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Application of the Kármán-Tsien's Method to the Flow of Compressible Fluids past Straight Cascades of Arbitrary Airfoils

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Theoretical investigations in the high subsonic flow of compressible fluids past cascades seems to attract renewed interests with the recent developments in transonic axial-flow compressors.

In this paper is given a new treatment of the flow of compressible fluids past straight cascades of arbitrary airfoils, based on the Kármán-Tsien's method. At first, the equation of continuity and the Kutta-Joukowski's condition are established by taking compressibility and stagger angle β into consideration. The analytical formulae giving the velocity distribution around the airfoil are obtained. A concrete numerical example is presented for a cascade, with the lens-shaped blade of attack angle $\alpha_1=11^\circ 08'$, stagger angle $\beta=59^\circ 25' 38''$ and solidity $t/l=1.0$, assuming Mach number $M_1=0.8$.

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