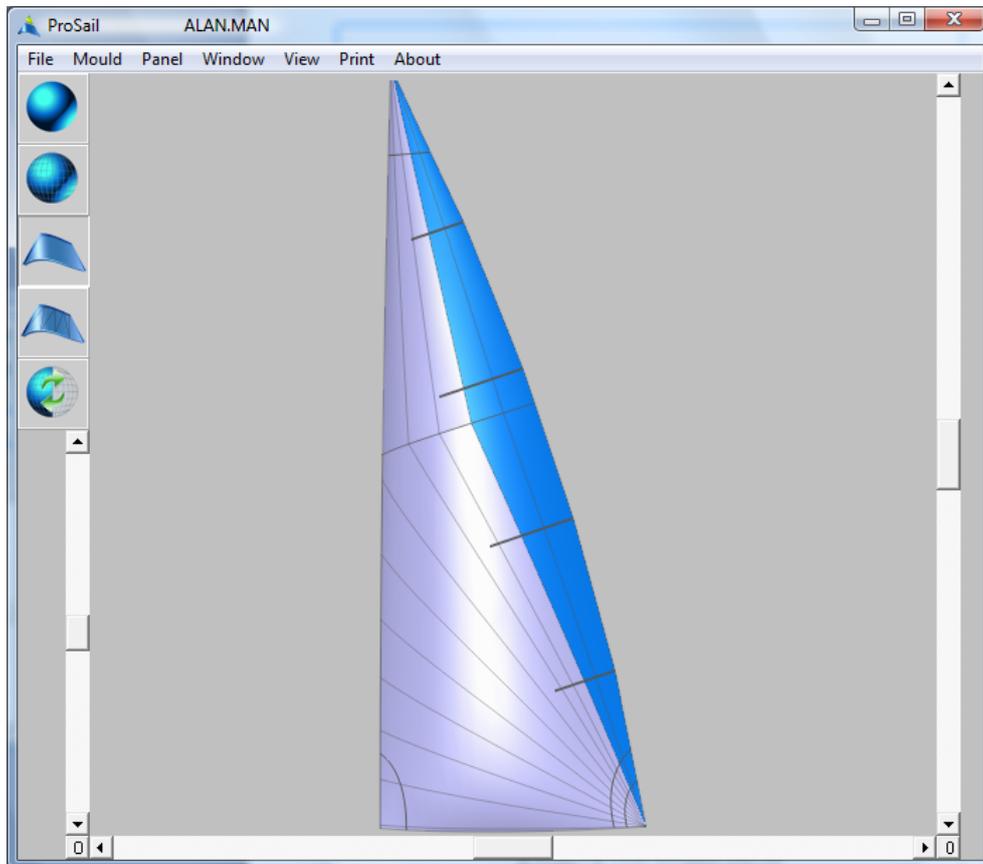


# ProSail 4

headsail/mainsail/gennaker/gaff/patches/patternMaker/Mitre

## Manual



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## **Dongle**



A dongle is a small USB connector that plugs into a USB port on your computer. For many ProSail machines, a dongle is required for the software to run.

## **USB to Serial converter**



With the ProSail plotter mkIII or the ProSail digitiser, the dongle is an optional extra and is not supplied as standard. With these machines the software will run so long as the USB cable from the "USB to Serial converter" is plugged into the computer (the machine does not need to be turned on, just the USB cable plugged in to the computer).

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## There are three main steps to designing a sail :

### 1) Generate a Mould :

- (i) **Dimensions** from the **Mould** menu : Specify luff, foot, leech etc.
- (ii) **Shaping** from the **Mould** menu : Specify mast-bend, depth, twist etc. Some of these curves can also be modified in the Chord window but the Shaping window is the best place because it allows you to fair these curves vertically up the sail.
- (iii) **Battens** from the **Mould** menu. Some girths can also be enforced in this window.

### 2) Generate Panels over the Mould :

- (i) **New** or **Open** from the **Panel** menu : Specify the panel layout.
- (ii) **Eyelets/2-Ply** from the **Panel** menu.
- (iii) **Patches** from the **Window** menu.
- (iv) **Colour Panels** from the **Window** menu. Colour the panels to indentify fabric.

### 3) Production :

**Nesting** from the **Window** menu : Send the panels to the Nesting window for nesting and driving a plotter or cutter.

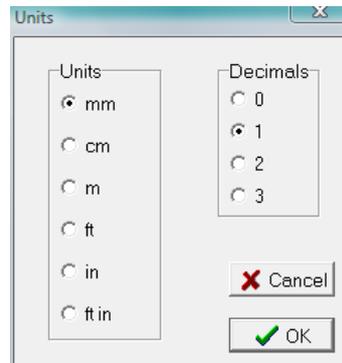
## Getting started :

When starting to use ProSail you probably won't know exactly how much % depth etc to put into your designs. Instead you will know how much shape you want in your panels. However with mould design programs it is not possible to directly enter your panel shapes and get a mould as a result.

Hence initially you will need to put a mould design in (start with one of the sample designs), get ProSail to develop it into panels and then go to **Panels** from the **Window** menu to see what panels have been produced. You can then modify the mould shape in order to produce the panel shapes you want.

The most important curve to modify to get the shapes you want is the Depth curve. The chapter titled "Shaping" has a section on the Depth curve and how the curvature of the depth curve largely determines the shape in the panels.

**Units** from the **File** menu :



This dialogue determines the current units and decimal places displayed in all of the dialogues throughout the program.

Although numbers will be displayed in these units they can be entered in any of the above units. For example if you want to enter 1.5 feet into a dialogue, you can enter 1.5f or 1.5' or 1f6i or 1'6". Then after pressing the Enter key it will be converted to the current units you selected in the Units dialogue. e.g. 457.2mm

If the current field is already displayed in the units that you want then when you enter a new number there is no need to add the units letters after the number. Just type the number.

Most dialogues have a % button that toggles between % and the current unit when you click in it.

If for example mm is displayed in the % button then fields in the dialogue will be displayed in mm.

If however % is displayed in the % button then some fields will be displayed as a %. Then if you enter a number into these fields it will be assumed to be a % unless you add the units letters to the end of the number.

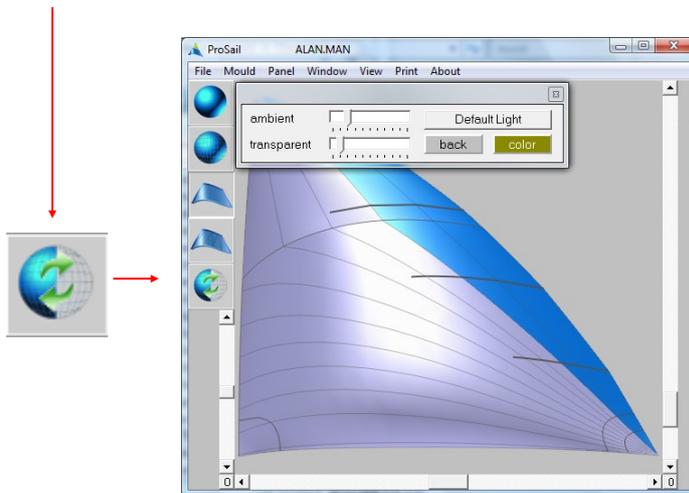
### Some examples

<u>entered</u>	<u>converted</u>
4.2f	1280.2mm
1.4m	1400.0mm
4.2f - 7mm	1273.2mm
10i	254mm
100+10.7	110.7mm

# Viewing

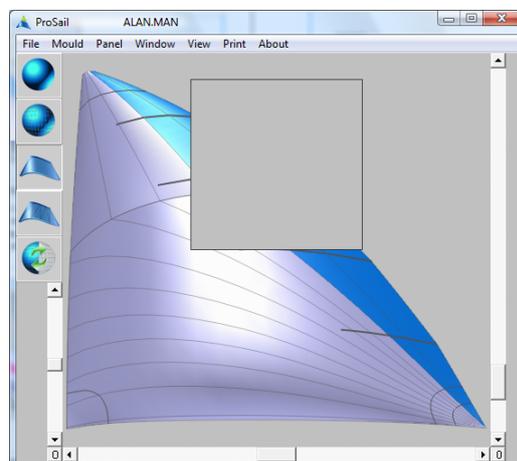
You can view your sail as a 3D “wire frame” or as a “solid rendering”.

To switch between wire frame and solid rendering click the icon on the left of the screen.



The view direction can be changed by dragging any of the 3 scroll bars around.

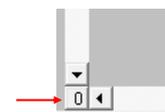
An easier way to change the view direction is with the Animate feature. Select **Animate** from the **View** menu (or click the “F1” key on the keyboard, or right click the mouse and click on **Animate**). A square outline will appear on the screen. As soon as the mouse enters the square the animate feature is activated. By moving the mouse from side to side and up or down you can rotate the view.



There are two animation modes when moving the mouse horizontally. It will either rotate the view in a horizontal plane or it will tilt the view clockwise/anticlockwise. To toggle between these 2 modes, press and release the Ctrl key on the keyboard while animating. This will redisplay the square outline. After moving the mouse into this square again, the mode will have changed.

To deactivate animation, click the mouse anywhere on the screen.

Clicking the small square at the bottom left of the screen will show the plan view.



# Viewing

The maximum rotation of the view (either 180 or 360 degrees) is set in **preferences** from the **File** menu : **scroll bars 360 degrees**.



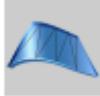
Displays the surface mould with minimal number of lines.



Displays the surface mould with a large number of lines.

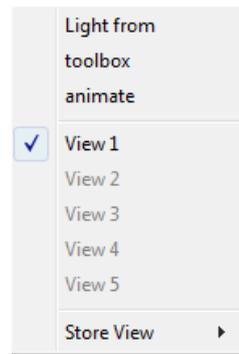


Displays the panels that have been generated.



Displays the panels that have been generated showing development lines.

Right clicking the mouse on the screen will display this popup menu :



**Light from :** Click on this to animate the direction of the light source. Works in a similar way to animating the view except it displays 2 arrows indicating the direction of the light source. The arrows are largest when pointing directly into the screen and change colour when at 90 degrees to this direction.

*There are actually 2 light sources - one directly in front which is fixed and another one that you can change the direction of using **Light from**.*

**toolbox :** Displays the lighting toolbox. See next page.

**View1, View1, View3, View4, View5 :** Click on one of these to go to that stored view. A quicker way is to use the "F2" key on the keyboard to loop through the different views you have stored.

**Store View :** Up to 5 different views including different light settings for each can be stored. Click **Store View** and select one of the 5 views to store the current view.

## Toolbox



- Ambient:** Changes the intensity of ambient light.
- Transparent:** Changes the level of transparency of the surface.
- Color:** Changes surface color.
- Back:** Changes the background color.
- Default Light:** Changes **color**, light direction, **ambient** and **transparent** to the default values.

## Zoom view

To zoom into part of the surface, hold down the Ctrl key on the keyboard and with it still held down press and release the Z key on the keyboard. Then release the Ctrl key. A horizontal and vertical line will be displayed at the mouse location. Move the mouse to the area you want to zoom in on. Click and hold down the left mouse button and drag the resulting selection box to encompass the area you want zoomed. When the mouse button is released, the selection box will be zoomed to fill the entire window.

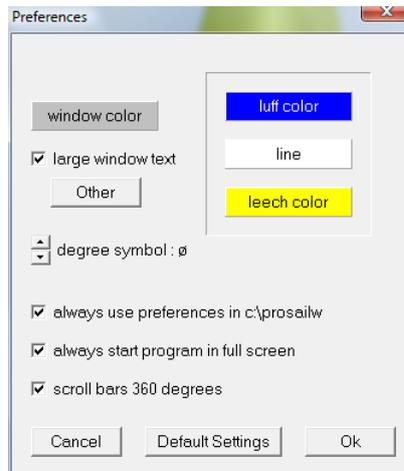
If viewing the surface as a solid render, you are able to animate the view while it is zoomed. The point on the surface at the centre of the window will remain at the centre as you animate.

To unzoom, click on any of these icons :



Note: there are two modes when dragging the selection box. Either the click of the mouse will correspond to one corner of the selection box or the click will correspond to the centre of the selection box. To swap between these two modes, press and release the Ctrl key while the selection box is visible.

**Preferences** from the **File** menu :



**Always use preferences in c:\prosailw :** Throughout ProSail you will specify various preferences. These are all stored in a file called untitled.psw. Normally ProSail is run from the C:\prosailw folder and it will use the untitled.psw file in that folder. However when you run ProSail by double clicking on one of its files (for example a plt file) that is stored somewhere else, it will create a new untitled.psw preferences file inside the folder that the plt file is in unless **always use preferences in c:\prosailw** is ticked in the above window.

It can be useful to have different preferences for different locations. However normally you will just want one preferences file and so it is recommended that you have **always use preferences in c:\prosailw** ticked in the above window.

**Always start program in full screen :** At startup the main viewing window will always start in full screen if **always start program in full screen** is ticked. If the viewing window becomes too large and overlaps the Microsoft windows taskbar at the bottom of the screen you can fix this by :

Right clicking the mouse on the taskbar and select "properties".

Make sure the "taskbar" tab is selected and then tick "keep the taskbar on top of other windows".

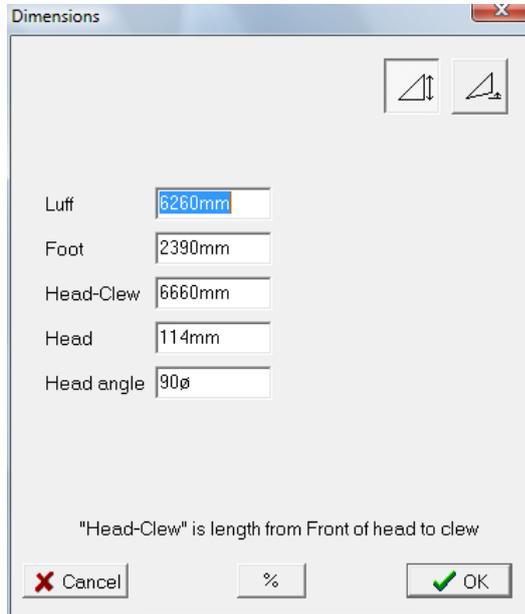
Batten, Girth, Eyelet and all Panel windows can also be zoomed to full screen by double clicking on their title bar. This will be remembered the next time you start ProSail and is independent of the **always start program in full screen** setting.

**Scroll bars 360 degrees:** Optionally viewing range can be the current 180 degrees or the new 360 degrees. 360 degrees is useful if animating.

# Dimensions

Select **Dimensions** from the **Mould** menu :

## Mainsails



Dimensions

Luff

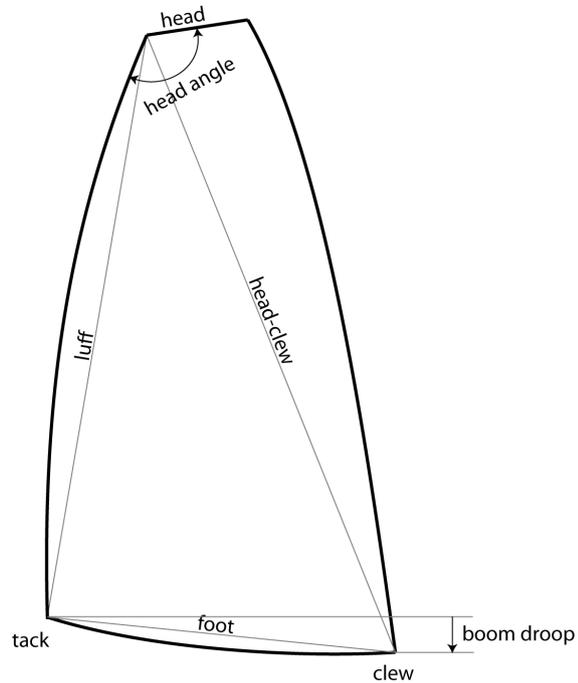
Foot

Head-Clew

Head

Head angle

"Head-Clew" is length from Front of head to clew



**Luff**, **Head-Clew** and **Foot** lengths are measured over the sail mould. These are the same measurements obtained by laying the sail on the floor and pulling it tight between the head, tack and clew.



If selected, the **Head-Clew** length must be entered.



If selected, **Boom droop** must be entered. Note that ProSail draws the 3D sail so the mast at the tack is vertical. A **Boom droop** of zero does not mean the tack angle is exactly 90 degrees as measured flat on the floor. **Boom droop** can optionally be expressed as a % of the **Foot** length. **Boom droop** can be entered as a -ve number to bring the clew above the tack.

**Head angle** : This angle can be between 80 and 100 degrees. (If the Gaff module is present, there is no restriction to this angle). Note : some older versions of ProSail will only be able to read files with a head angle of 90.

## Headsails

Dimensions

I 11580mm J 3480mm

Luff 95.7%

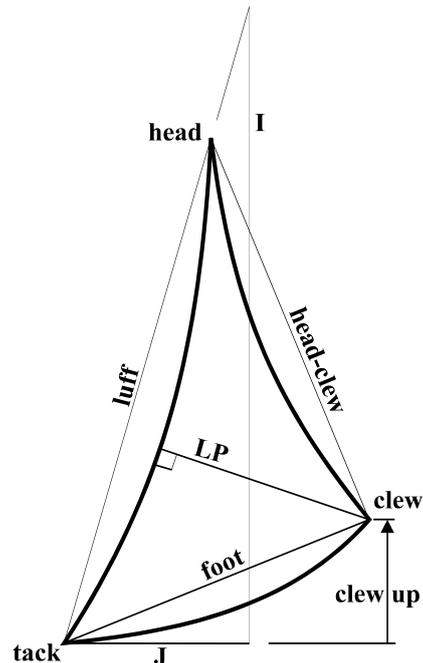
Foot 5390mm

Head-Clew 11390mm

Head 30mm

"Head-Clew" is length from Front of head to clew

Cancel % OK



If selected, **Foot** length must be entered.



If selected, **LP** length must be entered. So long as the correct **J** measurement has been entered, **LP** can be expressed as a % of **J**.



If selected, **Head-Clew** length must be entered.

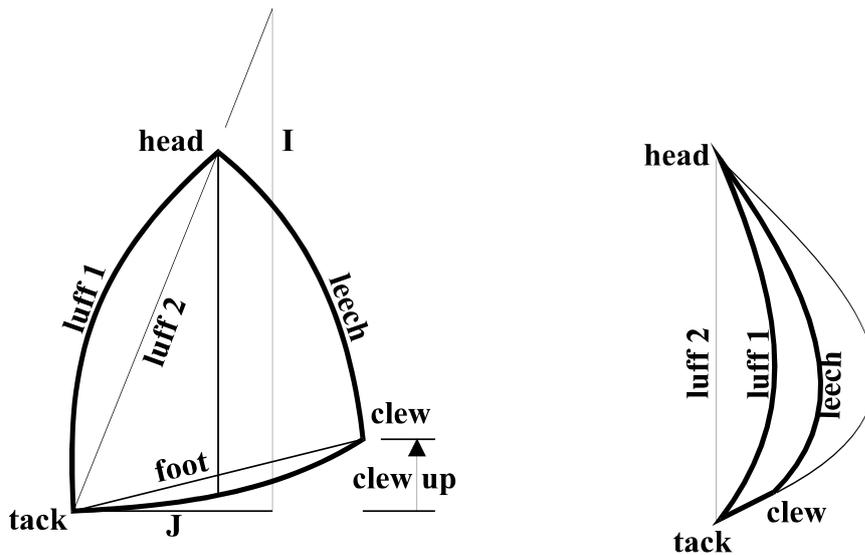


If selected, **Clew up** distance must be entered. Note that this is based on the triangle formed by **I** and **J**.

ProSail uses **I** and **J** as defined in the diagram above where **J** is measured back from the tack point and **I** is measured at 90 degrees to this. If you are simply defining the sail using **Luff**, **Foot** and **Head-Clew** lengths, the values you enter for **I** and **J** are not used. They simply rotate the sail for viewing purposes.

ProSail uses Pythagoras on **I** and **J** to work out the Hypotenuse. Hence so long as the correct **I** and **J** measurements have been entered, the **Luff** length can optionally be expressed as a % of this length.

## Gennaker (Extra Module)



Dimensions









I  J

Luff

Foot

Leech

Head

"luff" is length around Luff  
"Leech" is length around Leech



If selected, the **Luff** length you enter is taken as being the 3D straight line length as shown on the diagrams as **luff 2**. Note that this is not the length around the luff.



If selected, the **Luff** length you enter is the actual luff length measured around the luff as shown on the diagrams as **luff 1**. This is the most common method.



If selected, **Leech** length must be entered. This is the actual length around the leech. Hence it is not the same as the head-clew length used for mains or jibs.



If selected, **Clew up** distance must be entered. Note that this depends on the triangle formed by **I** and **J**.

