# Zep-CAD User Guide V1.0

Overview of Software

The Zep-CAD software utilizes a Python based Computer Aided Drafting program to create initial layouts of a rigid body Zeppelin airship. It is the first step to testing different configurations of airship and for determining if the structure and location of design elements is aesthetically pleasing and proportionate. The software takes numeric input and draws in 3-dimensions the main envelope of the Zeppelin, the gondola external to the envelope, engine pods, and stabilizing fins. Through successive redraws and additions of engine pod and fin locations, many different configurations and dimensions of elements can be modeled.

Main View and View Controls-

Below is a screenshot of the main view.
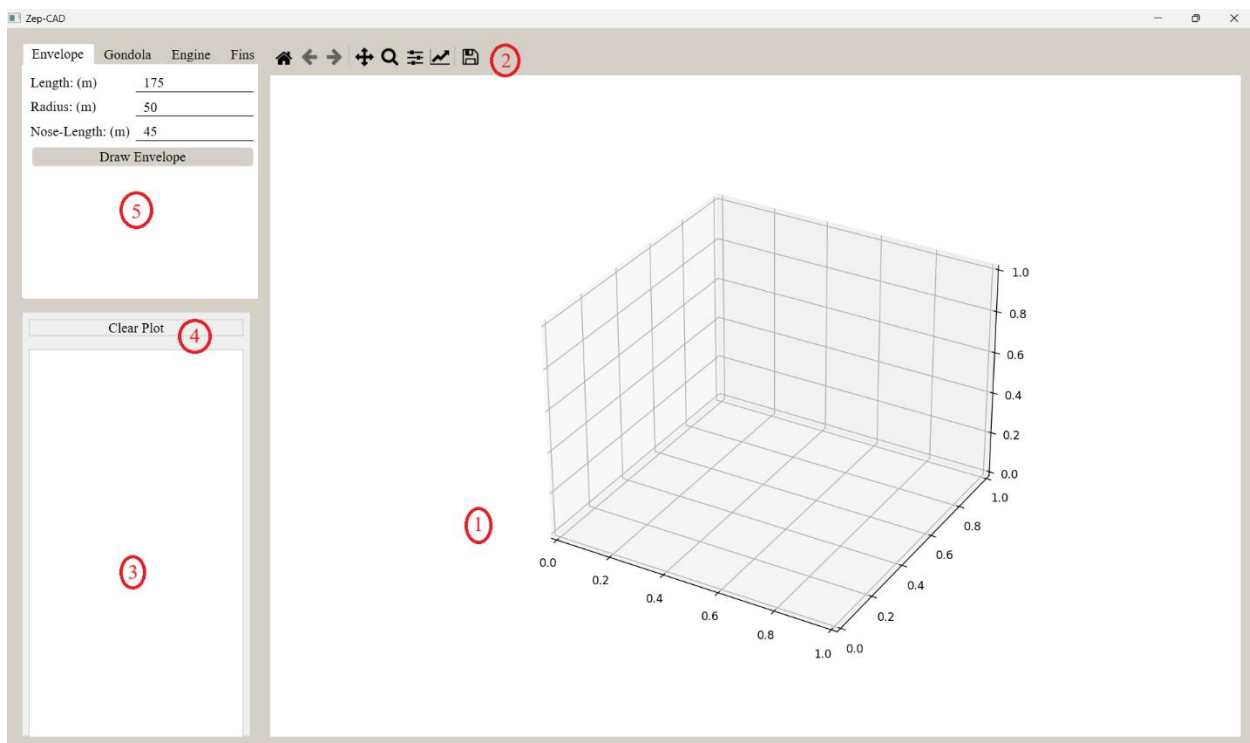
It is divided into several areas, all are interactive. The right side and largest portion of the interface is the main view window (Red Circle 1). It shows the xyz-coordinate axes and is rotatable by left-clicking on the view and moving the mouse around. Zoom and pan controls are located on the upper left hand side of the main view (Red Circle 2). The magnifying glass zooms in to a selected box area and the four arrows will pan the view. The forward/back arrows will cycle through the different views selected and the house button,

