**Using The Strak Machine, first steps**

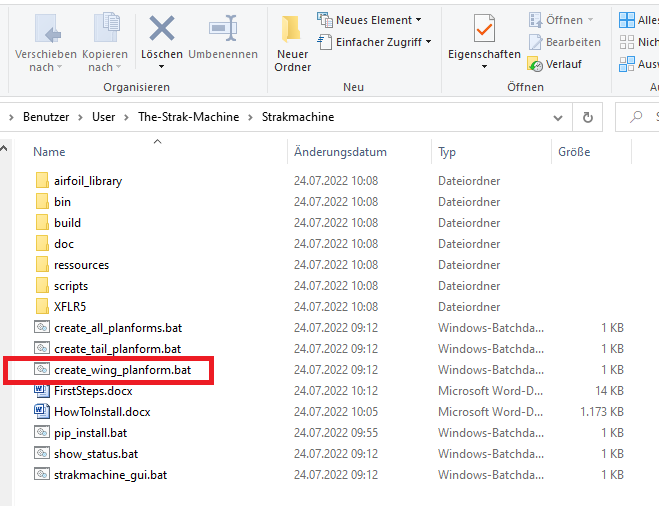
After you have succesfully installed Python and also the necessary additional packages, see **„HowToInstall.docx“,** you can now use the different parts of The Strak Machine.

These are mainly the two parts:

* Creating the wing- and tail- section of an aircraft
* Generating optimized airfoils using Xoptfoil-JX

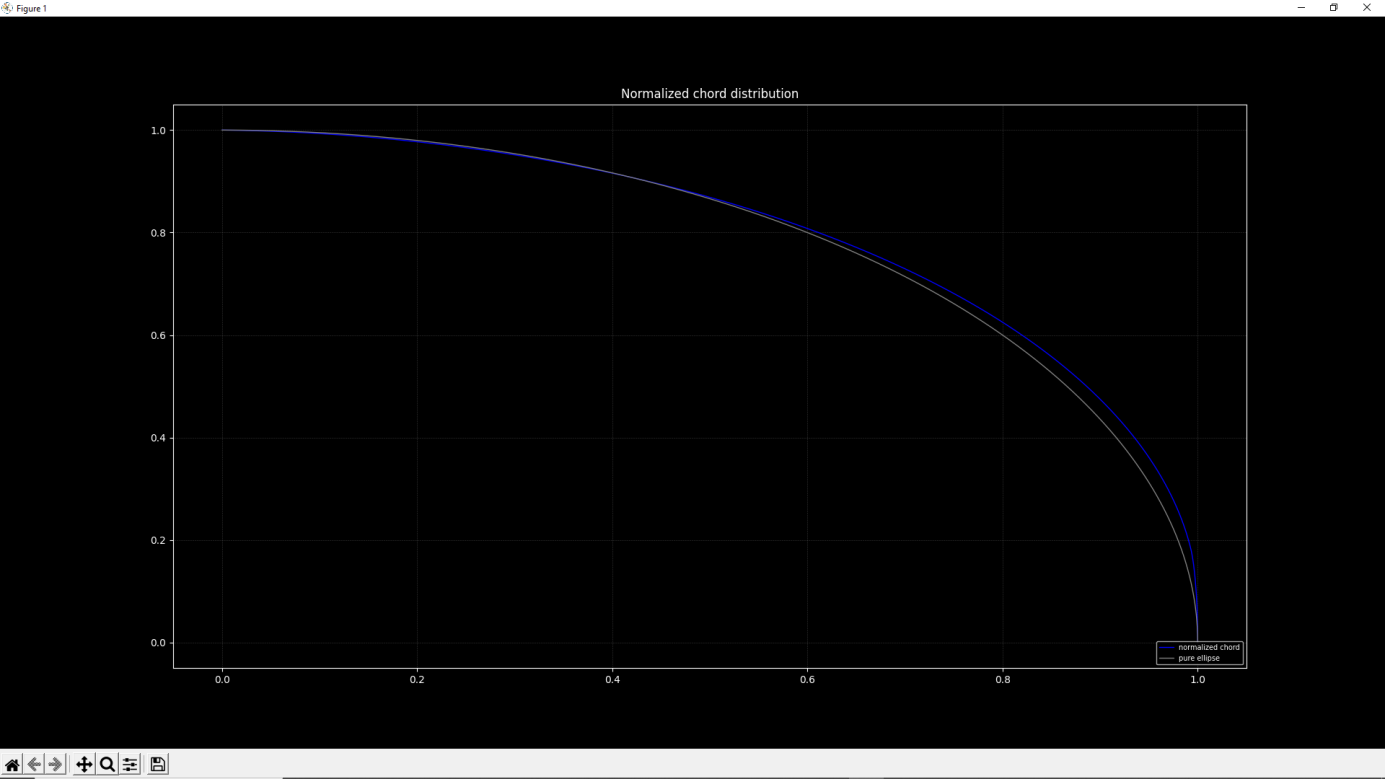
**To get a quick overview, please execute the following steps:**

1. **Execute the batchfile „create\_wing\_planform.bat“, which can be found in the „Strackmachine“-folder, to create only the wing-section of the aircraft:**



* The batchfile will pass the file „Strakmachine\ressources\planformdata\_wing.txt“ to the python-script „Strakmachine\scripts\planform\_creator.py“
* The python script „planform\_creator.py“ will create a wing, using the parameters of the .txt-file (you can look inside the .txt.file using a standard editor like notepad or notepad++)

You should see the following output:



