MSc in Computational Software Techniques in Engineering

CFD Flight Performance Investigation of the Latecoere 1928 Aircraft

INTRODUCTION

This thesis presents a flight performance investigation of the Latecoere 28.1, a French aircraft dating from 1928. Computational Fluid Dynamics was the means of study used. ICEM was the software used to generate any grid, and FLUENT the solver applied.

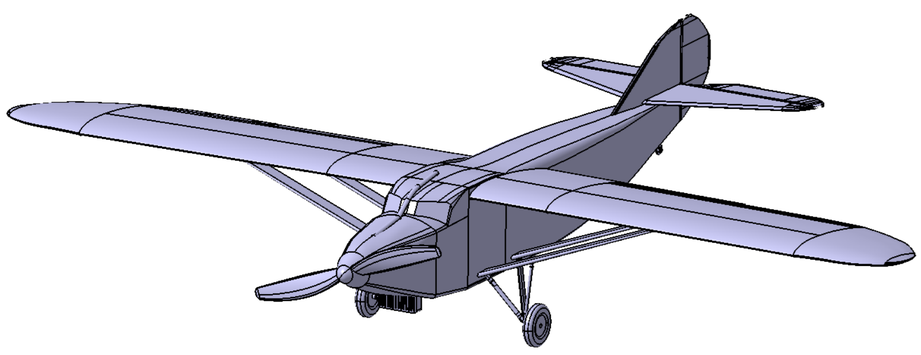

Figure 1: Latecoere CATIA model

AIMS AND OBJECTIVES

No trace of any aerodynamic study of the aircraft has been found to this day, dating from its original construction or later. Thus, it has been proposed to Cranfield university to study it, in order to gain an insight of its performance through CFD simulations. This project will investigate the aerodynamic coefficients such as lift and drag compared to a NACA 0012 airfoil.

CFD STUDIES

The lift and drag coefficients were the values evaluated through three studies, thanks to two turbulence models used: the Spalart-Allmaras and the SST k-ω ones.

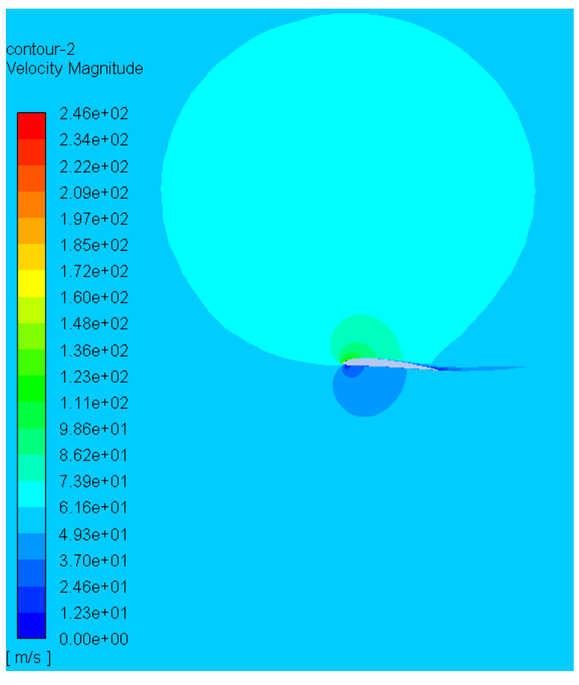

Figure 2: Latecoere airfoil velocity contour: α = 8 degrees

The results of the NACA 0012 airfoil study confirmed the accuracy of CFD, showing similarities with experimental results. The Latecoere airfoil study allowed to determine that the C_L curves slopes were the same as the NACA 0012 ones, and that the airfoil 0 C_L α was situated between -7 and -8 degrees, due to its cambered shape.

Finally, the results from the aircraft wing study allowed to obtain a new information: the position of the stall angle of the wing, found to be reached at an angle of attack of nearly 10 degrees. C_L and C_D results were found to be consistent with respect to the two previous studies led: the wing C_L curves have a less important slope than the aircraft airfoil C_L curves, which is due to the difference of geometry between the airfoil and the wing, the latter being more inclined to the production of drag.

