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UNIVERSITY OF TECHNOLOGY

Centre for Marine Science and Technology

SailTool 1.14 Help Manual



Please note: This is a printed version of the online help file provided with SailTool. Sections of text which appear double underlined are a hotlink to another section of the document. Sometimes it will be obvious where the link is pointing to, other times it will not. It will be necessary to refer to the online help file if the target of the hotlink is needed by the reader.

Centre for Marine Science and Technology, Curtin University of Technology
GPO Box U1987, Perth WA 6845, Australia
Ph: +61 8 9266 7380 Fax: +61 8 9266 4799 Web: www.cmst.curtin.edu.au

SailTool 1.14 Help Manual

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What is SailTool?

SailTool is a program which allows the analysis of yacht sail images.

The program permits the user to perform a range of measurements on the sails and rig of a yacht from images which have been loaded into the program.

SailTool has been developed as a tool to help in the various stages of sailing, fine tuning, characterising and performance validation of yachts.

SailTool provides the following analysis features:

[Draft Stripe parameterisation](#)

[Stripe Depth measurement](#) (from off the boat)

[Mast Bend measurement](#)

[Spinnaker Head Angle measurement](#) (and general angle measurement)

[Leech Twist Measurement](#)

[The overlay of a customisable grid](#)

[A Tape Measure Tool](#)

[Spinnaker Flying Distance estimation](#)

[Compare Analysis Results](#)

SailTool was developed by the [Centre for Marine Science and Technology](#) at [Curtin University of Technology](#) and is ©2000 Curtin University.

More information:

[Getting Started](#)

[Sail Analysis Tools](#)

Getting Started

Before starting SailTool it is necessary to load some yacht image files onto the computer you will be running SailTool. The possible ways of loading image files into the computer are:

- (a) download the images from a digital camera or
- (b) use a flat bed scanner to scan photographic prints. Images can be in the following [file formats](#): BMP, GIF, JPEG or PNG.

The SailTool program is launched by selecting the SailTool program icon  from the START menu.

Once the program window of the SailTool application is displayed, the next step is to load a yacht image file which is to be processed. From the "FILE" menu select "OPEN..." and then select an image file to open. ([more information...](#))

The loaded image should now be displayed on the SailTool main screen. At this point you could either:

- (a) start using the [Sail Imaging Analysis Tools](#) (mast bend, stripe analysis, etc) or
- (b) setup the [Configuration Information](#) for the yacht depicted in this image (e.g. class type, mast length for this class, etc).

Once you have finished performing the desired analyses on the image you can save the analysis information for this image (for access at a later time). From the FILE menu choose the SAVE command - this will save a "[*.saf](#)" file containing the analysis information. The sail image can then be closed or the SailTool application exited.

This briefly explains the overall function of the SailTool program. You are now welcome to find out more about the specific [sail analysis features](#) provided within the program.

Yacht Classes and Class Data

The SailTool program provides the capability to register the type of class of yacht depicted in a particular image and also memorise a range of data for that type of class. This information can then be used to automate the Tape Measure Tool by avoiding the need for repeated re-entry of commonly used data - such as the mast height for a 49er.

For example:

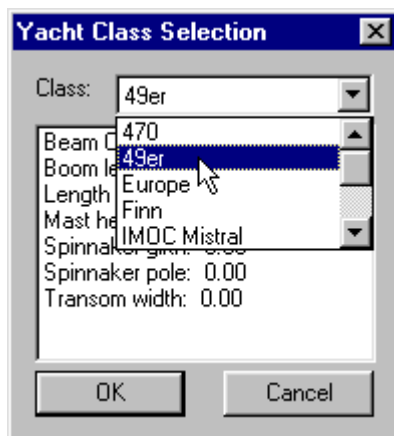
The yacht could be one of a range of different yacht classes: 470, 49er, Europe, Finn, IMOC Mistral, etc. Each yacht class has values for types of class data: boom length, mast height, transom width, etc.

The user has the ability to add new yacht classes (by editing the “.ini” file) and define values for Class Data items which have not already been entered.

To select the class of yacht

The class of a particular yacht depicted in the current image can be selected as follows:

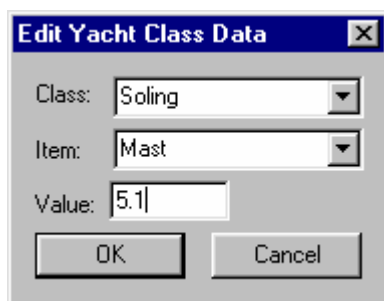
1. From the Edit menu, choose “Select Class”. (The Yacht Class Selection dialog box (shown below) is then displayed.)
2. From the Class box, select the type of class. (The current class data for that yacht classes is then displayed for reference purposes.)
3. Choose the OK button.



To edit the yacht class data

The class data for particular yacht classes can be edited as follows:

1. From the **Edit** menu, choose **Edit Class Data**. The “Edit Yacht Class Data” dialog box (shown below) is displayed.
2. From the Class box, click on the down arrow and select the type of class from the pull-down list.
3. From the Item box, click on the down arrow and select the class data item to be edited from the pull-down list.
4. In the Value box, enter a numerical value (the unit of measurement would normally be metres).
5. Press the OK button.



To add new yacht classes

A new yacht class can be created in a similar process to above:

1. From the **Edit** menu, choose **Edit Class Data**. The “Edit Yacht Class Data” dialog box is displayed.
2. Double click on the text in the Class box and type in the new Yacht Class name.
3. From the Item box, click on the down arrow and select a class data item from the pull-down list.

4. In the Value box, enter a numerical value (the unit of measurement would normally be metres).
5. Press the OK button.
6. Repeat this “edit yacht class data” process above to initialise the class data items for this new yacht class.

To add new yacht class parameters

A new yacht class parameter is added as follows:

1. From the **Edit** menu, choose **Add Class Parameter**. The “Add Yacht Class Parameter” dialog box is displayed.
2. Type the name of the parameter you wish to add.
3. Press the **Add Parameter** button and follow the prompts.
4. The value of this parameter in each of the yacht classes will be set to 0.00 so you will now need to manually set those values which you wish to have meaningful values (using Edit→EditClassData from the main menu).

