

USE OF NONLINEAR PROGRAMING METHOD FOR OPTIMIZATION OF THE LOWER PART OF AIRCRAFT WING PROFILE

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When studying the problems of profile flow around with viscous fluid Navier-Stokes mathematical model is often used. The respective algorithms developed for this model are so complicated and the errors are so grave that they become unsuitable for the problems of aerodynamics. Therefore, in practice the corresponding calculations are based on semi empirical formulas and relations. We construct the algorithm based on classical experiments and laws of mechanics. We consider incompressible viscous fluid and then using recalculation formulas, pass over to aerodynamic indices for compressible fluids. The article is based on nonlinear programming method for minimization of efficiency function – integral error consisting of kinematic conditions, boundary conditions and modified function of wing quality when integral laws of conservation of mass and energy for viscous fluids are presented in the form of limitations.

In order to demonstrate the new algorithm the problem of flow around of aircraft wing profile is presented. The upper part of aircraft wing is presented with the matrix of coordinates of profile points, while lower part is presented with cubic polynomial crossing the two given points (front and rear edges). The components of the vector field of the required speed are determined as the polynomials of two variables with unknown coefficients. The problem of determination of the lower contour of profile is stated and solved on condition of maximum quality.