## Gaff (Extra Module)

Dimensions

high aspect ratio

Luff

Foot

Gaff Angle   gaff angle

Gaff

Foot Angle   foot angle

**Low Aspect**

Dimensions

high aspect ratio

Luff

Foot

Leech   gaff angle

Gaff

Diagonal   foot angle

Headboard

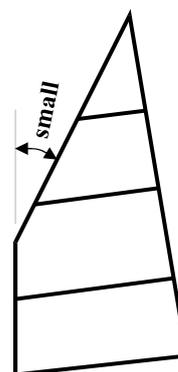
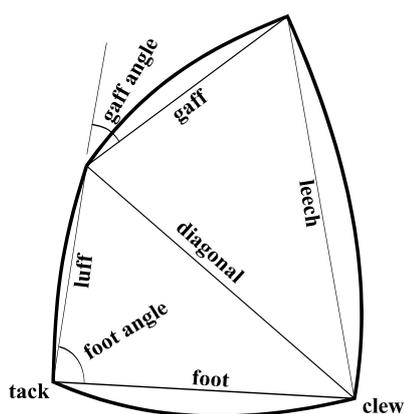
"Leech" is length around Leech

**High Aspect**

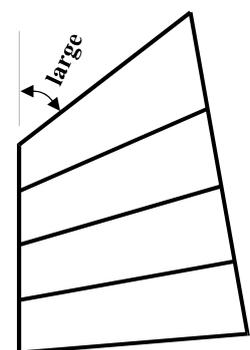
**High Aspect Ratio** This variable is very important and determines the direction of the chord shaping for the sail.

If the **Gaff Angle** is small, then the sail should be defined as a **High Aspect Ratio** sail so the chord shaping will be parallel with the foot as per conventional mainsails.

If the **Gaff Angle** is large, then the sail should not have **High Aspect Ratio** selected and so the chords will fan from the foot to the head. In that case the depth of the chord at the head should be set to zero.



**High Aspect**



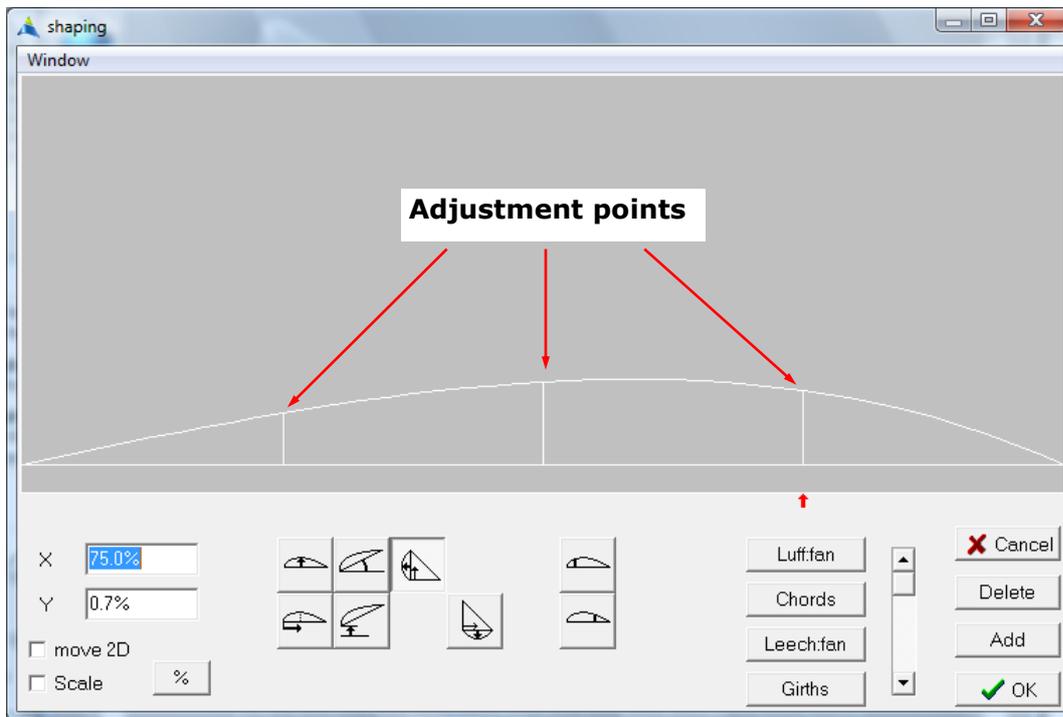
**Low Aspect**

**Head Angle** If selected, a **Gaff Angle** must be entered. Otherwise a **Leech** length must be entered.

**Foot Angle** If selected, a **Foot Angle** must be entered. Otherwise a **Diagonal** length must be entered.

# Shaping

Select **Shaping** from the **Mould** menu to display the shaping dialogue :



The shaping dialogue displays all of the curves that define the sail mould except roach. With the exception of foot-round and gaff-bend, all of these curves are considered vertically up the sail. For example with the mast-bend, the left of the shaping dialogue corresponds to the base of the luff (tack), and the right corresponds to the top of the luff (head).

To view a different curve, click the mouse in the icon corresponding to that curve.

To select an Adjustment Point, click anywhere above the Adjustment Point (but not too close to the point or you may move it). You do not need to be very close. Near the top of the window will do. Alternatively, use the left or right arrow keys on the keyboard. When selected, a red arrow indicates the selected Adjustment Point and the **X** and **Y** values are displayed for that point. **X** being the distance along the curve (height up the sail) and **Y** being the value of the curve.

There are three ways to move an Adjustment Point :

- (i) Click on an Adjustment Point (you need to click very close) and with the mouse button still down, drag it to the required location and release the mouse button. If **move-2D** is currently selected, **X** is changed also, otherwise only **Y** is changed. If **scale** is currently selected, all the Adjustment Points will move in proportion. This is useful for scaling the entire shape up or down.
- (ii) Click on the red arrow and drag it horizontally to change **X**. **Y** will also change so the curve remains the same shape.
- (iii) Type the desired **X** or **Y** value using the keyboard. Then press either the **Enter** or **Tab** key on the keyboard to see the result. **Enter** keeps you in the same field, **Tab** takes you to the next one.



Visually scales the curves up or down. This is only a visual effect to aid fairing and has no effect on the actual size of the curves.

Add

To add an Adjustment Point, click on **Add**, release the mouse and position the resulting vertical line at the desired horizontal location before clicking the mouse.

Delete

Deletes the currently selected Adjustment Point.

Chords

Goes to the Chord window. See chapter titled Viewing.

Girths

Goes to the Girth window. See chapter titled Girths.

# Shaping



Depth.



Position of Depth.



3D Mast-bend.



Twist.



Transverse Mast-bend. (Only available if Gennaker module present)



Foot Round.



3D Leech Hollow.



Forestay-sag.



3D Mast-bend that changes Depth.



Gaff-bend. (Only available if Gaff module present)



Forward Depth.



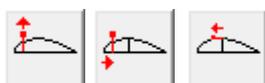
Aft Depth.



Forward Position (visible if selected in the Preferences from the Window menu)



Aft Position (visible if selected in the Preferences from the Window menu)



Forward B-Spline control points.

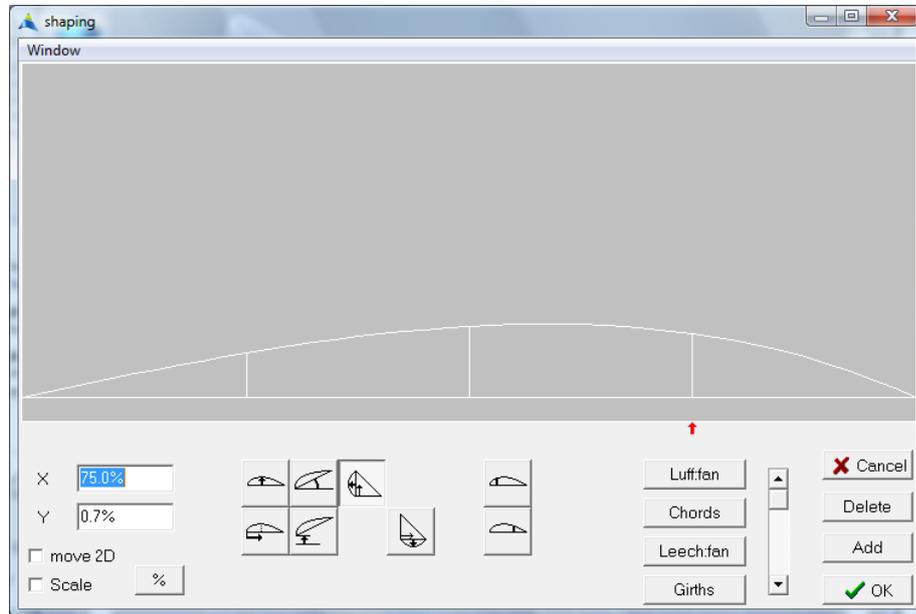


Aft B-Spline control points.

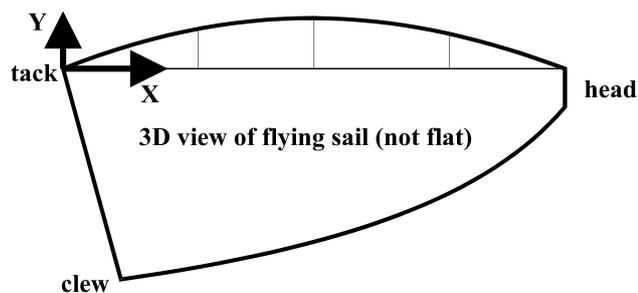


## 3D Mast-bend

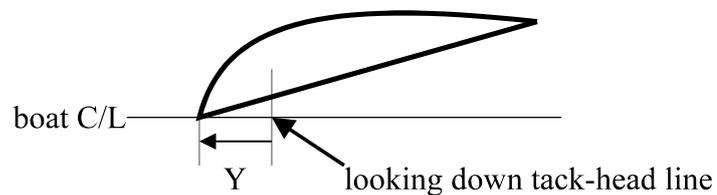
The shape of the actual mast measured from a line between the tack and the head.



Note : The mast-bend is not the same as the 2D Luff round you measure on the floor. It is the actual shape of the mast when the sail is flying.



The cross-sectional shape of the sail (chord) would look like the following where **Y** is the mast-bend at height **X** :



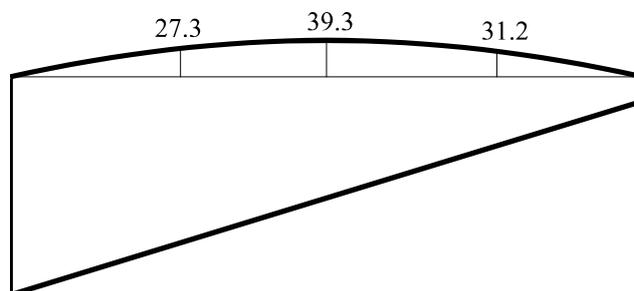
# Shaping

Luff:fan

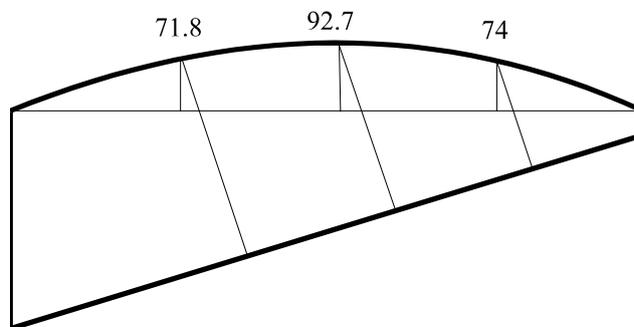
Click on this button to display the 2D Luff round/hollow that you measure on the floor.

There are two ways to measure luff round/hollow :

(i) Fanned (sometimes called flaked or folded) method where the sail is pulled tight between the tack and the head with the sail folded a short distance back from the luff. The rest of the sail is loose. This is probably the most common method of measuring luff round but it does vary a great deal depending upon such things as how tight it is pulled, stretch in the fabric and how far back from the luff the fold is made. ProSail uses a fold going from 10% along the foot to the headboard itself :

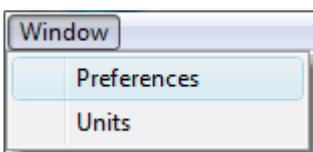


(ii) Flattened method where the cross-cut panels of the sail are laid together before sticking or sewing. Its also the same as a finished sail where all of the shape in the sail is flattened by pulling the luff and leech apart at intervals up the sail :

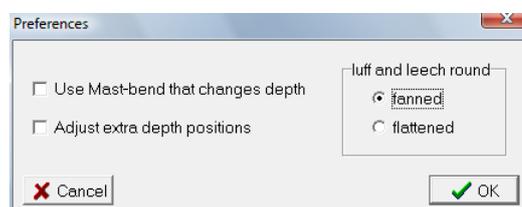


Leech:fan

Click on this button to display the 2D Leech round/hollow that you measure on the floor. Note that this is different from the roach in the batten dialogue since it is measured from the back of the headboard.

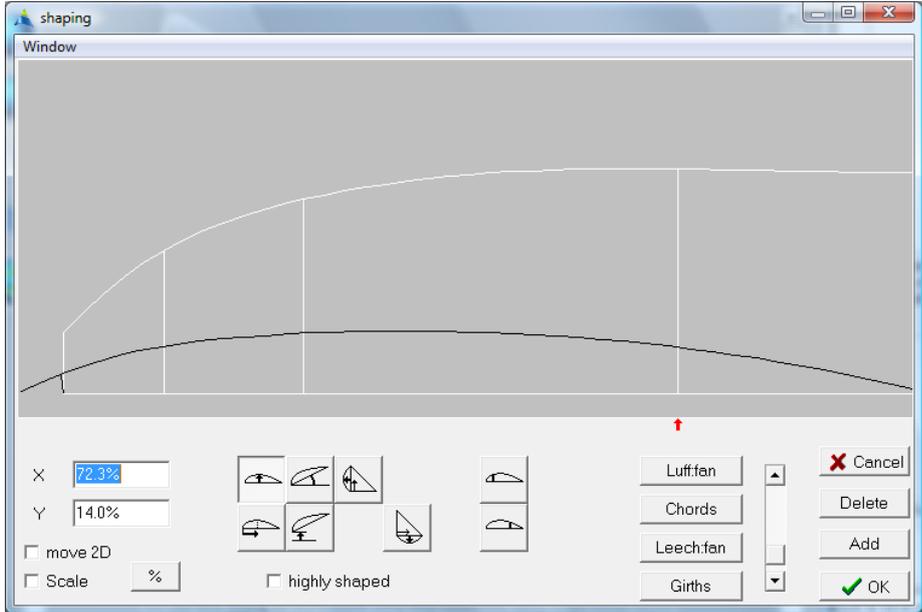


To change the method (fanned or flattened) you wish to see, select **Preferences** from the **Window** menu :





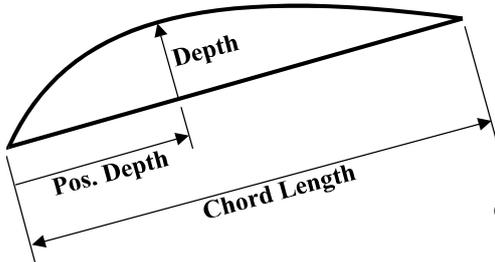
Depth



Two curves are drawn for the depth display. Both curves relate to the depth vertically up the sail. The left of the screen corresponds to just below the foot of the sail, the right corresponds to the head.

The lower curve is the physical depth curve. This is physically what you see on the 3D sail when it is flying. (You need to imagine the sail is heeling over 90 degrees) The upper curve is the %Depth curve. This is a graph of the depth in the sail drawn as a % of the width (chord length) of the sail at points up the sail.

At any height up the sail, the value of the %Depth is calculated as follows :



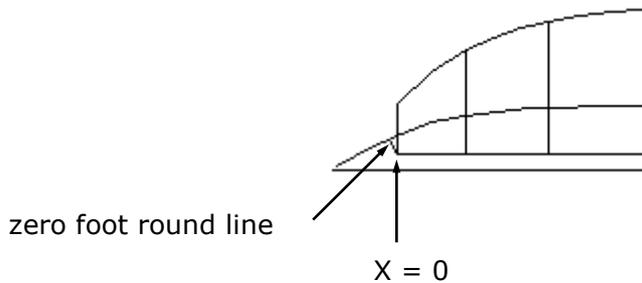
**%Depth = Depth / Chord Length as %**

One way of looking at these two curves is that the physical depth curve is what you see, whereas the %Depth curve is what the airflow sees.

Note : the %Depth in the head is not zero. Of course the physical depth is very close to zero because the chord length is small, but the %Depth should not be set to zero since it makes fairing the %Depth curve difficult.

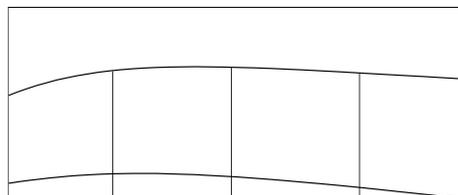
# Shaping

Note : The actual depth curve is drawn 5% below the tack height (i.e. below  $X = 0$ ). The reason for this is because of foot round, it is possible for the sail to extend below the straight tack to clew line. In fact even with zero foot round, the foot panel usually extends below this line. This zero foot round line is drawn on the actual depth curve :

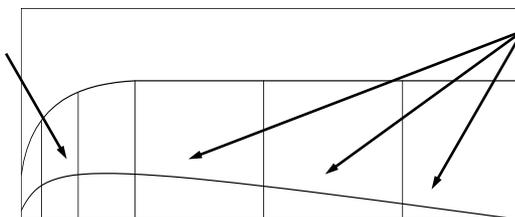


The most important factor determining the amount of shape a mould program will generate in the sail panels is the amount of **curvature** in the physical depth. The more curvature in the physical depth curve, the more shape there will be in the panels. It is not the actual value of depth that is important. It is the change in depth as you go from the foot to the head. Consider the following Depth shaping curves :

Not much curvature anywhere in this sail. Hence the sail will be fairly flat. Could increase curvature by reducing the depth at the foot.

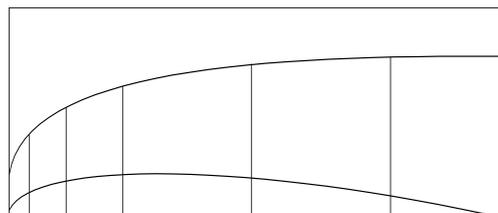


High curvature here. Hence a lot of shape in the lower part of the sail.



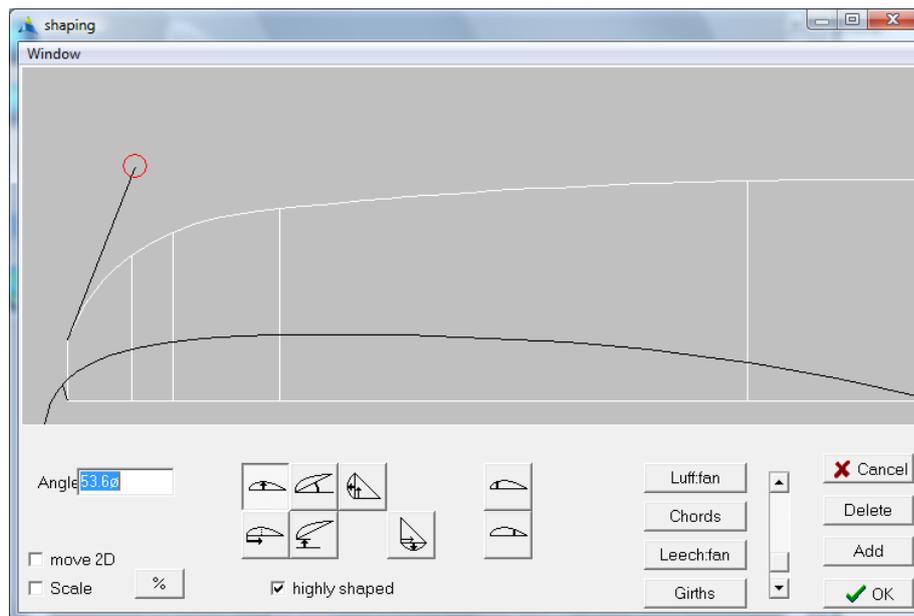
Not much curvature here. Hence little shape in the rest of the sail.

Large amount of curvature everywhere in this sail. Hence the sail will be fairly full.



# Shaping

For the % Depth curve, if **highly shaped** is selected, the lower section of the depth curve can be highly shaped without affecting the rest of the depth curve. Use this option when you require more shape in the panels in the foot area. In addition to the depth adjustment points, a lever is used. To move the lever, either drag its end point or type an angle through the keyboard. To select the lever, click anywhere on the lever (not necessarily the end of the lever).



