# Supersonic Flow Over a Wedge - Legacy Geometry Tutorial

Created using ANSYS 15.0

Note: There is an updated tutorial using ANSYS SpaceClaim 19.2 located here.

## Set Up

First, we need to specify that the geometry is 2-dimensional. Right click the Geometry box 2 Geometry and select ***Properties*** . This will open the *Properties of Schematic A2: Geometry* Window. Under *Advance Geometry Options* change ***Analysis Type*** from ***3D*** to ***2D*** .

| | A | B |
|---|---|---|
| 1 | Property | Value |
| 2 | General | |
| 3 | Cell ID | Geometry |
| 4 | Geometry Source | |
| 5 | Geometry File Name | |
| 6 | Basic Geometry Options | |
| 7 | Solid Bodies | ☑ |
| 8 | Surface Bodies | ☑ |
| 9 | Line Bodies | ☐ |
| 10 | Parameters | ☑ |
| 11 | Parameter Key | DS |
| 12 | Attributes | ☐ |
| 13 | Named Selections | ☐ |
| 14 | Material Properties | ☐ |
| 15 | Advanced Geometry Options | |
| 16 | Analysis Type | 2D |
| 17 | Use Associativity | ☑ |
| 18 | Import Coordinate Systems | ☐ |
| 19 | Import Work Points | ☐ |
| 20 | Reader Mode Saves Updated File | ☐ |
| 21 | Import Using Instances | ☑ |
| 22 | Smart CAD Update | ☐ |
| 23 | Enclosure and Symmetry Processing | ☑ |
| 24 | Mixed Import Resolution | None |

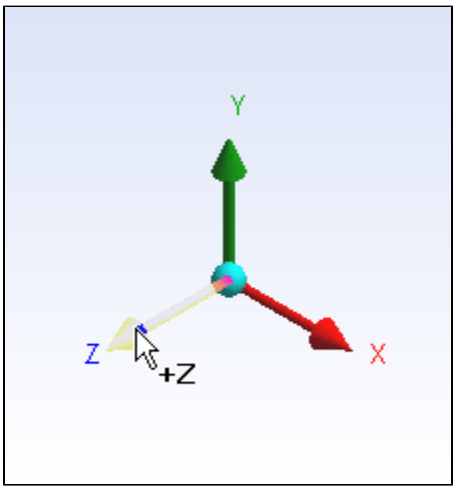
After the analysis type has been set, we are ready to launch Design Modeler, the geometry engine in ANSYS. Open Design Modeler by double clicking the geometry box 2 Geometry. After launching Design Modeler, you may be prompted to choose standard units. Select ***Meter*** as the standard unit, and click ***OK*** .

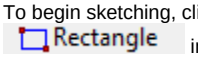
## Turn On Auto Constraints

In some versions such as ANSYS 15.0, Auto Constraints is not turned on by default. Turn on Auto Constraints by following these instructions. Otherwise, the points and lines you create for the geometry will not lie exactly on the coordinate axes which can cause problems later on.

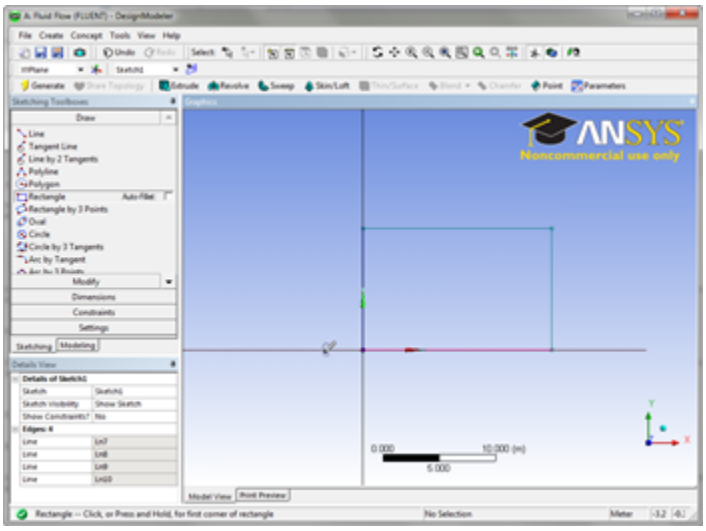
## Sketching

We want to sketch on the XY plane. To look at the XY plane, click the positive Z-Axis on the compass in the *Graphics* window.