'home,' will revert the view to the original orientation and zoom level. The small diskette button will save a copy of the current viewpoint as a static image file. The left side of the main view contains the program message box on the bottom of the left hand column (Red Circle 3). Message pertaining to construction or exceedance of tolerances are show here. A scroll bar is provided if the length of the out put becomes longer than the screen limits. Above the message box is the 'clear plot' button (Red Circle 4). This button will remove all plots form the main view screen. In the upper left hand corner (Red Circle 5), the tabs used to input and build the Zeppelin are ready for input.
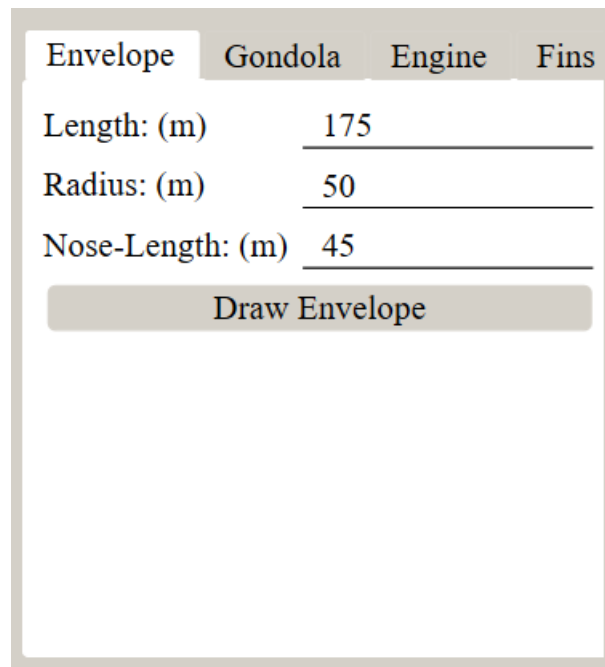
Tabs-

There are four tabs for creating the Zeppelin model; Envelope, Gondola, Engine, and Fins.

| Envelope | Gondola | Engine | Fins |
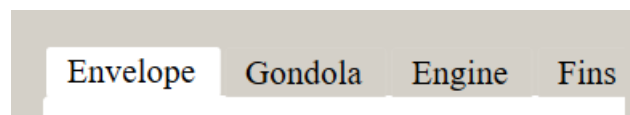
Each tab will display the details of the inputs required to build the element of the Zeppelin

Envelope-

The envelope Tab shown below takes the inputs for creating the envelope of the Zeppelin.

| Envelope | Gondola | Engine | Fins |

Length: (m)   175

Radius: (m)   50

Nose-Length: (m)   45

Draw Envelope

Length is the measure from the nose to the end of the rigid body. This overall dimension will define how long the Zeppelin will be. The Radius of the central body is measure from the centerline of the envelope, aligned with the x-axis in the model, to the outer most edge of

the envelope at its largest point. The Radius is measured along the z-axis in the model. The Nose-Length is how far from the nose and tail of the Zeppelin the control points for the taper in the main envelope are places. A larger value results in a pointy envelope! The values should be input as integers and are in units of meters.

