

## Reference

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Xfoil\_worker is a handy command line tool to do various tasks around airfoil modification and optimization.

Typically, Xfoil\_worker is called within a batch job to automate repeating tasks like setting numerous flap positions and calculating the polars for these flapped airfoils.

## Usage

```
Xfoil_worker -w worker_action [Options]
```

Following actions are supported

-w polar	Generate polars for an airfoil
-w norm	Repanel and normalize an airfoil
-w smooth	Repanel, normalize and smooth an airfoil
-w flap	Set flap at an airfoil – after repaneling and normalizing is done
-w set	Change max. thickness or max. camber of an airfoil
-w blend	Two airfoils are blended by a certain degree
-w check	Check the surface curvature of an airfoil

## Example

```
Xfoil_worker -w set t=8.2 -a MH32.dat
```

The options for the various actions are described in the following sections.

## Generate polars for an airfoil ( -w polar)

A defined polar for an airfoil will be generated in Xfoils polar format. The polar file is ready to be imported into xflr5 or flow5 via the menu function "Polars / Import Xfoil Polar(s)". The definition for the polar are defined in a Xoptfoil input file. Please find the description of the parameters in the Xoptfoil(-JX) documentation.

Command line options used for polar generation:

<code>-i input_file</code>	<p>Name of an Xoptfoil input file to read the settings for the polar generation. Only the following namelists are needed for polar generation:</p> <pre>&amp;polar_generation     Settings for polar: polar type, based on cl oder alpha, value range</pre> <p><code>&amp;xfoil_run_options</code> - optional Options for Xfoils aerodynamic calculations. Normally the default values are fine, so this namelist is optional</p> <p><code>&amp;xfoil_paneling_options</code> - optional Options for Xfoils repaneling which is done prior to the polar generation. Normally the default values are fine, so this namelist is optional</p>
<code>[-r xxxxxx]</code>	<p>The desired Reynolds number of the polar. If the Reynolds number is not defined in the input file, the value is taken from this command line option. This is useful to have a single input file for different Reynolds numbers</p>
<code>-a airfoil_file</code>	<p>The name of the airfoil file.</p> <p>If option -o is omitted the generated polar will be written to the folder</p> <p><code>&lt;airfoil_name&gt;_polars</code></p>
<code>[-o output_prefix]</code>	<p>The generated polar will be written to the folder</p> <p><code>&lt;output_prefix&gt;_polars</code></p>

Example:

```
Xfoil_worker -w polar -i iPolars.txt -r 600000 -a RG15.dat -o RG15
Xfoil_worker -w polar -i iPolars.txt -a Clarky.dat
```

iPolars.txt:

```
&polar_generation
generate_polars = .true.
type_of_polar   = 1
op_mode         = 'spec-al'
op_point_range  = -4, 13, 0.25
polar_reynolds  = 20000, 50000, 100000, 200000, 500000
/
```

## Repanel and normalize an airfoil ( -w norm)

An airfoil will be repeneled and normalized to have the leading edge at 0,0 and the trailing edge at 1,0. The new airfoil will have 7 decimals in the .dat file.

The default number of data points of the new airfoil is 200. This value can be changed if a Xoptfoil inputs file with namelist `&xfoil_paneling_options` is defined.

Depending on the “micro situation” at the leading edge an additional data point at 0,0 will be inserted. So the final number of data points could be +1 .

Command line options used for normalization:

<code>[-i input_file]</code>	<p>- optional - Name of a Xoptfoil input file to read the settings for repeneled. Only the following namelists are used for repeneled:</p> <p><code>&amp;xfoil_paneling_options</code>      - optional -</p> <p>Options for Xfoils repeneled. Normally the default values are fine.</p>
<code>-a airfoil_file</code>	Name of the airfoil file
<code>[-o output_prefix]</code>	<p>Name of the smoothed airfoil. Following file will be generated</p> <p><code>&lt;output_prefix&gt;.dat</code></p> <p>If option -o is omitted, the name of the output file will be</p> <p><code>&lt;airfoil_name&gt;_norm.dat</code></p>
<code>[-v]</code>	<p>In addition to the new airfoil .dat file, a file <code>&lt;output_prefix_design&gt;_coordinates.dat</code> will be generated allowing to inspect the result of repeneled and normalize with Xoptfoil_visualizer-JX.</p>

Example:

```
Xfoil_worker -w norm -a RG15.dat -o RG15_normalized
```

## Smooth an airfoil (-w smooth)

An airfoil will be repeneled by Xfoils PANGEN routine, normalized and smoothed by Xoptfoil-JX smoothing algorithm ('Chaikin Corner Cut'). This action is useful either in preparing an airfoil for optimization or just to improve the geometric quality of an airfoil.