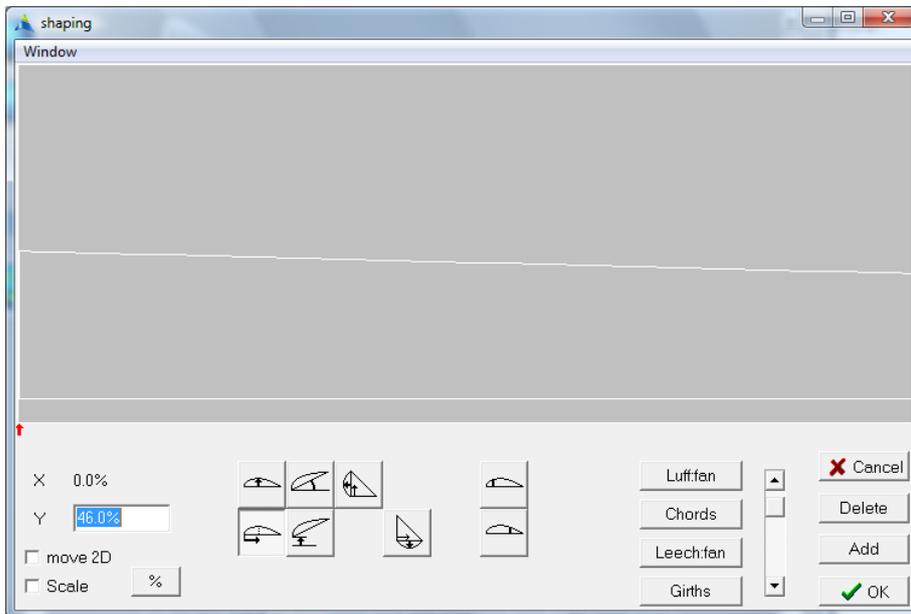
Notice the physical depth curve extends (5%) below the foot chord. Although the mould as seen on the 3D view of the sail starts from the foot chord, the panels generated on the sail usually extend below this chord even if zero foot round is specified. Hence it is useful to see the depth of the sail below the foot chord.

The small line drawn from the foot chord to 90 degrees with the absolute depth curve is an approximate location for zero foot round.

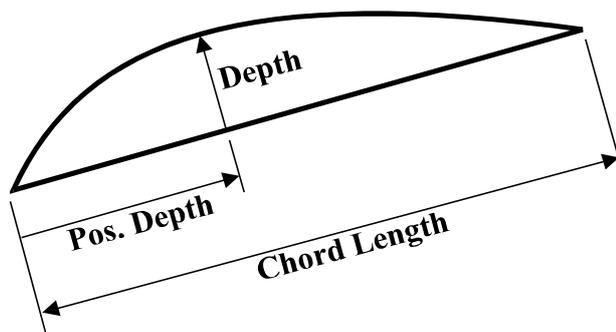
If you want to directly control the shape of the depth below the foot curve, you can drag the foot chord down to 5% below the foot by clicking on the red arrow below the foot chord and dragging it to the left.



## Position of Depth



The Position of Depth curve is a graph of the % position of depth in the sail going from the foot of the sail (at the left of the screen) to the head of the sail (at the right of the screen). At a given height up the sail, the cross-sectional (chord) shape would be as follows :

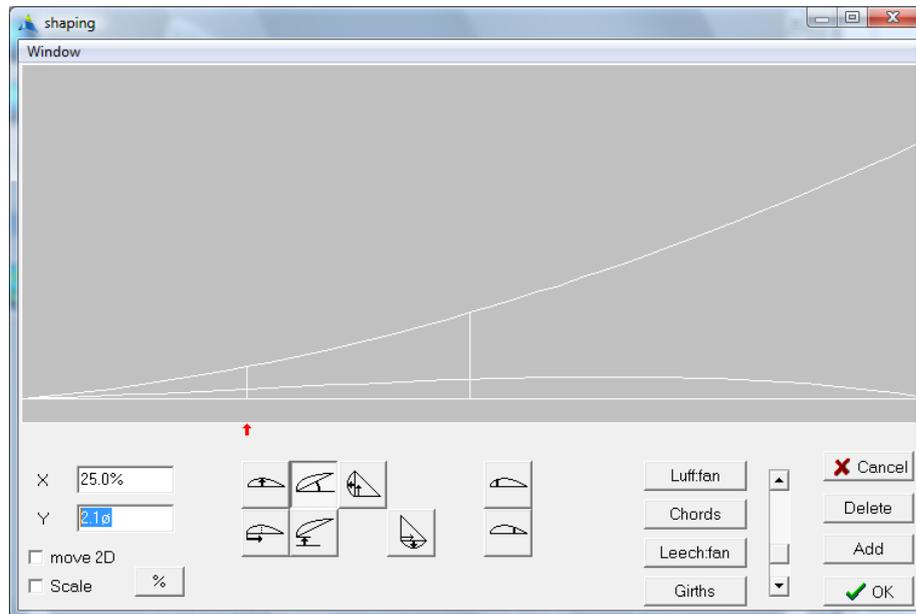


$$\% \text{ Pos. Depth} = \text{Pos. Depth} / \text{Chord Length as } \%$$

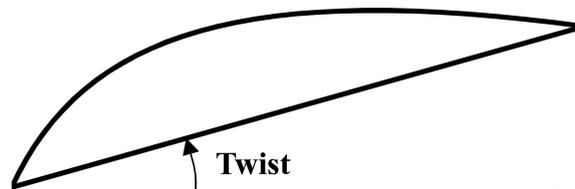
As with other curves as many adjustment points as desired can be added to the shaping curve. However since this curve is fairly flat, usually it is sufficient just to have one point at the foot and one at the head as in the above example with the position changing slightly from the foot to the head.



## Twist



The twist curve is a graph of the angle of twist in the sail going from the foot of the sail (at the left of the screen) to the head of the sail (at the right of the screen). At a given height up the sail, the cross-sectional (chord) shape would be as follows :



There are two curves drawn : The top curve is the angle of twist in the sail, the bottom curve is the effect of the twist on the leech as seen from aft of the boat. As with other curves as many adjustment points as desired can be added to the shaping curve. However most people find it sufficient just to specify a value of twist (between 5 and 15 degrees. More for a #1 than a #3) at the head and to have the twist increase in a linear fashion from the foot to the head as in the above example.

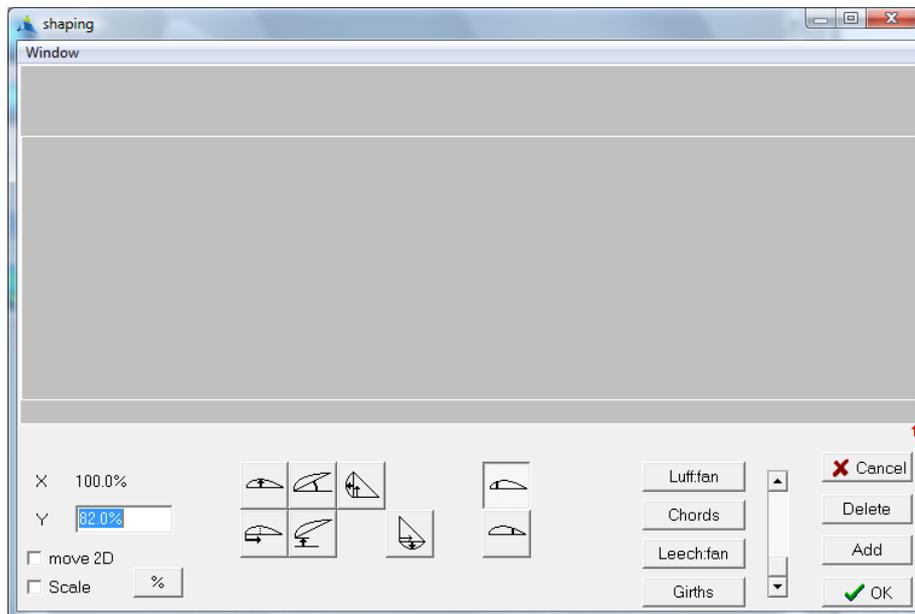
Because twist pushes the sail out, it also slightly increases the curvature in the physical depth of the sail. As explained earlier regarding the depth curve : The more curvature in the physical depth curve, the more shape in the panels. Hence increasing twist will slightly increase the panel shaping in the sail. In a similar way, increasing Mast-Bend and Roach will increase the shaping in the sail. Of course Mast-Bend also has the greater effect of increasing Luff Round.



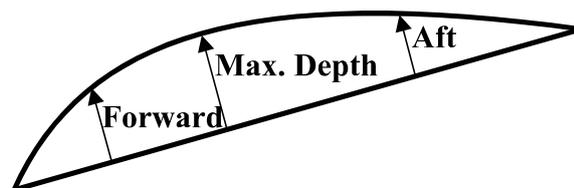
**% Forward Depth**



**% Aft Depth**



The Forward and Aft Depth curves are a graph of the forward and aft depths in the sail going from the foot of the sail (at the left of the screen) to the head of the sail (at the right of the screen). At a given height up the sail, the cross-sectional (chord) shape would be as follows :



If we take for example the Forward Depth : At a given height up the sail, it is expressed as a % of the maximum Depth at that height. The Forward Depth shaping curve is hence a curve that defines how the Forward Depth changes as a % of the maximum depth as we go up the sail. If the forward depth curve is totally straight and horizontal (which in most cases is sufficient), the Forward Depth in the sail will be exactly the same % of the maximum depth all the way up the sail. The maximum depth will of course change going up the sail, but the Forward Depth will change with it. To flatten the Entry of the chords for example, reduce the % Forward Depth curve.

The position of these Forward and Aft depths is described on the next page.

The Aft Depth is similarly expressed as a % of the maximum Depth.



### Forward Position



### Aft Position

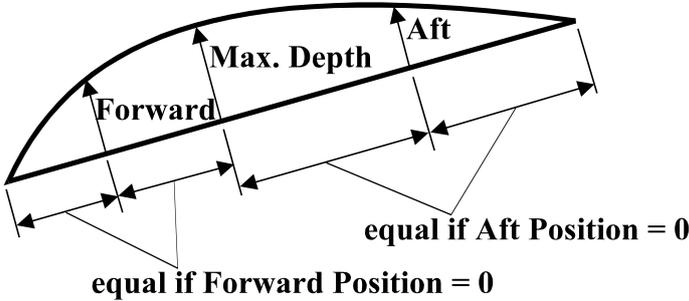
These control the position of the **forward depth** and **aft depth**. See also the Chord chapter.

If these curves are 0%, the position of the forward depth is half way between the luff and max. depth position and the position of the aft depth is half way between the max. depth position and leech.

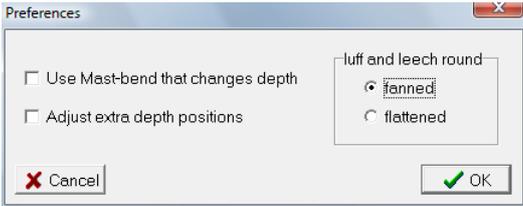
If these curves are 100%, the the position of the forward depth is 75% of the distance between the luff and max. depth position and the position of the aft depth is 75% of the distance between the max. depth position and leech.

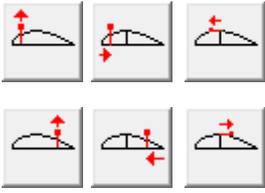
Increasing either of these curves will push the position of forward or aft depths away from the max. depth position.

With these curves it is possible to make chord shapes that are more Frisbee like. This is sometimes useful for gennakers. However for most sails it is sufficient just to set them to zero. If even more control is required, the B-Spline chords (next page) will offer this.



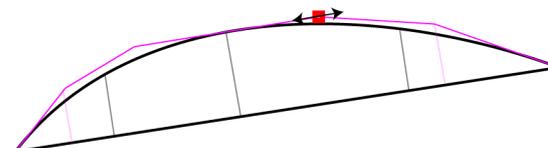
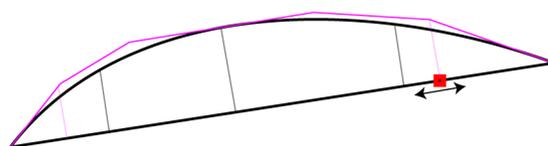
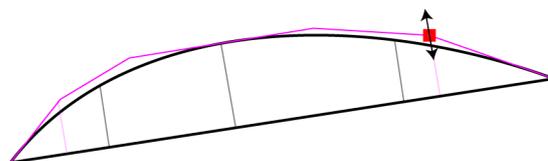
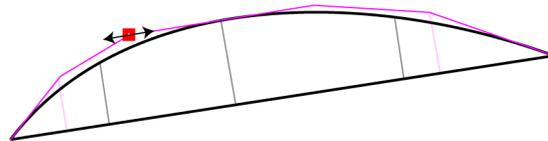
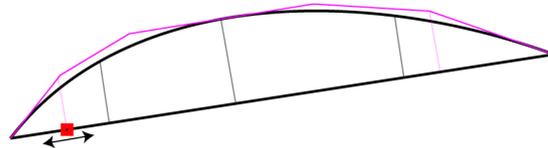
To display the Forward and Aft Position icons, select **Adjust extra depth positions** in the **Preferences** dialogue from the **Window** menu.





## B-Spline chords

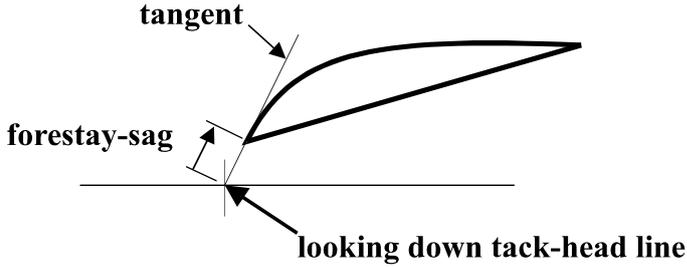
These B-Spline icons are an alternative to the Standard Fore and Aft Depth/Position icons. See the Chord chapter for an explanation of "Standard" chords and "B-Spline" chords.



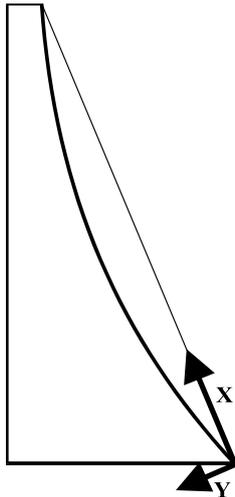


**Forestay-sag**

Forestay-sag is the displacement of the chord in a direction tangential to the entry of the chord. If you compare this curve with the 2D Luff Hollow displayed in the Fanned mode, they are very close to each other. If looking directly down the Forestay from head to tack, a typical chord in cross-section would look as follows :



**3D Leech Hollow**



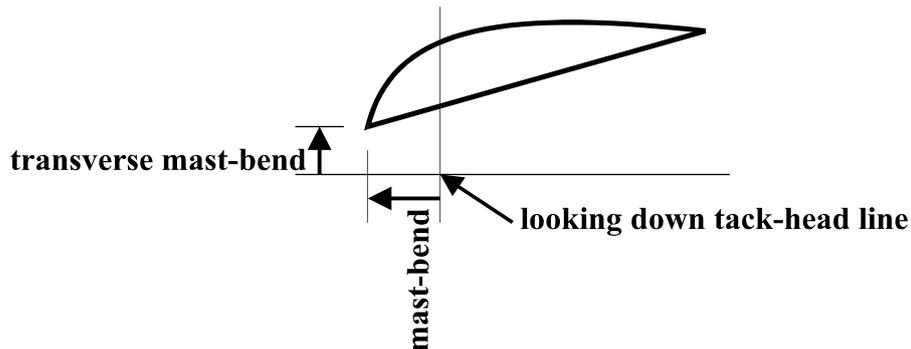
The 3D Leech Hollow curve is the amount of 3D hollow cut into the leech when looking side on at the 3D sail. It will not be exactly the same as the 2D Leech Hollow curve as seen on the sail laid flat on the floor.

Note that this icon is not available if the sail has battens since the Battens dialogue has its own way of defining hollow between the battens. Hence to see this icon in the shaping window, you need to remove all battens first.



## **Transverse Mast-bend** (Only available if Gennaker module present)

Transverse Mast-Bend is sideways mast-bend. It is only available if the Gennaker module is present. If looking directly down the luff from head to tack of a Gennaker, a typical chord in cross-section would look as follows :



## **Gennakers**

ProSail treats a Gennaker as if it is a mainsail with a large mast-bend and a large transverse mast-bend. You also need a large leech round which can be done by specifying a large -ve 3D leech hollow.

For some Gennakers, there are girth restrictions and so it may be necessary to go to the Girths dialogue (there is a Girths button in the Shaping window) to see the girths.

Once happy with the shape and girths, the next step is to look at the 2D luff round by clicking on the Luff Round button in the shaping window. Most designers know what they want in terms of the 2D fanned luff, usually a small hollow. By increasing the Transverse Mast-Bend curve, and then looking at the resulting 2D Luff Round, it will be reduced. Similarly it will be necessary to look at the 2D fanned leech.

In general, increasing the the Mast-Bend curve will increase the 2D luff round. However, increasing the Transverse Mast-Bend will decrease the 2D luff round. Hence the two curves compete against each other.



## Foot Round

This is the 2D shape placed on the bottom of the foot panel. The left of the screen corresponds to the tack, the right to the clew.

---



## Gaff-bend.

This is the amount of bend in the Gaff of a Gaff sail. The left of the screen corresponds to the luff, the right to the leech.

---



## 3D Mast-bend that changes Depth.

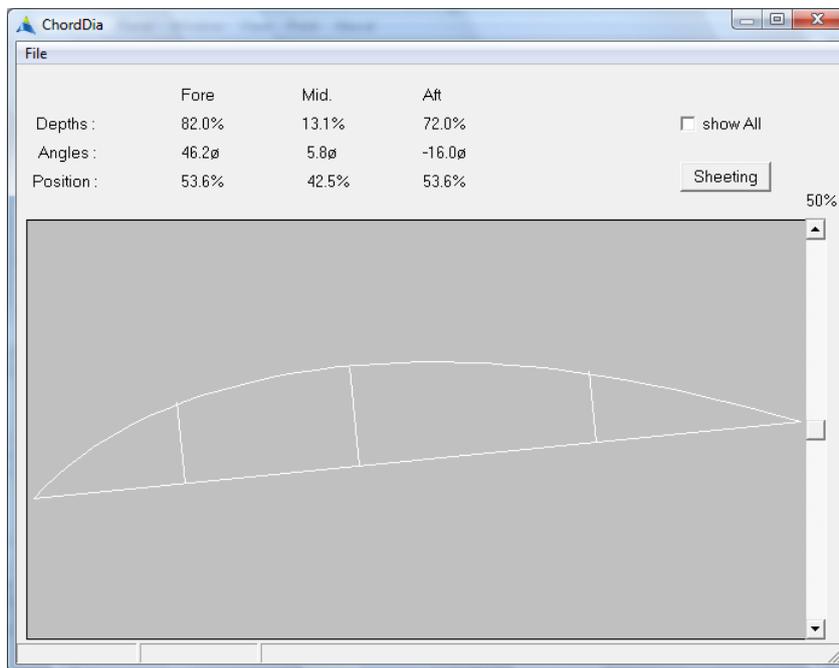
This is exactly the same curve as the 3D Mast Bend explained near the beginning of this chapter. The difference being that when you change this curve, the depth curve will change in order to keep the girths around the chords the same. For example, if you increase this curve, the depth in the sail will reduce.

However, these girths are only done at certain points up the sail. Namely they are at the same locations as the Adjustment Points on the Depth curve. Hence before using this method of changing Mast-Bend, you need to make sure you have several Adjustment points on the Depth curve.

Because this is the only curve in ProSail which directly changes another curve (all other curves are independent) please use it with care. This icon is usually hidden to prevent it being clicked on accidentally. To display this icon, select **Preferences** from the **Window** menu and tick **Use mast-bend that changes depth**.

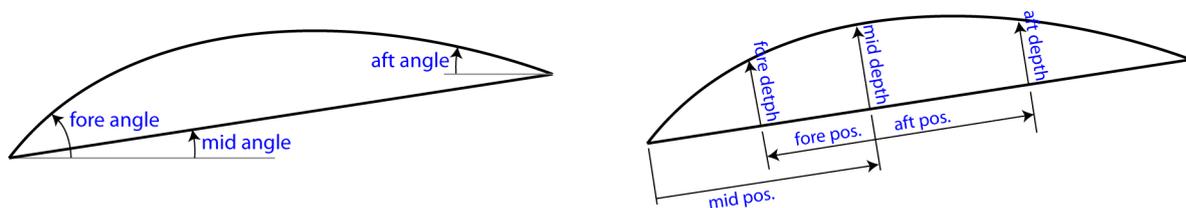
# Chords

Select **Chords** from the **Window** menu to see cross-sectional shapes (chords) up the sail :



50% ← % height up the sail.

Scroll bar displays chords at 5% intervals up the sail. ←



**Mid Depth** is the maximum depth of the chord and is displayed as a % of chord length.

**Mid Position** is the position of maximum depth.

**Fore position** is the position where the **Fore Depth** is measured and is displayed as a % of the position of maximum depth. Hence 50% is half way between the luff and the position of maximum depth.

