Aerodynamics research

Academic staff

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The aerodynamics research team within the Department of Civil Engineering have developed expertise in a wide range of aerodynamic issues that affect both network and vehicle operations.

Extreme wind effects and climate change are central to the work of the team and link closely with the work in the Environment theme of the Railway Centre. Aerodynamics links these factors with the operation of vehicles through dynamic train modelling and cross wind simulation. Safety and reliability of vehicles in such extreme conditions is becoming more critical with the demand for higher operating speeds and lower vehicle weight. The safety of passengers, trackside workers and the damage to network infrastructure caused by high-speed vehicle slipstreams are also key themes of the team's work. Such concerns have been highlighted by recent events and the team works closely with industry to identify the key factors that are contributing to these issues. There is also an increasing awareness of the need to understand the aerodynamic interaction between vehicles, such as when vehicle pass each other at speed, and the vehicle-infrastructure interaction, such as in tunnels. Such interactions can cause discomfort for passengers as well as damage to vehicles or infrastructure thereby increasing maintenance costs.The aerodynamics research team within the Department of Civil Engineering have developed expertise in a wide range of aerodynamic issues that affect both network and vehicle operations.

Facilities:

The group has expertise in full scale measurements, physical model measurements and the use of computational fluid dynamics. For full scale measurements a large range of velocity, pressure and force measurement devices are available and the group has carried out measurements of pressures, slipstream and wake velocities and forces on trackside structures. For model scale experiments a large environmental wind tunnel is available (with a 2.5m square cross section) and the group own and operate the **large moving model TRAIN Rig (/research/activity/railway/research/train-rig.aspx)** , formerly owned by Delta Rail, which is housed in Derby. For CFD calculations the group uses the University multi-processor BlueBear facility, mainly for running LES (Large Eddy Simulation) calculations.

Recent and current projects:

- **AeroTRAIN (funded by EU FP7) (/research/activity/railway/research/aerodynamics/aerotrain/index.aspx)**
- **Review of Euronorm design requirements for trackside and overhead structures subjected to transient aerodynamic loads (funded by RSSB) (/research/activity/railway/research/aerodynamics/euronorm.aspx)**
- **Flow around High Speed Trains in partially enclosed spaces & tunnels (UOB studentship) (/research/activity/railway/research/aerodynamics/tim-gilbert.aspx)**
- **The aerodynamics of freight trains (UOB studentship) (/research/activity/railway/research/aerodynamics/freight-trains.aspx)**
- **CFD projects (/research/activity/railway/research/aerodynamics/cfd/index.aspx)**
- **Measurement of train aerodynamic phenomena in operational conditions (funded by EPSRC) (/research/activity/railway/research/aerodynamics/aerodynamic-phenomena.aspx)**

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