

1.6.2 Key**A cover for the single-person pedal-powered vehicle*****Introduction***

Urban air pollution has become a central issue in transport policy decision-making. Air quality in city centres is linked to the level of vehicle emissions², and urban transport policy in the UK aims to reduce the use of private cars in city centres by 25% within the next ten years³. As a result, much research has focused on developing environmentally-friendly commuter vehicles such as the Single-Person Pedal-Powered Vehicle (SPPPV). However, although there has been an increase in the sale of SPPPVs, safety and comfort issues need to be addressed if the number of users is to increase to a level at which a significant effect on environmental pollution can be achieved.

Researchers have studied and improved many safety aspects of the SPPPV. In 1999, Wang *et al.* responded to the need for increased safety by designing an SPPPV surrounded by a ‘cage’ of safety bars⁴, and in 2002 Martinez introduced a reinforced polymer screen which could be fitted to the safety bars to protect the cyclist’s head in the event of a collision⁵. The issue of comfort has also been addressed by many design teams; in 2008 Kohl *et al.* introduced an SPPPV with a built-in rain/sun umbrella, which could be opened at the touch of a button⁶, and more recently, Martinez⁷ added a mesh filter which can be placed over the entire cage to reduce the risk of environmental pollution. However, it has been suggested that both the shape of the umbrella and the weight of the mesh filter negatively affect aerodynamic efficiency (Zhang *et al.*, 2019).

In this study, we model the aerodynamic effect of these safety and comfort features and use the data thus obtained to propose a new design which balances design parameters with optimum aerodynamic performance.