Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

**The Forward Fin – First Results**[1] M G MUNGAL, TIOGA BENNER, Santa Clara University — Motivated by the surprising existence of forward facing fins in certain tropical fish, this study reports on a combined numerical and experimental investigation of low-aspect-ratio forward vs. backward facing fins from low to high angles of attack, at moderate Reynolds numbers. Several cases are investigated using the STAR-CCM+ code with a few select cases investigated in a wind tunnel. The experimental lift and drag measurements and surface flow visualizations support the flow dynamics found in the numerical simulations which show, as expected, a complex flow with positive and negative interacting shed vortices. The forward fin, either in single or tandem configurations, produces a smoother lift curve with angle of attack ("rolling stall") while the backward configuration exhibits the lift decrease associated with classical stall ("sudden stall"). Straight fins show a "two-time stall" behavior previously reported by others. The forward fin shows less drag relative to the backward fin for angles of attack less than 20 degrees while the reverse is true at larger angles up to 60 degrees. The dynamics of a developing stall bubble rationalizes the results which are reported for both pointed and rounded fins.

[1]Work supported by a Kuehler Grant, Santa Clara University.

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Date submitted: 24 Jul 2020 Electronic form version 1.4