Motivation
A substantial obstacle to the widespread adoption of autonomous vehicles is the perception of safety and reliability. Safe operation relies on an increasing array of sensors, the performance of which may be impaired by both airborne spray and direct obstruction. This necessitates increased consideration of both tyre spray and direct surface contamination throughout the aerodynamic design process.

Methodology
This study investigates two configurations of the quarter-scale Windsor Model and how the inclusion of 20° rear-end side tapers alters the rear-end contamination and downstream spray produced by the vehicle. Simulations are carried out using OpenFOAM v7, with continuous phase (air) computed in a Eulerian framework, using the Spalart-Allmaras DDES turbulence model. An inlet velocity of 40 ms⁻¹ and time-step of 2×10⁻⁶ s results in a Reₜ₀ = 3×10⁶ and CFL < 1 throughout the recirculation region. The dispersed phase (water droplets) is simulated concurrently in a Lagrangian framework, injected from a conical source behind the wheel using experimentally derived velocity and size distributions. [2]

Cumulative Mass Deposition
The baseline configuration produces a large area of rear-end deposition, while the inclusion of side tapers sees soiling concentrated to a lower, and tighter region along with a significant lateral shift. Quantitatively, the side tapers reduce peak and total rear-end deposition by 14% and 20% respectively.

Proper Orthogonal Decomposition
Proper Orthogonal Decomposition (POD) breaks the ‘random’ instantaneous mass field down into underlying coherent structures. Figure 5 depicts lateral (left) and vertical (right) switching behaviour in the rear-end deposition of the baseline configuration. This is comparable to the bistable switching behaviour seen in the flow-fields of similar bluff bodies. [3]