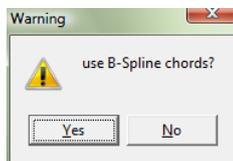
**Aft Position** is measured as a % of the distance between the position of maximum depth and the leech. Hence 50% is half way between the position of maximum depth and the leech.

**Fore and Aft Depths** are the depths at the **Fore** and **Aft Positions** expressed as a % of the **Mid Depth**.

**Fore** and **Aft angles** correspond to the Entry and Exit angles. **Mid. angle** is the Twist.

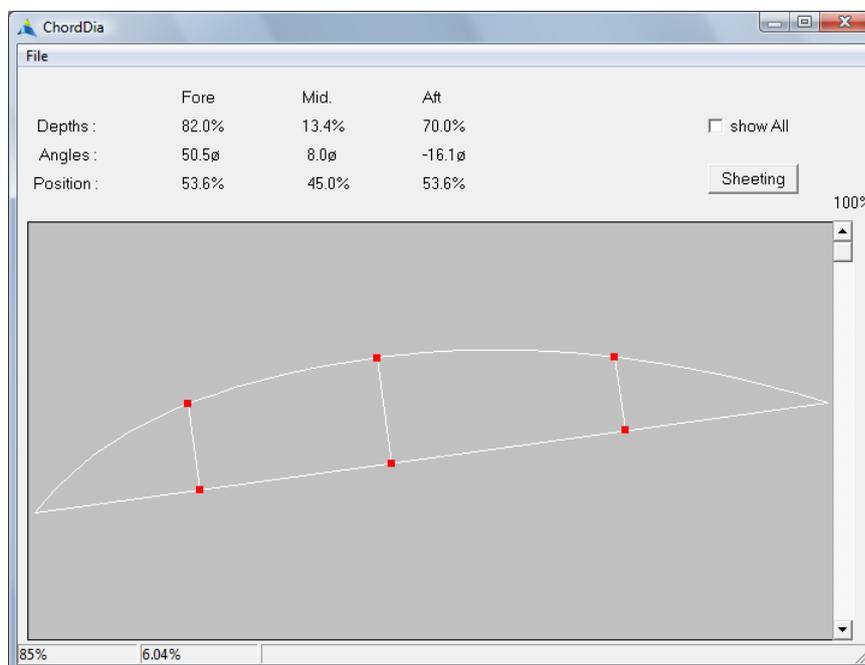
# Chords

There are 2 types of chords in ProSail : "Standard" Chords and "B-Spline" Chords. "Standard" chords are quick and easy to use. "B-Spline" chords give more control if that is required. The type used for a particular sail is specified when creating a new sail : **New** from the **File** menu :



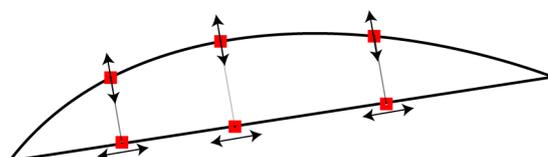
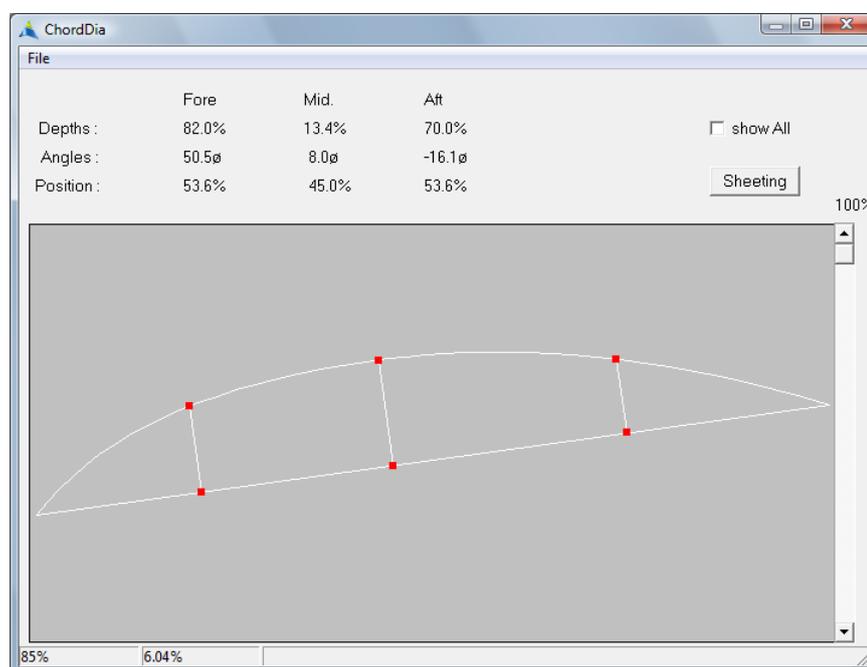
Both "Standard" Chords and "B-Spline" Chords have control points that you can adjust in the chord window and will change the corresponding curves in the shaping window.

To see these red control points, click the mouse anywhere in the view :



NOTE : Dragging a control point on the currently displayed chord will change the shape of the chord at the current height up the sail. However it is important to relate this height back to your placement of adjustment points on the various curves making up the sail in the shaping window. For example if you try to move the depth control point on a chord at 60% height but you don't have an adjustment point on the depth curve in the shaping window within 25% of this height, ProSail will add an adjustment point for you in the shaping window. However you will be prompted before it does this.

## Standard Chords :



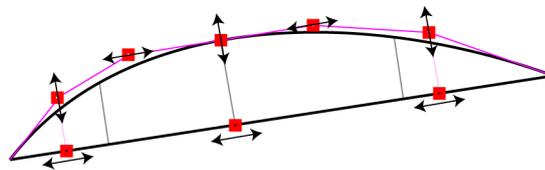
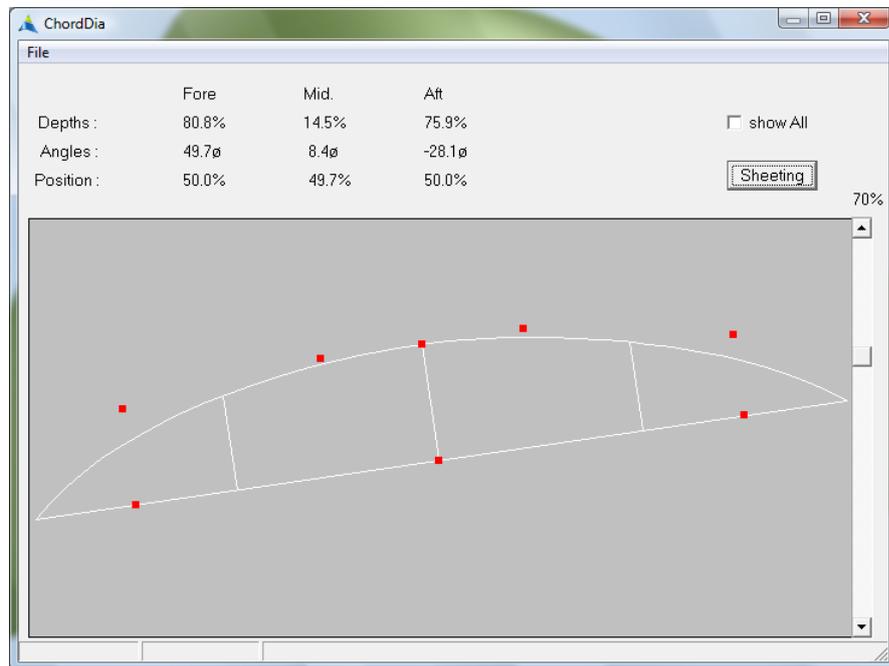
Standard Chords have up to 6 control points.

The lower middle control point controls the position of max. depth, the upper middle controls the max. depth.

The upper left and right control the forward depth and aft depth respectively.

The bottom left and right (if they are visible) control the fore and aft depth position curves respectively. If these are not visible, tick **Adjust extra depth positions** in **Preferences** from the **Window** menu in the Shaping window.

## B-Spline Chords :



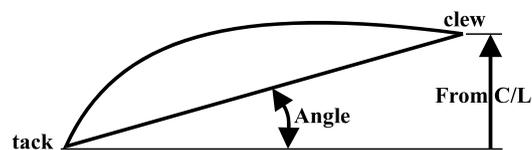
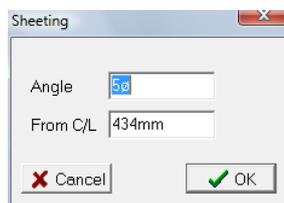
B-Spline chords have 8 control points.

The lower middle control point controls the position of max. depth, the upper middle controls the max. depth.

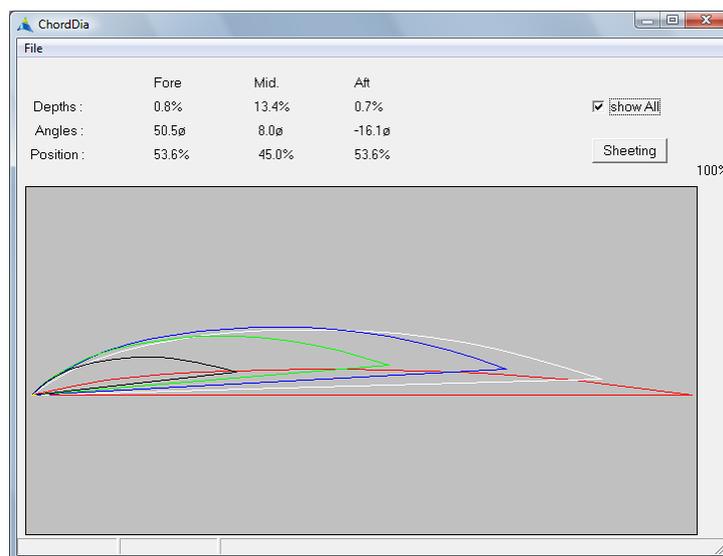
The other control points do not lay on the chord itself but they influence it.



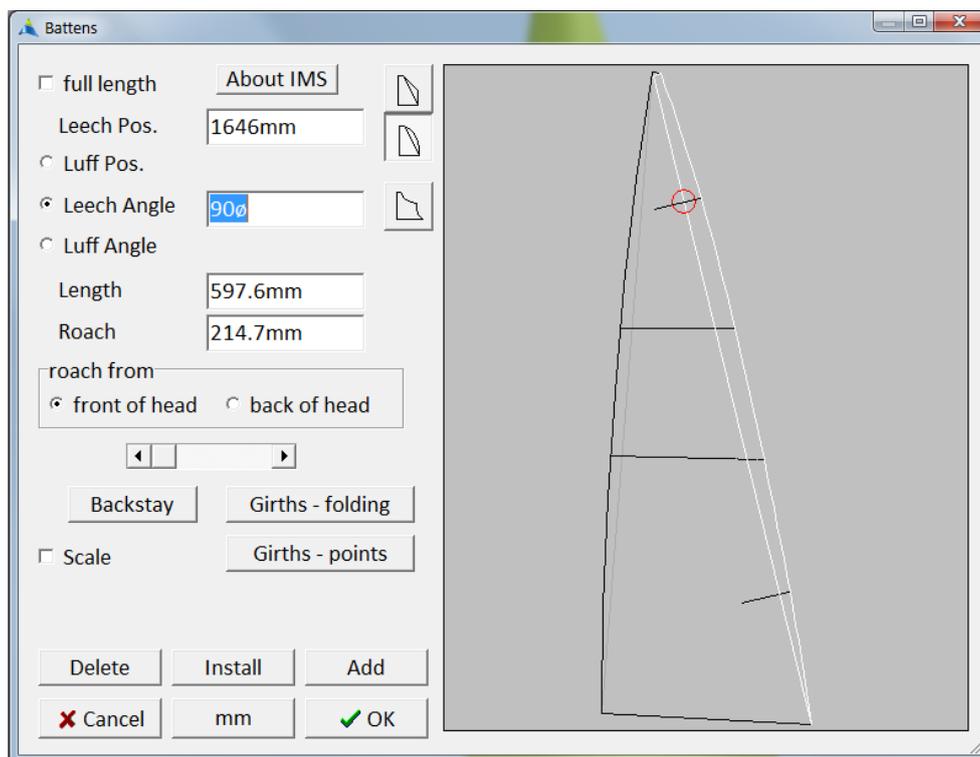
Will display the following dialogue where you can specify either sheeting **Angle** or distance **From C/L**. If distance **From C/L** is entered, ProSail will calculate the sheeting **Angle** for you. If at a later date, foot length for example is changed, the sheeting **Angle** will remain the same but the distance **From C/L** will change. As well as rotating the view in the chords window, it also changes the view in the 3D viewing window. However, it has no effect on the shape of the panels generated and is only a visual effect especially useful for looking at Entry and Exit angles :



**Show All** If selected, chords will be drawn superimposed at 20% intervals. If not selected, chords will be displayed individually at 5% intervals and their size scaled to fit inside the window.



Select **Battens** from the **Mould** menu :



The operation of the batten dialogue is closely related to the operation of the shaping dialogue. The data displayed corresponds to the batten drawn with a circle next to it. To select another batten click the mouse near it.

The roach curve specified in this dialogue is added to the mould to form a smooth leech. At the start of panel development, this smooth leech is trimmed to give the specified hollow between the battens.

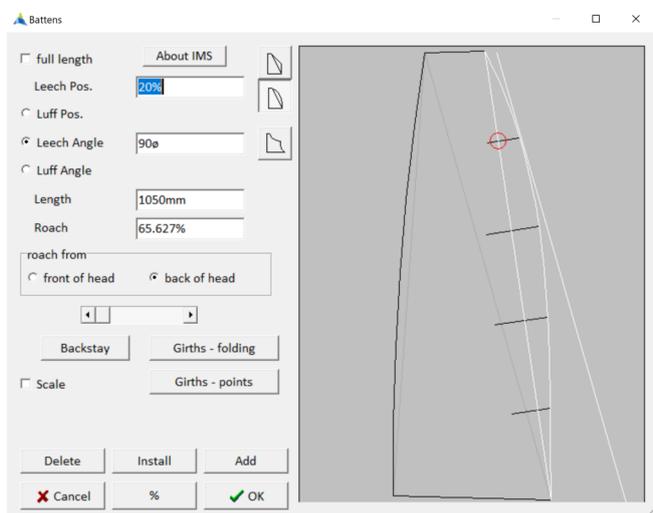
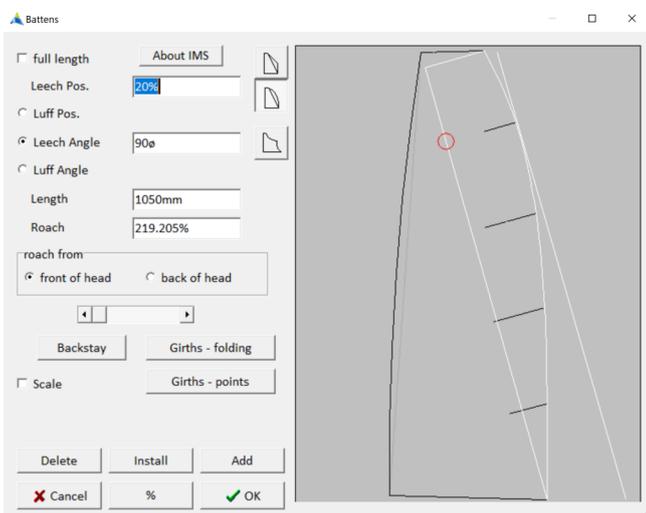


These two icons change the display of the roach curve so it is drawn either as a curve or straight between battens. Note that this has no effect on the form of the leech and is solely for viewing purposes in this window. The form of the leech between the battens is determined by the hollow icon.

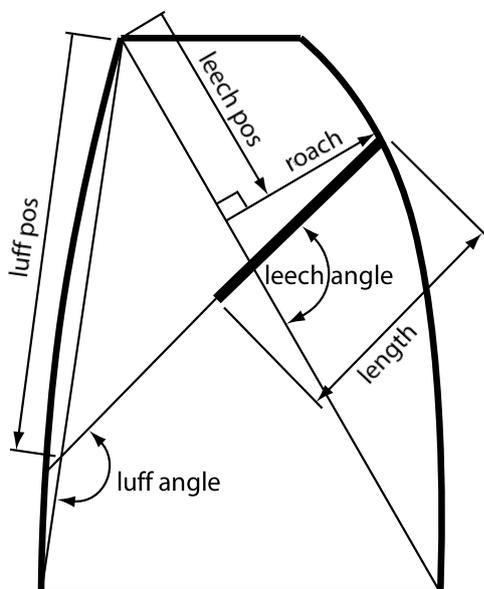
# Battens

roach from  
 front of head    back of head

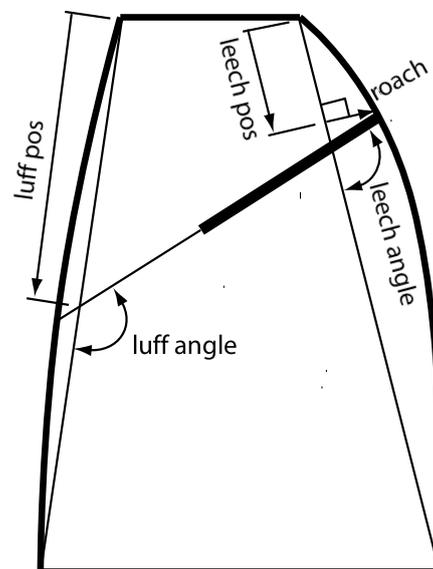
Roach can be specified either from the **front of the head** or from the **back of the head**.



**front of head**



**back of head**



NOTE : Some older versions of ProSail will not be able to read files where roach is specified from **back of head**.

When swapping between **back of head** and **front of head**, the batten locations on the leech are changed and hence the sail will have changed. The amount of change will depend upon the size of the headboard.

full length

Makes the current batten a full length batten. The batten length will be displayed and will change as you change the sail shape. e.g. by changing the roach.

Add

Adds another batten. Click Add and then click where you want the batten to go.

Install

Displays a dialogue allowing insertion of evenly spaced 90 degree battens. If four battens are specified, their lengths will be based on **E** as governed by the IMS rules. By default, **E** is set to the foot length. If the foot length is later changed, **E** and the batten lengths will be changed in proportion.

Delete

Deletes the currently selected batten.

About IMS

Displays the IMS calculations used by this version of ProSail in the Girths dialogue.



Visually scales the roach up or down. This is only a visual effect to aid fairing and has no effect on the actual size of the roach. To directly scale the roach curve, use the **scale** check box.

Backstay

Displays a dialogue asking for the position of the backstay so it can be drawn in the batten window. Its position is specified by the distance directly aft from the front (or back if roach from back is used) of the headboard and directly aft from the clew.

Girths - folding

Displays the Girths dialogue for folding method. See [folding method](#).

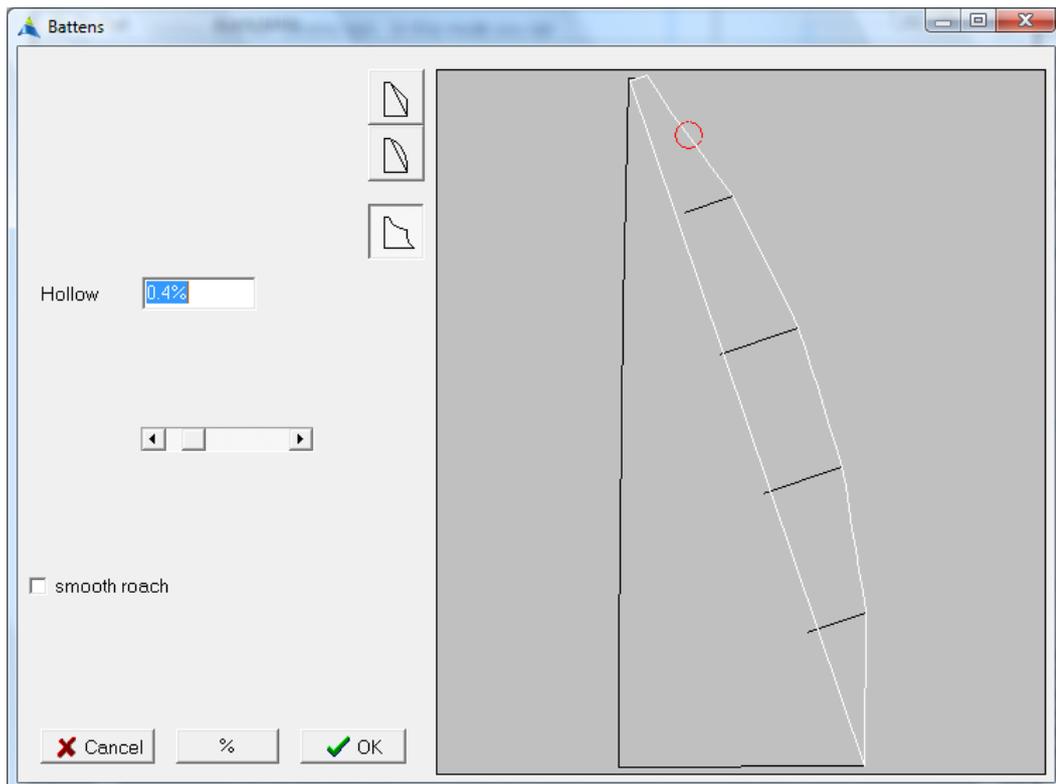
Girths - points

Displays the Girths dialogue for point to point method. See [point method](#).