Once all the values are input, press the "Draw Envelope" button and the program will compute and display an envelope with the specifications entered. An example envelope is shown below!
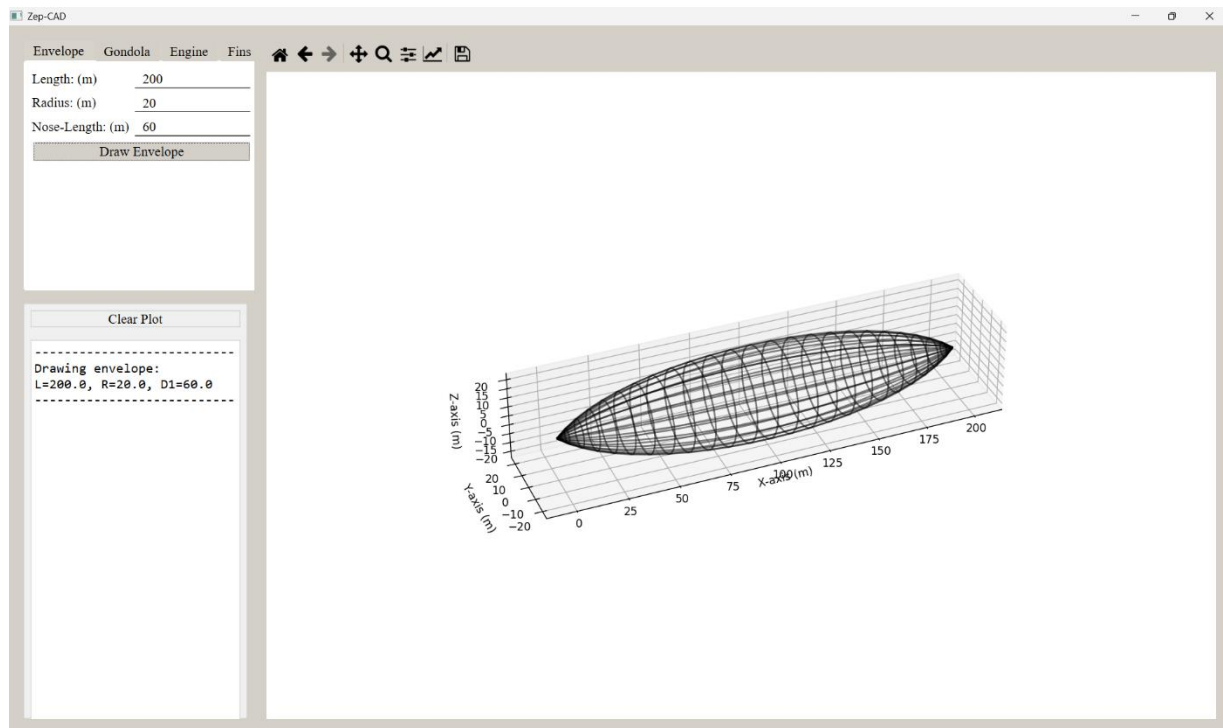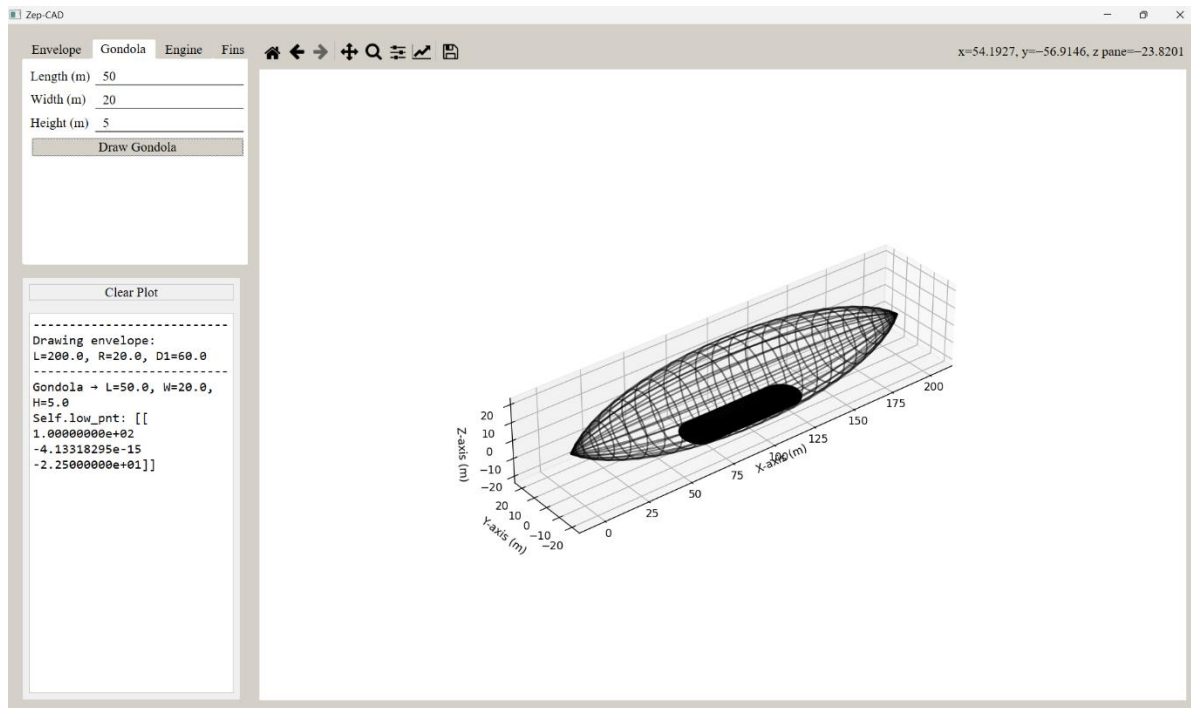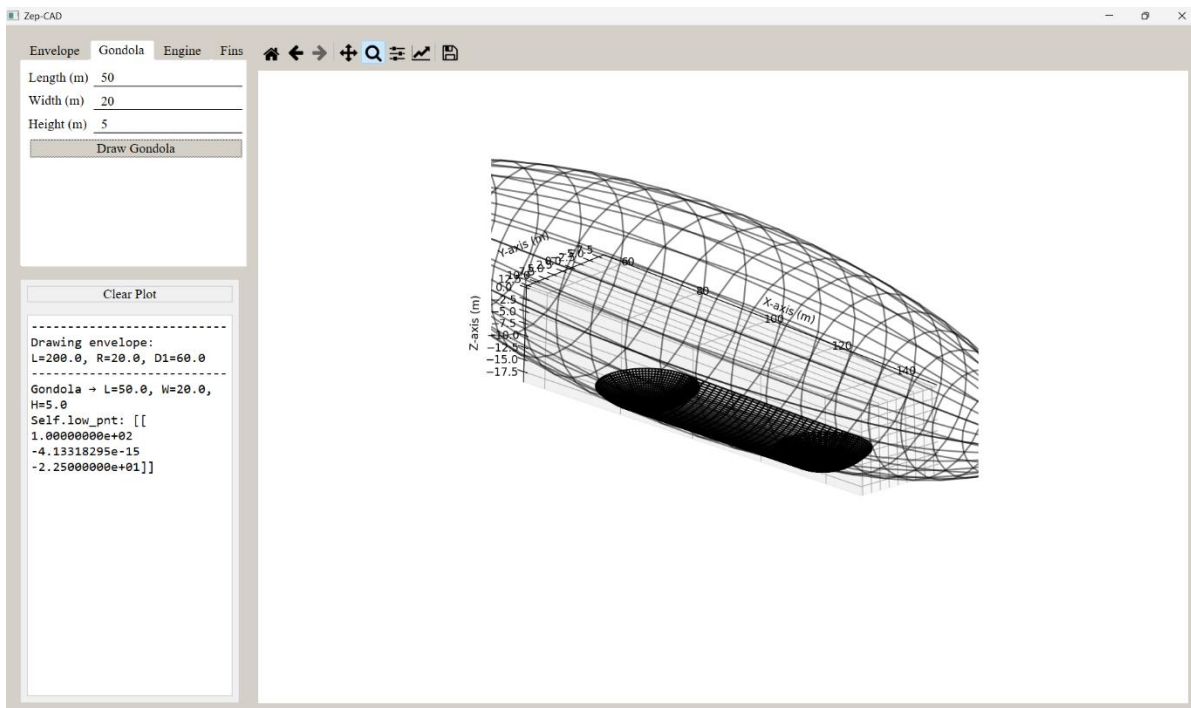

