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Experimental study of flow field around a plunging flexible hydrofoil[1] LEONARDO MARTIN-ALARCON, TAO YANG, FANGJUN SHU, MINGJUN WEI, New Mexico State University — Recent developments in micro air vehicles (MAVs) have led to the improvement of computational fluid dynamics (CFD) simulations capable of simulating flexible flapping wing phenomena. For validation of these simulations, an experimental methodology is applied to characterize the flow physics involved with an immersed flexible flapping hydrofoil. Using a one-degree of freedom crank-shaft system, a silicone hydrofoil was actuated to flap under various kinematic conditions. The hydrofoil was subject to active plunging and passive pitching motion in both water and aqueous glycerin solutions. Phase-locked particle image velocimetry (PIV) measurements were obtained around the flapping hydrofoil. These measurements, along with force measurements using a six-axis load cell, are used to compare the results with those of the numerical simulations. By comparing the hydrofoil deformation, vortex evolution and force generation, good agreements between CFD and experimental results were observed.

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