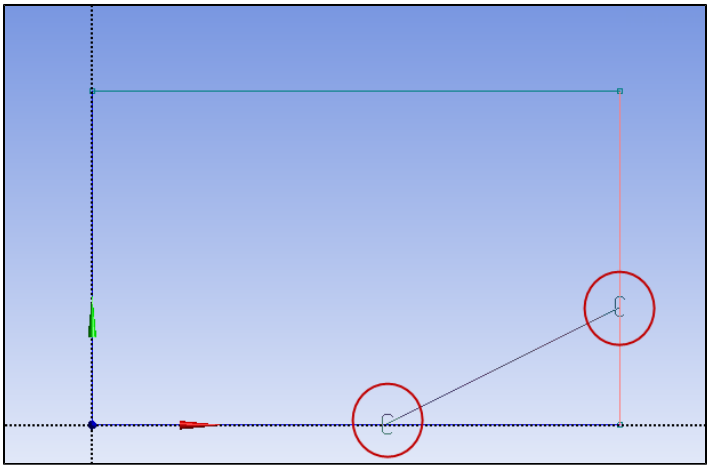

To begin sketching, click on the ***Sketching*** tab in the *Tree Outline* window. To draw our domain, we will use the Rectangle tool. Click on 

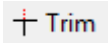
in the *Sketching Toolboxes* window. In the graphics window, draw the rectangle by first clicking on the origin (make sure the P icon is showing, meaning you are in fact selecting the point), then select a point in the 1st quadrant.



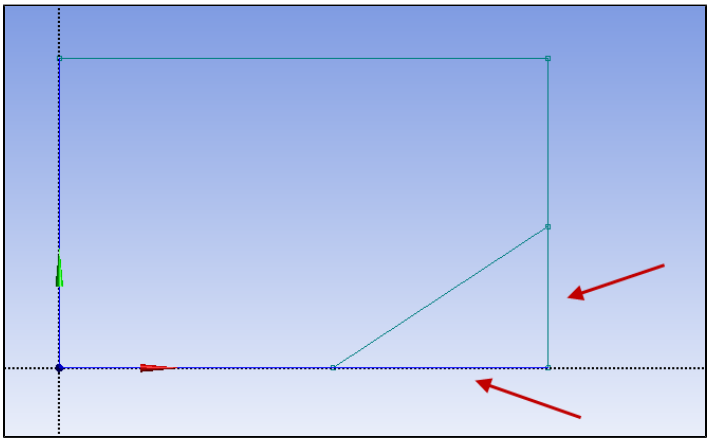

Now, we need to draw the wedge outline in the geometry. We will use the line tool to create the wedge. Select the line tool in the *Sketching Toolboxes* wind ow. 

Click on the points shown in the below figure. Make sure the "C" is showing.

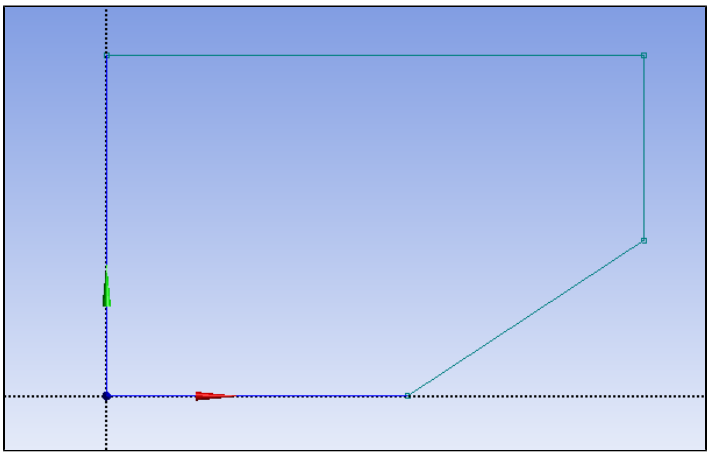


Now, we need to remove the extraneous lines that we created. In the *Sketching Toolboxes* window, click the ***Modify*** tab, and select 

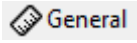
. Next, trim the lines indicated by the figure below



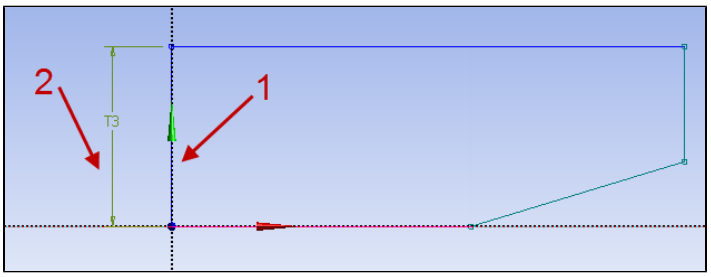
The final sketch should look like the image below