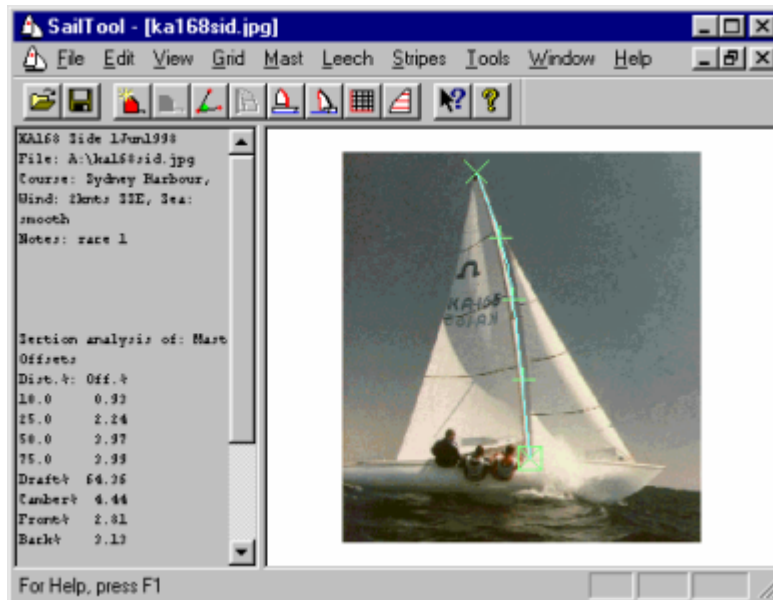
To delete a yacht class parameter

A yacht class parameter is deleted as follows:

1. From the **Edit** menu, choose **Delete Class Parameter**. The “Delete Yacht Class Parameter” dialog box is displayed.
2. Select the name of the parameter you wish to delete from the drop-down list.
3. Press the **Delete Parameter** button and follow the prompts.

The User Interface

The SailTool application provides a Windows style user interface which we hope you will find fairly intuitive to use. All of the program's functions can be accessed from the pull down menus on the menu bar at the top left of the screen. Most of the main functions can also be accessed from the toolbar buttons. While the program is being used, keep an eye on the status bar on the bottom of the screen - messages identifying which mode the program is in appear in this area.



The SailTool program displays yacht images in their own window within the main SailTool application window. Multiple images can be loaded at once and individual windows can be maximised, minimised or closed in the normal Windows fashion. You will probably find the program easiest to use if you maximise all windows to use the full screen area available.

Each sail image window contains two Frames - the right hand frame contains the yacht sail image and the left hand frame is a text display of sail analysis results. The relative size of the two frames can be adjusted by grabbing the dividing bar between the two frames.

If you have multiple yacht images loaded into SailTool during the one session, you can gain easy access to all loaded images by using the commands in the WINDOW Menu.

The SailTool application displays the results of most analysis tools as graphics overlaid on top of the sail image. The overlaid graphics provide immediate feedback to the user that the program is functioning correctly. ([more information...](#))

The SailTool application provides a range of shortcuts to speed up the activation of commonly performed tasks. Three types of shortcuts provided by SailTool:

- [toolbar buttons](#),
- [keyboard shortcuts](#), and
- [right-clicking the mouse](#).

Further information:

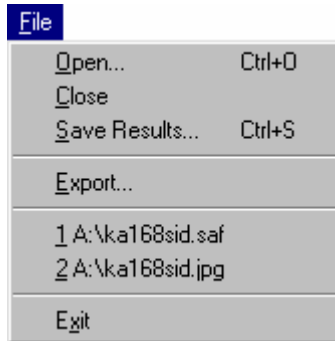
- [The menu bar](#)
- [The toolbar](#)
- [The status bar](#)
- [Overlaid Graphics](#)
- [shortcuts](#)

The Menu Bar

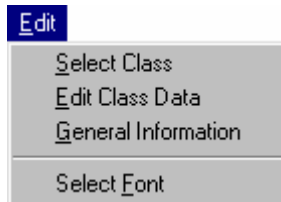
The menu bar is the first point from which all of the analysis tools can be activated.



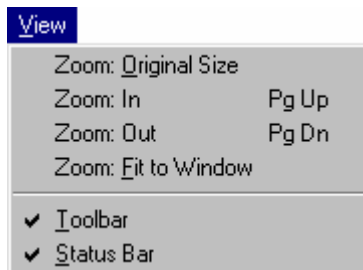
Each item in the menu bar has its own associated pull-down menu:



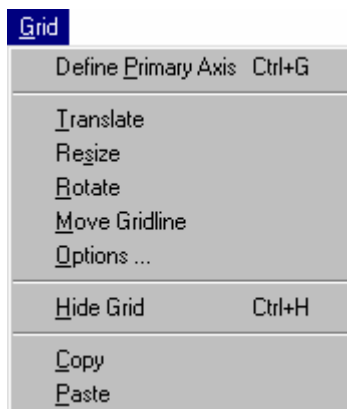
The **FILE** menu provides access to the standard file handling actions and access to recent documents. The program is exited via the EXIT item in the FILE menu.



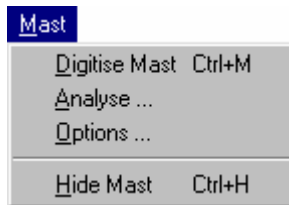
The **EDIT** menu provides options for setting the yacht's class and editing class data items as well as providing General Information for the loaded image and selecting the font for the text frame.



The **VIEW** menu provides controls for the Zoom function and controls to toggle on and off the toolbar and status bar.



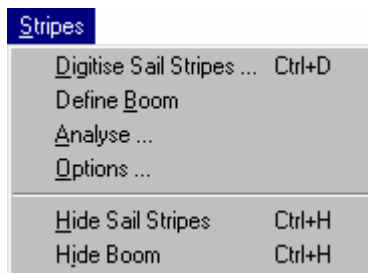
The **GRID** menu provides access to the various functions of the GRID OVERLAY tool.