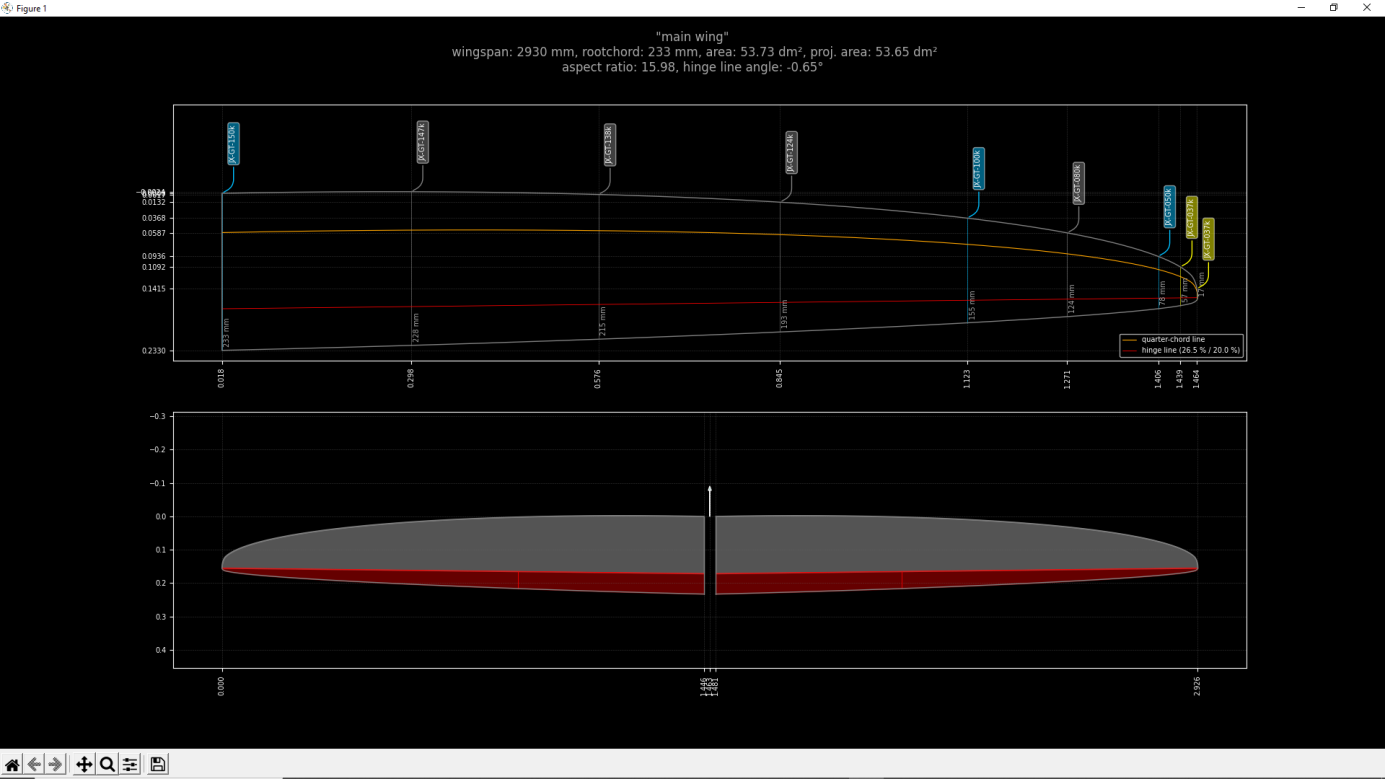
This is the „normalized“ distribution of the chord-lengths along the half wingspan.

You will see a comparison between a pure ellipse (gray) and the generated wing (blue), which is over-elliptic in this case.

Normalized means:

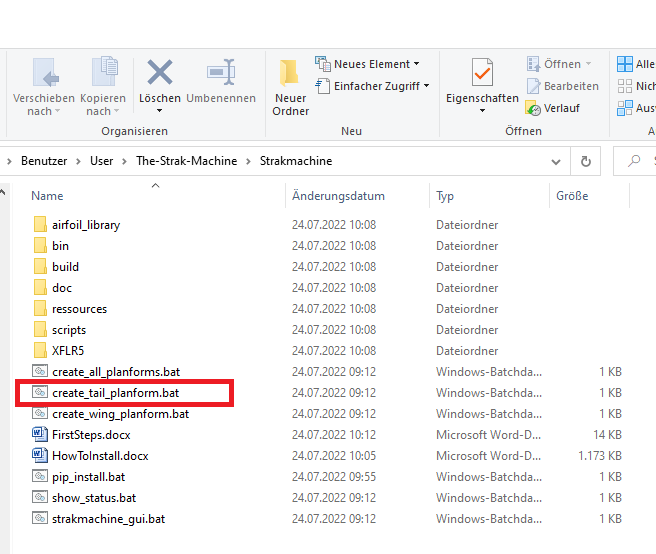
* on the x-axis, 1.0 equals the half wingspan
* on the y-axis, 1.0 equals the length oft he root-chord of the wing

