

COMPARISON BETWEEN THE DRAG POLAR CURVES USING ANALYTICAL AND NUMERICAL METHODS IN CONTROLLED RADIO AIRPLANE

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ABSTRACT

This paper aims to compare the drag polar curves between numerical and analytical methods of a controlled radio airplane and identify its result at the maximum takeoff weight. It's presented a theory about Fluid Mechanics and Aerodynamics, beyond the boundary conditions and the software used in the CFD simulations. It was observed by the results that the two methods resulted in similar drag polar curves, but the curve obtained in the CFD simulations resulted values much closer in practice for small and high angles of attack. It was obtained a relative error between the C_D and C_L using the two methods below 10% for much of the speed range, beyond a relative error of the 3.5% in the prediction of the maximum takeoff weight using the numerical method and 7.9% using the analytical method, in comparison to the maximum takeoff weight obtained in flight tests. The analytical method can be used in the preliminary design, while the numerical method can be used to predict with more accuracy the C_D and C_L values and finally to result in a better prediction of the airplane performance than analytical method in conditions of the takeoff, landing and straight flight.