# Battens



Hollow between battens icon. In this mode you can individually specify the hollow between each set of battens. This can be expressed in absolute units or as a % of the length between the battens. Note that this needs to be specified individually for each set of battens. To select another set of battens, click the mouse between them.

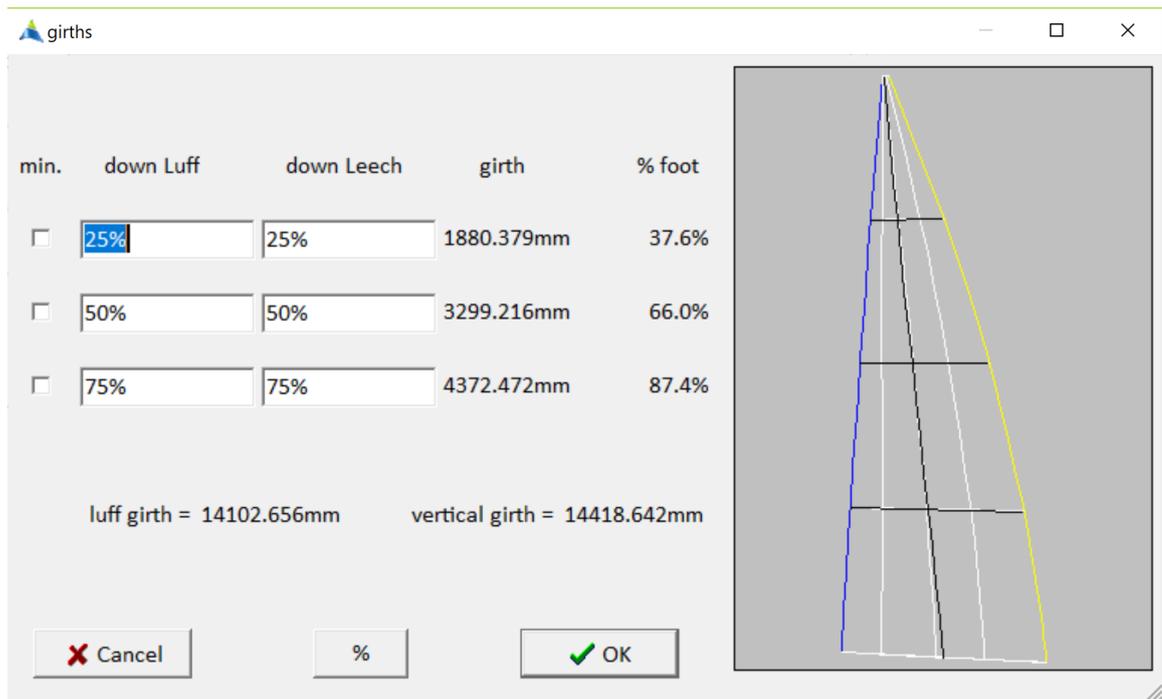


If **smooth roach** is selected, the leech will be a smooth curve exactly the same as it would be if -ve leech hollow was specified in the shaping window.

Select **Girths** from the **Window** menu.

There are two windows for calculating the girths across the sail depending upon the method you are using to measure these girths.

**Point to Point Method** : If you simply want the girth measured from a specified point on the luff to a specified point on the leech then select **Girths** from the **Window** menu or the Girths button in the Shaping window to display the following :

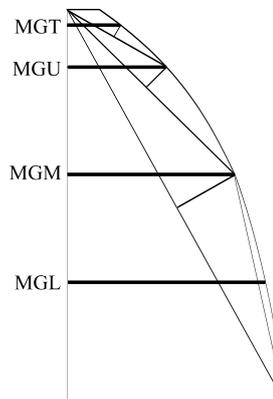
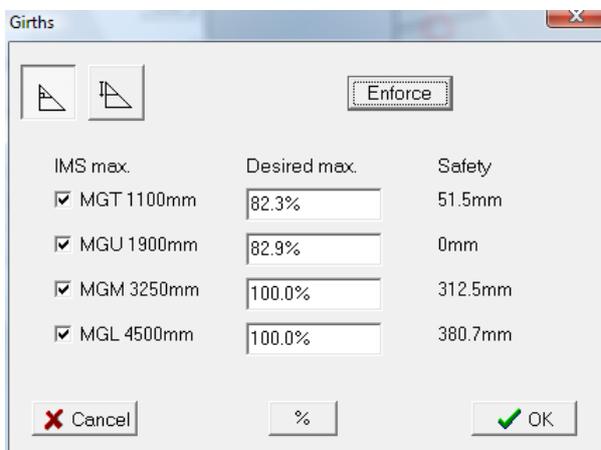


Note that this method does not involve folding the sail but simply specifying a distance down the luff from the front of the headboard and around the actual leech from the back of the headboard. There are three locations that can be specified.

Additionally the vertical girth running from the middle of the foot to the head is also displayed. However, care must be taken when looking at this figure since it is only the girth measured over the mould. Although it includes the foot round, it does not make any allowance for the panel layout you are going to use. By placing panels over the mould, you are in effect reducing the size of the sail slightly because the panels lie inside the mould. For horizontal girths this is only a small reduction, however for vertical girths, this could be quite significant depending upon the panel layout and how many panels there are. You can see this effect if you view the cross-cut panelled sail from below showing Panel Development Lines (see Viewing chapter) and look at the foot area. Notice how the panels are rather jagged. Although the panel seams lie on the mould, the middle of the panels lie inside the mould. This is necessary to develop a mould into panels.

**Min.** Is minimum distance to luff.

**Folding Method** : If you want to measure girths by folding the sail, go to the Batten window and click on the **Girths** button to display the following :



Note : Although IMS terms are used in this dialogue, the sail does not need to be an IMS sail to use the folding method.

**MGM** : Maximum Girth Middle : The leech position for MGM is obtained by folding the front of the headboard to the clew.

**MGU** : Maximum Girth Upper : The leech position for MGU is obtained by folding the front of the headboard to the leech position of MGM.

**MGT** : Maximum Girth Top : The leech position for MGT is obtained by folding the front of the headboard to the leech position of MGU.

**MGL** : Maximum Girth Lower : The leech position for MGL is obtained by folding the clew to the leech position of MGM.

The luff position for each girth depends upon which of the following two icons is selected :



Take the minimum distance to the luff. This is the standard IMS method.



Use the luff position obtained by folding the sail on the luff in the same way as for the leech. For example, MGM will go to exactly half way along the luff.

The values on the left of the dialogue (**IMS max.** column) are the maximum allowable IMS girths based on P and E. If you want to see the calculations this version of ProSail is performing, go back to the batten window and click on the **About IMS** button.

The values in the centre (**Desired max.** column) are the maximum girth you want to allow. i.e. This is the envelope that you allow. They can be expressed either in units e.g. mm or as a percentage of the **IMS max.** If you are making an IMS sail you can specify 100%.

The values on the right (**safety** column) are the difference between the maximum girth you have allowed and the actual girths across the mould you have designed. If the value is positive it means your mould is smaller than the maximum girth you have allowed. i.e. you are safely within the specified girth. If it is negative then your mould is larger than the girth you have allowed.

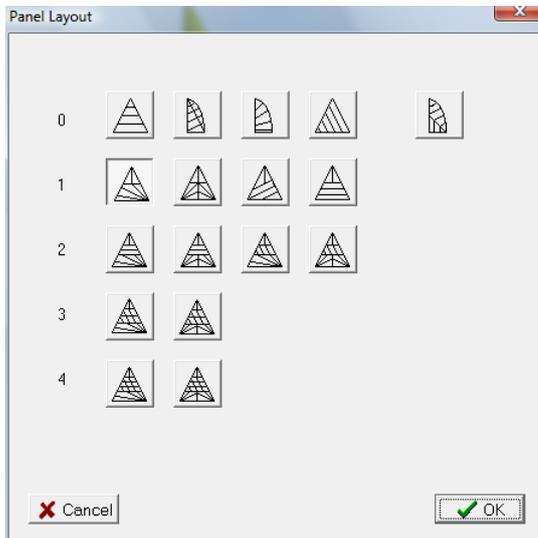
If you click on the **Enforce** button, ProSail will enlarge or reduce the roach curve uniformly until one of the girths has reached the **Desired max.** you have specified and all the other girths (which have been ticked) are smaller than their **Desired max.** If you are not interested in all of the girths, simply remove the tick next to the girths you are not interested in. For example if you are only interested in MGM, make sure only MGM has a tick next to it. After clicking on the **Enforce** button, MGM should then be equal to the **Desired max.** you have specified.

NOTE : It is important to enforce girths (if specified) before panel development if changes have been made to the mould since the girths around the mould will have changed.

# Panel Development

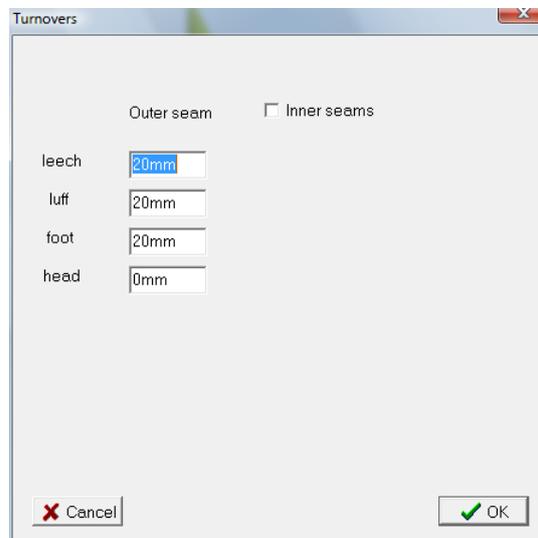
To develop the current sail into panels, either select **New** from the **Panel** menu to create a new panel layout or select **Open** from the **Panel** menu to use an existing panel layout.

(i) If **New** is selected, the following Panel Layout dialogue will appear (This is the method to use when first learning to use the program):



Double click on the layout you want. Note that all these panel layouts are for both headsails, mainsails, gennakers and gaffs regardless of whether the icon looks like a headsail or mainsail.

The Turnover dialogue will appear next :

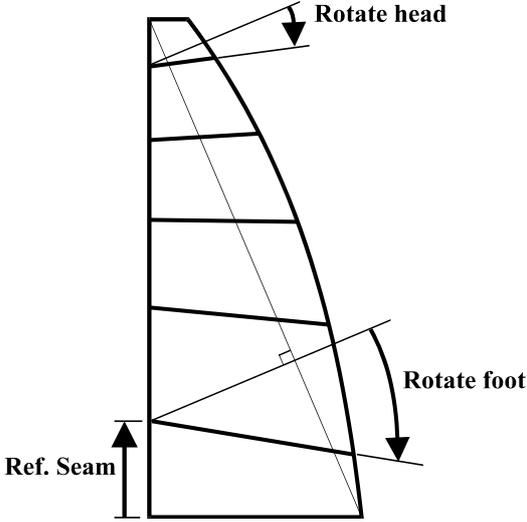
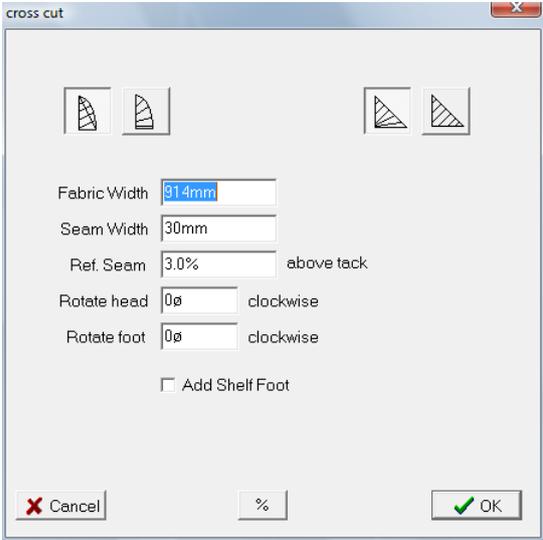


Specify the extra seam allowances you want around the sail for turnovers. These seams are added to the sail dimensions entered in the Dimensions dialogue. If you don't want any, just set everything to zero. In the case of a high aspect ratio Gaff sail, the luff and gaff turnover are the same. Inner seams are lines drawn inside the sail dimensions.

# Panel Development



## Cross-cut & Fan-cut



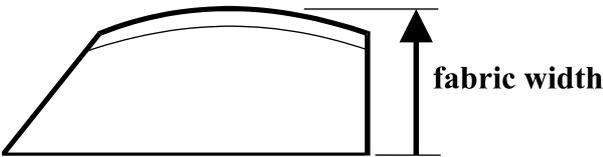
If the cross-cut icon is selected, the seam lines will be at 90 degrees to the head-clew line if **Rotate head** and **Rotate foot** are set to 0.



If the fan-cut icon is selected, the seam lines will be at 90 degrees to the actual leech curve if **Rotate head** and **Rotate foot** are set to 0.

**Rotate head** and **Rotate foot** : If non-zero values are specified, each seam is gradually rotated between the **Rotate head** angle and **Rotate foot** angle going from the head down to the **Ref Seam**. These angles can be -ve if desired. This method can be used for example to make the seams parallel to the foot.

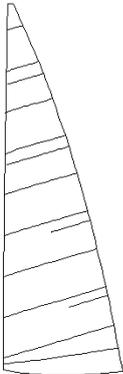
Panels are generated from the head down to approximately the **Ref. Seam** location. The panels are shaped on the top side and straight on the bottom side. The **Ref. Seam** is only an approximation since ProSail generates panels from the head down, it can only approximate where the last panel will come.



# Panel Development

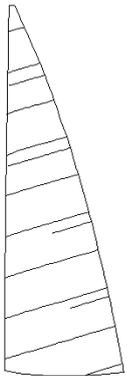


These two icons determine how the panels below the **Ref. Seam** location are developed :



If selected, ProSail will first generate cross-cut panels down to approximately the **Ref. Seam** location and display the Twist Seam dialogue described on the following page for specifying the seams below the **Ref. Seam**.

For a high clew sail, **Ref. Seam** must be sufficiently large to prevent the last cross-cut panel from going below the clew.



If selected ProSail will continue developing parallel panels below the **Ref. Seam** location.

If **Shelf Foot** is selected, ProSail will add a lens panel at the foot of the sail :



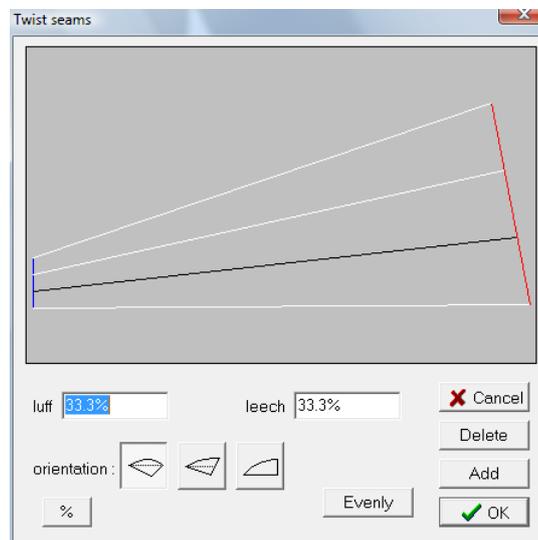
The top of this lens panel will be shaped so it joins to the panel above. NOTE that this shape will not necessarily be exactly the same as the foot chord shape since the seam line for the panel above will not lie exactly on this chord line. However the bottom of this lens panel will be equal to the foot round you specified in the shaping window.



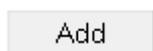
## Twist seams

The following Twist Seam dialogue will be displayed after either :

- (i) selecting the above icon in the Panel Layout dialogue. In this case the entire sail will be drawn in this dialogue. See the lower next page.
- or (ii) the last cross-cut panel has been generated using the cross-cut panel layout with selected (see previous page). In this case the remainder of the sail below the **Ref. Seam** is drawn in this dialogue as follows :



With this dialogue you can add seams at any location and at any angle. **Luff** and **Leech** are the distance up the luff and leech for the currently highlighted seam. These are displayed in absolute distance or as a %. The currently highlighted seam is the one that is drawn as a dark line. To highlight another seam, click the mouse near that seam line. Note that the very top seam can also be highlighted.



Adds another seam. A useful feature of add is that the position of the seam it adds is exactly half way between the currently highlighted seam and the seam below.



Deletes the currently highlighted seam. If you do not want any seams below the **Ref. Seam** (i.e. just have one panel) delete all seams.



Makes all the seams evenly spaced up the luff and leech.

# Panel Development

## Orientation :

The panel below the currently highlighted seam can be rotated in three different ways on the fabric depending upon the following icons :



Top of panel is parallel with the fabric. Most common method.



Centre of panel is parallel with the fabric.



Bottom of panel is parallel with the fabric. Sometimes used for the foot panel.

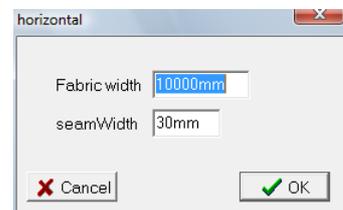
Note that the above orientations only apply to the currently highlighted seam. If you want to change the orientation of all the seams, you need to select each seam in turn selecting the appropriate icon. Note that the top seam can also be selected.



If you selected this icon in the Panel Layout dialogue rather than doing cross-cut panels, the entire sail will be drawn in the Twist Seam dialogue. This method is used if you want to create a sail with :

- (i) Only a few horizontal shape seams for use with PatternMaker.
- (ii) For placing seams on batten locations. e.g. for a Catamaran sail.

First the following dialogue will appear where the **fabric** width field is used as a check to see that the resulting panels do not exceed this limit. Usually this is not important and so a large value is entered. Note that it does not make panels to this width, it only serves as a check.

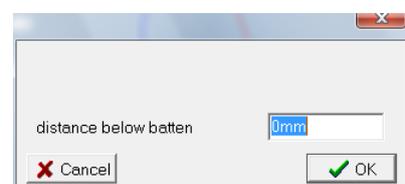


Next the Twist Seam dialogue will appear showing the entire sail. If the sail has battens, there will also be a **battens** button.

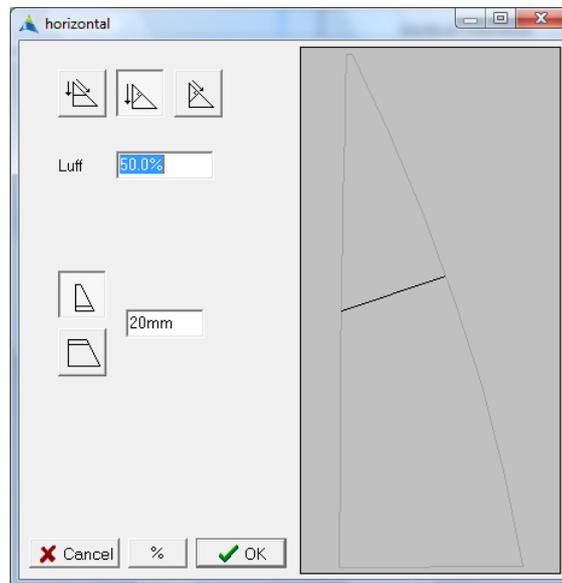
Battens

Replaces the current twist seams (if any) with seams which lie on batten locations. The seam will be placed at **distance below batten**.

If desired you can then add seams between battens using the Add button.



## Horizontal Interface



Specify the interface seam using a distance down from the head for both the luff and leech.



Specify the interface seam using a distance down from the head for the luff and at 90 degrees to the head-clew line.



Specify the interface seam using a distance down the head-clew line and at 90 degrees to the head-clew line.



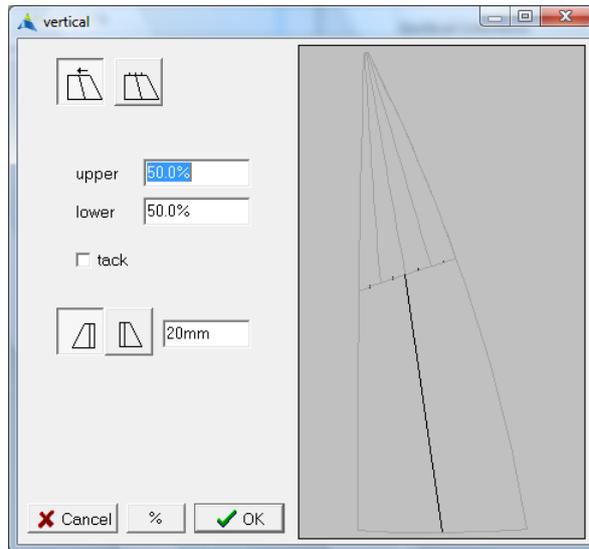
Place the interface seam width on the upper panels.