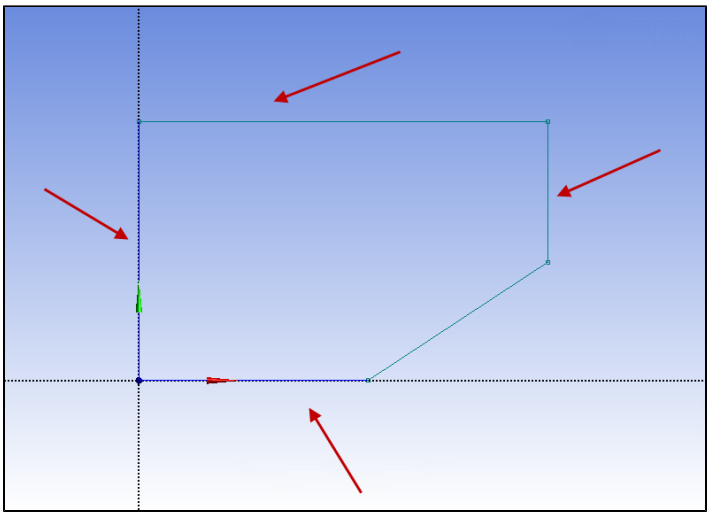
## Dimensions

Next, we need to add the dimensions for the geometry. In the *Sketching Toolboxes* window, select the ***Dimensions*** tab. Next, select the general dimensioning tool 

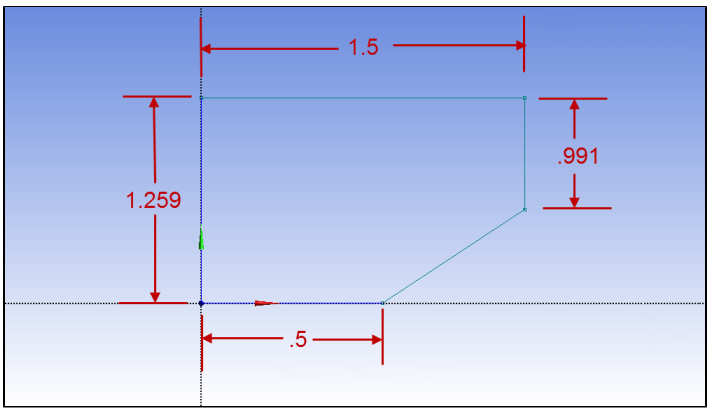
. To create a dimension, you first select a line. This will create a dimension for that line. Next, you will need to place the dimension next to the line. See the image below for guidance.



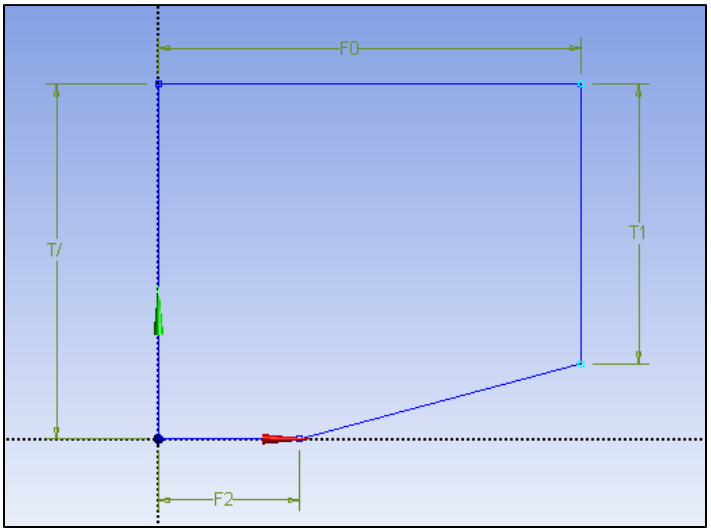

Next, create dimensions for the following 4 lines:



In order to add magnitudes to the dimensions, look to the *Details* window. You will see 4 dimensions that have been specified. Click on a dimension magnitude, and notice that the corresponding dimension will be highlighted in the graphics window. Use the following diagram to add the dimensions to the geometry.