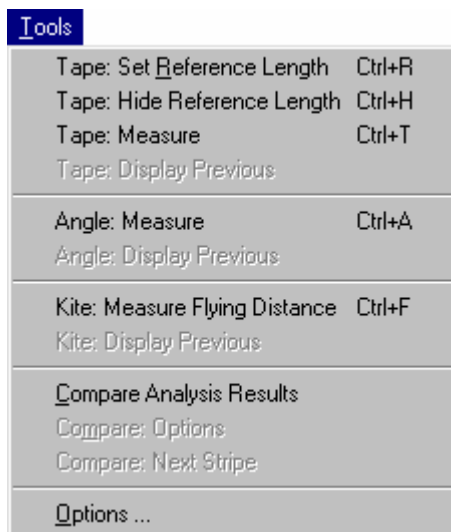
The **MAST** menu provides access to the various functions of the MAST BEND ANALYSIS tool.



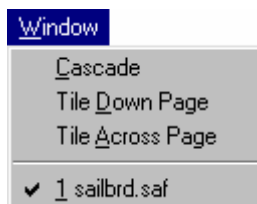
The **LEECH** menu provides access to the various functions of the LEECH TWIST MEASUREMENT tool.



The **STRIPES** menu provides access to the various functions of the DRAFT STRIPE ANALYSIS tool.

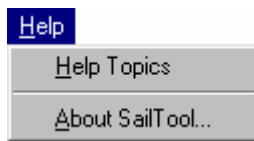


The **TOOLS** menu provides access to four different tools: the TAPE MEASURE tool, the PROTRACTOR tool (for angle measurement), KITE FLYING DISTANCE tool and a tool to allow the COMPARISON OF ANALYSIS RESULTS. The option to change the colour of the overlaid graphics is also available.



The **WINDOW** menu provides tools for accessing multiple image windows when the SailTool program has been loaded with 2 or more yacht images. The Cascade, Tile Across Page and Tile Down Page items arrange the yacht

image windows so that they can all be seen on the screen. The bottom portion of the WINDOW menu lists the currently loaded yacht images. Select the desired file name to go to that particular yacht image.



The **HELP** menu provides access to this on-line help and access to the program's about box.

Further information:

[File Handling](#)

[Yacht Classes and Class Data](#)

[Grid Overlay Tool](#)

[Mast Bend Analysis Tool](#)

[Leech Twist Measurement Tool](#)

[Draft Stripe Analysis Tool](#)

[Tape Measure Tool](#)

[Protractor Tool](#)

[Kite Flying Distance Tool](#)

[Compare Analysis Results](#)

The Toolbar

The Toolbar buttons provide easy access to commonly used Sail Analysis functions.



The meaning of each of the toolbar buttons can be easily determined by moving the cursor on top of the button and looking at the Status Bar.

The meaning of each of the toolbar buttons shown above (from left to right) are as follows:

- Open File
- Save Results
- Set Tape Measure Reference Length
- Measure Length using Tape Measure tool
- Protractor Tool (for measuring angles)
- Kite Flying Distance
- Mast Bend Measurement tool
- Leech Twist Measurement tool
- Grid Overlay tool
- Draft Stripe Measurement tool
- Help (this document)
- About

Sometimes individual toolbar buttons will be greyed out. This occurs when the function activated by a particular button cannot be performed at this time:

e.g.

- The Tape Measure tool cannot be used until a reference length has been set.
- The Flying Distance tool cannot be used until a reference length has been set.
- Sail Analysis Tools cannot be used when the results frame is selected.

The Status Bar

The Status Bar appears at the very bottom of the application window. Information appears in this area identifying the particular mode the program is in. Instructions for the correct order to select points also appear in this area (e.g. When the “Digitise Mast” tool is used, the message “Click on bottom and top of mast, then click on intermediate points.” appears in the status bar to remind the user of the correct sequence of operation.)

Keep an eye on this area if you forget the sequence of events.

Overlaid Graphics

The SailTool application displays the results of most analysis functions as graphics overlaid on top of the sail image. An example of this is shown below:



The overlaid graphics provide immediate feedback to the user that the program is functioning correctly.

If the graphics are hard to see because the graphics are drawn using a similar colour to that appearing in the yacht image, it is possible for the user to change the colours used for the graphics. Simply use the OPTIONS command in the relevant pull-down menu to change to graphics colours.

For example: to change the colour of the Mast analysis graphics, select OPTIONS from the MAST menu.

The overlaid graphics can be hidden or shown using the HIDE/SHOW command of each individual analysis tool.

The program uses different types of graphic symbols to indicate different types of selection points:



This symbol indicates the primary end of a curve measurement (bottom of mast, clew of sail, etc)



This symbol indicates the secondary end of a curve measurement (top of mast, head of sail, etc).



This symbol indicates points entered by the user which the program uses to model the curve of the particular item you are digitising.

Depending upon the tool graphics being displayed at any one time, the program may display a range of different curve or line graphics. These can represent (a) the fitted curve (b) the straight line between start and end points (c) offset measurement locations and (d) parameter measurement locations (e.g. maximum camber, front and back %, etc).

For more information see the help page for each of the analysis tools:

[Mast Bend Measurement](#)

[Draft Stripe Measurement](#)

[Leech Twist Measurement](#)

[Angle Measurement](#)

[Grid Overlay](#)

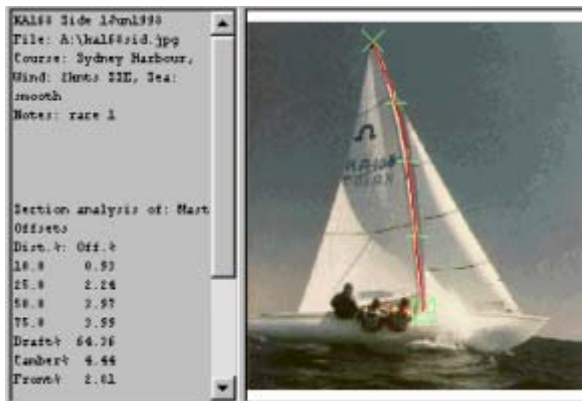
[Tape Measure Tool](#)

[Flying Distance Estimation](#)

Results Frame

The SailTool application displays various results information in the left hand frame of the sail image window.