1. Close the window to get the next output, that should look like this:



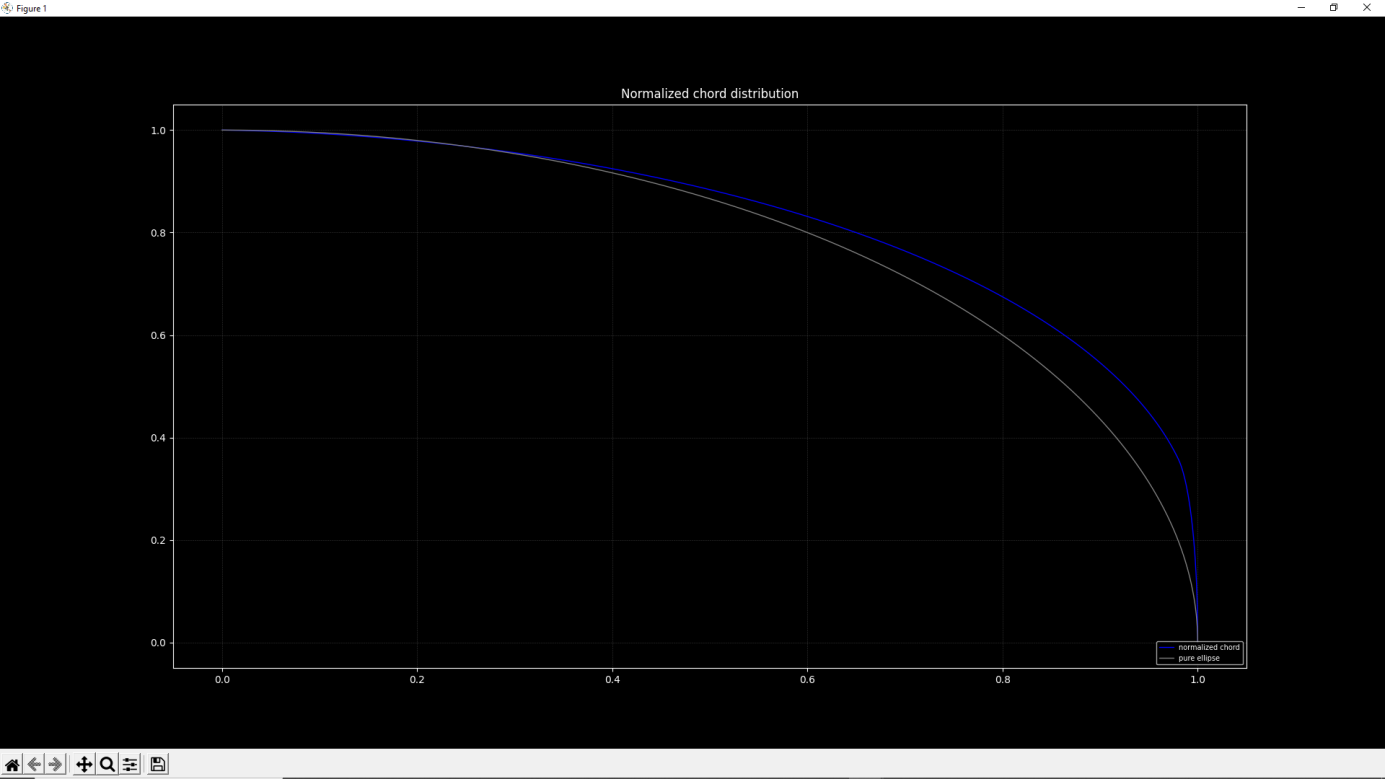
* You will see the wingplan with positions of the different airfoils, airfoilnames etc. in the upper part of the screen (plain view) and the **projected** view on top of the wing in the lower part.
* Projected view means, if the wing has a dihedral angle, which is normally the case, the wingplan and the projected view will differ in half wingspan.
* In this example, the wingplan shows half wingspan = 1464 mm and the projected view shows half wingspan = 2926/2 = 1463 mm, which is nearly the same, but at a dihedral angle of only 3°.
* When looking at a vtail with a much higher dihedral angle, this topic will become much more important.
* Please close the window again

1. **Execute the batchfile „create\_tail\_planform.bat“, which can be found in the „Strackmachine“-folder, to create only the tail-section of the aircraft:**

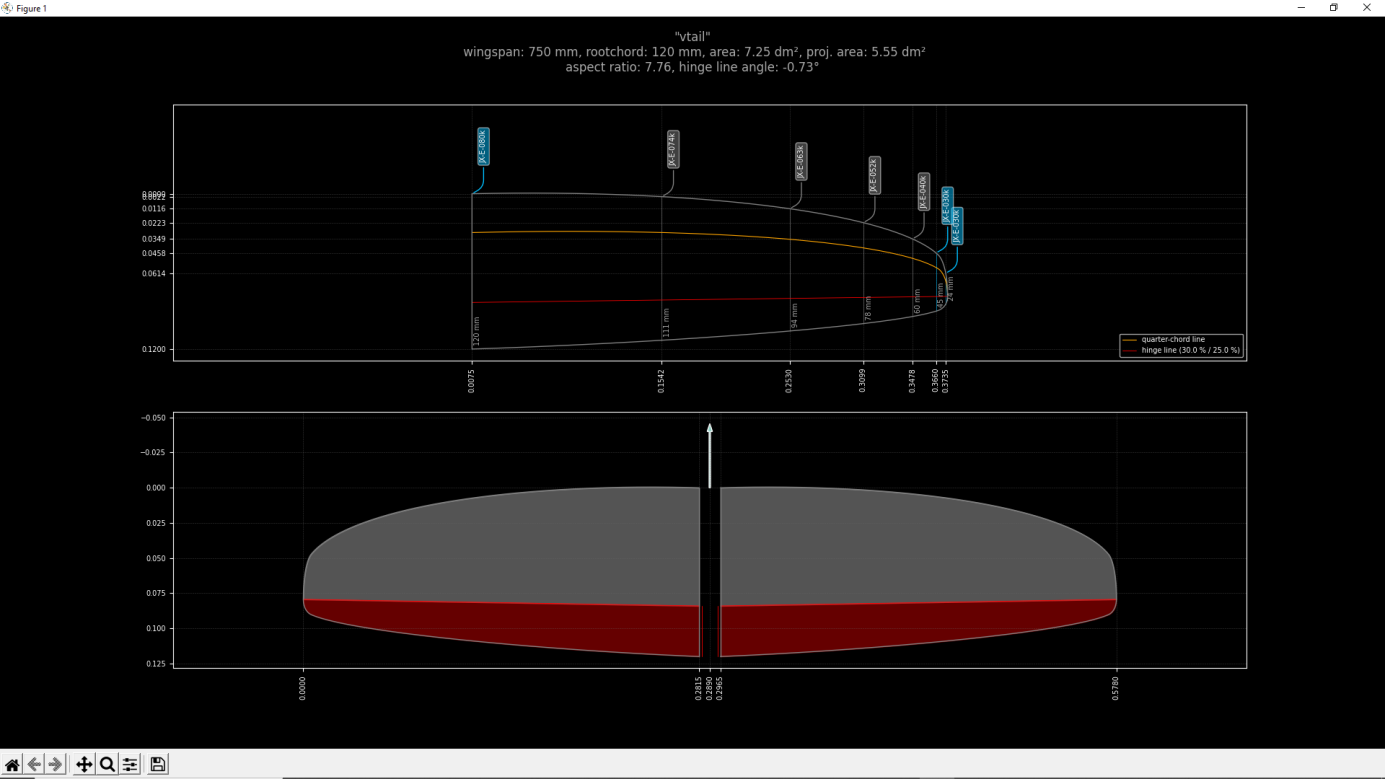


* The batchfile will pass the file „Strakmachine\ressources\planformdata\_tail.txt“ to the python-script „Strakmachine\scripts\planform\_creator.py“

