# *Design of blades*

Blade design (turbine, fan or naval propeller blades) is a multidisciplinary design problem involving two domains, fluid and solid.
In this report, I want to show how to design naval propeller blades, once the fluid dynamics of the propeller is known.
Following this approach, one has to start from the requirements of the propeller (power, mass flow rate, etc..) and to solve for the fluid dynamics of the problem (making the correct assumptions); then, after the fluid dynamics analysis, the triangles of velocity and all other geometrical details of the blades are known.
Therefore, if the geometry is known, the mechanical design of the blades is possible, and a coupled simulation of the fluid-solid interaction is not required.

1) Design of a blade: The knowledge of the geometry of a single blade at a given radial position (taken from fluid dynamics analysis), integrated with a prescribed description of the camber line and of the thickness distribution (from NACA archives), permits to track the section of the blade at a given position.
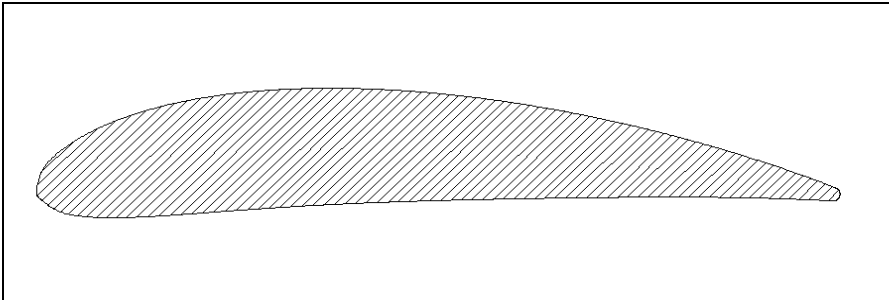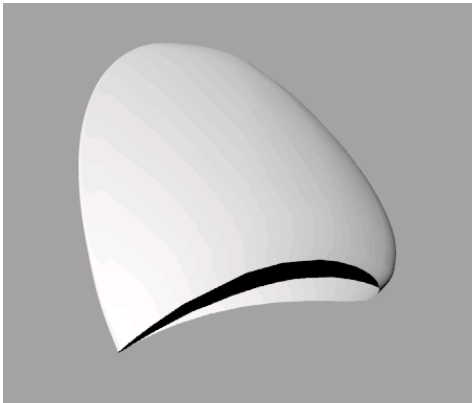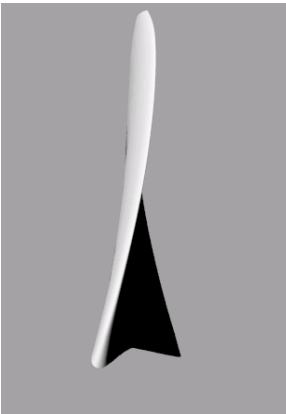

2) Repeatition of this procedure for each value of the radial position, with the right inclination with respect to the flow, gives the following result (where the profiles have common leading edges):
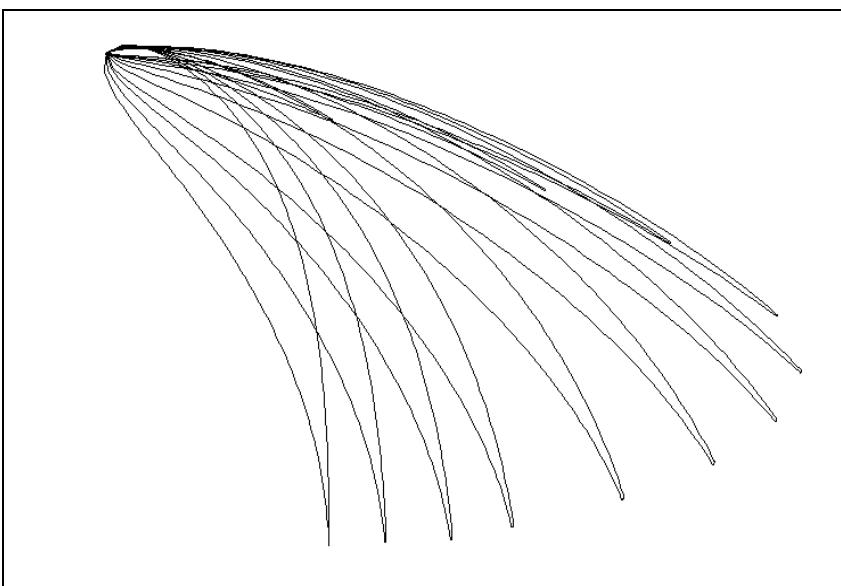
3) Then, stacking the profiles with respect to a common center (simmetry line):
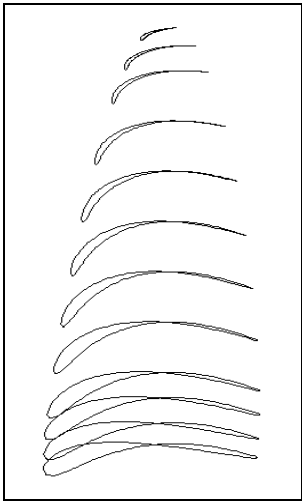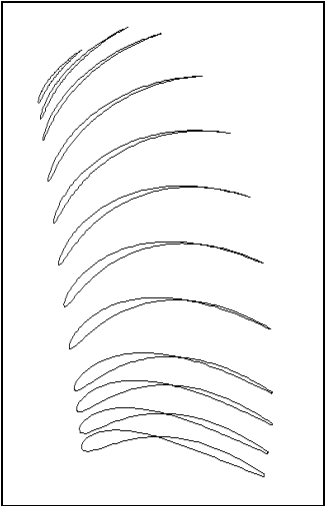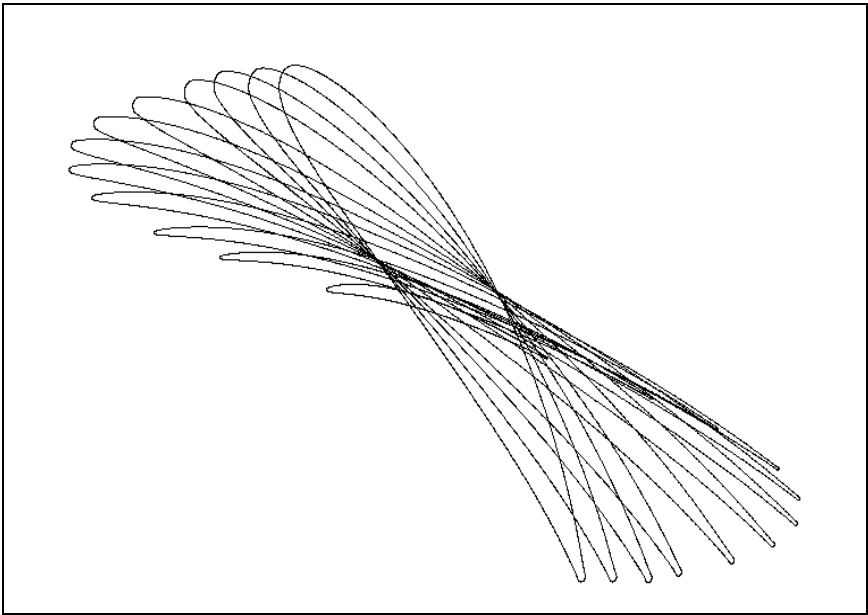
4) It is now possible to obtain 3-D rendering of a single blade

5) Then the assembly of each single blade into the whole propeller is possible, and an example of such an operation is shown: