Effects of sweep and spanwise changing circulation applied to airfoils: a case study

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Isolated stationary airfoils of simple geometry were tested in incompressible flow in order to study the combined aerodynamic e®ects of sweep, spanwise changing circulation, and their combination. Endwall e®ects were excluded from the studies. The tool of study was computational fluid dynamics, supplemented with wind tunnel experiments involving laser Doppler anemometry and flow visualisation. The computational results suggested unloading e®ects due to leading and trailing edge sweep. A model has been proposed for the description of such e®ects. It has been rendered probable that harmonization of the sweep with the spanwise circulation gradient results in reduction of the fluid pathline length on the suction side, giving a potential for reduction of pro¯le losses.

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