentages of kinetic pressure on tunnel axis

Fig 22 Distribution of kinetic pressure in working section (provisional)



a Longitudinal and horizontal components 0.25m below centre-line



b Vertical component

Fig 23 Rms turbulence components in working section

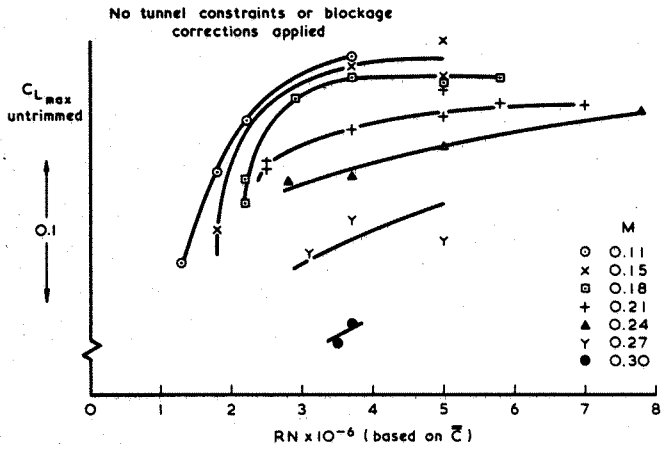
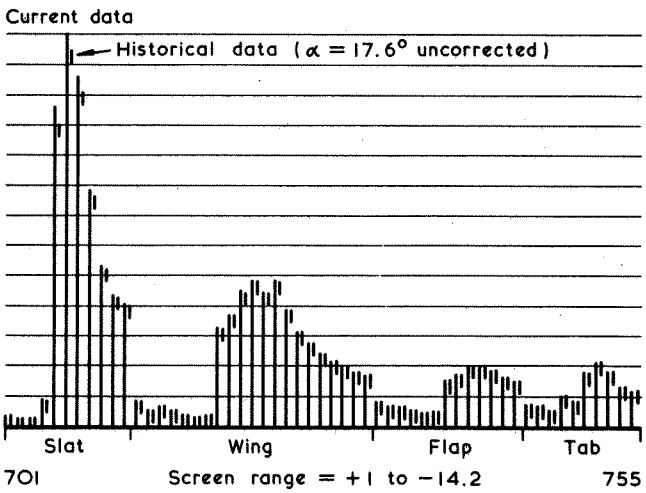


Fig 24 Maximum lift coefficient on A300B model in take-off configuration (provisional)

Datapoint = 97 Historical datapoint = 96
Record No. = 4



M = 0.21 P_T = 215 kpa Re = 5.0 x 10⁶
y/semispan = 0.8194 α = 18.1° uncorrected

Fig 25 Typical pressure distribution on A300B model in take-off configuration (provisional)