

Abstract Submitted
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**Assessment of Control Volume Estimation of Thrust for a Sinu-
soidally Pitching Airfoil at Low Reynolds Number¹** PATRICK HAMMER,
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versity — The proper estimation of thrust is very important for understanding the
aerodynamics of oscillating airfoils at low chord Reynolds number Re . Although
direct force measurement is possible, force values at low Re are often small, and sep-
aration of the test-models inertia forces from the data may not be straightforward. A
common alternative is a control-volume (CV) approach, where terms in the integral
momentum equation are computed from measured wake velocity profiles. Although
it is acceptable to use only the mean streamwise-velocity profile in estimating the
streamwise force on stationary airfoils, recent work has highlighted the importance
of terms relating the velocity fluctuation and pressure distribution in the wake for
unsteady airfoils. The goal of the present work is to capitalize on 2D computational
data for a harmonically pitching airfoil at Re in the range 2,000-22,000, where all
terms in the momentum-integral equation are accessible, to evaluate the importance
of the various terms in the equation and assess the accuracy of the assumptions
that are typically made in experiments due to the difficulty in measuring certain
terms (such as the wake pressure distribution) by comparing the CV results with
the actual computed thrust.

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