Gondola-

The centrally located Gondola section is built from the inputs on this tab.

Length, Width, and Height are simply the dimensions of the centrally located gondola under the main envelope.

A zoomed in view of the gondola is helpful to see the details.

The gondola is left off the other example plots for clarity of the plot.

Engine-

The Engine Tab is where the engine values are set and plotted, there are 4 values that can be set for the construction of the engines. The values can be entered as decimal meters and the final 'percent' value entered in whole number, not decimal values (i.e. 50% would be entered as 50, not 0.5 which would be one-half percent).

Engine Length is the front to back distance of the engine pod, the radius is measured from the center of the engine pod. The taper value sets how 'rounded' the pod is drawn. "Percent Aft of Nose" is how far along the envelope the engine pods will be drawn. Once the values are entered to your satisfaction, press the "Draw Engine" button and the program will display the engines in the Main View as shown below!
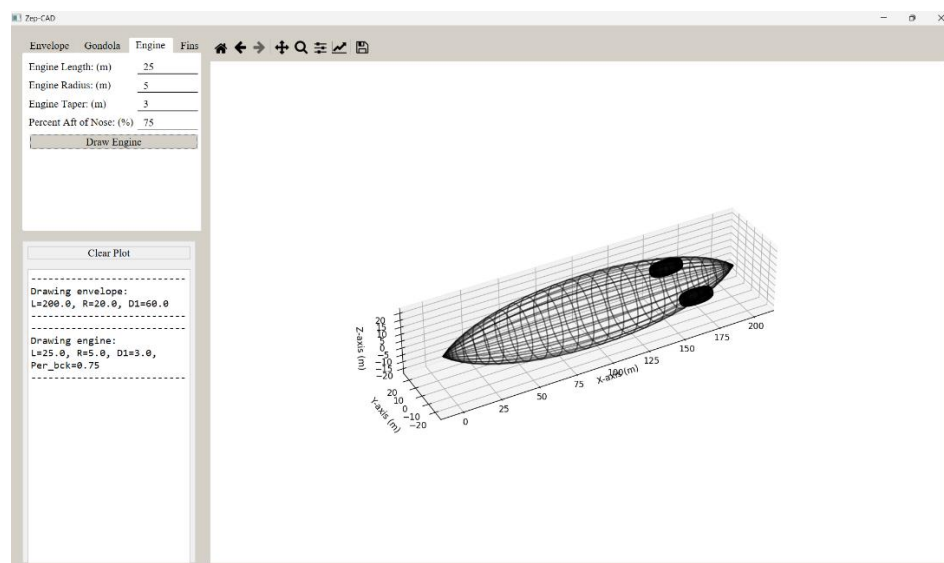
Additional pairs of engines can be drawn by adjusting the previously entered values and then clicking on the "Draw Engine" button again! In the view below, the Percent Aft has been changed to 50 and another set of engines plotted.
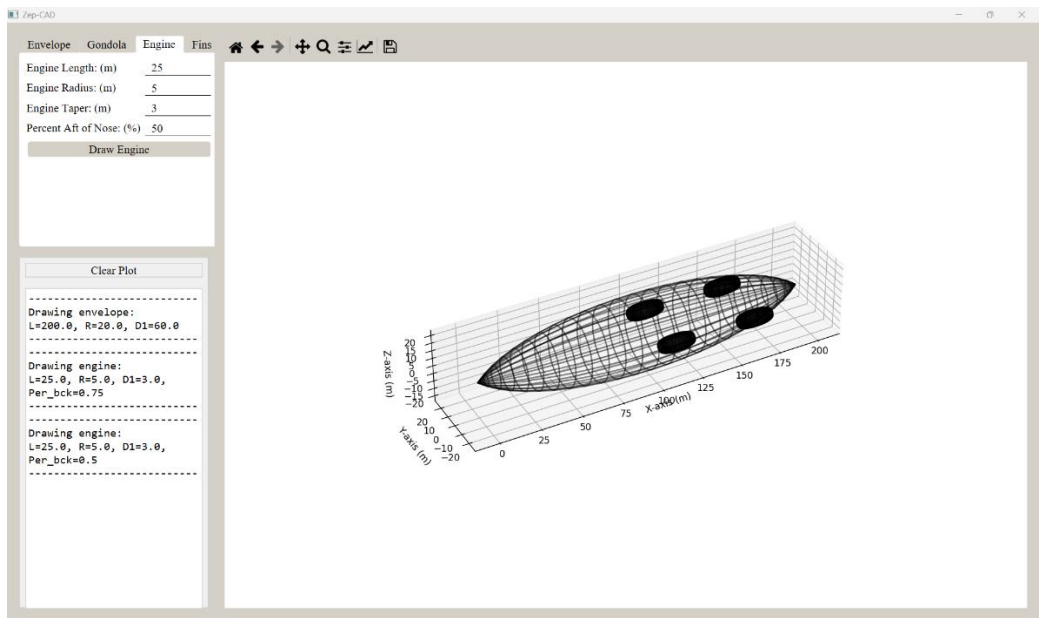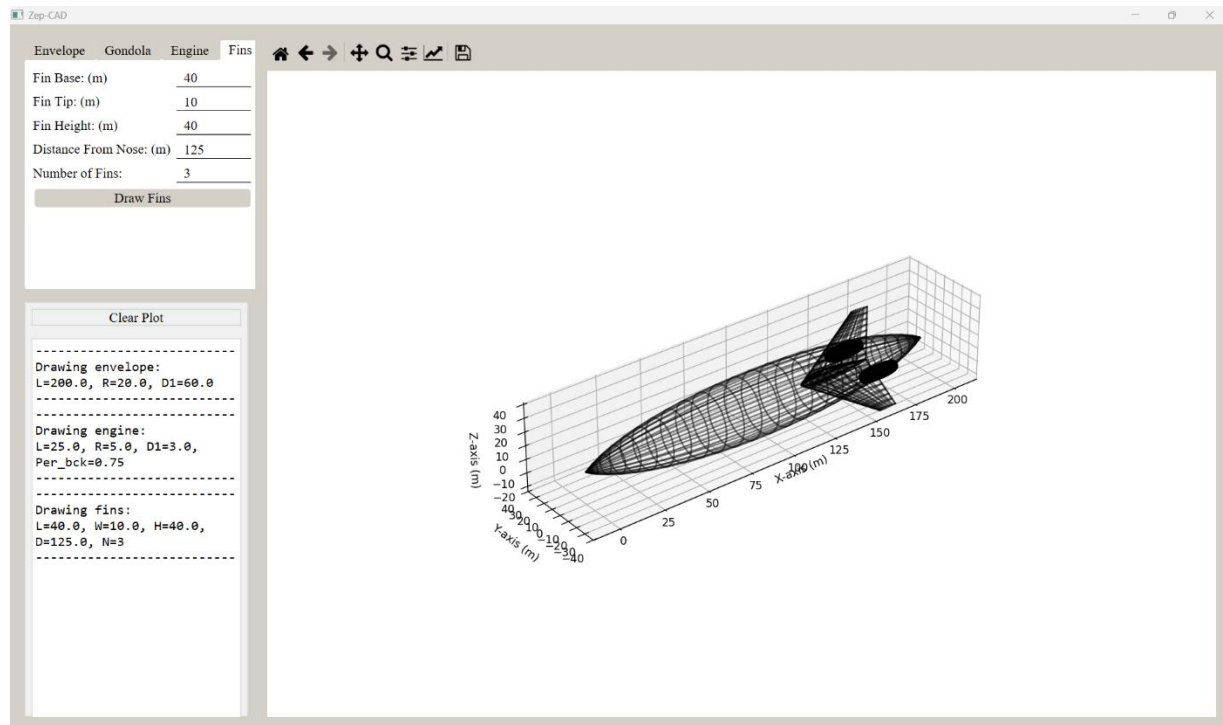

Fins-

The Fins tab is where the values for the Fins are set. There are 5 values to set, the base chord length (Fin Base), the tip chord length (Fin Tip), the Fin Height, the distance in meters from the nose the leading edge of the Fin base will be located and the number of fins to be built.