Command line options used for smoothing:

<code>[-i input_file]</code>	<p>- optional - Name of an Xoptfoil input file to read the settings for repeneled and smoothing. Only the following namelists will be used for smoothing:</p> <p><code>&amp;smoothing_options</code> - optional</p> <p><code>spike_threshold</code> threshold for spike detection (default = 0.8)</p> <p><code>&amp;constraints</code> - optional</p> <p><code>curv_threshold</code> threshold for curve reversal detection. Only used to display information (default = 0.1)</p> <p><code>highlow_threshold</code> threshold for curve highs &amp; lows detection. Only used to display information (default = 0.05)</p> <p><code>&amp;xfoil_paneling_options</code> - optional</p> <p>Options for Xfoils repeneled which is done prior to smoothing. Normally the default values are fine, so this namelist is optional</p>
<code>-a airfoil_file</code>	The name of the airfoil file
<code>[-o output_prefix]</code>	<p>Name of the smoothed airfoil. Following file will be generated</p> <p><code>&lt;output_prefix&gt;.dat</code></p> <p>If option -o is omitted, the name of the output file will be</p> <p><code>&lt;airfoil_name&gt;_smoothed.dat</code></p>
<code>[-v]</code>	<p>In addition to the new airfoil .dat file, a file</p> <p><code>&lt;output_prefix&gt;_design_coordinates.dat</code> will be generated allowing to inspect the result of repeneled and normalize with Xoptfoil_visualizer-JX.</p>

Example:

```
Xfoil_worker -w smooth -i iSmooth.txt -a RG15.dat -o RG15_smoothed
Xfoil_worker -w smooth -a AG40.dat
```

## Set flap at an airfoil (-w flap)

A flap is set to defined angles after the airfoil was repeneled and normalized.

If more than one flap angle is defined several airfoils will be generated having the flap angle as part of the airfoil name.

Command line options used for setting flap:

<code>-i input_file</code>	<p>Name of a Xoptfoil input file to read the parameters for setting flaps</p> <p>Only the following namelists are used when setting flaps:</p> <pre>&amp;operating_conditions  x_flap      x position of flap hinge ranging 0...1 (default = 0.75) y_flap      y position of flap hinge ranging 0... (default = 0.0) y_flap_spec type of y position either 'y/t' or 'y/c' (default = 'y/t') flap_degrees list of flap angles  &amp;xfoil_paneling_options      - optional Options for Xfoils repeneled which is done prior to setting flaps. Normally the default values are fine, so this namelist is optional</pre>
<code>-a airfoil_file</code>	<p>Name of the airfoil file</p>
<code>[-o output_prefix]</code>	<p>Name of the flapped airfoil. If just one flap angle is defined the following file will be generated</p> <pre>&lt;output_prefix&gt;.dat</pre> <p>If more than one flap angle is defined the following file will be generated</p> <pre>&lt;output_prefix&gt;_&lt;angle&gt;.dat</pre> <p>If option -o is omitted, the name of the output file will be</p> <pre>&lt;airfoil_name&gt;-flap_&lt;angle&gt;.dat</pre>

### Example:

```
Xfoil_worker -w flap -i iflap.txt -a RG15.dat
```

iflap.txt:

```
&operating_conditions
x_flap      = 0.75
flap_degrees = 2, 4, 6, 8, 10
/
```

## Set geometry parameters of an airfoil (-w set)

The geometry parameters thickness, location of maximum thickness, camber and location of maximum camber can be set.

Command line options used for set:

<code>-w set parameter</code>	<p>The argument 'parameter' defines the modification which should be applied to the airfoil:</p> <p><code>t=yy</code>    Set thickness to xx% <code>xt=xx</code>   Set location of maximum thickness to xx% of chord</p> <p><code>c=yy</code>    Set camber to xx% <code>xc=xx</code>   Set location of maximum camber to xx% of chord</p>
<code>[-i input_file]</code>	<p>- optional - Name of a Xoptfoil input file to read the parameters for setting</p> <p>Only the following namelist is used when setting flaps:</p> <p><code>&amp;xfoil_paneling_options</code> Options for Xfoils repaneling which is done prior to changing geometry. Normally the default values are fine, so this namelist is optional</p>
<code>-a airfoil_file</code>	Name of the airfoil file
<code>[-o output_prefix]</code>	<p>Optional name of the new airfoil.</p> <p>If option -o is omitted, the name of the output file will be</p> <p><code>&lt;airfoil_name&gt;-&lt;parameter&gt;.dat</code></p>
<code>[-v]</code>	<p>In addition to the new airfoil .dat file, a file <code>&lt;output_prefix_design_coordinates.dat</code> will be generated allowing to inspect the result set with Xoptfoil_visualizer-JX.</p>

Example:

```
Xfoil_worker -w set t=8.5 -a RG15.dat
```

... will set the thickness of RG15.dat to 8.5%

## Blend two airfoils (-w blend)

An airfoil is 'blended' with another airfoil by a certain percentage

Command line options used for set:

<code>-w blend percentage</code>	percentage is the amount of the second airfoil which is blended to the airfoil
<code>-a airfoil_file</code>	Name of the airfoil file
<code>-a2 snd_airfoil_file</code>	Name of the second airfoil file to be blended to the first one
<code>[-i input_file]</code>	<p>- optional - Name of a Xoptfoil input file to read the parameters for setting</p> <p>Only the following namelist is used when setting flaps:</p> <p><code>&amp;xfoil_paneling_options</code> Options for Xfoils repaneling which is done prior to changing geometry. Normally the default values are fine, so this namelist is optional</p>
<code>[-o output_prefix]</code>	<p>Optional name of the new airfoil.</p> <p>If option -o is omitted, the name of the output file will be</p> <p><code>&lt;airfoil_name&gt;-blended&lt;percentage&gt;.dat</code></p>
<code>[-v]</code>	<p>In addition to the new airfoil .dat file, a file <code>&lt;output_prefix&gt;_design_coordinates.dat</code> will be generated allowing to inspect the result set with Xoptfoil_visualizer-JX.</p>

Example:

```
Xfoil_worker -w blend 60 -a ClarkY.dat -a2 RG15.dat
```

... will be blend 60% of RG15 to ClarkY