

**Numerical Flow Simulation of Mechanism of Increase and Method for Suppressing Increase in Lift Force of  
Pantograph Head of Conventional Line Pantograph under Crosswind**

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We numerically investigated the aerodynamic characteristics of a conventional line pantograph in a crosswind by using large-eddy simulations (LESs). Although previous experimental study revealed that the lift force increases significantly under crosswind conditions, the mechanism of the phenomenon has not been clarified. Therefore, the flow fields around the pantograph head were carefully investigated by LESs. It was found that there are two main mechanisms: one is a stationary large-scale vortex generated on the upper surface of the pantograph head, and the other is a pressure increment on the lower surface of the pantograph head. In addition, LESs were conducted using modified pantograph head shapes to investigate methods for reducing the lift force of the pantograph head taking account of the mechanisms above. As a result, maximum lift reduction rate reaches approximately 60%, indicating that effective lift force reduction method was proposed.