You should see the following output:

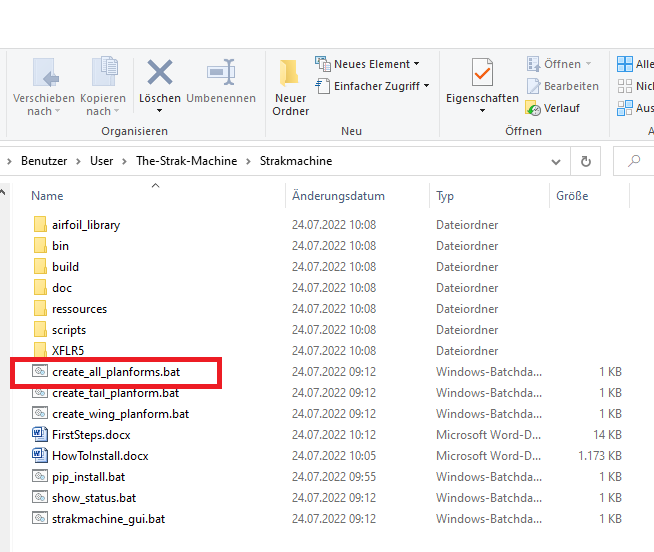


* This is the „normalized“ distribution of the chord-lengths for the V-tail.
* As you can see, looking at the comparison between the pure ellipse and the normalized chord of the „wing“ (V-tail), this planform is a lot more over-elliptic than the wing before.
* Close the window to get the next screen , that should look like this:



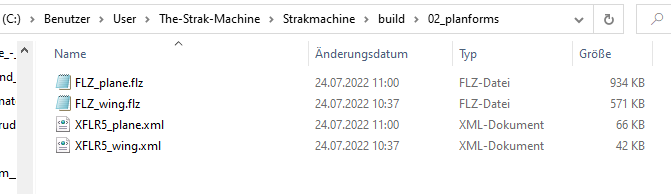
* You will see the wingplan oft he V-tail in the upper part of the screen (plain view) and the **projected** view of the V-Tail in the lower part.
* Please close the window again

1. **Execute the batchfile „create\_all\_planforms.bat“, which can be found in the „Strackmachine“-folder, to the wing- and also the tail-section of the aircraft:**

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* The batchfile will execute the steps 1. and 2. And you will see the same four output-windows, when closing each window to proceed.

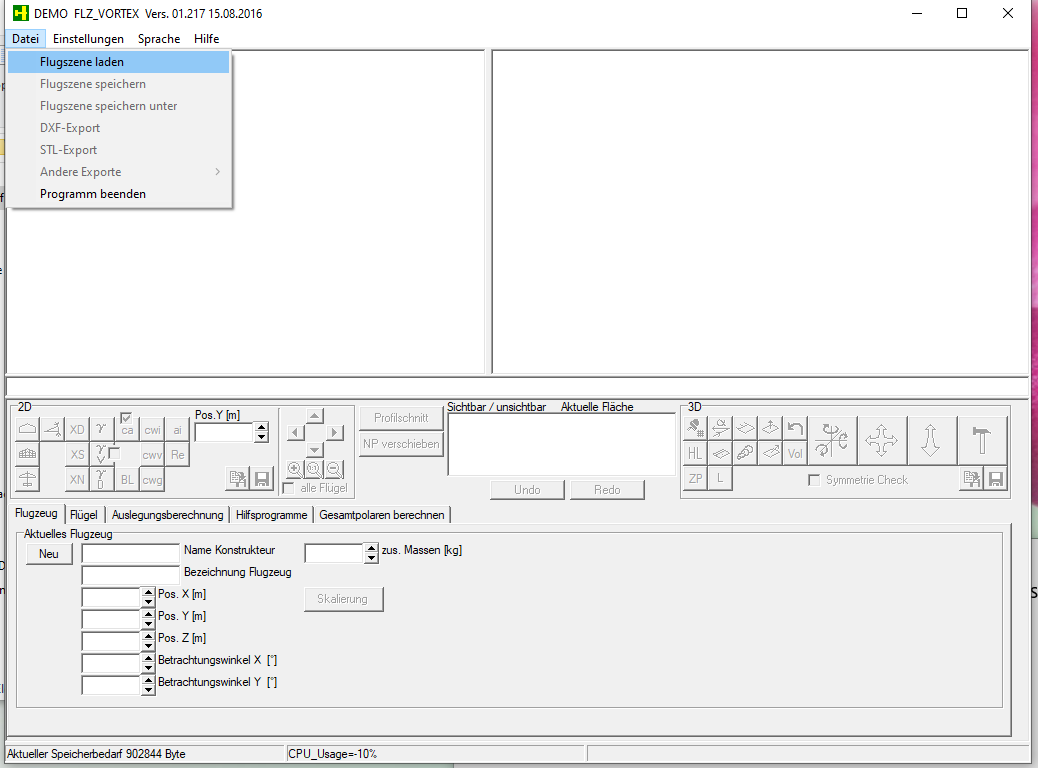
The output of the script „planform-creator.py“ can be found in the folder **„Strakmachine\build\02\_planforms“:**

