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Ventilated Partially Cavitating Hydrofoils in Steady Flow and in Periodic Gusts JAMES KOPRIVA, ROGER ARNDT, University of Minnesota, EDUARD AMROMIN, Mechmath LLC, MARTIN WOSNIK, University of Minnesota — Experiments with the partially cavitating, low-drag hydrofoil OK-2003 have been carried out in the SAFL high speed water tunnel to study the ventilated hydrofoil behavior under steady and periodic conditions. The periodic conditions are created by a two-dimensional gust generated by two NACA hydrofoil-flaps oscillating upstream of the tested cavitating hydrofoil. The designed system allows +/-10 degrees oscillations of the flap angle of attack. A flywheel and the ability to adjust the servo-motor's PID gains allow the system to run very smoothly, with a motor RPM error as low as 0.5 percent. The motor's ability to operate up to 3500 RPM and the water tunnel's flow speed capabilities give a wide range of attainable Strouhal numbers, allowing the ability to model the desired sea wave impact. LDV has been used to analyze the generated oscillating flow showing a nearly perfect gust that can be represented with a cosine function with frequency equal to the upstream perturbation. Measurements of the lift and drag of the ventilated hydrofoil OK-2003 and its ventilation flow-rate under impact of the gust of various magnitudes and frequencies have been made and are compared with their values in steady incoming flow.

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