

THE FLOW AROUND HIGH SPEED TRAINS

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ABSTRACT: This paper considers aspects of the aerodynamic behaviour of high speed trains. It does not specifically address the many aerodynamic problems associated with such vehicles, but rather attempts to describe, in fundamental terms, the nature of the flow field. The rationale for such an approach is that the flow fields that exist are the primary cause of the aerodynamic forces on the train and its components which result in a whole range of aerodynamic issues. This paper thus draws on a wide range of model scale and full scale experimental and computational work and attempts to build up a comprehensive picture of the flow field. Attention is restricted to trains in the open air (i.e. tunnel flows will not be considered) for both still air conditions and crosswind conditions. For still air conditions the flow field will be described for a number of flow regions i.e.

- around the nose of the train;
- along the side, roof and underbody of the train;
- the wake of the train;

Calculations of the nature of the wind relative to the train will be presented for a variety of train speeds and wind speeds. For crosswind conditions, the nature of the flow field around typical trains, including surface pressure distributions, will be presented. In addition the aerodynamic admittances / weighting functions for different types of train will be discussed. Finally some remarks will be made as to the relevance of the data that has been presented to current issues in train aerodynamics