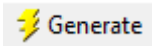



When the dimensions have been correctly applied, the geometry should look like this:

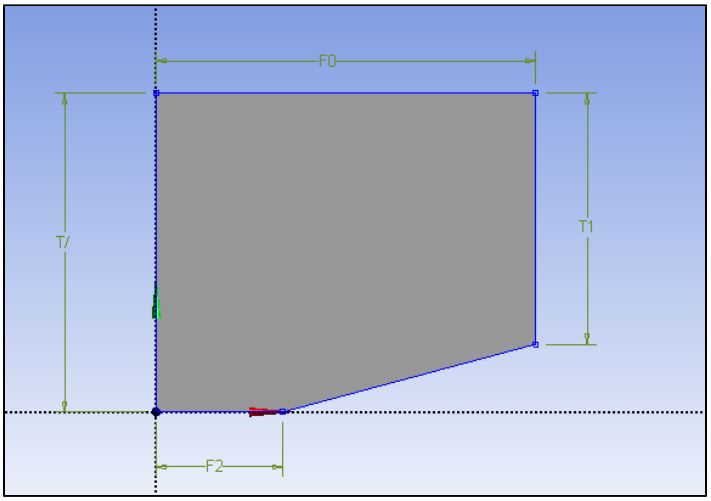



## Create Surface

Next, we need to create a surface from the sketch. In the menu tool bar, select **Concept > Surface from Sketches** . In the graphics window, select any line of the geometry.

Next, in the details window, select ***Base Objects > Apply*** . Finally, press 

. The geometry should now look like the figure below.

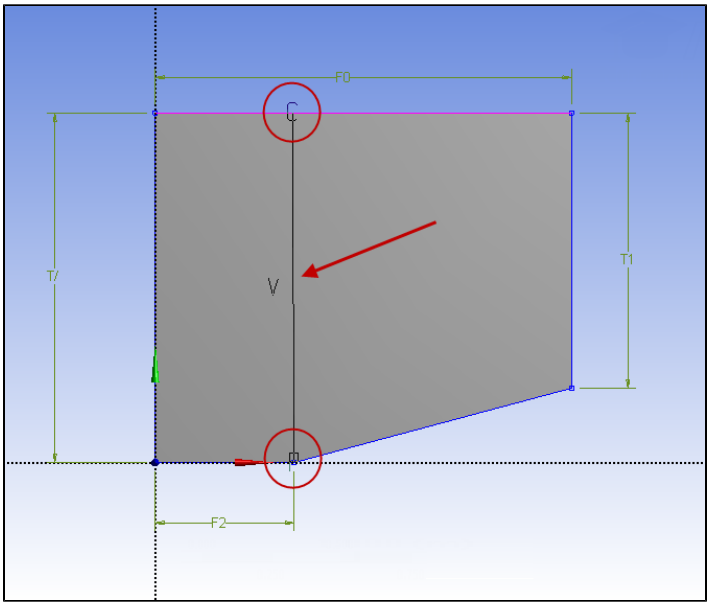


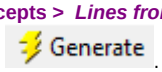

## Create a projection

Now, we want to project the center vertical line onto the surface body we just created. This will help us with our mesh. In the menu bar, select ***New Sketch*** i con to create a new sketch


This will create a new sketch. In the *Outline* window, return to the *Sketching* tab. Again, select the 

tool. Draw a line from the vertex of the wedge to the top of the geometry. Make sure that when you click a vertex, a "P" appears (meaning point, constraining the line to the vertex), a "V" appears on the line (meaning vertical, putting a vertical constraint on the line), and a "C" appears when you click on the top line (constraining the newly created line to the top line). Right before you make your second click to define the line, make sure it looks like this:




The line will turn dark blue if you have done this correctly (meaning the line is fully constrained) Now, we need to create a line body from this sketch. In the menu bar, go to **Concepts >** ***Lines from Sketches*** . In the graphics window, select the line you just drew. In the *Outline* window, select ***Base Objects > Apply*** . Finally, press 

