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Classification of Airfoils by Abnormal Behavior of Lift Curves at Low Reynolds Number SUTTHIPHONG SRIGRAROM, CHI-SENG LEE, Nanyang Tech. Univ., Singapore, DI-BAO WANG, FEI-BIN HSIAO, Natl. Cheng Kung Univ., Taiwan, YEN-HOCK LIM, Nanyang Tech. Univ., NCKU-NTU COLLABORATION — Flow phenomena at low Reynolds number in the region of 104∼105 are more complicated than those occurring at high Reynolds number. They present unfavorable aerodynamics characteristics and, they are poorly understood. This paper tries to classify airfoils according to the type of pattern showed by its corresponding lift coefficient (Cl) curve. Preliminary study of over 45 published airfoils data reveals that the shape of Cl curve is strongly related to the combination of airfoil's maximum thickness (t/c), camber, and the shape of the trailing edge. It was also observed that increasing the camber and leading edge radius would result in the transition of lift behavior from one trend to another. We determine the reasons contributing to the abnormal behaviors of the lift curves for various airfoils by investigating their flow line plots using a computational fluid dynamics (CFD) program and find common physical parameters between airfoils that may lead to the display of similar undesired characteristics in their lift curves. Results indicated that the formation of a long trailing edge separation bubble would induce a drastic drop in the lift coefficient due to the collapse of the suction peak and the formation of a short leading edge separation bubble would lead to a sudden jump in the lift coefficient. The trailing edge angle also played a significant role in determining the lift characteristics of an airfoil.

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