NAME

plotfoil – generate a PostScript plot of airfoil data.

SYNTAX

plotfoil [*options*] [*filename...*]

DESCRIPTION

This program plots (in PostScript) airfoil sections (well, actually any section that is not smoothly closed). It can also allow for spars, sheeting, and prints registration marks that are aligned with the L.E. and T.E. It uses Bezier splines to interpolate between data points, with an option to use straight lines instead.

OVERVIEW

Plotfoil reads airfoil data and generates PostScript code that when printed on a PostScript printer will deliver a plot of the airfoil section along with spars (if any). The bounds of the section are also drawn, with crosses, and these can be used for registration of the ribs or templates. If the plot is going to be larger than one page, it will automatically be spread over as many pages as are required.

PostScript is a printer language for describing printed pages. Printers that accept PostScript include the Apple LaserWriters, QMS PS- series printers, DataProducts LZR-2665 and 2660 and the Linotronic 100 and 300 typesetters. PostScript is a trademark of Adobe Systems Incorporated. The ghostscript program can convert PostScript to a variety of printer formats if a PS printer is not available. (Ghostscript can also be used to preview plots on the display.)

Bezier splines are used to calculate interpolating curves between the points. In some case the process may not deliver a smooth curve, and you will have to use the straight-line plot option (**–s**).

The program can also account for sheeting. If the wing you are building is to be sheeted, the ribs or templates need to be inset from the required surface by the thickness of the sheet. The airfoil outline is plotted with a dotted line, and the template line is drawn with a solid line.

OPTIONS

Under MS-DOS, the “/” can be used as the option character instead of the “–”.

–c Sets the chord of the section to plot. The argument is the chord, in units of either mm, cm or inches. The units are specified by a trailing ‘m’, ‘c’, or ‘i’, with the default of mm being used if unspecified.

–s This flag indicates that for *x* values of greater than 2.5%, straight lines should be used to join the points. This results in a PostScript file which is probably just as good but should print in less time. The limit (2.5%) can be changed with the **-l** option.

–l This option changes the limit used with the **-s** option. It takes the percentage-chord as argument.

–p This invokes the interactive mode where plotfoil will prompt you for all the paramters of the plot. If plotfoil is invoked without an arguments it automatically enters prompt mode.

–i This option draws the section inset by the specified amount, which is what you would use if the wing you are building is sheeted. The units default to those used for the chord.

–sp This option adds a spar to the plot. It takes two arguments, the offset (expressed as a percentage of the chord) and the thickness of the spar (default units: same as used for the chord). This option can be used multiple times to draw more than one spar. Also, 0-thickness spars can be used to draw vertical lines on the plot.

–th This option sets the height of the template outline, measured from the chord line. The default is 0.

–tl

–tt These options set the horizontal extents of the template. The value specified is the distance of the edge of the template from the {leading, trailing} edge. The units default to those specified while setting the chord. The default value is 0.

If any of **–th**, **–tl** or **–tt** is used, a template will be drawn.

−h Prints some help information.

−o Writes the output to the specified file.

−x This option moves the drawing on the page to the right. Some printers (or ghostscript drivers) have different ideas about what constitutes centered. This option can be used for fine-tuning.

−y Same as **−x** except that it moves the drawing up.

INPUT FORMATS

There are two formats for input data, distinguished by how coordinates are specified. The first line of the file is taken to be the name of the section and is printed along with the plot.

The smallest *x* value (usually 0.0) is the L.E. and the largest (usually 1.0) is the T.E.

This is the first format:

```
SD-8020
1.0 0
0.9 0.011
0.85 0.02
...
1.0 0
```

Note: it starts at *x*=1.0 (the trailing edge), goes around and ends again at the T.E. This is the format used by the sections in Soartech 8.

This is the second format:

```
Clark YH
0 0 0
0.0125 0.0409 -0.0183
0.025 .0529 -.0271
...
1.0 0 0
```

This starts at the L.E. and ends at the T.E., with the columns being the upper and lower ordinate values. This is the format that most of the NACA sections were published in.

EXAMPLES

This command:

```
plotfoil -c 20c -i 2m -sp 32 0.2 sd8020 | lpr
```

will plot the SD-8020 section with a chord of 20cm, with a sheeting allowance of 2mm, and a spar 2mm wide at 32% chord. The name of the section and the sheeting allowance are also printed.

```
plotfoil -c 8.5i -i 0.125 -s -l 10 -o clarkYH.ps clarkYH
```

will plot the Clark YH with a chord of 8.5 inches. Only the area from the L.E. to 10% back will interpolated with splines, and from 10% to the T.E.; straight lines will be used to connect the points. A sheeting allowance of 0.125" (1/8") will also be drawn. The PostScript will be left in "clarkYH.ps".

```
plotfoil -c 450m -i 1 -sp 5 0.5 -sp 30 2.5 -th 70 -tt 10 -tl 10 -x -1.5c -o
rg15.ps RG-15
```

This plots the RG-15 airfoil with a chord of 450mm. Since this is too large to fit on one page it will be automatically split across two pages. A sheeting allowance of 1mm is printed, and there are two spars: one at 30% that's 2.5mm thick, and another at 5% that's very narrow, i.e. a LE marking. A rectangular template is drawn around the plot; and all the graphics are moved to the *left* by 1.5cm, i.e. negative numbers can be used in the positioning. The PostScript is saved in "rg15.ps".

DISTRIBUTION

plotfoil is free; anyone may redistribute copies of it to anyone under the terms stated in the Gnu General Public License version 2, a copy of which should accompany each copy of plotfoil. See the file ‘‘COPYING’’ in the source area. If you do not have this file, a copy may be obtained from the author, or from:

Free Software Foundation
1000 Mass Ave.
Cambridge, MA 02138

or from the author.

Also, if you make any changes to this program and re-distribute it, the same conditions apply to the modified version so that we can all benefit from it. And please send me those changes!

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BUGS

On some printers, there may be a stack overflow if the plot is on more than one page and there are more than a certain number of coordinate values. If this happens, try

a) finding another printer, or

b) removing some of the airfoil data.

In the latter case you may still get satisfactory results because of the smooth interpolation used.

Since the program doesn’t know how big the printer page size is, it can get confused. This should only err conservatively, like producing an extra blank page on a multi-page plot. As long as the page is higher than about 11 inches (27 cm) everything should be fine. If you have a compiler, adjust the values in plotfoil.h and recompile.

I don’t know of any other bugs right now, but please send all bug reports to me. Include version number and the exact details (input files, command-line options etc.), please.