An example of the sail image window is shown below (reduced size). Take note of the results frame on the left hand side and the yacht sail image on the right.



The results frame shows (a) the general information registered for this image, (b) labeled image measurements and (c) analysis results. The results frame allows the side-by-side comparison of results for two different sail images.

The font size used in the results frame can be customised using the **Select Font** command from the **Edit** menu. (Please note that the results frame must be selected to use the **Select Font** command - click in the results frame, then choose **Select Font**).

The size of the results frame can be adjusted by dragging the dividing line between the two frames.

More information:

[General Information](#)

[Image Measurement Labels](#)

Zoom

The SailTool application allows the user to zoom in and out of the image in the sail image window. The image can be zoomed out so that the whole image can be seen at once (where the image is larger than the screen) or the image can be zoomed in so that fine detail in the image can be easily seen for digitisation. The following zoom controls are accessible from the **View** menu:

Zoom Function	Function
View → Zoom: Original Size	Display the sail image at 1:1 size (1 image pixel to 1 display pixel)
View → Zoom: In	Enlarges the image in the display window by one step
View → Zoom: Out	Reduces the size of the image in the display window by one step
View → Zoom: Fit to Window	Resizes the sail image such that it fits the current display window (this could either mean an enlargement or a reduction depending upon the size of the window and the size of the image).

Keyboard shortcuts also exist for the Zoom In and Zoom Out functions:

Zoom Function	Keyboard Shortcut
View → Zoom: In	PAGE UP
View → Zoom: Out	PAGE DOWN

Shortcuts

The SailTool application provides several shortcuts to speed up the use of the program.

The toolbar buttons are the first type of shortcut. These are discussed in the [toolbar section](#).

Keyboard shortcuts provide yet another way of activating the major functions of the program.

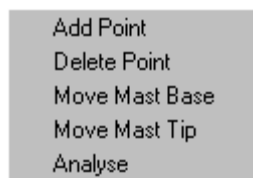
General “Windows” type keyboard shortcuts:

Key sequence	Function
F1	HELP
SHIFT F1	CONTEXT HELP
CTRL N	NEW
CTRL O	OPEN
CTRL P	PRINT
CTRL S	SAVE
CTRL F4	CLOSE
ALT F4	EXIT
CTRL C	COPY
CTRL INSERT	COPY
CTRL X	CUT
SHIFT DEL	CUT
CTRL V	PASTE
SHIFT INSERT	PASTE
CTRL Z	UNDO
ALT BACKSP	UNDO

Specific “Sail Imaging” keyboard shortcuts:

Key sequence	Function
ESC	CANCEL THE CURRENT MODE (BACK TO ROOT)
CTRL M	MAST DIGITISE
CTRL G	GRID - DEFINE PRIMARY AXIS
CTRL D	DRAFT STRIPE DIGITISE
CTRL H	SHOW/HIDE TOGGLE THE CURRENT GRAPHICS
CTRL A	ANGLE MEASUREMENT
CTRL L	LEECH DIGITISE
CTRL R	SET REFERENCE (for TAPE MEASURE)
CTRL T	TAPE MEASURE
CTRL F	MEASURE FLYING DISTANCE
PAGE UP	ZOOM IN
PAGE DOWN	ZOOM OUT

During the Digitisation of the Mast, Stripes and Leech, a right click of the mouse will bring up the following option window:

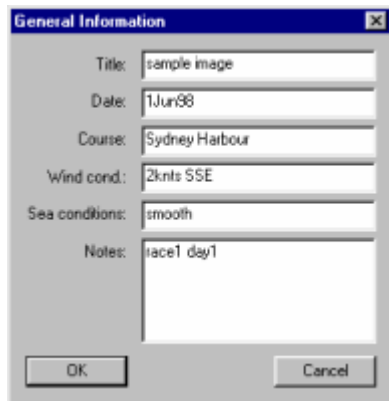


This pop-up allows quick access to the **Analyse** command as well as enabling the deletion of points and moving the start and end points. Select the appropriate command to perform that action.

General Information

The SailTool program allows a range of general information to be defined for the image.

Select **General Information** from the **Edit** menu and enter the relevant information in the General Information dialog box (shown below). The information from the dialog box is saved in the “.saf” file when the Save Results command is used.



The image shows a dialog box titled "General Information" with a close button (X) in the top right corner. The dialog box contains several input fields and a text area, each with a label to its left:

- Title: sample image
- Date: 1 Jun 98
- Course: Sydney Harbour
- Wind cond.: 2knts SSE
- Sea conditions: smooth
- Notes: race1 day1

At the bottom of the dialog box, there are two buttons: "OK" on the left and "Cancel" on the right.

File Handling

The SailTool program's file handling capabilities are similar to most Windows applications but with a few subtle differences.

The most obvious file handling action of the program is the opening of image files. The image file (either bmp, gif, jpg or png) holds the yacht image on which image analysis is to be performed.

When the program's image analysis tools are used, various analysis results are generated. The program provides the capability of saving the analysis results so that they can be retrieved later without the need to re-analyse the image. When the **File** → **Save Results** command is selected, the program stores the sail analysis results in a separate file. This file has the same file name as the image file but with the extension ".saf" (sail analysis file). When you wish to load the image and access previously stored results, load the ".saf" file instead of the image file itself.