A single fin will be oriented 'up' like a regular airplanes vertical tail. As the number of fins is increased, they will be spaced equidistantly around a circle starting with the first vertical fin. Two fins will be oriented up and down and 4 will be at each 90 degree point from the

vertical fin. The values should be all integers for building the fins. Once the values are set as desired, press the "Draw Fins" button to generate the fins on the model.
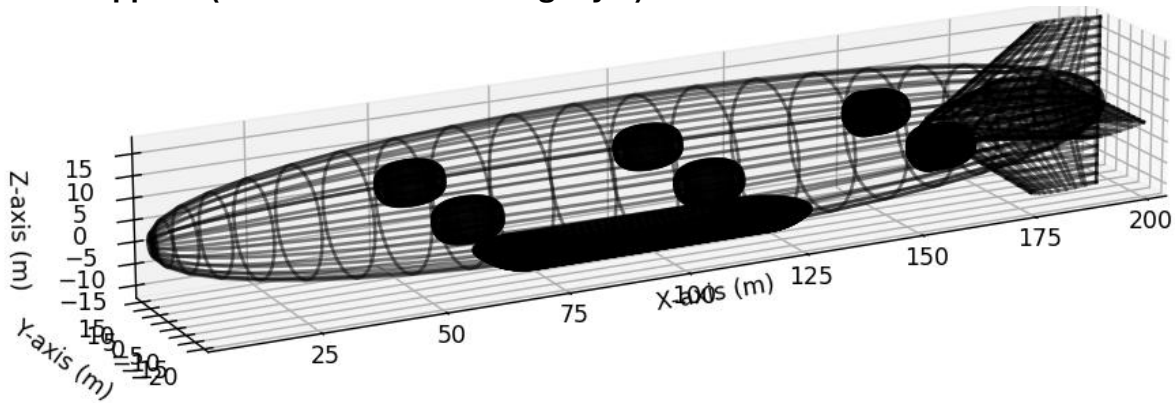

Like the engines, multiple sets of fins can be generated by setting new values and pressing the "Draw Fins" button.
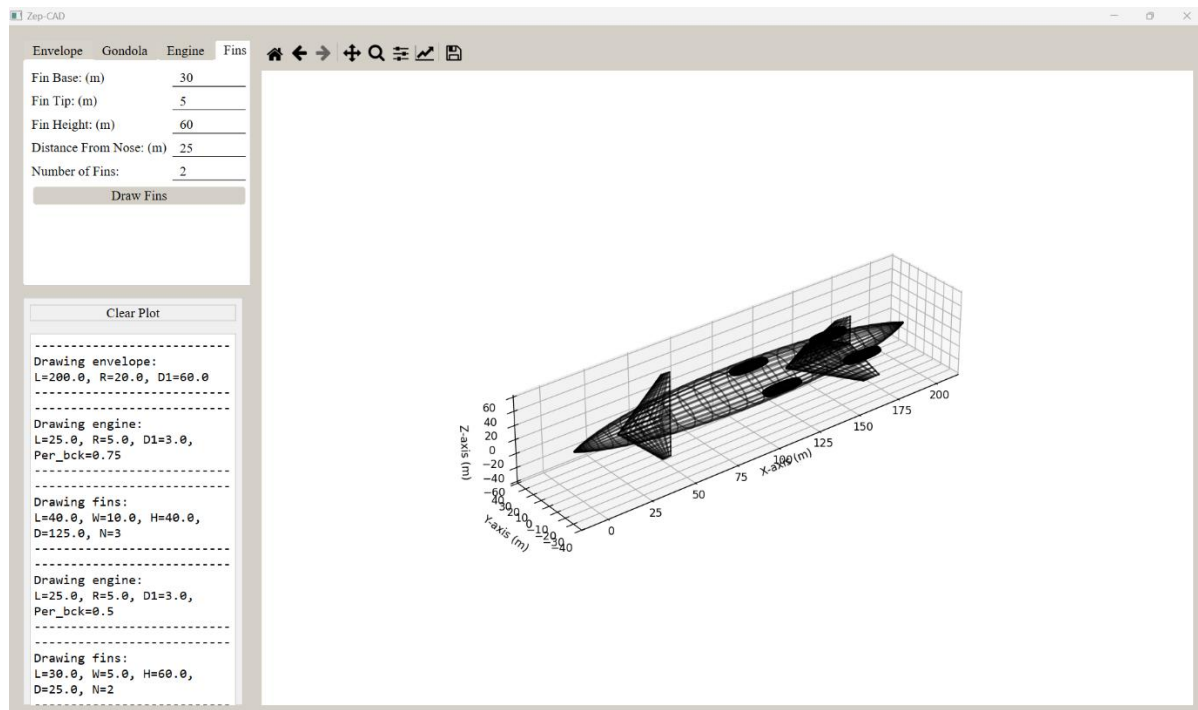
Example Plots-

