Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Active Drag Reduction in Turbulent Airfoil Flow WOLFGANG SCHRDER, MARIAN ALBERS, Institute of Aerodynamics, RWTH Aachen University — Drag reduction in turbulent boundary layers is key for substantial energy savings in aerodynamics. Large parts of the flow over the wing of modern aircraft are turbulent such that even net energy savings of a few percent lead to high cost savings. Active drag reduction methods have shown to be capable of significantly reducing the drag in generic external turbulent wall-bounded flows. Based on the knowledge of previous studies for flat-plate turbulent boundary layer flow the technique of spanwise traveling transversal surface waves is applied to 74 percent of the surface of a NACA4412 wing section at a chord-based Reynolds number of $Re_c = 400,000$. Different parameter combinations are tested for maximum drag reduction and maximum net power saving. The results show a reduction of the total drag of up to 8.5 percent and a decrease of the viscous drag by up to 12.9 percent. Note that this includes all actuated and non-actuated parts of the surface, i.e., locally a much higher decrease of the wall-shear stress is achieved. Additionally the lift is slightly increased by up to 1.4 percent.

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Date submitted: 20 Sep 2019 Electronic form version 1.4