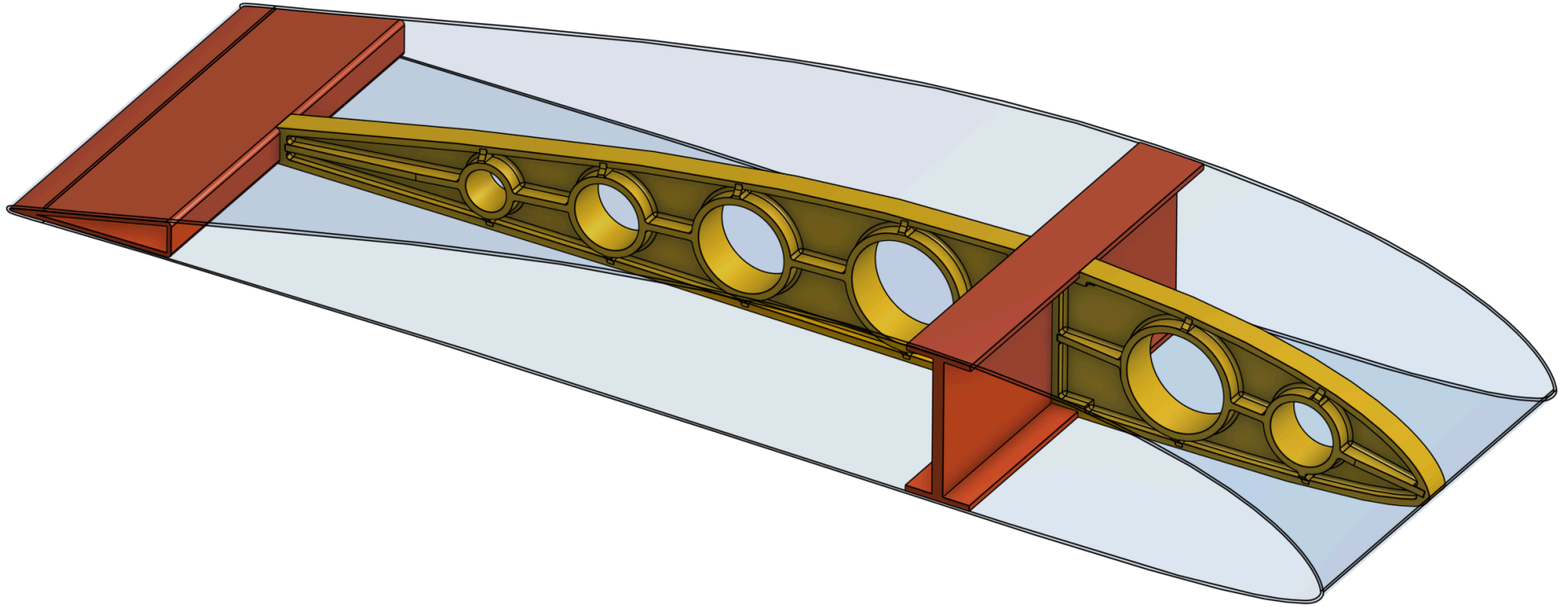# Profile Generator

PG Profile Generator

Created by:

Darren Lynch

Description:

This feature allows the user to generate an aerofoil from UIUC aerofoil database or using the NACA 4 digit parametric method quickly as a sketch profile.

Prerequisites:

For Profile Placement:
A plain to define the normal and two vertices; one for leading edge and another for trailing edge. The two vertices define the cord length and orientation.

For Profile:
Profile generator requires the user to select an aerofoil and NACA four digit requires four numbers. Additional parameters are required for advance aerofoil definition

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Profile Generator 1 — Data Base / NACA XXXX

Plane and Points
- Right plane
- Vertex of Sketch 1
- Vertex of Sketch 1

Field	Value
First Digit	0
Second Digit	0
Third and Fourth Digit i.e. '12'	12
Spline Type	Upper and Lower
Leading Edge Type	Smoothed
Magnitude of Smoothing	0.4
Trailing Edge Type	Curved
TE Upper Possition	0.05
TE Lower Possition	0.05
TE Upper Magnitude	1
TE lower Magnitude	1

Labels (NACA XXXX panel):
- Plane for profile normal
- Leading edge point
- Trailing edge point
- First digit
- Second digit
- Third and fourth digit
- Number of Splines
- Leading Edge Type (Two Spline Only)
- Magnitude of Smoothing
- Trailing Edge Type (Two Spline Only)
- Point of curve start relative to spline length from TE
- Magnitude of curve

Profile Generator 1 — Data Base / NACA XXXX

Plane and Points
- Right plane
- Vertex of Sketch 1
- Vertex of Sketch 1

Field	Value
Data Base	UIUC
Aerofoil	NACA 0012-64
Spline Type	Upper and Lower
Leading Edge Type	Smoothed
Magnitude of Smoothing	0.4
Trailing Edge Type	Curved
TE Upper Position	0.05
TE Lower Position	0.05
TE Upper Magnitude	1
TE lower Magnitude	1

Labels (Data Base panel):
- Type of Definition
- Database
- Aerofoil

Profile Generator

Spline Type:
Single spline is the simplest to define if speed is required, it also provides a nice smooth leading edge however has some trailing edge deformation.

Double spline has a sharp trailing edge at default which is desirable, however, it also has a sharp leading edge at default which is undesirable.

