2022

ENGSCI 344 Tutorial 2 – Geometry

Part 2 – Geometry import, repair and creation

A cylindrical spar (spar.adgb) and two .dat files are provided on Canvas for this tutorial.

The cylindrical spar provided can be used as an initial spar geometry for the project. The two .dat files contain sets of points of the airfoil cross-section that you will be using for the project.

You need to import the spar and the points into Design Modeler and use those as the basis to build the overall wing geometry. This includes a spar, five ribs, and the surfaces covering the top and bottom of the wing (as in Figure 1, but with surfaces along the full length). The surface of one spar will also be used to define the geometry for the aerodynamic modelling.

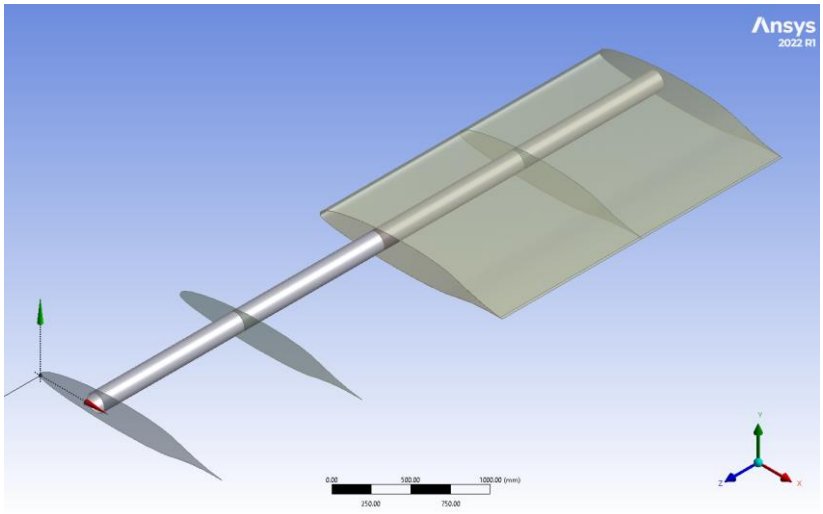


Figure 1. Wing Geometry

Various Ansys tools that may be useful are mentioned at the end of this document.

To begin, create a geometry template from the Component Systems section. Open Design Modeler from the template. Then,

1. **Rib geometry creation and repair:**

Import both sets of points into DesignModeler using some of the tools mentioned at the end of this document (the points are in meters).

Create curves over the points, move the curves to their correct position relative to each other (moving the leading edge of the airfoil to the origin will help you define additional coordinate axes easier), and complete the geometry. Note that the points provided do

not completely define the shape, so some repairs or additional geometry may be required.

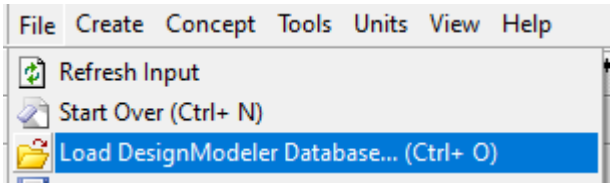
Create a surface model of the airfoil shape and export it as an .adgb file. This geometry will be used for both the aerodynamic and structural models.

Create a domain around the airfoil surface for the CFD analysis, thinking about how the domain size can be later changed if needed.

Save the Aerodynamic model geometry.

2. **Build the structural geometry:**

Import the spar into DesignModeler (File > Load DesignModeler Database).



Using the surface geometry of the rib (import the airfoil surface model into DesignModeler), duplicate the geometry and move the copies to the correct positions along the full length of the wing.

Move the spar it so that it intersects the ribs where the airfoil thickness is largest. Then modify the geometry such that the spar and the ribs form a single part – think about how this can be done in a way that its dimensions can be easily changed, and how it should intersect with the ribs

Optional: You can add a skin to the wing for the structural analysis.

Useful Tools:

General:

The project description document.

