

Abstract Submitted
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How dynamic is static stall?¹ JULIEN DEPARDAY, KAREN MULLENERS, UNFoLD, Institute of Mechanical Engineering, Ecole Polytechnique Federale de Lausanne, CH-1015 Lausanne, Switzerland — The static stall angle is the critical angle of attack above which the flow detaches from the airfoil's surface. When the static stall angle is exceeded, the transition from attached to separated flow is not instantaneous. The transient development is characterized by different stages and time-scales similar to the dynamic stall flow development stages and stall delays. Static stall can be seen as an extreme case of dynamic stall where there is no motion during the stall development. On a NACA0018 profile, we initiated static stall by an increase in the angle of attack from 0.3° below to 0.3° above the static stall angle in 10% of a convective time unit. We measured the time-resolved flow field and aerodynamic forces and analysed their temporal evolution. The transition time from attached to separated flow is longer in the static stall case than in the dynamic stall cases even though the topological flow development is comparable. Special emphasis is directed towards linking the inception of stall to the motion of the leading edge stagnation point. These results will serve as a basis to improve low-order models based on indicial response.

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