

عنوان مقاله:

Laminar Flow Control and Drag Reduction using Biomimetically Inspired Forward Facing Steps

محل انتشار:

مجله مکانیک کاربردی و محاسباتی، دوره 7، شماره 2 (سال: 1400)

تعداد صفحات اصل مقاله: 12

نویسندگان:

Dinesh Bhatia - *School of Aerospace Engineering, The University of Nottingham Ningbo China, 199 Taikang East Road, Ningbo 315100, China*

Guangning Li - *School of Astronautics, Northwestern Polytechnical University, 127 Youyi West Road, Xi'an 710072, China*

Jing Sun - *School of Aeronautics, Northwestern Polytechnical University, 127 Youyi West Road, Xi'an 710072, China*

Jian Wang - *Faculty of Science, Engineering and Computing, Kingston University London, Friars Avenue, London SW15 3DW, United Kingdom*

خلاصه مقاله:

This paper explores the use of shark-skin inspired two-dimensional forward facing steps to attain laminar flow control, delay boundary layer transition and to reduce drag. Computation Fluid Dynamics (CFD) simulations are carried out on strategically placed forward facing steps within the laminar boundary layer using the Transition SST model in FLUENT after comprehensive benchmarking and validation of the simulation setup. Results presented in this paper indicate that the boundary layer thickness to step height ratio (d/h), as well as the location of the step within the laminar boundary layer (x/L), greatly influence transition onset. The presence of a strategically placed forward facing step within the laminar boundary layer might damp disturbances within the laminar boundary layer, reduce wall shear stress and energize the boundary layer leading to transition onset delay and drag reduction as compared to a conventional flat plate. Results presented in this paper indicate that a transition delay of 20% and a drag reduction of 6% is achievable, thereby demonstrating the veracity of biomimicry as a potential avenue to attain improved aerodynamic performance

کلمات کلیدی:

Laminar Flow Control, Drag Reduction, Forward Facing Steps, CFD, Shark Skin, Biomimetics

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