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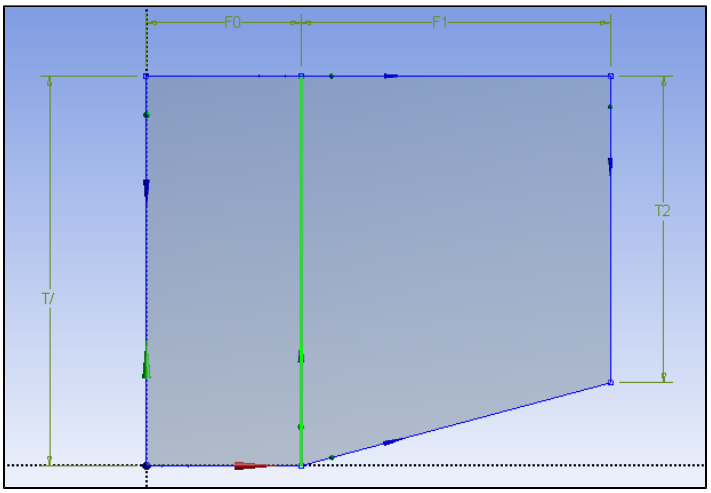
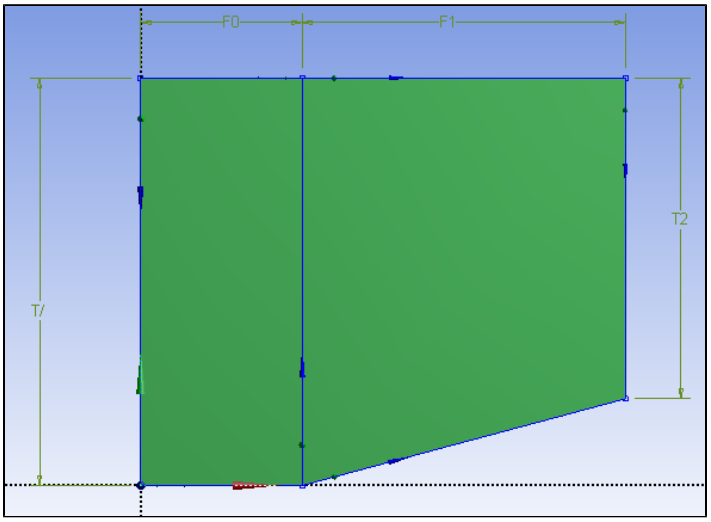
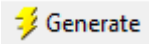
Now we are ready to project the line on the surface. In the menu bar, go to ***Tools > Projection***. First, you will need to select an edge. Select the middle vertical line we just created. In the *Details* window, select ***Edges > Apply.***

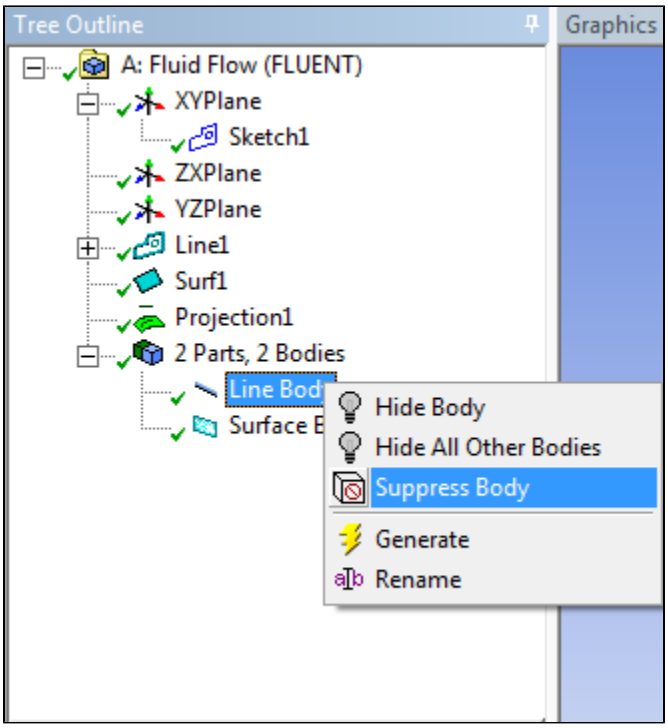



Next, we need to select the surface body for the projection. In the *Details* window, select ***Target*** , then select any point on the surface body.




In *Details* window, select ***Target > Apply*** . Finally, press 

. The line should now be projected on the surface. Now that we have the surface and the projection, we no longer need the line body we first created. In the *Tree Outline* window, Expand ***2 Parts, 2 Bodies*** . Right click ***Line Body*** and select ***Suppress Body.***




### Change type to "Fluid"

Under "Tree Outline", select "Surface Body". Then set the type "Fluid/Solid" to Fluid.

### Save Project

Save the project using *File* > *Save*. Call the project *wedge*, This will create two entities: a file called *wedge.wbpj* and a folder called *wedge_files*. You will need both entities to resume the project. After the session, you can save these on a flash drive.

Close Design Modeler.

## Go to Step 3: Mesh

## Go to all (ANSYS or FLUENT) Learning Modules