

The aerodynamics of freight trains

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The rail freight industry in the UK is a growing sector with increasing volumes of international trade coupled with a gradual return from road to rail transportation. Efficiency studies into increased volumes of freight trains within an already overstretched network indicate to developing faster and longer trains. The movement of a vehicle causes deformation in the surrounding air, creating so called transient aerodynamic effects. The airflow around a moving vehicle is called a slipstream [1]. Induced slipstream forces can interact with trackside objects, potentially destabilising such objects and people [2]. In the last forty years there have been twenty four train slipstream incidents, the majority caused by freight trains [3].

Concerns over the possibility of slipstream induced incidents have led to a number of high speed passenger train studies investigating the effects of slipstreams. This experimental study will focus on freight trains, assessing slipstream development of a container freight train and the crosswind loadings on a container. A series of open air experiments are undertaken at the TRAIN (TRansient Aerodynamic INvestigation) rig facility in Derby [1], using a purpose built 1/25 scale container freight train. The effect of loading configuration on slipstream development will be investigated by measuring slipstream velocities and pressures for different container loading efficiencies.

The results from model scale experiments are compared to full scale container freight data collected from the West Coast Mainline, UK. Comparisons to passenger slipstream velocities at UK platform and trackside safety positions will be made and conclusions drawn on suitability in relation to container freight passage.

REFERENCES

- [1] Baker, C., S. Dalley, T. Johnson, A. Quinn, and N. Wright, 2001: The slipstream and wake of a high-speed train. *Proceedings of the Institution of Mechanical Engineers, Part F: Journal of Rail and Rapid Transit*, 215 (2), 83–99.
- [2] Jordan, S., M. Sterling, and C. Baker, 2009: Modeling the response of a standing person to the slipstream generated by a passenger train. *Proceedings of the Institution of Mechanical Engineers, Part F: Journal of Rail and Rapid Transit*, Volume 223, Issue 6 (6), 567–579.
- [3] Temple, J. and T. Johnson, 2008: Effective management of risk from slipstream effects at trackside and on platforms. Tech. rep., A report produced for Rail Safety and Standards Board.