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Blunt nose airfoils for improved stall performance and transonic aerodynamics YUXIN ZHANG, WSU, MATTHEW KRALJIC, ZVI RUSAK, Rensselaer Polytechnic Institute — We numerically study the aerodynamic performance of blunter than classical airfoils in terms of both the delay of critical Mach number for transonic shock waves to higher values and the increase of stall angle of attack at low subsonic speeds. The approach is motivated by the optimal critical airfoils developed by Schwendeman et al. (ZAMP 1993) and the recent results on the delay of stall by Kraljic & Rusak (PRFluids 2019). The nose of the airfoils is given by a canonic shape $y = (ax)^{1/a}$ where $a \geq 2$. The effect of changing the airfoils nose parameter a, thickness ratio δ, and location of maximum thickness x_t/c from leading edge on the wave drag and stall angle of attack are determined. Increasing a and decreasing x_t at a fixed δ help in deriving airfoil shapes with better performance at subsonic and transonic speeds for application in wings of transport jet airplanes, rotors of helicopters, and rotating turbines.

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