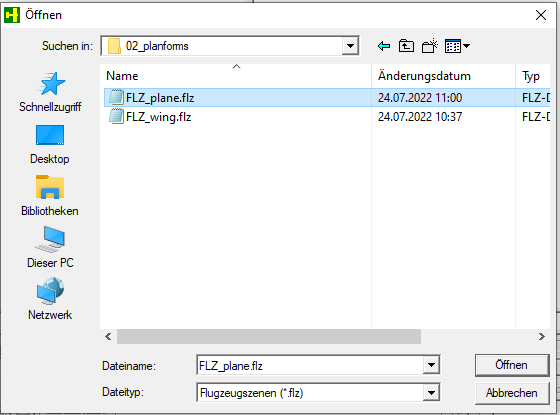


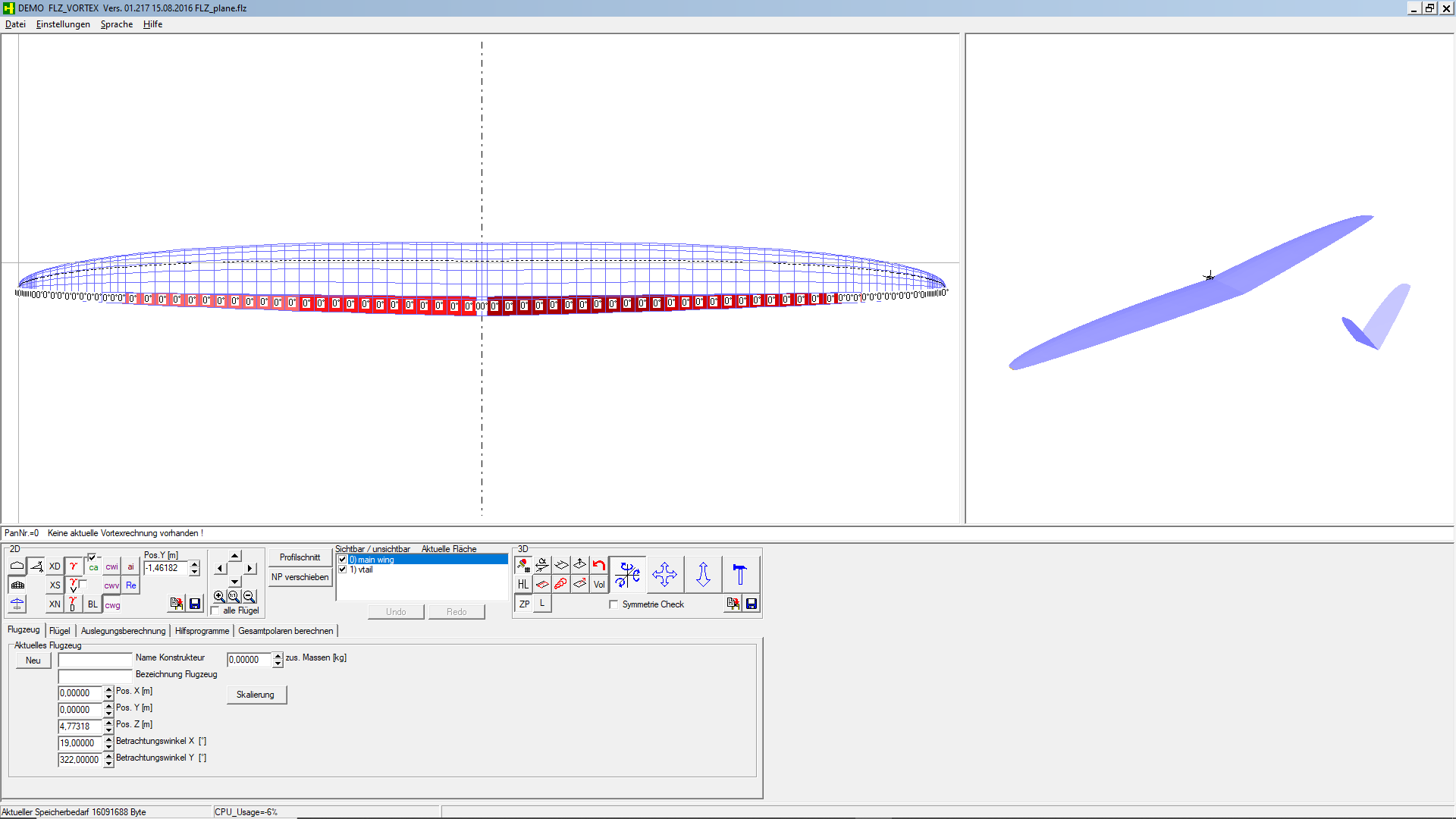
You will find here:

* FLZ-Vortex compatible file, containg the wing- and V-Tail-section (**FLZ\_plane.flz**)
* FLZ-Vortex compatible file, containg only the wing-section (**FLZ\_wing.flz**)
* XFLR5 compatible file, containg the wing- and V-Tail-section (**XFLR5\_plane.xml**)
* XFLR5 compatible file, containg only the wing-section (**XFLR5\_wing.xml**)

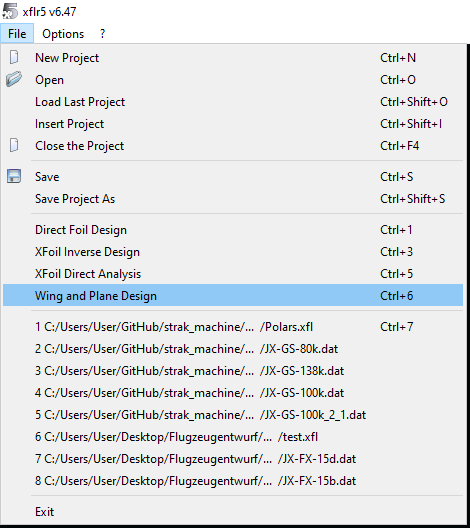
The .flz-files can be directly opened in FLZ-Vortex:

