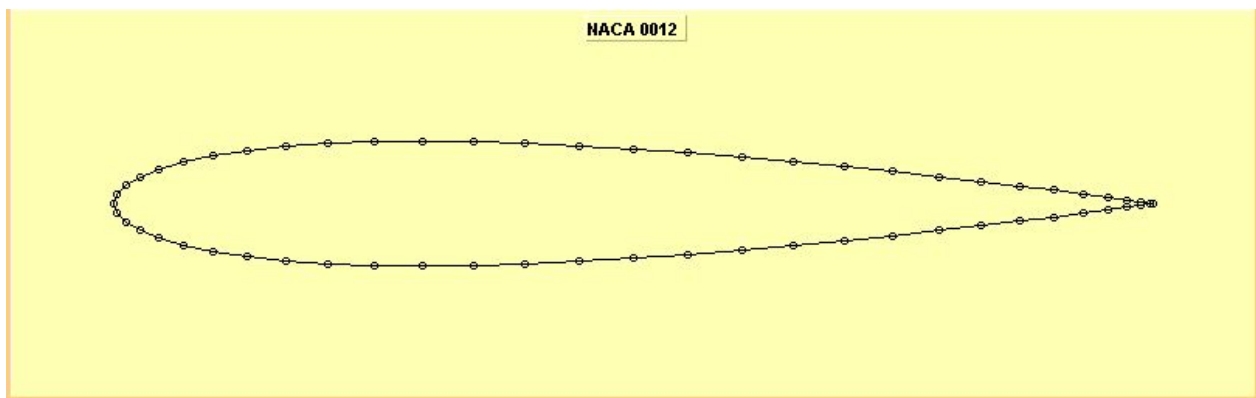


## ABSTRACT

In this study we will try to model single Dielectric Barrier Discharge(DBD) plasma actuator in steady state actuation of voltage. We will implement this over an airfoil NACA 0012 using Gmsh and OpenFOAM. This project aims to reduce the drag over the airfoil. The 60% of the fuel consumption is due to the aerodynamic drag of the body. Using plasma actuator will reduce the drag which will result in reduction of total fuel consumption. The application of this is not only limited to wings, this can be implemented in blades of windmill, car-spoilers, vortex generator etc.

## PROBLEM STATEMENT

Study of steady state turbulent flow over NACA 0012. Use coordinate file generated by JavaFoil as shown in the Figure 1. Use  $k-\omega$  turbulence model. Calculate the aerodynamic coefficient with and without plasma actuator at different angle of attack, along with the reduction in total drag force.



**Figure.1:**Diagram of NACA 0012 generated by JavaFoil

### Simulation Conditions:

$P = 1 \text{ atm}$

Freestream velocity( $U$ ) = 43.822 m/s; ( $Re=3e6$ )

Density = 1.225 kg/m<sup>3</sup>

$\mu = 1.7894e-5 \text{ Pas}$