Place the interface seam width on the lower panels.

ProSail will generate interface seams so they are almost straight. Most of the shape will come from the panels themselves (This is probably the opposite of what you did on the floor where the horizontal seams were shaped and the panels flat). However the small amount of shape produced in the interface seam is important and should not be removed. The same applies to vertical interface seams.

## Vertical Interface



Specify the distance (absolute or %) from the leech for the top of the interface seam.



Line up the top of the interface seam with seams above (i.e. head or vertical panel seams).

The top of the interface can be moved with the mouse. Click the mouse on the top of the interface seam line drawn in this dialogue and with the mouse button still down, drag it horizontally to the desired location.

**Lower** Distance along the foot from the clew.

**Upper** Distance along the horizontal interface from the leech.



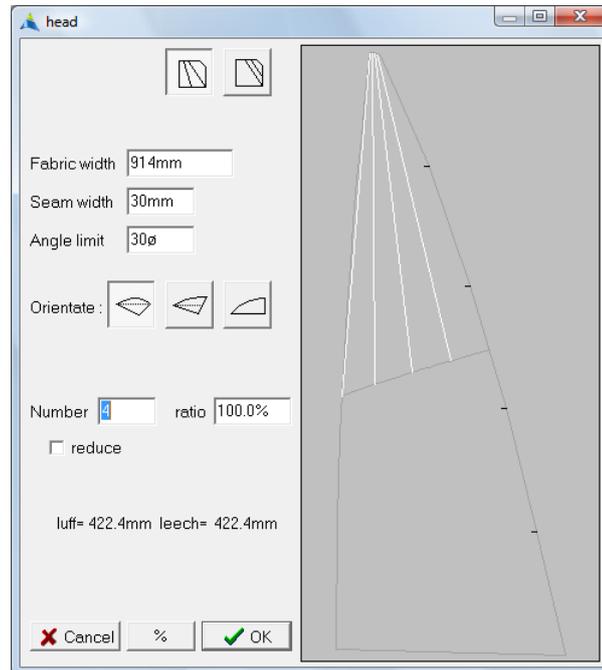
Place the interface seam width on the radial-tack panels.



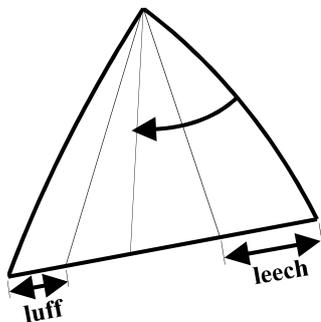
Place the interface seam width on the radial-clew panels.

**tack** A special case occurs when this is selected. The horizontal interface seam will pass through the tack. This seam will correspond to the seam on the last tack panel. Because of this, tack panels will be generated before clew panels.

## Radial-Head panels



Panels are developed based on **Number** and **ratio**. They are developed from the leech to the luff where **ratio** determines how the edge width of the panels change :



**leech** : Edge width of the leech panel. This does not include the seam allowance or shaping.

**luff** : Edge width of the luff panel. This does not include the seam allowance or shaping.

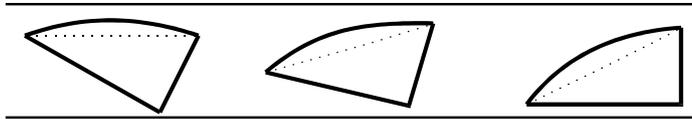
**ratio** =  $\text{luff} / \text{leech}$  as a %

NOTE : **Fabric Width** is not used to generate the panel size since panel size is totally defined by **Number** and **ratio**. However it is used after the panel has been generated as a test to see if the panel has exceeded this size. If it has, a warning message will be displayed.

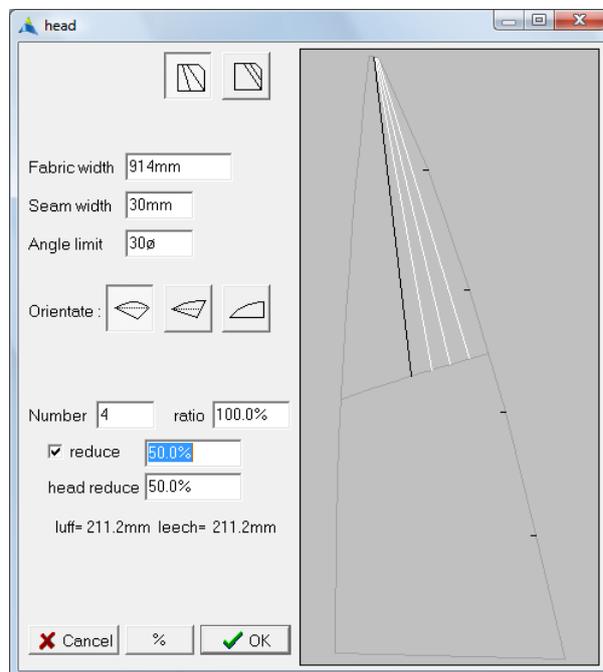
**Angle Limit** is similar to **Fabric Width** in that it is only a test to see if the angle of the panel (measured near the head) has exceeded this angle. This is useful for some fabrics where you might not want to exceed say 6 degrees for example. If you are not worried about angle, specify a large value. e.g. 30.

# Panel Development

**Orientation** defines the orientation of all the head panels on the fabric. The left icon corresponds to the edge of the fabric being parallel with the leech.



**Ratio** is useful for smoothly changing panel widths. However when a sudden change in panel width is required, tick **reduce** :

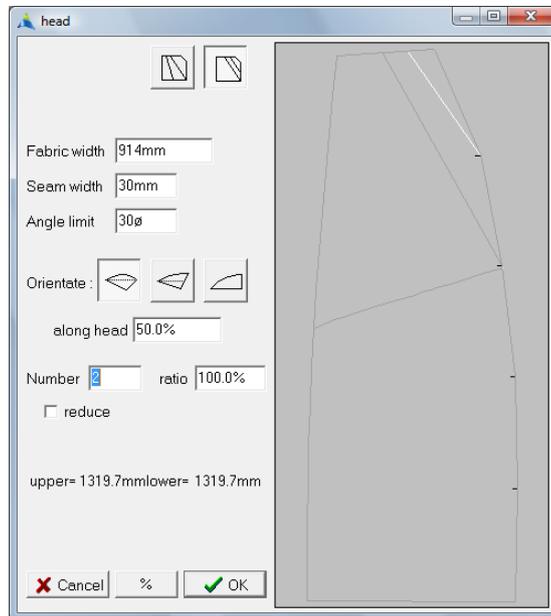


**Reduce** splits the head panels into regions. The value specified for **reduce** is the length of the region either as a % of the horizontal interface seam or in absolute length. As well as specifying a value for reduce, you can also click on the end of this reducing line and drag it to the required location along the horizontal interface.

**Head reduce** relates to the width at the headboard. Within this region the panels are defined using **Number** and **ratio**. Once this region has been generated the radial head dialogue will be displayed again for the remainder of the head. If desired this can be split again using **reduce**.

## Head panels down the leech

To enable development of radial-head panels for sails with a large headboard, radial head panels can spread down the leech.



After entering the head panel dialogue click on this icon :



**Along head** is the distance along the head from the leech defining the region of head panels that intersect the leech.

The **reduce** check box can be used to further reduce this region. This can be useful for defining panels individually for example. As well as specifying a distance down the leech you can also click on the end of this line and drag it to the required location down the leech.

Double clicking on the window title bar will make the window full screen if you want a closer look. Double click again to reduce its size.

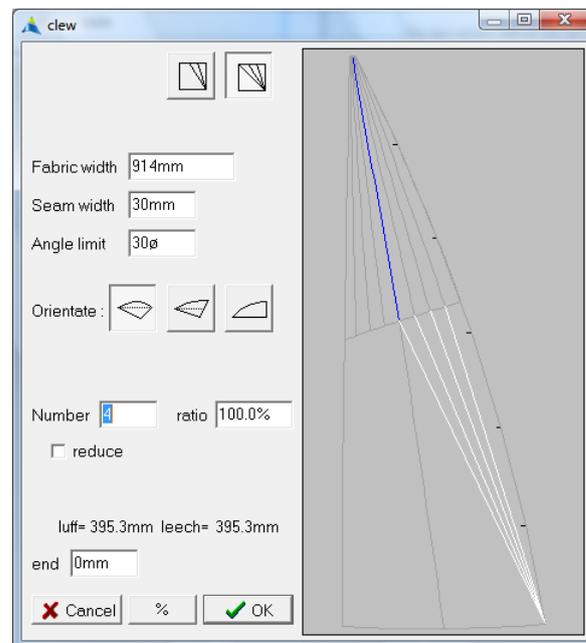
### Important notes :

- 1) The position of these seam lines down the leech will not be exact since after panel development ProSail needs to trim the panels to allow for hollow between the battens. This will usually cut into the generated panels however sometimes it can actually enlarge them slightly. This will move the leech seam lines up or down the leech slightly.
- 2) Some older versions of ProSail will not be able to correctly read panel configuration files saved (**save** from the **Panel** menu) if some head panels are spread down the leech.

# Panel Development

## Radial-Clew panels

Radial-Clew panels are specified in a similar way to Radial-Head panels except in two sections. The first section defines the panels that touch the horizontal interface seam.



To make these panel seams line up with the seams above, use the same **Number** and **ratio** as the panels above.



If selected, panels will be generated right to the end.

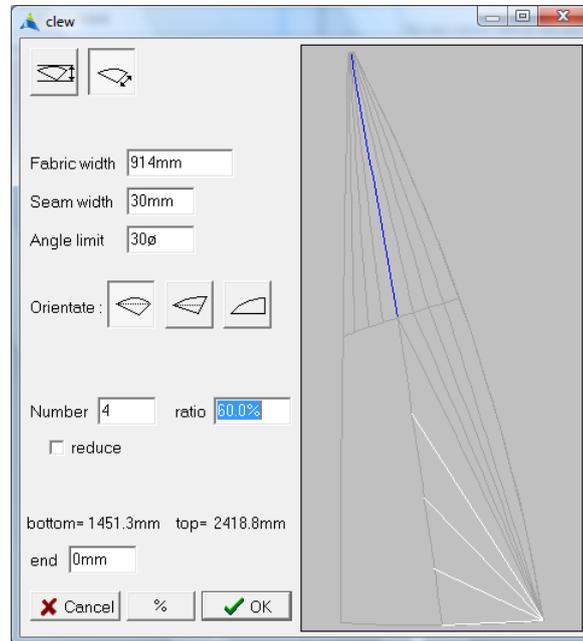


If selected, panels will stop short of the end. This allows the next panel to straddle the corner. This is commonly used if the next panels are to be made to the full fabric width.

**end** If zero, the panels will all terminate at the clew. If non-zero, the clew end of the panels will have a width equal to this value (excluding the seam width). i.e. they will radiate along the foot.

# Panel Development

The next section defines the clew panels that touch the luff or vertical interface seam :



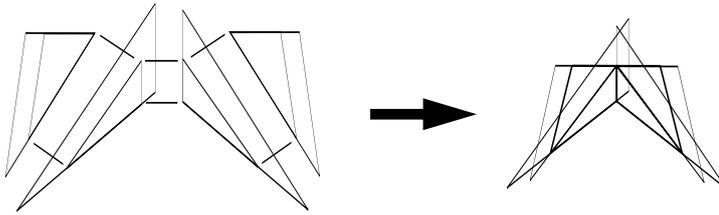
If selected, panels are developed so their edge width is defined by **Number** and **ratio** as described previously. This method is often used when a sail has a vertical interface seam to allow the tack and clew panels to line-up across the seam.



If selected, panels are developed to either their full **Fabric Width** or to their full **Angle Limit** whichever is the most limiting. If angle is not important, specify a large Angle Limit. This method is often used when the clew panels terminate on the luff (e.g. c-cut layout) and the first clew panel on the luff straddles the luff and horizontal interface.

## Radial-Tack panels

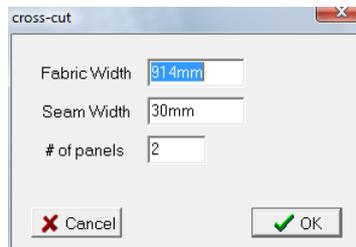
Radial-Tack panels are specified in a similar way to the Radial-Clew panels. The first section of panels are from the luff to the vertical interface. The second section to the foot. To make the tack and clew panels line-up across the vertical interface, specify the same **Number** and **ratio**. When joining the tack and clew panels together at the join between the horizontal and vertical interfaces be careful to join them in the following way :



Normally clew panels are developed before tack panels. However the reverse is true if the **tack** check box has been ticked in the Vertical Interface dialogue.

## Centre cross-cut panels

If a panel layout requires cross-cut panels in the centre (e.g. for a tri-radial panel layout), the following dialogue will appear :



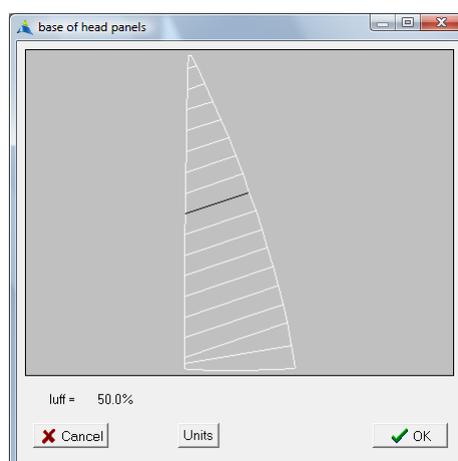
Specify the number of panels required. The panels will be generated at 90 degrees to the head-clew so it is recommended that the horizontal interface generated previously should also be at 90 degrees to the head-clew. Be careful not to specify more panels than can be generated in the sail.

---



## Radial-Head with cross-cut panels sail

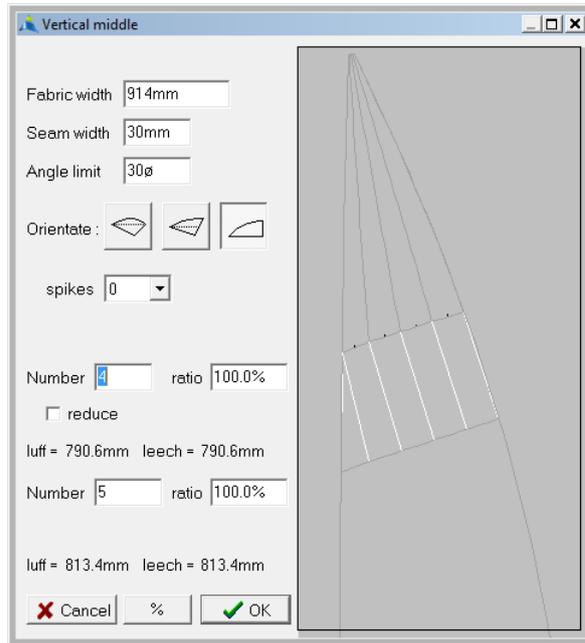
This panel layout is done in two steps. First the sail is developed as if it was a totally cross-cut sail. After the cross-cut panels and twist panels have been developed, the following dialogue will appear :



Click the mouse on the seam where you want the base of the radial-head panels to go and that seam will be highlighted. Select OK and the radial-head dialogue will appear. Specify the head panels required and ProSail will replace the upper cross-cut panels with these radial-head panels.

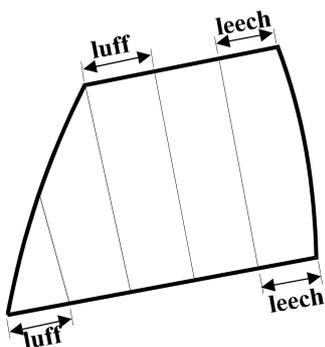
# Panel Development

## Mid-Vertical panels



Vertical panels in the middle of the sail are specified using two sets of **Number** and **ratio** :

The top set define the seams on the upper interface. The bottom set define the seams on the lower interface.

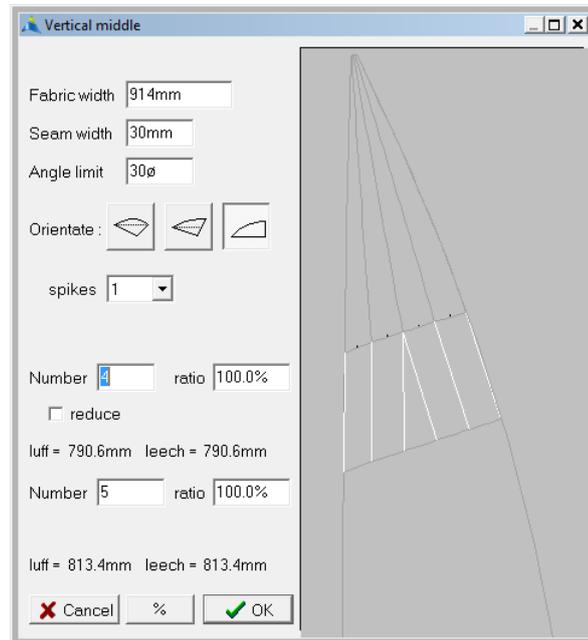


$$\text{ratio} = \text{luff} / \text{leech as a \%}$$

$$\text{ratio} = \text{luff} / \text{leech as a \%}$$

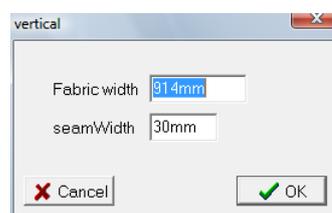
# Panel Development

**Spikes** If ticked, you can enter the number of panels you want in a spike. To change the position of the spike, click the mouse in the picture where the top of the spike is to go.



## Vertical-cut sail

If the entire sail is to be developed into vertical panels the following dialogue is used :

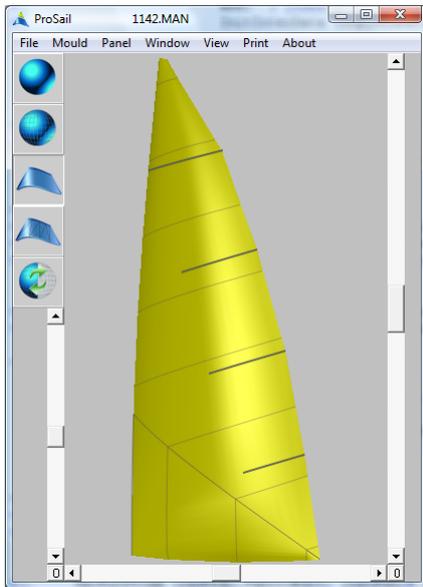


Panels are developed to the specified **Fabric Width - Seam Width** starting from the leech.

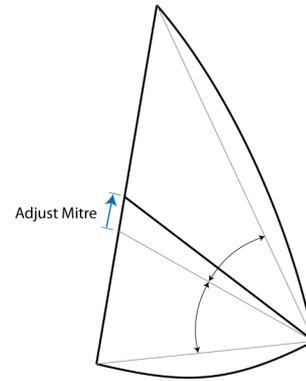
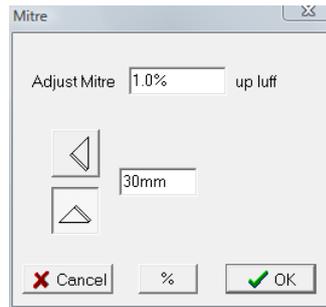
# Panel Development



## Mitre-Cut (Extra module)



Cross-cut and vertical seams will lineup across the mitre-cut.

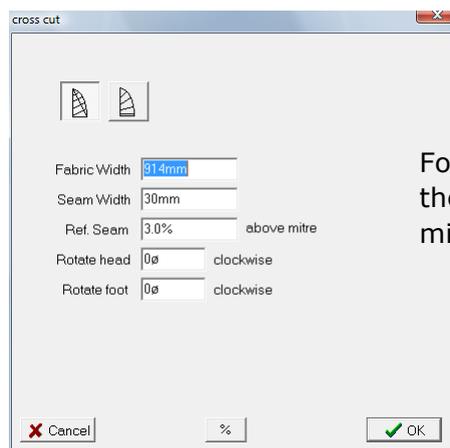


The above dialogue specifies the location of the mitre-seam. The seam is found by bisecting the angle between the Head-Clew and Tack-Clew lines. It is then adjusted by the specified **Adjust Mitre** distance up the luff. The greater the **Adjust Mitre** value the further up the luff the mitre seam will go and correspondingly the narrower the vertical panels in the foot will become. It is usually necessary to specify a value greater than zero (1% is typical) to prevent the vertical panel widths from exceeding the horizontal fabric width since often there is more shape in the vertical panels.

As well as moving the mitre-seam up the luff, **Adjust Mitre** also rotates the bottom of the vertical panels toward the clew slightly to further help reduce the width of the vertical panels.

If during panel development you are warned that the vertical panels exceed the fabric width you will need to re-generate the panels increasing **Adjust Mitre**.