Further information is available from the following topics:

[File Types](#)

[Opening Files](#)

[Saving Results](#)

[Closing Files](#)

File Types

There are three main types of files which the program deals with:

- Image Files
- Sail Analysis Files
- Initialisation File

Image Files (*.bmp, *.gif, *.jpg, *.png)

The program accepts image files in any of the following formats:

BMP	Windows Bitmap Format (*.bmp)
GIF	CompuServe Graphics Interchange Format (*.gif)
JPEG	Joint Pictures Expert Group Format (Lossy Compression) (*.jpg)
PNG	Portable Network Graphics Format (Lossless Compression) (*.png)

Each format has its own characteristics and compromises between: file size, compression (lossy vs. lossless), colour depth and transportability. If you have an image file in a format different from the above list, you could use a program such as Paint Shop Pro from JASC Inc. to convert the image to one of the above formats. Paint Shop Pro is a shareware package available from: <http://www.jasc.com>

Sail Analysis Files (*.saf)

When the program's image analysis tools are used, various analysis results are generated for the loaded image. The program can save these analysis results so that they can be retrieved later without the need to re-analyse the image. When the **FILE** → **SAVE** command is used, the program stores the sail analysis results in a separate file. This file has the same file name as the image file but with the extension ".saf" (sail analysis file). When you wish to reload the analysis results and image, make sure you load the ".saf" file instead of the image file only.


It is important to take some care when copying, moving or renaming image files so as to maintain the link with the sail analysis information (kept in the "*.saf" file). When copying or moving image files, make sure you also copy or move the relevant "*.saf" file if you wish the analysis results to be retained. If you rename the image file, make sure you also rename the relevant "*.saf" file so that it has the same file name as the image (but with the ".saf" extension of course).

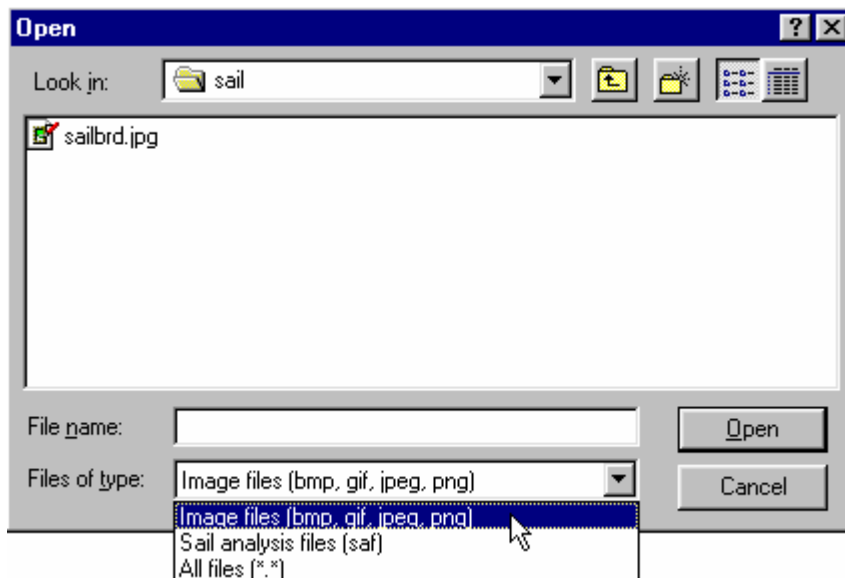
Please also be aware that some confusion could result if you had two image files with the same file name but different extension (e.g. "whit1.jpg" and "whit1.png"). Although the filename of the analysed file will be stored in the sail analysis file, it would be a good idea to avoid having different format image files with the same filename.

Initialisation File (SailTool.ini)

The SailTool application stores a range of configuration information in the “sailtool.ini” file located in the Windows directory. This file stores the class list and class data, along with other configuration information. If you enter additional classes and class data it would be to your advantage to backup this file in your regular backup routine. The file is a text format file which can be edited with a text editor if so desired.

Opening Files

Files are opened using the OPEN command from the FILE menu or by pressing the FILE OPEN  toolbar button. This brings up the file open dialog box window from which you can select the file you wish to open. At the bottom of the dialog box, the type of files to be displayed for easy selection can be selected from “All SailTool Files”, “Image Files”, “Sail Analysis Files” or “All Files”.



If you wish to load an image with its previously saved sail analysis results, make sure you load the relevant “*.saf” (sail analysis file).

Saving Results

The FILE SAVE RESULTS command saves the analysis data which has been measured from the currently displayed image file. The SAVE RESULTS command does not save or modify the image file itself, it generates a sail analysis file for the loaded image (as discussed in the [File Types help topic](#)) with the same file name as the image file but with the extension “.saf”.

Please read the precautions for copying, moving and renaming image files to ensure that an image file’s corresponding sail analysis file is not lost. (see the [File Types help topic](#)).

Closing Files

The FILE CLOSE command closes the currently active (open) image window.

If you wish to retain sail analysis information from the current image for use at a later time, use the **File Save Results** command to save a sail analysis file. See the [File Save help topic](#) for more information.

Exporting Data

The **File Export** command exports/saves the sail analysis results in a text file.

The data can then be used in external programs for further data analysis or databasing.

Sail Analysis Tools

The SailTool program can perform the following types of analysis on the yacht sails and the rig:

- **Sail Draft Stripe Analysis** (from ON the boat, looking up at sail, for the main, jib & spinnaker) using the [Stripe Analysis Tool](#)
- **Sail Stripe Depth** (from OFF the boat, from leech/luff coincident view of the sail) using the [Tape Measure Tool](#)
- **Measurement of Mast Bend** (side-ways or fore-aft) using the [Mast Bend Analysis Tool](#)
- **Measurement of Spinnaker Leech to Luff Flying Distance and Stripe Depth** (from luff/leech coincident view of spinnaker) using the [Flying Distance Tool](#)
- **Measurement of Spinnaker Head Angle** (from on boat) using the [Protractor Tool](#)
- **Measurement of Leech Twist** (from off the boat, from leech/luff coincident view of the sail) using the [Leech Twist Measurement Tool](#)

The program also has the ability to:

- **Superimpose a user-defined grid over the image** using the [Grid Overlay Tool](#)
- **Make arbitrary linear measurements within the image** using the [Tape Measure Tool](#)
- **Perform a side-by-side comparison of analysis curves** using the [Compare Analysis Results](#) tool.