LE Smoothing:
Leading edge smoothing was implemented to get the same tangential leading edge as is available with the single spline type. This means that you can get the smooth edge from a single type but the sharp controlled edge of a double

Single

Double

Double with Smoothing
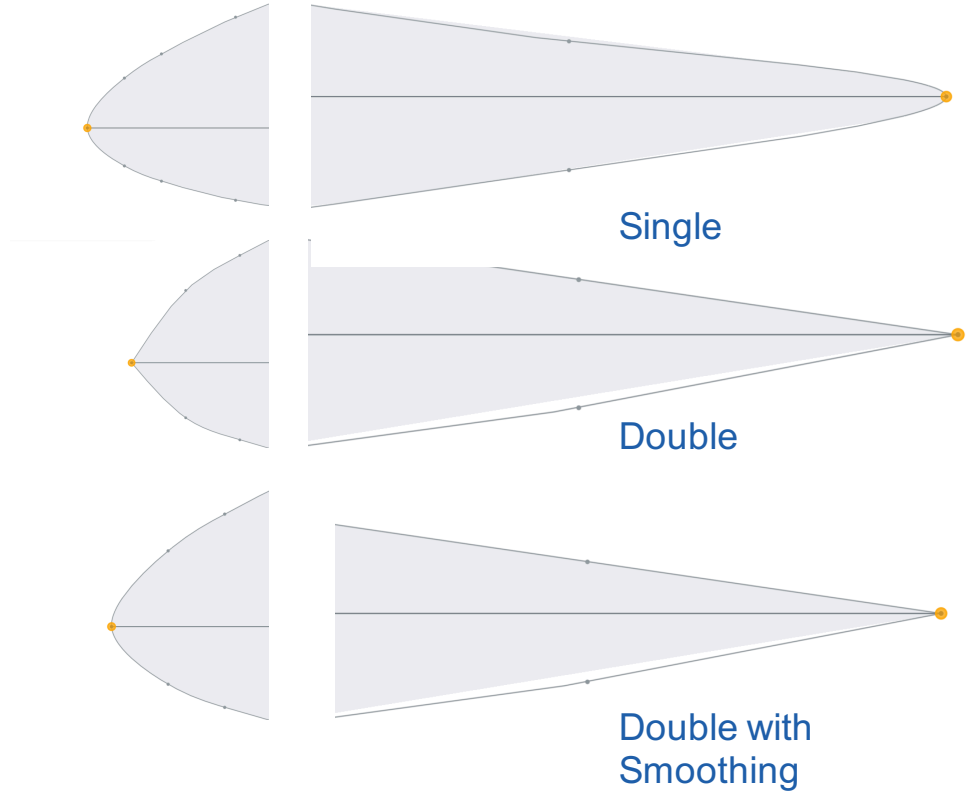
Profile Generator

TE Type:
Straight trailing edge will construct a line between the two trailing edge points ONLY if it is open.

Curved will construct a spline to curve the trailing edge, this is regardless of it being open or closed, however must be modelled using two splines. For best results experiment with varying position and magnitude for upper and lower points.
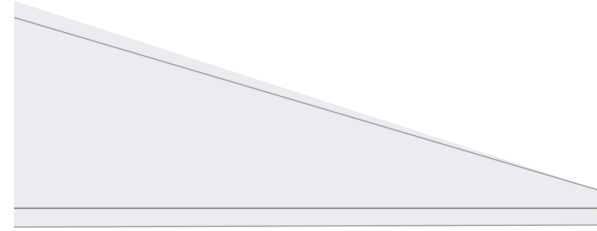
Straight
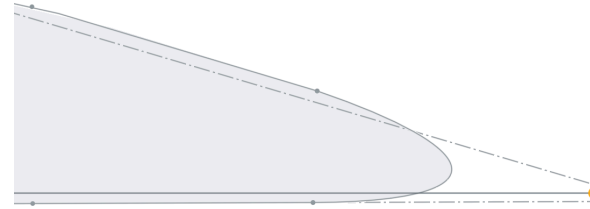
Curved

What's New?

06/10/2016   **Documentation written.**

16/10/2016   **Multi Spline added to tool set.**

25/10/2016   **Documentation Updated with Multi Spline feature.**

17/04/2017   **Wing Structure script added (Documentation to follow)**

25/04/2017   **Large Update:**
- **NACA and Profile Generator scripts merged**
- **Added a data base to Profile Generator including just under 1600 airfoil coordinates**
- **Added ability to model both airfoil types as single or double splines**
- **Added smoothing to the front of double spline modeling as a 'best of both worlds' option.**
- **Added ability have a straight closure at rear of an airfoil with an open trailing edge**

12/06/2017   **Minor Update:**
- **Added ability to have a curved trailing edge for both open and closed airfoils**
- **Added flip manipulators**
- **Merged point and plane selection fields to reduce time taken to define**
- **Update feature script version**
- **Fixed bug that prevented airfoils that didn't have (0,0) coordinates from being plotted as twin Spline**
- **Fixed bug that prevented single spline foils from having the straight closed edge**
- **Multi-Spline documentation separated from Profile Generator**
- **Wing Structure documentation will not be added here**

25/06/2017   **Code improvements including functions to simplify and full comments added for readability, and some basic integrated debug lines added for future improvements.**