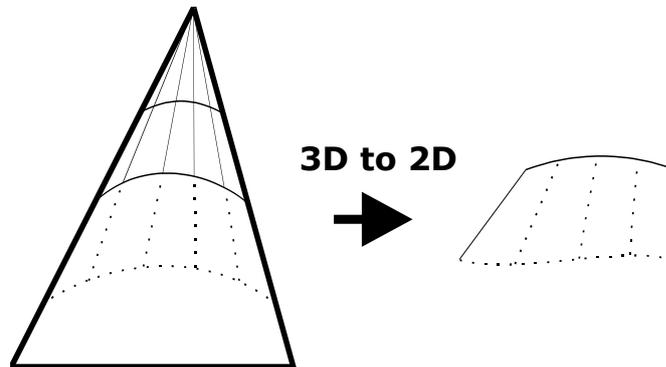
Note : For low aspect ratio gaff sails the mitre-seam can not go above the gaff corner.



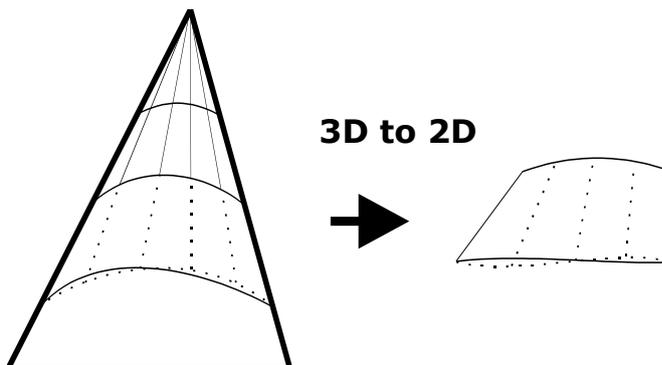
For Mitre-cut sails the **Ref Seam** refers to the height above the luff location of the mitre seam.

## Panel Development (The method used by ProSail)

ProSail develops panels so they have one straight edge. To do this it must find where the seam lies over the 3D mould so it results in a 2D panel with a straight edge. ProSail first takes a guess where this seam lies on the 3D mould. Then using trigonometry, the resulting 2D panel is calculated :



However, this 2D panel will not have a straight edge. Hence ProSail needs to modify the seam on the 3D mould to get a straighter edge on the 2D panel :

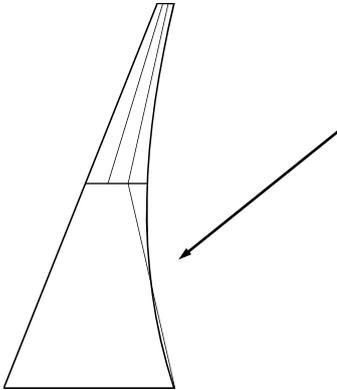


This process is continued until ProSail has generated the 2D panel with an edge that is within 0.1mm of being perfectly straight. In some cases ProSail will have difficulty achieving this. If after trying 10 times, ProSail has failed to achieve this, it will display a message telling you how close it has got :



# Panel Development

If this happens, select **Yes** and ProSail will keep trying. If the message is displayed again, and the value has not reduced, then ProSail is probably unable to generate that panel :



This sometimes happens with the clew panel on the leech of a sail with a lot of leech hollow. This is because the hollow is so great that it completely cuts into the panel.

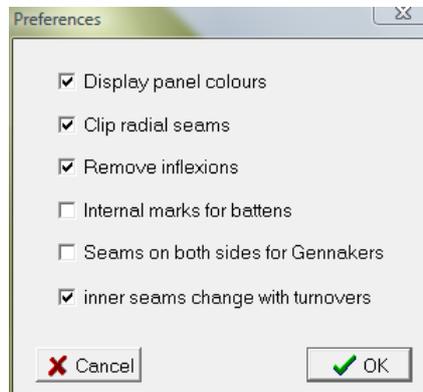
If during panel development, a panel exceeds either its **Fabric Width** or **Angle Limit**, a warning message will be displayed.

## Saving Panel Layout Files

Once a sail has been completely developed, the information entered into the panel, interface and turnover dialogues (e.g. seam widths etc) can be saved to disk for later use by selecting **Save** or **Save As** from **Panel** menu. Then the next time you develop panels with that configuration on any sail, instead of selecting **New**, select **Open** from **Panel** menu. This is more efficient than selecting **New** since you can save the seam widths etc that you normally use.

## Panel Preferences

Select **Preferences** from the **Panel** menu :



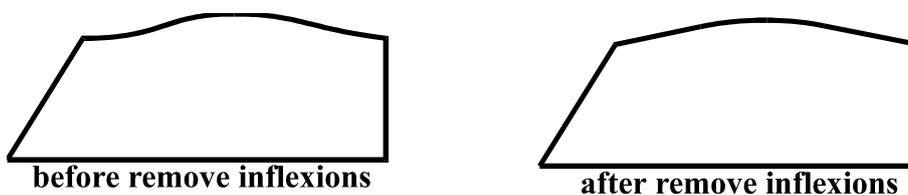
### **Clip radial seams**

On radial panels, seams can produce a large spike unless they are clipped. Hence it is common to clip them.



### **Remove inflexions**

Replaces panel inflexions during panel development with a straight section :



All mould programs can produce panels which have inflexions in them. This can occur near the tack and clew and is most severe when there is a large change of depth for example in Dinghy sails. Although it may appear odd, it is in fact the correct development of the mould which tries to blend smoothly into the corners which cause it to inflect. Most Sailmakers choose to remove these inflexions by making sure **Remove Inflexions** is selected which will replace the inverted part of the curves with a straight line. The only problem with doing this is that because it changes the angle on the corners of the panel, the luff and leech curves may come out slightly unfair near the foot.

# Panel Development

## **Internal marks for battens**

As a batten crosses a radial panel, the plotter will mark a cross on the panel where the batten enters and leaves.

## **Seams on both sides for Gennakers**

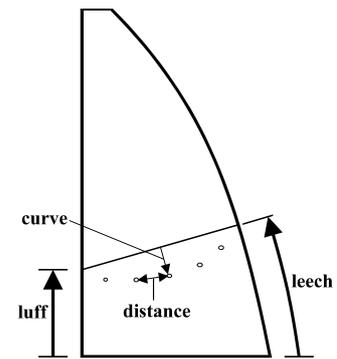
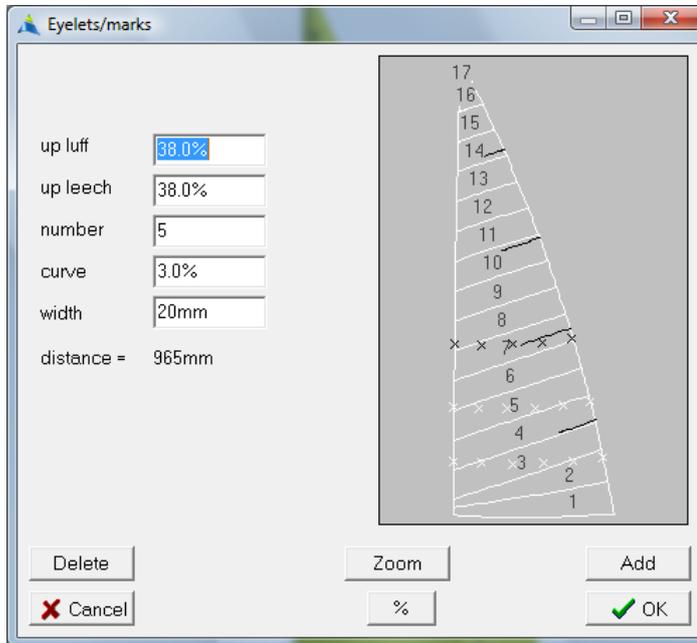
All gennaker panels will have seams on both sides. The exception to this rule will be at interface seams where only the selected side will have a seam.

## **inner seams change with turnovers**

In the Turnover dialogue, the inner turnover seams will automatically be set equal to the specified outer turnover seams.

Eyelets from the **Panel** menu :

## Eyelets



To select a Reef, click near the desired Reef. It will then be highlighted and its information will be displayed to the left.

**Add**

Displays the following dialogue where 3 different types of items can be added to the sail.



Adds a reef.



Adds a single eyelet. Also useful as a mark.



Adds a dividing line (see next page)

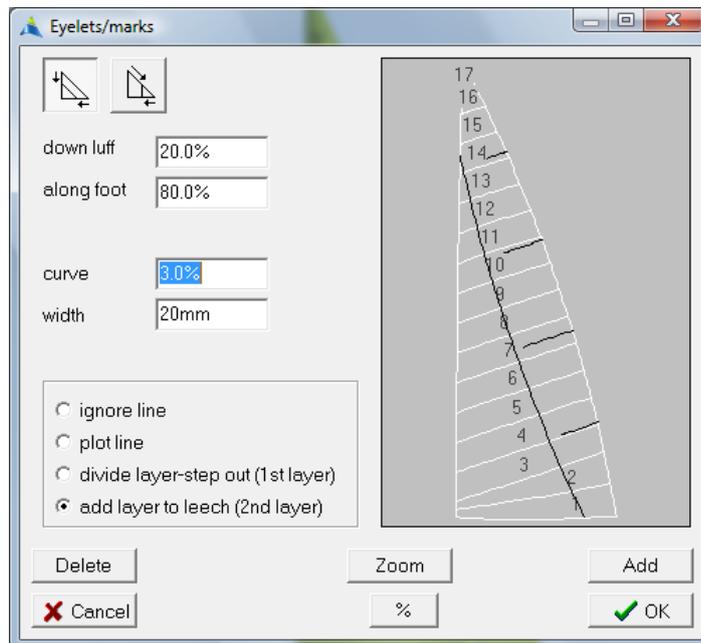
**Delete**

Remove the currently selected Reef.

**Zoom**

Zoom the sail picture in the standard way as described in the Viewing chapter of this manual.

## Dividing Lines



Dividing line intersects the leech.



Dividing line intersects the luff.

**Down luff/down leech** is the position of the line measured down from the head. **Along foot** is the foot position of the line measured from the clew. If **curve** is +ve the line will curve towards the luff. If -ve, towards the leech.

The type of line depends upon which of the following is selected :

**ignore line** : Line is totally ignored. This is used if you want to keep the information about the line so it can be used later.

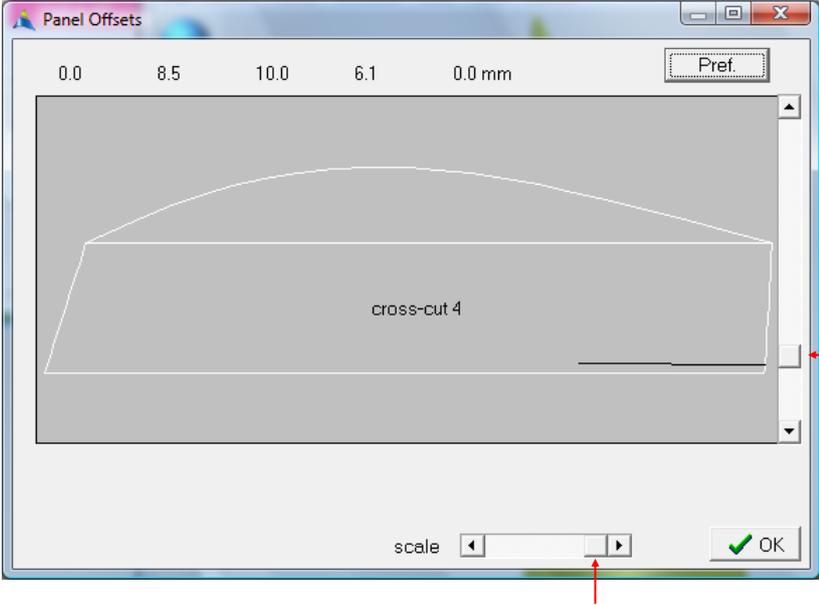
**plot line** : The line will be drawn by the pen on the panels.

**divide layer-step (1st layer)** : The panels will be divided along this line. Joining the luff and leech panels will give the full width of the sail. The specified **seam** will be placed on the luff panels. However if **seam** is -ve, it will be placed on the leech panels. (NOTE : for this to work you must have the PanelMaker module).

**add layer to leech (2nd layer)** : The leech panels will be the same as **divide layer-step** but the luff panels will be the full length of the sail. Hence the leech of the sail will be 2 ply. (NOTE : for this to work you must have the PanelMaker module).

# View Panels

Select **panels** from the **Window** menu.

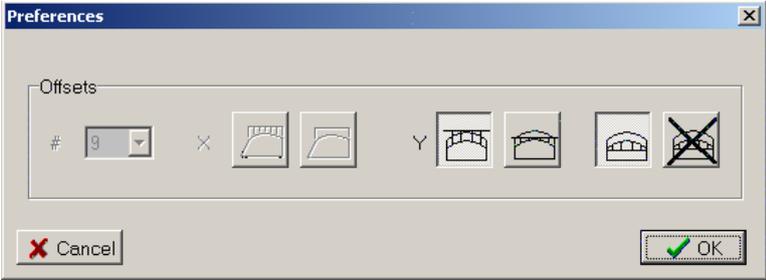


Loops through all the panels.

Visually exaggerates panel curves for ease of viewing.

The offset numbers correspond to 0, 25, 50, 75 and 100% locations.

To specify the way the panel offsets are displayed, click on the **Pref** button to display the following :



Offsets are measured up from a flat line between the ends. Most common.



Offsets are NOT measured up from a flat line between the ends. They are measured down from the maximum depth point on the curve. The following 2 icons determine whether this includes the seam allowance.



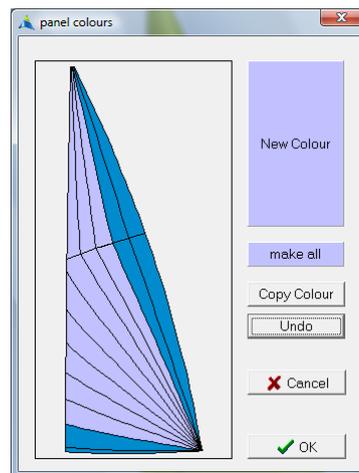
Includes seam allowance.



Does not include seam allowance.

# Colour Panels

Select **Colour Panels** from the **Window** menu:



Click on the large **New Colour** button to display the following :



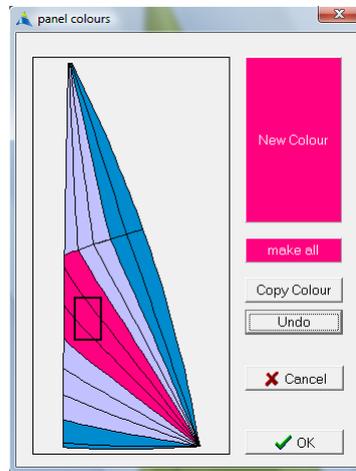
You can either select a colour by clicking in one of the boxes under the heading **Basic Colors** or under the heading **Custom Colors**. Click **Ok** to leave the dialogue. Or you can define (and store) your own custom colours.

To define your own custom colours :

- 1) First click in one of the empty boxes under the heading **Custom Colors**. This is where your custom colour will be stored. It is important to click here before defining the colour otherwise it will by default be stored in the first location which might overwrite one of your previously stored colours. Very annoying.
- 2) Then click the closest colour to the colour you want in one of the colours under the heading **Basic Colors**. Alternatively you can click on the large rainbow coloured square in the right half of the dialogue.
- 3) You can then modify the colour using the controls on the right half of the dialogue. The far right vertical scroll bar is useful for specifying luminosity (intensity). Red, Green, Blue give the relative mix of each of these colours that creates the resulting colour. These vary between 0 and 255 and you can enter them directly if you wish. The colour black corresponds to Red, Green, Blue all being 0. White corresponds to them all being 255.
- 4) Once you are happy with your colour, click on **Add Custom Colors** to add this colour to the original position you selected at point 1). Click **Ok** to leave the dialogue.

## Colour Panels

To make a panel the same colour as the **New Colour** button (current colour), simply click in that panel. Do this for all the panels you want to make that colour. You can also click (and with the mouse button still down) drag a selection rectangle across multiple panels. All the panels that intersect that rectangle will become that colour.



To make all the panels the current colour click the **make all** button.

To make the current colour the same colour as one of the panels, first click the **Copy Colour** button and then click on that panel.

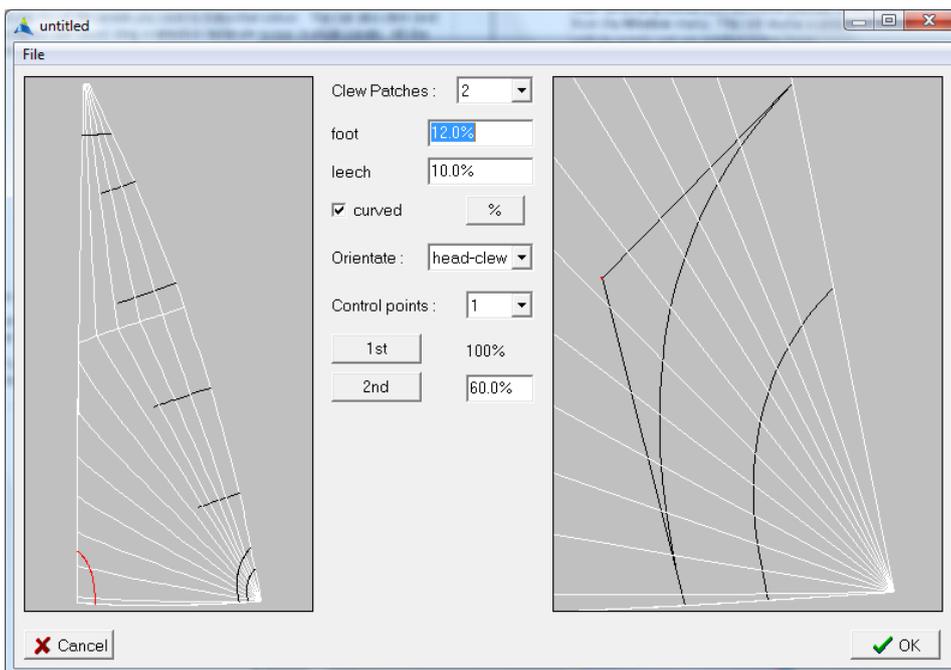
At any stage if you make a mistake you can click the **Undo** button. Undo can be used as many times as required.

## Patches (Extra module)

After developing panels you can define patches (if this module is present) by selecting **Patches** from the **Window** menu. This will display a picture of the sail in the left half of the window with its panels and any patches it may have.

The right half of the window shows the current corner of the sail we are looking at. To look at another corner of the sail click the mouse near that corner in the picture of the sail.

The name of the corner and the number of patches it has will be displayed at the centre top of the window. In the example below we are looking at the **Clew Patches** and there are 2 of them :



*The first time you enter this dialogue there will be no picture to the right. Namely no patches. To specify clew patches, click on a number next to **Clew Patches**.*

**Clew Patches** : Number of clew patches. They are all the same shape but different sizes.

**foot** : Distance along the foot of the 1st (largest) patch.

**leech** : Distance along the leech of the 1st (largest) patch.

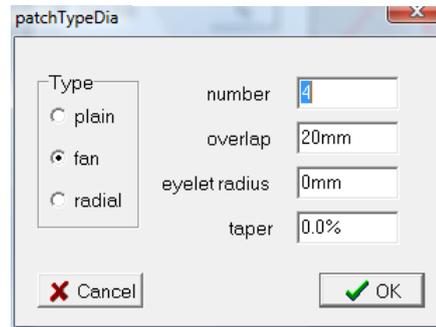
**curved** : Ticked if the patches are curved.

**Orientate** : Specifies the fabric orientation of the patches used when nesting. If you are not happy with **luff**, **head-clew** or **leech** orientation, you can select **other**. If **other** is selected, a small lever will appear with a control point on the end of it. This control point can be dragged with the mouse to define the thread line direction.

**Control points** : Specifies the number of small red control points the 1st patch has around it. These points can be dragged with the mouse. If **curved** is ticked, these control points will not lay on the patch but will influence it. The more points, the more control you have over the shape of the patch however the more difficult it is to produce a nice looking shape.

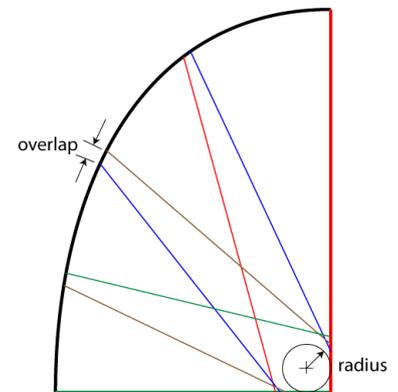


Clicking one of these buttons will display the following dialogue for the corresponding patch number :



1) If **fan** is selected the following information can be specified :

- number :** Number of strips in that patch.
- overlap :** The overlap seam on the perimeter of the patch.
- Eyelet radius :** How far from the corner of the sail the centreline of the strips will pass.
- taper :** % of seam taper. 0% means the strips will be parallel. 100% means the strips will narrow at the corner of the sail to a width equal to twice the **Eyelet radius**.