More information:

[Mast Bend Analysis Tool](#)

[Stripe Analysis Tool](#)

[Leech Twist Measurement Tool](#)

[Grid Overlay Tool](#)

[Tape Measure Tool](#)

[Protractor Tool](#)

[Spinnaker Flying Distance Tool](#)


[Compare Analysis Results Tool](#)

Mast Bend Measurement Tool

The Mast Bend Measurement Tool allows the characterisation of the bend of the yacht's mast. Once the mast has been digitised by the user, the program calculates mast bend offsets as a percentage of the mast height. Shown below is an example of the display after the mast has been digitised by the user.



The process to perform a mast bend analysis is as follows:

- Select Digitise Mast from the **Mast** menu (or click the  toolbar button or press CTRL+M)
- Digitise the mast by selecting the bottom and top of the mast and then selecting points along the mast. ([more information...](#))
- Select Analyse from the **Mast** menu (or right-click the mouse and select Analyse).
- The “**Mast Offsets**” window will appear from which you can read the mast measurement values or adjust some of the configuration settings. ([more information...](#))

For further information, refer to the following topics:

[Digitise Mast](#)




[Analyse Mast](#)

[Mast Graphics Options](#)

[Show/Hide the mast graphics](#)

[Definition of Mast Section Parameters](#)

Mast Digitise

When the **Digitise Mast** mode is selected the user is prompted to “Click on bottom and top of mast, then click on intermediate points”. Move the mouse around the screen to the bottom of the mast and then press the left mouse button. A  symbol will be shown at the point selected. Next select the top of the mast - a  symbol will be displayed. Next, select intermediate points along the mast - a  symbol will be displayed at every point selected.

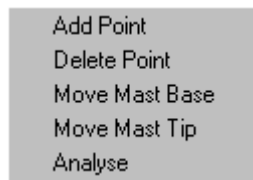
After you provide the first intermediate point, the program calculates and displays a fitted curve. You can add further intermediate points so as to make the fitted curve fit the image on screen.

At this stage the image could look something like this:



If you wish to **delete points**, this is done by:

- (a) moving the mouse pointer over the point you wish to delete,
- (b) press the right mouse button,
- (c) the following window will appear:



(d) select the “Delete Point” option.

If you wish to **move the mast base or mast tip points**, this is done by:

- (a) move the mouse pointer to the place you wish the mast base or mast tip point to be,
- (b) press the right mouse button (the window shown above is displayed) and
- (c) select the “Move Mast Base” or “Move Mast Tip” option.

Once you are happy with the digitised image (and the quality of the fitted curve), you are ready to **analyse the results**. Select Analyse from the Mast Menu (or right-click the mouse and select Analyse).

During the digitisation process, a couple of special features of the program can be used to aid the digitisation process:

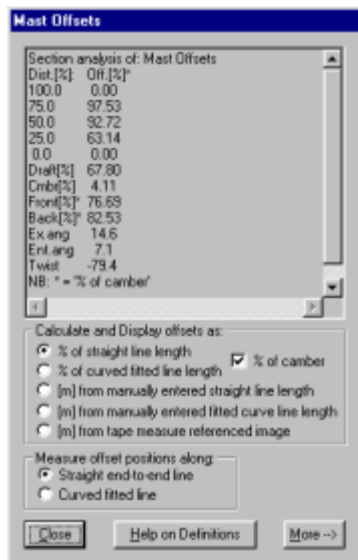
- You can zoom in and out of the image by pressing the PAGE UP and PAGE DOWN keys
- The overlaid graphics can be turned off and on by pressing CTRL+H.
- If the overlaid graphics are hard to see (probably because the graphics are the same colour as that appearing in the image), select OPTIONS from the MAST menu to change the colours used.

Please note:

- The program can only be as accurate as the points which you select so please select the points carefully.
- When the “Mast Digitise” mode is selected, it is important that the bottom of the mast is the first point selected.

Mast Analyse

When the **Mast Analyse** mode is selected (either by selecting “Analyse” from the “Mast” menu or by right-clicking the mouse and selecting Analyse) the Mast Offset dialog box is displayed (shown below reduced size).



Of primary interest is the listing of mast bend offsets and curve section parameters. This information can be selected (using the mouse), copied (CTRL+INSERT) and pasted into another application.

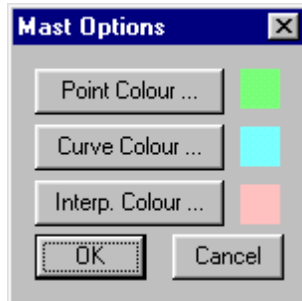
This window is very similar in function to the Analysis dialog box for the draft stripe and leech tools. Please refer to the common [Parameter Analysis Window help page](#) for more detailed information on the functions of this window.

Further information:

[Parameter Analysis Window help page](#)

Mast Options

The mast options window (shown below) is displayed when **Options** is chosen from the **Mast** menu. This window allows the user to select the colours used for the overlaid graphics. This could be used if one of the default colours clashed with the colours occurring in the yacht image.



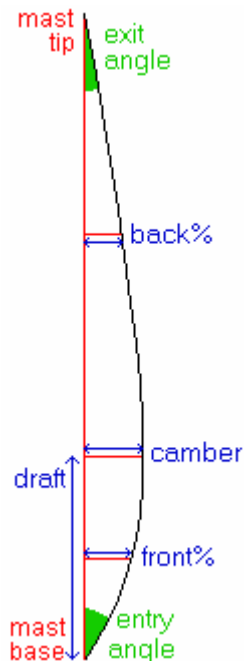
Mast Show/Hide

The mast overlay graphics can be hidden or shown using the **Hide Mast / Show Mast** command in the **Mast** menu. This command can be used at any time.

A short cut key CTRL+H can also be used but this only applies to the mast graphics when mast analysis is the current tool.

