

## Helicopter performance calculation

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### Abstract

The purpose of this scientific initiation is to develop software that simulates the performance of coaxial helicopters to achieve their maximum performance, using physical concepts and numerical methods, which will make their use more versatile.

### Key words:

Performance, MatLab, Monorotor.

### Introduction

The final purpose of this scientific initiation is to develop software that simulates the performance of coaxial helicopters to achieve their maximum performance, using physical concepts and numerical methods, which will make their use more versatile. For this, it is necessary to simulate the performances of the helicopters with different types of rotors in different scenarios that involve variations of the variables involved.

For these simulations will be used simulation softwares, which are powerful tools for planning and projecting dynamic systems of various types. This is due to the efficiency provided by these softwares, related to the minimum consumption of time, money, freedom to vary parameters and different situations and possibility to compare the performance of different innovations.

### Results and Discussion

Combining the theories *Blade Element Method* and *Momentum Method*, there is a called *Combined Blade Element and Momentum Theory*. This combination allows the development of equations for the analysis of the various variables involved in a Hover flight.

Some of these equations involve: Calculation of the local flow angle; Calculation of the local sustained angle; Calculation of the power produced by the rotor.

Then, it is possible to draw graphs for analysis of the forces, coefficients and angles obtained in relation to the split parts of the blades by the blade element method.

Such results will vary based on the various flight conditions, like the chart below:

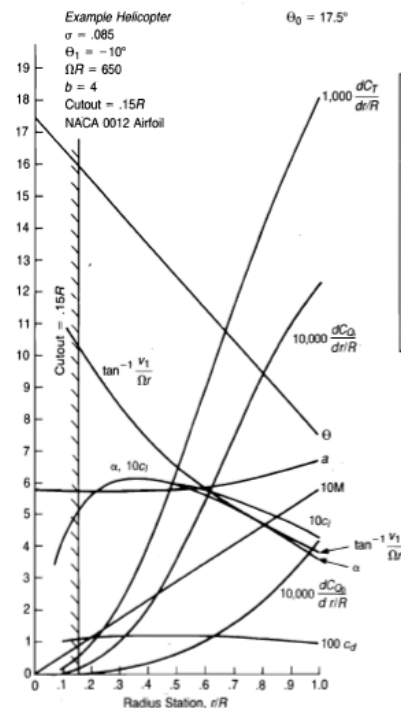


Image 1. Variables involved in hovering

### Conclusions

A bibliographic review of Hover flight for mono-rotor helicopters was first made. In this way, it deepened in the study of theories and methods like Momentum Method and Blade Element Method, which are basis for the understanding and calculation of the performance of helicopters in different types of flight. Based on this study, a MatLab program was developed to calculate the performance of the hover flight.

<sup>1</sup> Prouty, R. W. Helicopter Performance, Stability, and Control. Malabar, Florida: Krieger Publishing Company, INC. (1995)

<sup>2</sup> Johnson, Wayne - Helicopter Theory. Princeton, New Jersey. (1980)

<sup>3</sup> Seddon - Basic Helicopter Aerodynamics. (1990)