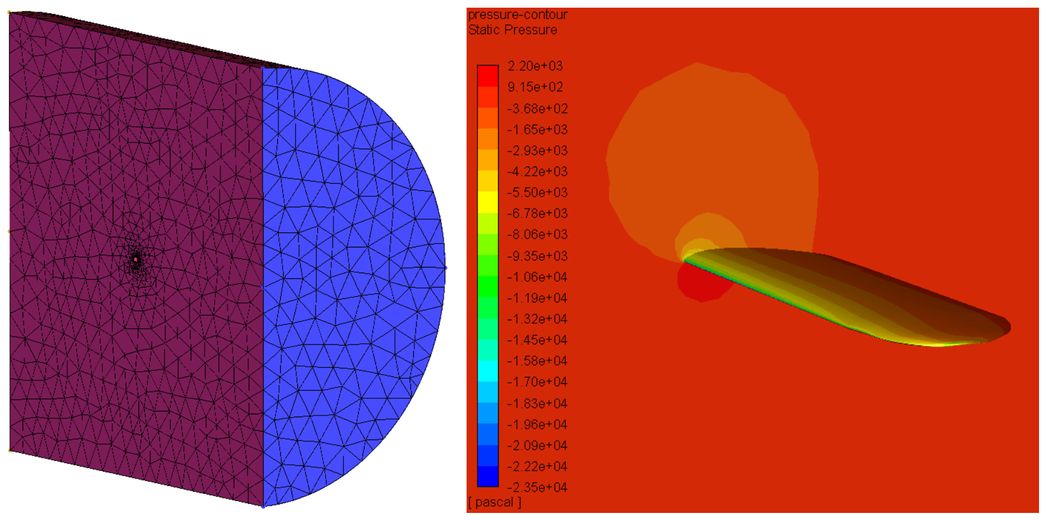

Figure 3: Wing Medium grid and pressure contour: α = 10 degrees

C_L VS α CURVES RESULTS

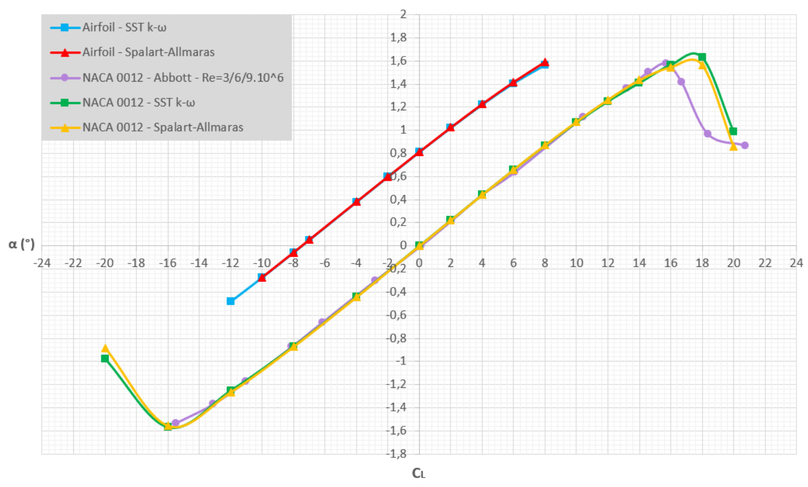

Figure 4: Latecoere airfoil C_L vs α curves

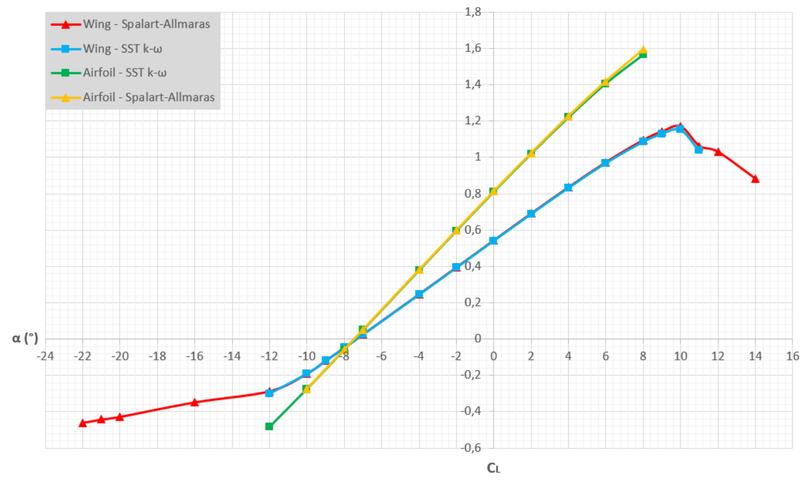

Figure 5: Latecoere wing C_L vs α curves

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