2) If **plain** is selected the patch will be made from one piece of fabric.

3) If **radial** is selected the patch will be made up of radial strips which exactly lay on top of the radial panels in that corner. This option is only available if you also have the PanelMaker module.

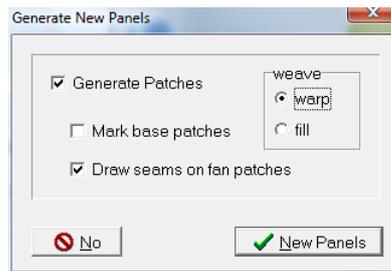
To define the other patches for that sail corner click on the corresponding button : **1st, 2nd** etc. Each patch can be defined differently. For example a plain patch can be placed over a fan patch.

To the right of the patches corresponding button will be a %. This is the size of the patch as a % of the size of the 1st patch.

The information defining patches is saved in the Patch files. These files are handled using the **Open, Save** and **Save As** menu items under the **File** menu in this patch screen. Note : Patches are not saved with the sail mould. Like panel files, panel layout files and fabric files, they are saved separately from the mould. The advantage being you can load patch files generated on one mould for use on another mould. They will of course be slightly different since they need to adjust for the change in angles from one sail to another.

# Nesting

After developing panels, select **Nesting** from the **Window** menu to take the panels to the nesting window.

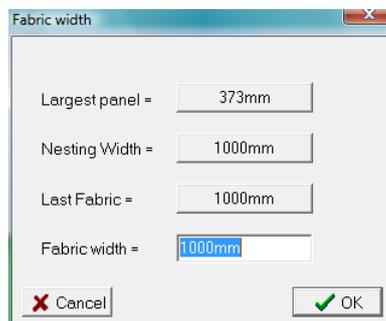


Click **New panels** to take the developed panels to the nesting window. If you click **No**, the panels on the nesting window (if any) will not change.

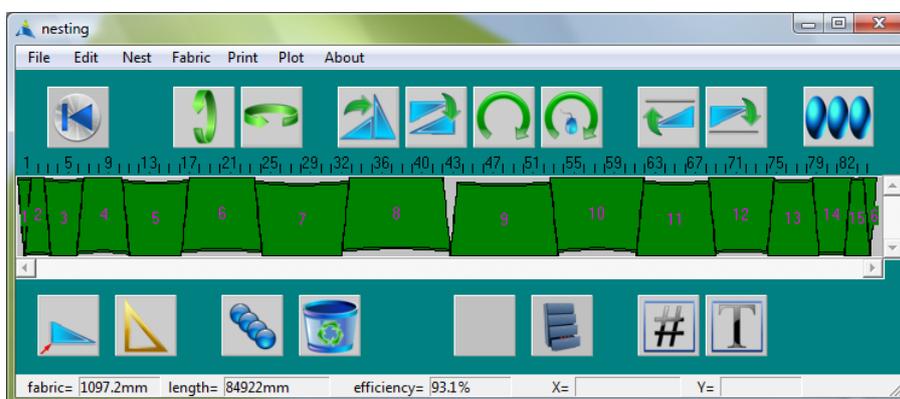
If the sail has patches, tick **Generate Patches** to have these patches added to the end of the nested panels.

If any patches are of the Plain patch type, click on **warp** or **fill** to select which way you want the panels orientated on the cloth.

If **Mark base patches** is ticked, the largest Plain patch in each corner of the sail will have the location of its smaller patches marked on it. This can help in sewing the different layers of patches together.



Enter the desired **fabric width** to be used. See the PanelMaker & Nesting manual for details.



**IMPORTANT :** If go back to the 3D viewing window and redevelop panels, you have to select **Nesting** from the **Window** menu again to load these new panels on to the nesting screen. If you just click on the nesting window to bring it to the front, it will still have the previous panels on it.

## PatternMaker (Extra module)

With PatternMaker you can take a set of cross-cut panels comprising a sail and cut them up into radial panels of any complexity using a pattern.

Once a pattern is defined for one sail it can quickly be superimposed onto any other set of cross-cut panels from other sails.

This method differs from conventional mould design since all the shape comes from the horizontal seams. The radial seams have no shape.

The advantages are :

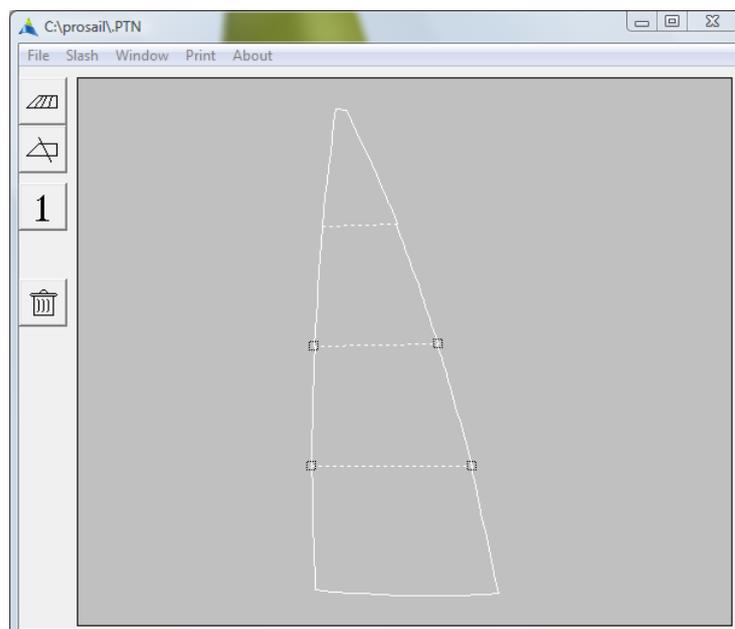
- 1) Shorter design times.
- 2) Shorter manufacturing times since it is easier to stick straight seams together.
- 3) Sails are easier to repair.
- 4) More accurate assembly particularly for large sails with a lot of seams.

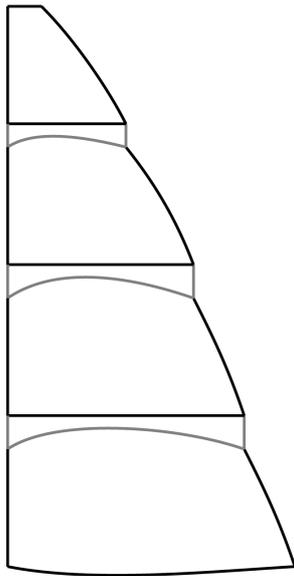
This method however is not suitable for small sails with few seams.

To enter PatternMaker, develop the sail with some cross-cut panels. The entire sail does not need to be cross-cut panels. For example you could use these panel layouts :



Then select **PatternMaker** from the **Window** menu. This will take any cross-cut panels to PatternMaker :





The cross-cut panels are automatically joined together so that the centre of the top side of one panel is in line with the centre of the bottom side of the panel above. The distance between them at their closest point is equal to the bottom panel's seam width.

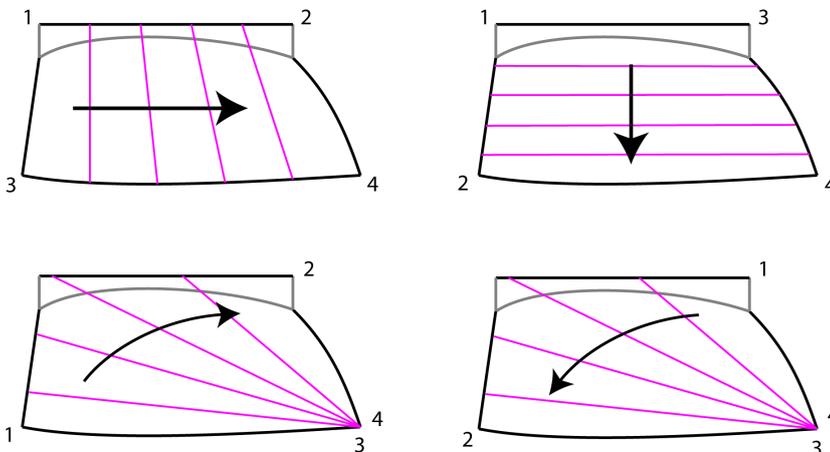
This forms a closed boundary that a pattern may be placed over. Initially the boundary contains as many regions as there are cross-cut panels.

Within each region we can define a pattern :

(i) First highlight the region by clicking in it. The highlighted region will have small squares drawn on its corners (see previous page).

(ii) Click in 

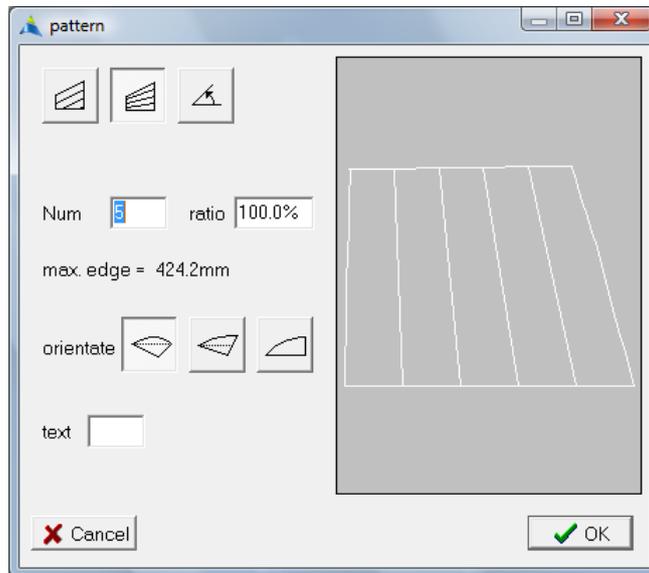
(iii) Click the mouse 4 times at desired locations on the region. These locations define the edges of the resultant panels. The first and second clicks define one edge of the panels. The third and fourth clicks define the other edge of the panels. Note that the order in which the panels are developed is also determined. See the examples below :



The pattern can be changed at any time by clicking in the icon again and re-doing the 4 clicks.

# PatternMaker (Extra module)

To alter the definition of a pattern in a region, double click the mouse inside the region (A pattern must be defined before you can do this) to display the pattern dialogue :



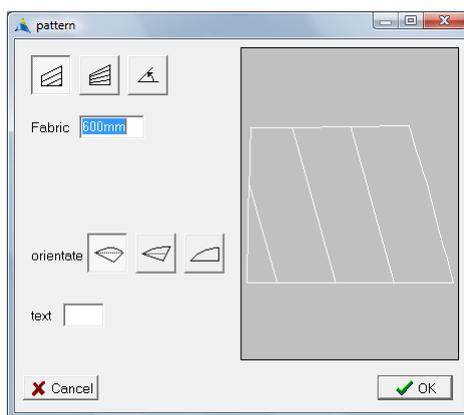
Generate parallel panels based on **fabric width**.



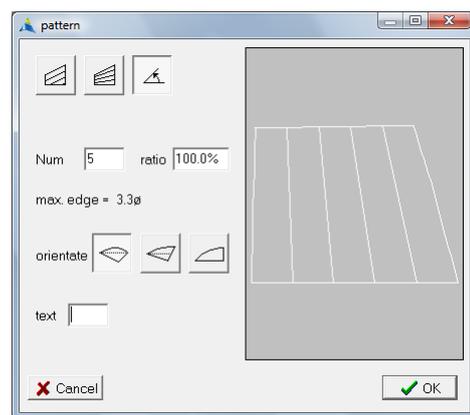
Generate the specified number of panels where the edge width of each panel is defined by **ratio**. This method is useful if you wish to line-up panels across an interface.



Generate the specified number of panels where the angle of each panel is defined by **ratio**. This method is sometimes useful for radial panels.



**Based on width**



**Based on angle**

In the **text** field you can enter up to 3 letters. These letters will be plotted next to the panel number for all panels in that region. Because of the room it requires on the screen, you will only see the text in the first panel within the region on the screen display.

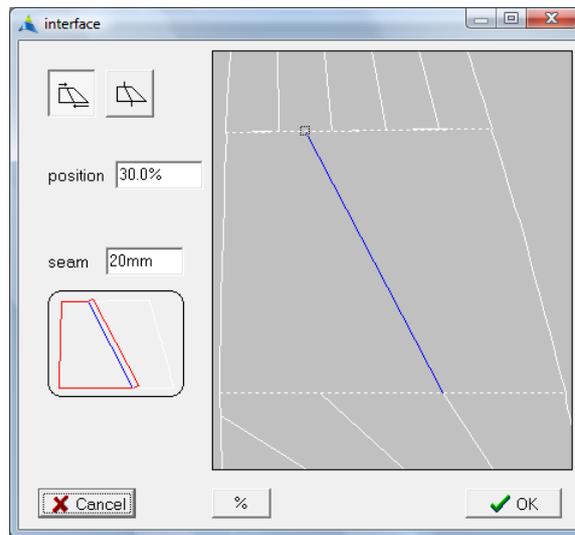
Interfaces are used to divide one region into two. To create a new interface :

(i) Highlight the desired region.

(ii) Click in 

(iii) Click the mouse outside the highlighted region and while holding the mouse down, drag the resultant line across the highlighted panel.

When the mouse is released, the region will be divided along that line. The ends of this interface line can later be dragged with the mouse (see note below). To specify more detail for the interface, double click in the middle of the line to display the following :



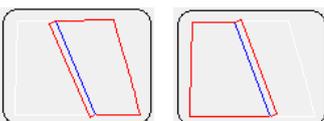
To highlight an end of the interface seam, click near it. A small square will appear on that end.



Locate the highlighted end of the interface using **position**.



Locate the highlighted end of the interface by lining it up with seams or interfaces in neighbouring regions. Note that if the pattern in the neighbouring region is later changed, this interface will move to whichever becomes the closest seam or interface.

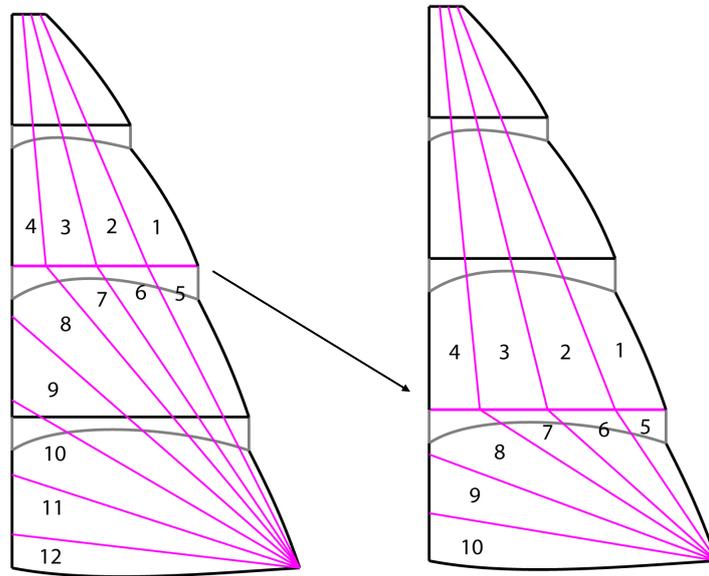


Defines which side of the interface the seam width is placed. Click on the desired side.

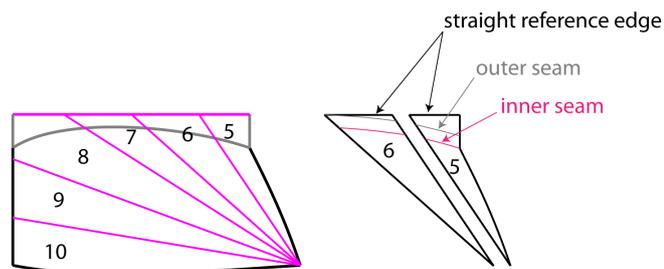
Note : The ends of the interface can also be dragged (both in this dialogue and on the full PatternMaker screen). Note that the mouse must be released outside the region so the resultant line cuts through the region.

If some regions corresponding to cross-cut panels have been removed, you will have some choice as to where to place the border between the regions. To move a border :

- (i) Click the mouse very close to the border.
- (ii) With the mouse still down, drag the resulting line to its new position.



To generate panels from PatternMaker, select **Nesting** from the **Window** menu. When the panels are plotted, an extra reference line will be drawn at interface seams :



Panels 5 to 8 should be sewn together using this straight reference edge as a guide (compare it to a straight line on the floor). This straight edge is there solely for this purpose and allows a sail to be sewn together very accurately. It can be cut off later.

# PatternMaker (Extra module)

To remove an interface (or to combine two regions into one larger region) :

(i) Click on the interface (or one of the regions) to highlight it.

(ii) Click in 

---

To reorder panel numbering :

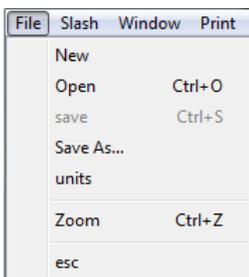
(i) Click on this icon 

(ii) Then click in each region starting with the region you want to have the largest panel numbers. Keep clicking in all regions until you finally click in the region you want to have the smallest panel numbers.

(iii) To finish, click the mouse anywhere other than in a region (for example an empty part of the screen).

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The screen can be zoomed in the normal way. To unzoom click in this icon : 

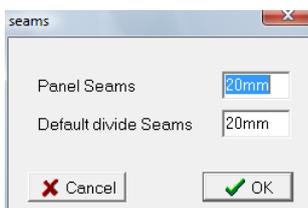


**New, Open, Save** and **Save As** from the **File** menu relate to the Pattern file containing everything defined in PatternMaker.



**Open** from the **Slash** menu will open the cross-cut panels the pattern is placed over. Initially when you enter PatternMaker from ProSail it will take cross-cut panels from the ProSail mould into PatternMaker. However you can select other cross-cut panels you want the pattern placed over by selecting **Open** from the **Slash** menu.

**seam width** from the **Slash** menu :



**Panel Seams** is the seam width on the pattern generated seams.

**Default divide Seams** is the default seam width used on interface seams. You can later change these individually in the interface dialogues.

## File

<b>New</b>		: Create a new sail mould file.
<b>Open</b>	<b>Ctrl O</b>	: Open an existing mould file.
<b>Save</b>	<b>Ctrl S</b>	: Save the changes made to the current mould.
<b>Save As.</b>		: Save the current mould with a new name.
<b>Units</b>		: Displays the Units preferences dialogue.
.....		
<b>Zoom</b>	<b>Ctrl Z</b>	: Zoom in.
.....		
<b>Preferences</b>		: Displays the general preferences dialogue.
.....		
<b>Quit</b>	<b>Ctrl Q</b>	: Leave ProSail.

## Mould

<b>Shaping</b>	<b>Ctrl F</b>	: Displays the Shaping window.
<b>Battens</b>	<b>Ctrl B</b>	: Displays the Chord window.
<b>Dimensions</b>	<b>Ctrl D</b>	: Displays the Dimensions dialogue.
.....		
<b>Rescale</b>	<b>Ctrl R</b>	: Force ProSail to rescale the mould (ProSail does this automatically before panel development).
<b>Area</b>		: Calculates the sail area around the mould including the foot round.

## Panel

<b>New</b>	<b>Ctrl P</b>	: Display the Panel Layout dialogue for developing panels.
<b>Open</b>	<b>Ctrl W</b>	: Open a previously saved Panel Layout and develop panels.
<b>Save</b>		: Save the current panel Layout.
<b>Save As.</b>		: Save the current Panel Layout with a new name.
.....		
<b>Eyelets</b>	<b>Ctrl E</b>	: Displays the Eyelets/2-Ply window.
<b>Preferences</b>		: Display the Panel Preferences dialogue.
<b>Show numbers</b>		: Show or Hide panel numbering on the panels.

## Window

<b>Chords</b>	<b>Ctrl C</b>	: Display the Chord window.
<b>Girths</b>	<b>Ctrl G</b>	: Enter the Girths window.
<b>Panels</b>	<b>Ctrl A</b>	: Display the panel window.
<b>Patches</b>		: Display the Patches window.
<b>Colour Panels</b>		: Enter the Panel Colouring window.
<b>PatternMaker</b>		: Display the PatternMaker window.
<b>Nesting</b>	<b>Ctrl N</b>	: Enter the Nesting window.

## View

- Animate**      **F1**      : Animate view.
- .....
- Toolbox**                    : Display lighting toolbox
- Light from**                : Change light direction
- Next view**      **F2**      : Loop through the stored views.
- Show scrollbars**         : Show or Hide the viewing scroll bars

## Print

- Dimensions**                : Display the sail dimensions for sending to the printer.
- Offsets**                    : Display the panel offsets for sending to the printer.
- .....
- Screen**                     : Prints the screen.

## About

- About**                      : Display information about software version etc.
- Bug Report**                : Creates a problem report file that can be e-mailed to Armstong-White Automation for problem support.