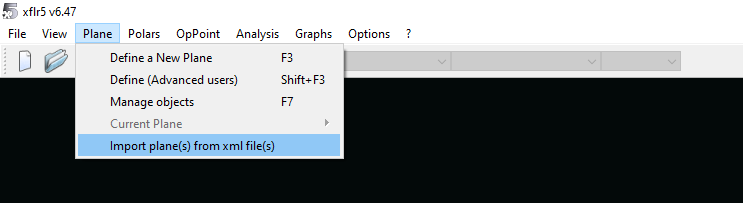


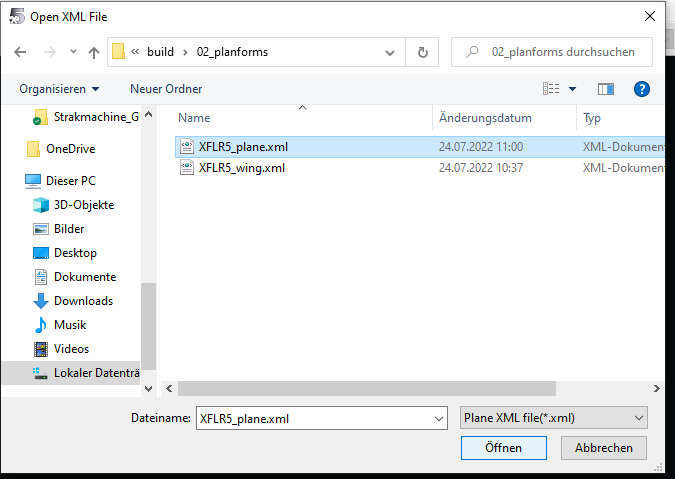


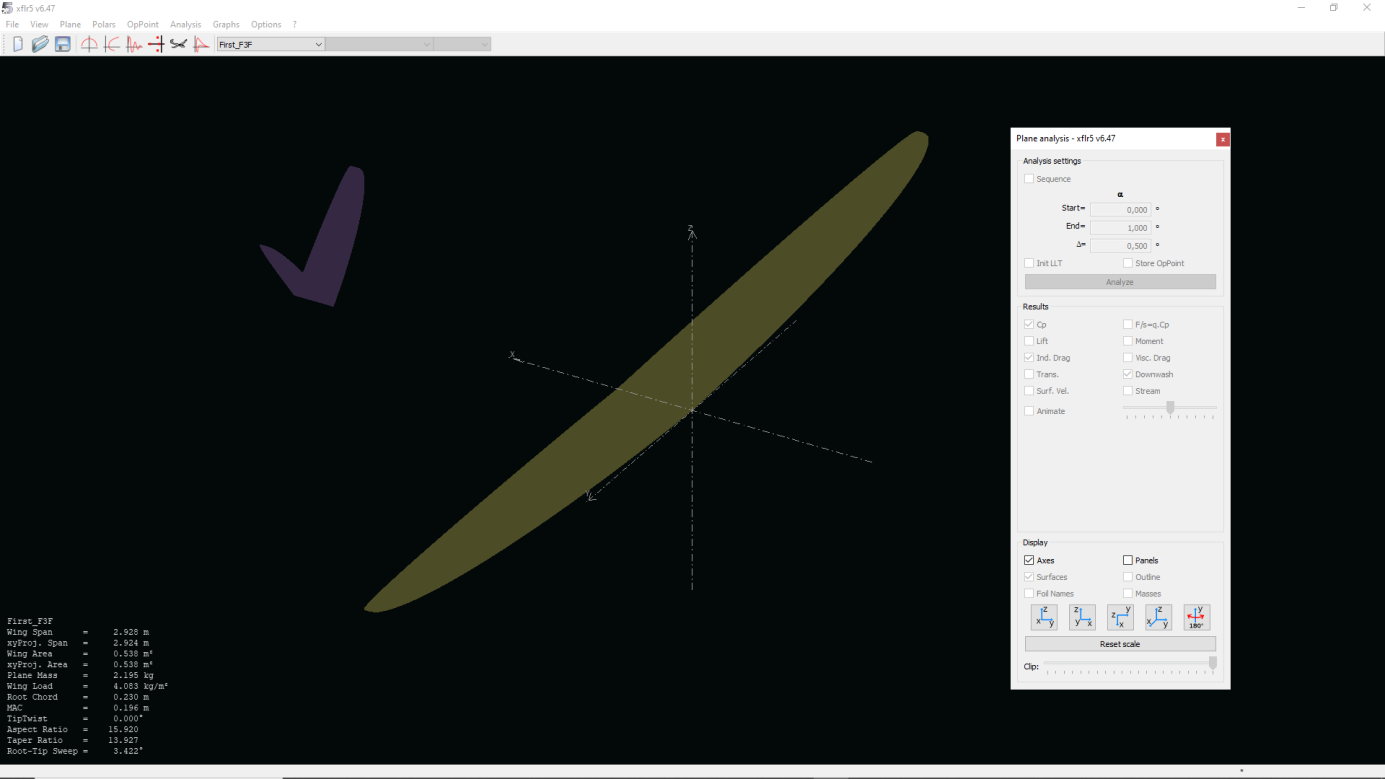


The .xml-files can be imported in XFLR5:

