Investigation of methods for removing the boundary layer from the surface of a streamlined plate

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The formation of a substantial boundary layer can negatively impact flow parameters, leading to separation zones. This may result in a reduction in flow momentum due to the increase in the thickness of the displaced boundary layer, adversely affecting the efficiency of various systems. To address this issue, drain holes are utilized to eliminate excess boundary layers. The significance of this challenge has been demonstrated in various studies, such as [1–3]. Given the diverse shapes and methods of placement of drain holes, optimizing their arrangement for efficient boundary layer drainage is essential. A study on this subject was conducted in [4], examining the influence of gap width on separation zone size based on experimental data.
To conduct a more detailed analysis of the configuration and placement impact of the drainage ports on the thickness of the displaced boundary layer and loss of liquid momentum, a series of three-dimensional (3D) numerical simulations were conducted. The variables that were altered included the linear dimensions, depth, and relative positioning of the drainage orifices, with flow parameters being assessed. Software packages utilizing gas dynamics modelling, employing the resolution of the Reynolds-averaged Navier-Stokes equations through the finite volume approach, were employed to address this issue.

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