Monash/RMIT Joint Aerodynamic Noise & Aerodynamic Loading Test Facility

by J.W. Saunders and W.H. Melbourne

SUMMARY

Monash and RMIT are now using a Mechanism C Infrastructure Grant from the ARC to develop a joint facility for research into aerodynamic noise and aerodynamic loading of vehicles, buildings and components of industrial complexes. This development is based on the existing cooperative agreement for RMIT to undertake vehicle-aerodynamics studies at Monash and will extend the capability of the near-completed Environmental Wind Tunnel to facilitate noise and loading research associated with turbulence over a large range of scales. In conjunction, with support of industry, a vehicle aerodynamics test facility will be designed to exceed the current world standards in vehicle aerodynamic noise and the effect of cross-winds in particular.

Significant funds have already been spent in extensive acoustic treatment of the 1 MW fans. The teams will be developing or building:

(a) an anechoic test section which will be either open-jet or Parkinson-type active wall for testing full-scale cars;

(b) six-component force balance with oscillating mechanism; and

(c) a moving floor is being considered.

In addition, we will be looking for close cooperation with CSIRO and computational researchers at Monash University and the University of Sydney in the use of these facilities to investigate latest developments in computational fluid mechanics.

Besides the on-going need for building aerodynamic noise research, aerodynamic noise in the US is often the number two customer complaint. There are no low-noise wind tunnels publicly-available internationally for general research. BMW has a 1/5 scale low-noise tunnel specifically-built for its own work and running at 75 dbA. GM (Detroit) has a 75 dBA tunnel in 24 hour proprietary-use for noise work. Lockheed (Georgia) & NRC (Ottawa) also test at about 70 dBA which is rather loud. We have been advised that at 60 km/h, an Australian car interior noise level is about 45 dBA. The inadequacy of these overseas tunnels is obvious.

The action of wind turbulence on automobiles, particularly when it is cross-wind, has resulted in fatalities. It is proposed to incorporate a mechanism on top of the balance which will oscillate the model and permit measurement of the dynamic aerodynamic derivative coefficients. This information is important for the dynamic performance of vehicles in gusting cross-winds. Research in this area is scant.

Australia already offers a unique testing ground for air-conditioning in Queensland and high-speed outback testing under harsh conditions in Northern Territory. At Monash, we propose a joint facility to offer the quietest wind tunnel available; more sophisticated cross-wind testing; and a full range of vehicle aerodynamics facilities potentially moving to low temperature testing.

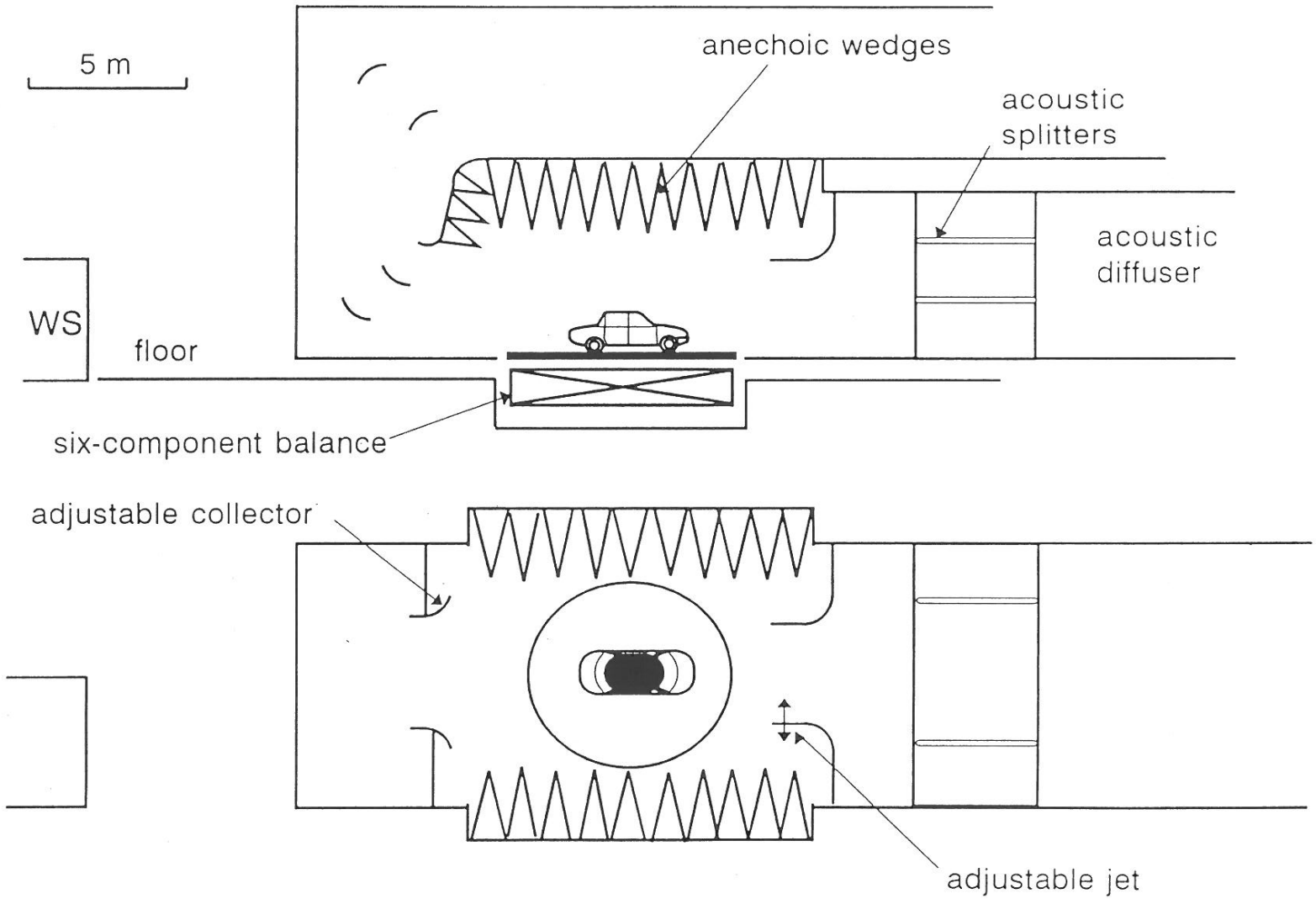

Fig. 1 - Proposed Vehicle Aerodynamics Section