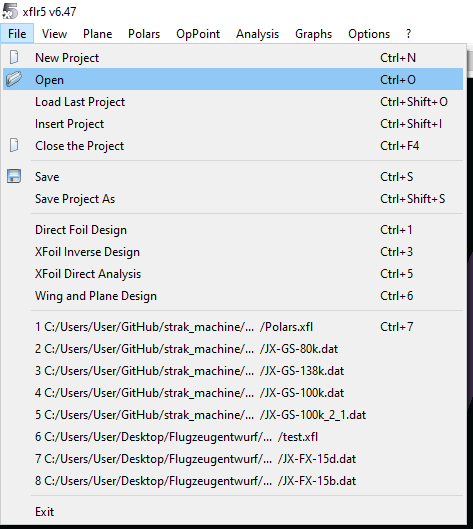




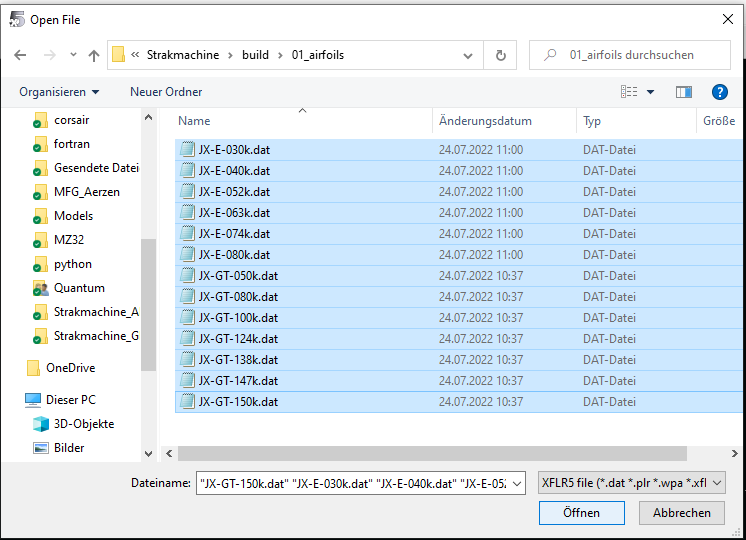




* In FLZ-Vortex, all airfoils will be already be included in the .flz-file
* In XFRL5 it is necessary to import the airfoils in the project:

