

AERODYNAMIC AND DYNAMIC ANALYSIS OF THE GYROPLANE MAIN ROTOR

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Abstract: This paper presents the results of aerodynamic and dynamic analysis of the main rotor of the gyroplane. This kind of vehicle is a type of rotorcraft which uses a non-powered rotor in autorotation to develop lift and engine-powered propeller to provide the thrust. The autorotation may be obtained when the air flowing through the rotor disc generate the lift force which accelerate the blades' rotation rate, until the rotor turns at a stable speed with the drag and thrust forces in balance.

The main goal of presented research was to find the range of useful flight speed and main rotor configuration to obtained the autorotation. The study was divided into two phases. The first one was dedicated only to the aerodynamic analysis of the one blades for different angle of attack, azimuth angle ψ and the rotation rate. The Figure 1 presents the C_p distribution on the one blade rotor respect to the azimuth angle. Results of analysis were used to prepare aerodynamic model of free-spin blades. The final step includes the dynamic simulation of gyroplane two blade rotor. As a results the maximum possible rotation rate versus flight speed and angle of attack were obtained.

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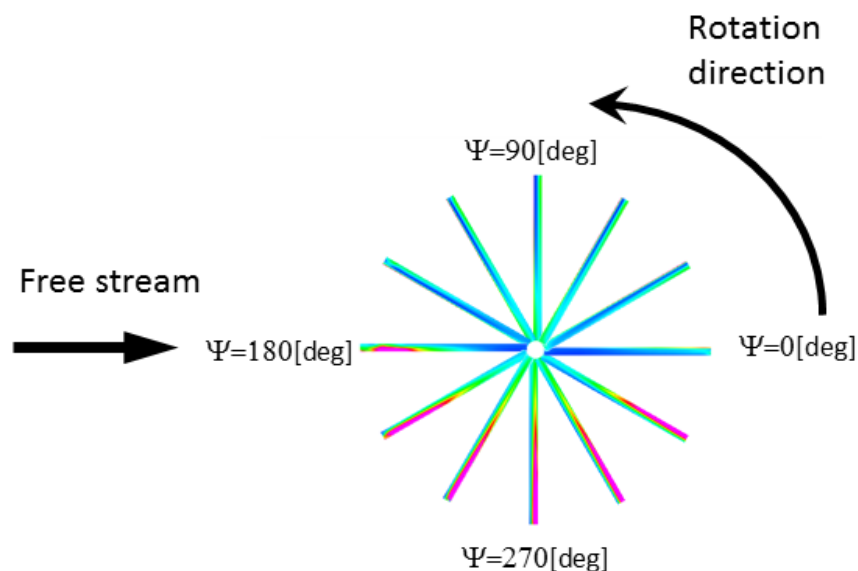


Figure 1 C_p distribution on the one blade rotor respect to the azimuth angle.