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**Experiments on a Steady Low Reynolds Number Airfoil in a Shear Flow**<sup>1</sup> DAVID OLSON, AHMED NAGUIB, MANOOOCHEHR KOOCHEFAHANI, Michigan State University — The aerodynamics of steady airfoils in uniform flow have received considerably more attention than that of an airfoil operating in a non-uniform flow. Inviscid theory by Tsien (1943) shows that an airfoil experiences a decrease in the zero lift angle of attack for a shear flow with uniform clockwise vorticity. The current work utilizes a shaped honeycomb technique to create a velocity profile with a large region of uniform shear in a water tunnel. Direct force measurements are implemented and validated using experiments on a circular cylinder and NACA 0012 in a uniform cross-flow. Results for a NACA 0012 airfoil with a chord Reynolds number of  $1.2 \times 10^4$  in a non-uniform approach flow are compared to concurrent CFD calculations (presented in a companion talk) showing an increase in the zero lift angle of attack; in contradiction with inviscid theory. The effect of shear on the mean lift coefficient over a wide range of angles of attack is also explored.

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