Definition of Mast Parameters

The section parameters calculated and shown in the parameter analysis dialog box are defined as follows:



- In the results list: **Dist.** refers to the **distance** from the base of the mast (up the straight line between base and tip) and **Off.** refers to the **offset** at that location. 0% is the base of the mast and 100% is the top of the mast.
- The **CAMBER** is the maximum offset of the mast.
- The **DRAFT** is the position along the straight line between **mast base** and **tip** of the maximum mast offset.
- **FRONT%** is the mast offset value half way between the **camber** and the **mast base**.
- **BACK%** is the mast offset value half way between the **camber** and the **mast tip**.
- **Camber, draft, front%, back%** and **offsets** are expressed as either:
 - (a) a percentage of the straight line distance between the mast base and tip, and/or
 - (b) a linear distance measurement.
- **ENTRY angle** is the angle (in degrees) between the straight line and the tangent of the curved line at the base of the mast.
- **EXIT angle** is the angle (in degrees) between the straight line and the tangent of the curved line at the tip of the mast.
- **TWIST** is the angle (in degrees) between the straight line and the bottom of the photograph.

See also:

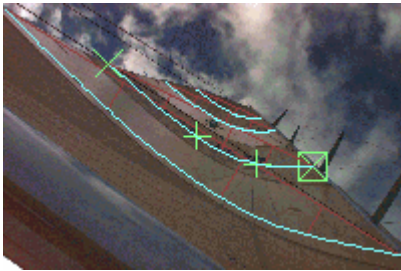
[Parameter Analysis dialog box](#)

[Leech Parameter Definitions](#)



[Sail Stripe Parameter Definitions](#)

Sail Stripe Measurement Tool

The Sail Stripe Measurement Tool allows the parameterisation of a sail's draft or camber stripes. This tool is only designed to be used on sail images taken from on the deck of the yacht. Shown below is an example of the display after the sail's draft stripes have been digitised with the draft stripe measurement tool.



The process to perform a mast bend analysis is as follows:

- Select Digitise Sail Stripe from the **Stripe** menu (or click the  toolbar button, or press CTRL+D)
- Digitise the first (bottom) stripe by selecting the leading end (mast or luff end) of the stripe, then select the trailing end (leech end) of the stripe. ([more information...](#))
- Digitise the next stripe by selecting Digitise Sail Stripe from the **Stripe** menu (or click the  toolbar button, or press CTRL+D), then digitise points on the stripe as per the previous step.
- Digitise all of the stripes by repeating the above process.
- Once you have digitised all stripes, select Analyse from the **Stripe** menu (or right-click the mouse and select **Analyse**).
- The Sail Stripes dialog box will appear from which you can read the sail stripe parameter values or adjust some of the configuration settings. ([more information...](#))

If you wish to have twist measurements calculated relative to the boom, it is necessary to digitise the boom. This is done by selecting **Define Boom** from the **Stripes** Menu and then clicking on either end of the boom.

For further information, refer to the following topics:

[Digitise Sail Stripes](#)

[Analyse Sail Stripes](#)

[Sail Stripes Options](#)

[Show/Hide the sail stripe graphics](#)

[Define Boom](#)

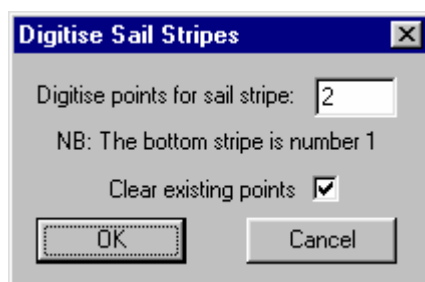
[Show/Hide Boom](#)




[Definition of Sail Stripe Section Parameters](#)

Digitise Sail Stripes

The digitisation of sail stripes is a multi-stage process - each sail stripe is digitised individually.

When the **Digitise Sail Stripes** command is selected (from the **Stripe** menu), a dialog box (shown below) is displayed informing/asking the user which stripe is to be digitised. Normally this will be the next undigitised stripe. Confirm that it is the stripe you wish to digitise and press OK.

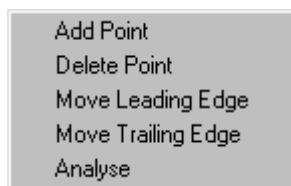


The sail image will then be shown on the screen and the user is prompted to “Click on leading edge and trailing edge of stripe, then click on intermediate stripe points”. Move the mouse pointer to the leading edge (mast or luff end) of the first (bottom) stripe and then press the left mouse button. A  symbol will be shown at the point selected. Next select the trailing edge (leech end) of the stripe - a  symbol will be displayed. Next, select intermediate points along the stripe - a  symbol will be displayed at every point selected.

After you provide the first intermediate point, the program calculates and displays a fitted curve. You can add further intermediate points so as to make the fitted curve fit the image on screen.

During the digitisation process you can **delete points** by:

- (a) move the mouse pointer over the point you wish to delete,
- (b) press the right mouse button (the following window will appear), and



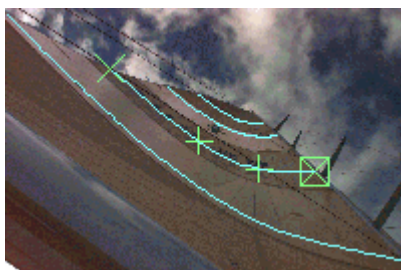
- (d) select the “Delete Point” option.

During the digitisation process you can change the position of the **Leading Edge or Trailing Edge** points by:

- (a) move the mouse pointer to the place you wish the Leading Edge or Trailing Edge point to be,
- (b) press the right mouse button (the window shown above is displayed), and
- (c) select the “Move Mast Base” or “Move Mast Tip” option.

Once you are happy with the curve fit achieved with the first stripe you can proceed to digitise the remaining stripes. Select **Digitise Sail Stripe** from the **Stripes** menu. Digitise the stripe using the process described above.

Once you have digitised all of the stripes, the image could look something like this:



If you are happy with the digitised image (and the quality of the fitted curves), you are ready to **analyse the results**. Select “Analyse” from the **Stripes** Menu (or right-click the mouse and select Analyse).

