

Numerical study of an airfoil interacting with the vortical wake of an upstream cylinder

Raj Solanki

B.Tech. II Year

Department of Mechanical Engineering

National Institute of Technology Karnataka, Surathkal, Karnataka, India

ABSTRACT

The present study numerically investigates two-dimensional flow of air past a circular cylinder to the freestream followed by an airfoil at a variable distance. A vortical environment is created using a circular cylinder, and changes in flow direction are simulated using an NACA0012 airfoil. The vortical flow passed a pitching airfoil is analyzed numerically at different ratios of the gap to the cylinder diameter. The flow behavior is presented in terms of the numerical contours of velocity field, turbulence intensity, and vorticity downstream of the airfoil. The properties of the numerical study such as parameters are listed below along with the figure of study. We can use pimpleDyMFoam, as dynamic mesh is there, and for turbulence we'll include it's model.

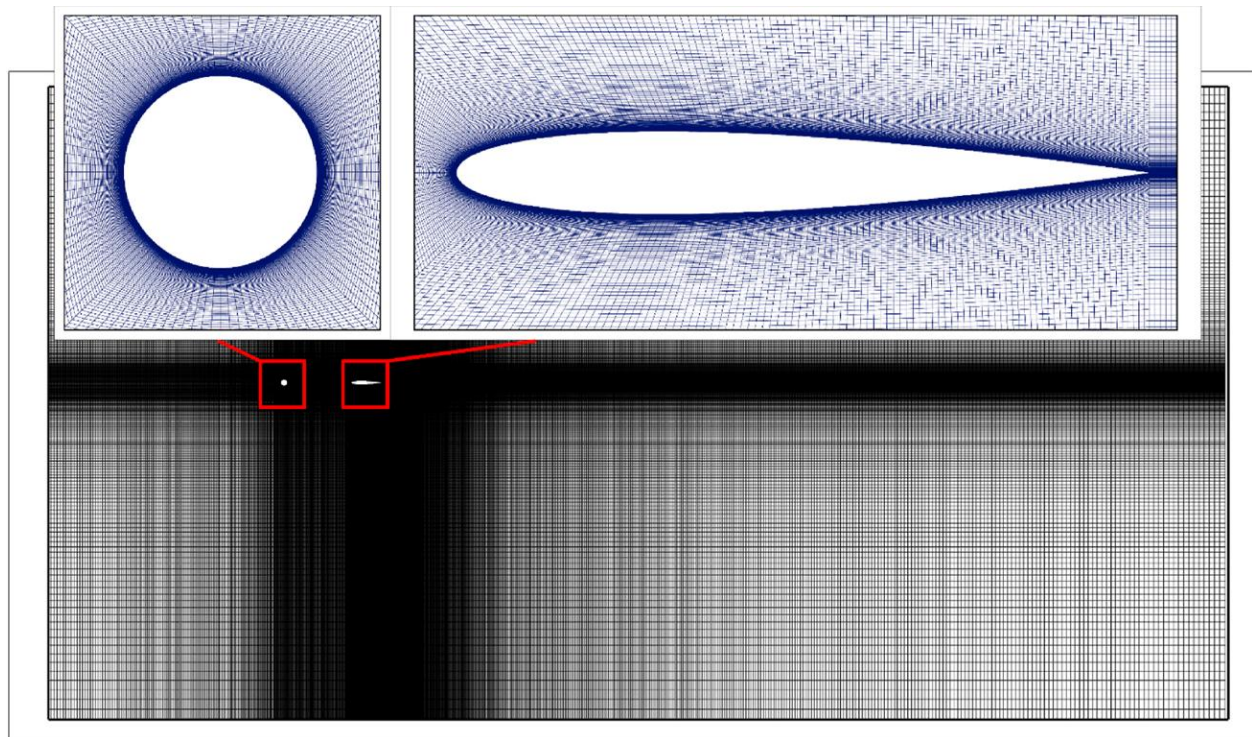


Figure1: Mesh generated around the cylinder and the pitching airfoil (Referred from the paper)

Table-1:- Details of geometry and flow conditions

Geometry details	Cylinder diameter = 25mm
	airfoil chord $C = 5.28D = 132$ mm
	Freestream velocity $U = 11.06$ m/s
	Re(c) 100000 Re(D) 19250
Gap	2D, 6D, 10D

References:

Mehdi Pouyan Rad, Abdolamir Bak Khoshnevis. *Experimental and numerical study of a pitching airfoil interacting with the vortical wake of an upstream cylinder*. Ocean Engineering, [Volume 322](#), 1 April 2025, 120559