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Origin of transonic buffet on airfoils. J. CROUCH, The Boeing Company, A. GARBARUK, D. MAGIDOV, Saint-Petersburg Polytechnic Univ. — Transonic airfoils are characterized by a zone of supersonic flow followed by a shockwave, which intensifies with increasing lift coefficient. At sufficiently high values of lift, the flow becomes globally unsteady resulting in dramatic oscillations in the shock position. This buffet onset has been shown to result from global instability (Crouch, Gabaruk & Magidov 2007, J. Comput. Phys. v. 224, p. 924). The stability analysis is based on linear perturbations to steady solutions of the Reynolds-averaged Navier-Stokes equations (RANS), which are required to analyze the flow at the high Reynolds numbers of interest for transonic flow. We briefly describe the global-stability approach, and then apply the stability analysis and unsteady RANS calculations to investigate the origins of the buffet onset. Buffet-boundary predictions from the stability analysis are shown to be in good agreement with experiments.

Jeffrey Crouch
The Boeing Company

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