Classic Zeppelin (USS Akron/Hindenburg Style)
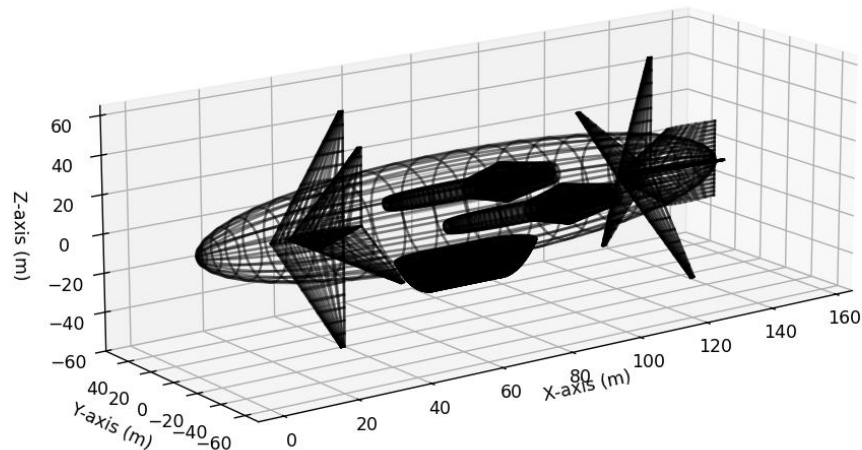

Values-

Envelope: Length = 200, Radius = 15, Nose-Length = 50

Gondola: Length = 50, Width = 20, Height = 5

Engine: Length = 15, Radius = 5, Taper = 2,
           Percent Aft of Nose (%) = 25, 50, 75 (plot 3x)

Fins: Fin Base = 40, Fin Tip = 15, Fin Height = 20, Distance from Nose = 160
         Number of Fins = 4

Sky Pirate! (Steampunk Style)

Values-

Envelope: Length = 150, Radius = 25, Nose-Length = 40
Gondola: Length = 20, Width = 20, Height = 20
Engine: Length = 50, Radius = 5, Taper = 1, Percent Aft = 40%
           Length = 50, Radus = 10, Taper = 20, Percent Aft = 50%

Fins: Fin Base = 20, Fin Tip = 1, Fin Height = 40, Distance from Nose = 25
                Number of Fins = 3
                Fin Base = 20, Fin Tip = 1, Fin Height = 60, Distance from Nose = 20
                Number of Fins = 2
                Fin Base = 10, Fin Tip = 1, Fin Height = 60, Distance from Nose = 120
                Number of Fins = 5
                Fin Base = 30, Fin Tip = 15, Fin Height = 20, Distance from Nose = 120
                Number of Fins = 2