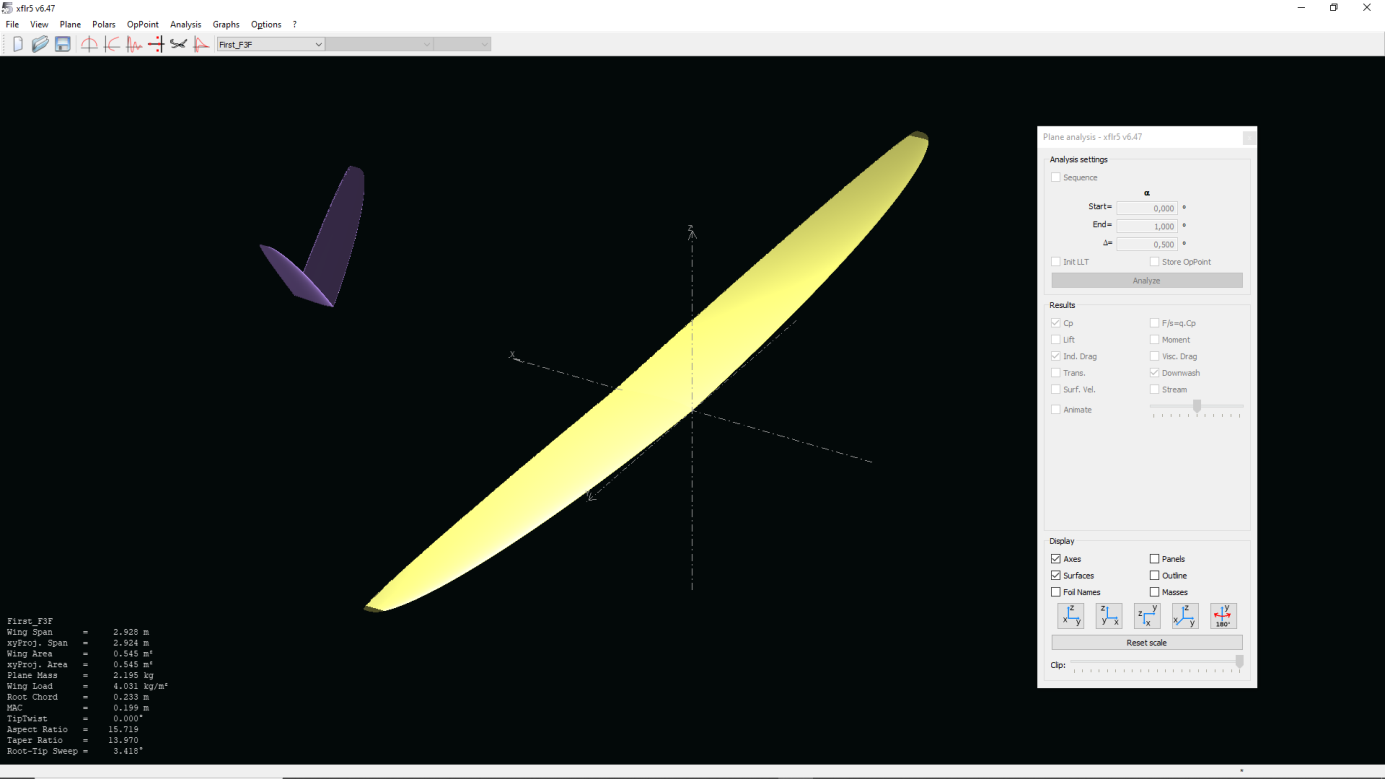


They can be found in the folder **„Strakmachine\build\01\_airfoils“:**



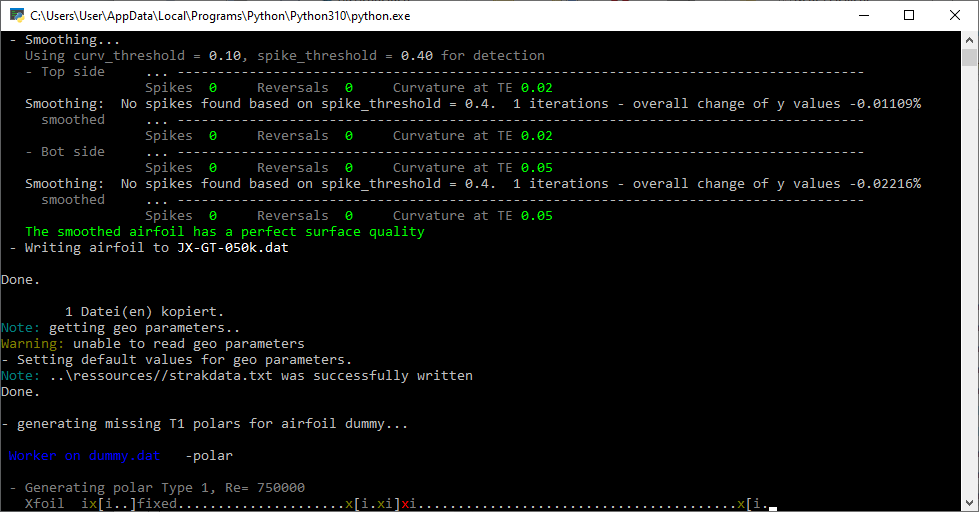
In this case, the airfoil „JX-GT-37k.dat“ is still missing, as we have to create it using the airfoil-optimizer Xoptfoil-JX“.

Back in the „wing and plane design“-view in XFLR5, you should now see that the wing is coloured in a brighter yellow, except the wing tips with the missing airfoil „JX-GT-37k“:

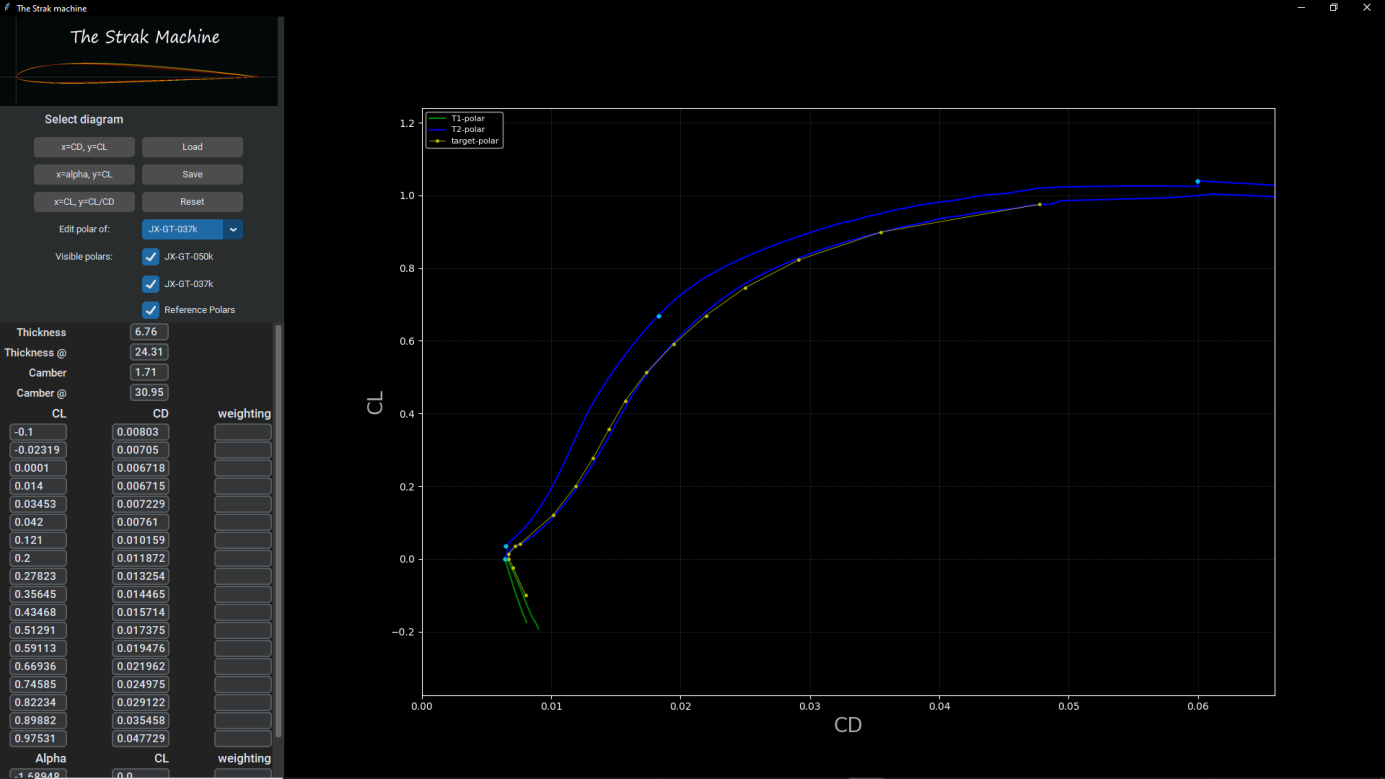


1. **Execute the batchfile „strakmachine\_gui.bat to start the graphical editor for setting up the objectives for the optimizer**

* You should first see a command line window like this:



* The Strak machine will now perform some calculations using XFoil, like polars, generate seed-foils etc. when this has been finished, the following screen will appear:



You will find a short video, how to use the graphical editor to setup the target-polars, on YouTube:

<https://youtu.be/wIMoLMIpCR8>

Please follow this video, to make your first steps and create your own first optimized airfoil(s).

Like the other generated airfoils before, you will also find the airfoils, that were generated by the optimizer in the folder **„Strakmachine\build\01\_airfoils“.**

Further information, concerning Simulation of the plane with XFLR 5, will follow in a later version of this document:

* import generated airfoil to XFRL5
* use create\_wing\_polars.bat, use create\_tail\_polars.bat to create polars
* import polars to XFLR5
* simulate the plane in XFLR5