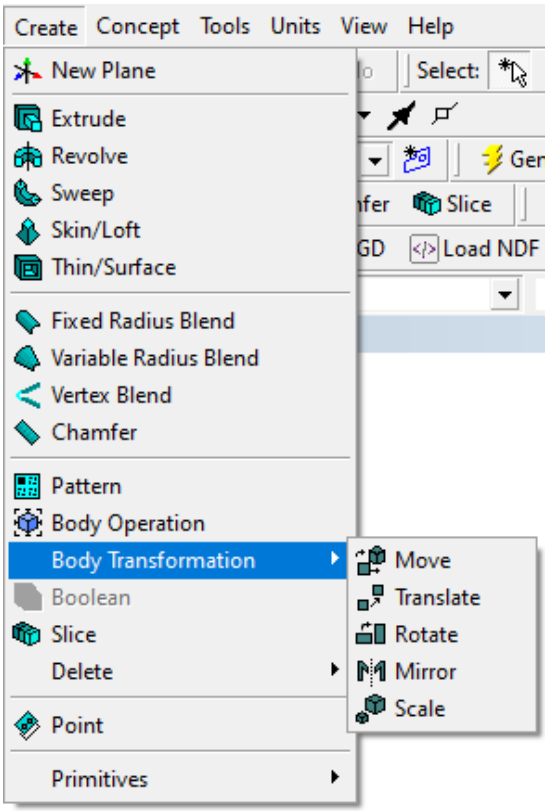
Undo/Redo are useful commands.

Initial geometry creation and repair:

Import the points using the 3D Curve option (Concept > 3D Curve > Definition > From Coordinates File > Import the .dat files).

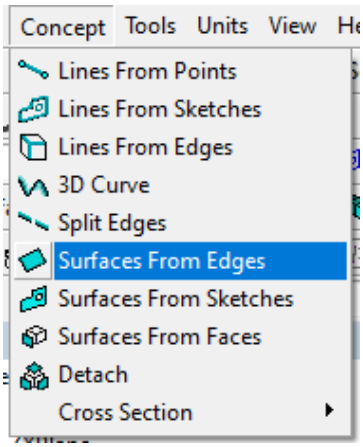
Details View	
Details of Curve3	
Curve	Curve3
Definition	From Coordinates File
Coordinates File	Not selected
Coordinates Unit	Meter
Base Plane	XYPlane
Operation	Add Material
Refresh	No
Merge Topology?	No

Create>Body Transformation to move the curves to create a complete geometry



Airfoil rib geometry:

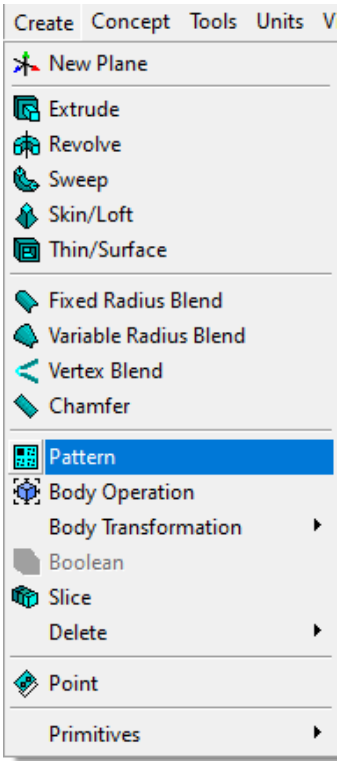
Concept > Surface from Edges to create a surface from the 3D curves generated earlier.

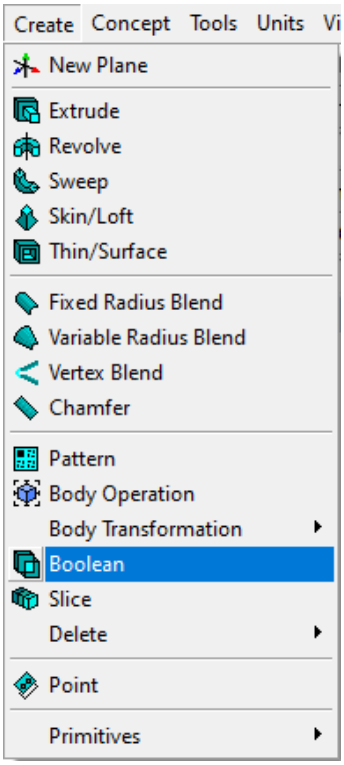


Structural model:

Create > Pattern to create multiple ribs.

Create > Boolean is useful while creating the wing with the spar.





Optional:

Create > Boolean is useful while creating the wing.

Extrude and Skin/Loft. These commands are helpful in creating the skin of the plane wing.