



## MECHANISMS OF TRANSONIC BUFFET OVER SUPERCRITICAL AIRFOILS REVEALED BY DNS



**Thursday, June 25, 2026 | 10 am**

Mechanical Engineering Seminar Room  
2164 Glenn L. Martin Hall

*Speaker*

**DR. GIULIO SOLDATI**

*Post Doctoral Research Fellow  
Sapienza Università di Roma*

### ABSTRACT



Figure 1: Numerical Schlieren snapshot of fully developed buffet flow at  $M = 0.7$ ,  $Re = 6 \times 10^5$ , and  $\alpha = 7^\circ$ .

Transonic buffet is an aerodynamic instability characterized by low-frequency shock oscillations and severe lift fluctuations. In this work, buffet is investigated using direct numerical simulations (DNS) at Mach number 0.7 and Reynolds number  $6 \times 10^5$ . The angle of attack is increased from stable conditions into the fully developed buffet regime. The results reveal a coherent global oscillation dominated by a single low-frequency mode accompanied by higher harmonics. Large-scale pressure fluctuations are generated at the shock foot, convect downstream along the separated shear layer, and scatter upstream-travelling disturbances. These acoustic waves circumvent the shock crest and impinge on the shock from the upstream supersonic region. Independent estimates of downstream and upstream travel times yield a buffet period consistent with the observed shock oscillation frequency. These findings indicate that the spatial organization and frequency selection of transonic buffet are associated with acoustic propagation pathways.

### BIO

Giulio Soldati is a Postdoctoral Research Fellow in Aerospace Engineering at Sapienza Università di Roma, where he earned his Ph.D. in 2026. His research focuses on computational aerodynamics, high-speed flows, and wall bounded turbulence. He is co-developer of a high-fidelity, GPU-accelerated DNS solver for turbulent compressible flows in generalized curvilinear coordinates. He has served as a Visiting Researcher at the Center for Turbulence Research (CTR) at Stanford University, where he focused on transonic buffet. Prior to dedicating himself to academia, he competed internationally as a member of the Italia Triathlon National Team.