During the digitisation process, several special features of the program can be used to aid the digitisation process:

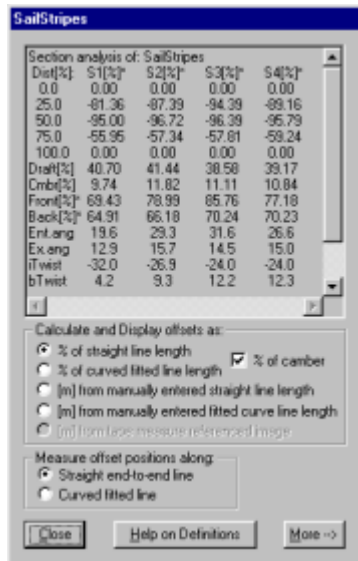
- You can zoom in and out of the image by pressing the PAGE UP and PAGE DOWN keys
- The overlaid graphics can be turned off and on by pressing CTRL+H.
- If the overlaid graphics are hard to see (probably because the graphics are the same colour as the colours present in the image), select OPTIONS from the MAST menu to change the colours used.
- If you wish to edit or redigitise a previously digitised stripe, select **Digitise Sail Stripe** from the **Stripes** menu. In the “Digitise Sail Stripes” dialog box which pops up, type in the number of the stripe you wish to edit or redigitise. If you wish to redigitise the stripe, make sure “Clear existing points” is ticked and press OK. If you wish to edit the digitised points, make sure “Clear existing points” is unticked and press OK.
- If you wish to calculate boom relative twist measurements, it is necessary to digitise the boom.

Please note:

- The program can only be as accurate as the points which you select so please select the points carefully.
- It is important that the leading (luff) end of the stripe is the first point selected.

Analyse Stripes

When the **Analyse Stripes** command is selected (either by selecting “Analyse” from the “Stripes” menu or by right-clicking the mouse and selecting Analyse) the Sail Stripes dialog box is displayed (shown below reduced size).



Of primary interest is the listing of stripe curve offsets and stripe section parameters. This information can be selected (using the mouse), copied (CTRL+INSERT) and pasted into another application.

This window is very similar in function to the analysis window for mast and leech analysis. Please refer to the common [Parameter Analysis Dialog Box help page](#) for more detailed information on the functions of this dialog box.

Further information:

[Parameter Analysis Dialog Box help page](#)

Sail Stripe Options

The Sail Stripe Options dialog box (shown below) is displayed when **Options** is chosen from the **Stripes** menu. This dialog box allows the user to select the colours used for the overlaid graphics. This could be used if one of the default colours clashed with the colours occurring in the yacht image.



This window also allows the user to set the number of draft stripes which appear on the sail. The default number of stripes is 4. It will only be necessary to change this figure if the sail image contains more or less than 4 sail stripes.

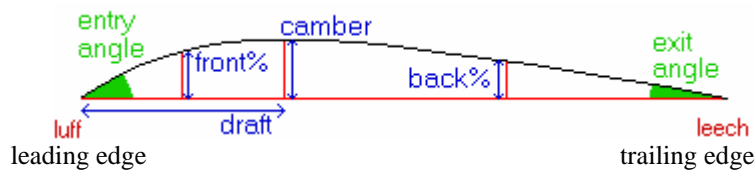
Show/Hide Sail Stripes

The sail stripe overlay graphics can be hidden or shown using the **Hide Sail Stripes / Show Sail Stripes** command in the **Stripes** menu. This command can be used at any time.

A short cut key CTRL+H can also be used but this only applies to the sail stripe graphics when sail stripe analysis is the current tool.

Definition of Sail Stripe Parameters

The section parameters calculated and shown in the [parameter analysis dialog box](#) are defined as follows:



- In the results list: **Dist.** refers to the **distance** from the luff of the sail (along the straight line between luff and leech) and **Off.** refers to the **offset** at that location.
- The **CAMBER** is located at the point of maximum stripe depth.
- The **DRAFT** is the position along the straight line between **leech** and **luff** of the maximum offset.
- **FRONT%** is the offset value half way between the **camber** and the **luff**.
- **BACK%** is the offset value half way between the **camber** and the **leech**.
- **Camber, draft, front%, back%** and **offsets** are expressed as either:
 - (a) a percentage of the straight line distance between the luff and leech, and/or
 - (b) a linear distance measurement.
- **ENTRY angle** is the angle (in degrees) between the straight line and the tangent of the curved line at the luff.
- **EXIT angle** is the angle (in degrees) between the straight line and the tangent of the curved line at the leech.
- **iTWIST** is the angle (in degrees) between the (luff to leech) straight line and the bottom of the photograph.
- **bTWIST** is the angle (in degrees) between the (luff to leech) straight line and the boom (when the boom has been digitised).
- **BOOM angle** is the angle (in degrees) between the boom and the bottom of the photograph.

See also:

[Parameter Analysis dialog box](#)

[Mast Parameter Definitions](#)

[Leech Parameters Definitions](#)

Define Boom

If you wish to calculate boom relative twist measurements during the sail stripe analysis process, it is necessary to digitise the boom.

From the **Stripes** menu, select the **Define Boom** option. Then click on both ends of the boom in the image.

The boom overlay graphics can be hidden or shown using the [Boom Show/Hide](#) command.

Show/Hide Boom


The boom overlay graphics can be hidden or shown using the **Hide Boom** / **Show Boom** command in the **Stripes** menu. This command can be used at any time.

A short cut key CTRL+H can also be used but this only applies to the boom graphics when boom digitisation is the current tool.

Leech Twist Measurement Tool

The Leech Twist Measurement Tool allows the characterisation of the leech twist of a yacht's sail. This function only works optimally on images in which the leech of the sail is approximately coincident with the luff. Once the sail's leech has been digitised by the user, the program calculates leech twist offsets.

The process to perform a leech twist analysis is as follows:

- Select “[Digitise Leech Twist](#)” from the **Leech** menu (or click the  toolbar button or press CTRL+L)
- Digitise the leech by selecting the clew and head of the sail and then selecting intermediate points along the leech. ([more information...](#))
- Select [Analyse](#) from the **Leech** menu (or right-click the mouse and select Analyse).
- The Sail Leech Offsets window will appear from which you can read the leech twist measurement values or adjust some of the configuration settings. ([more information...](#))

For further information, refer to the following topics:

[Digitise Leech](#)




[Analyse Leech](#)

[Leech Graphics Options](#)

[Show/Hide the leech graphics](#)

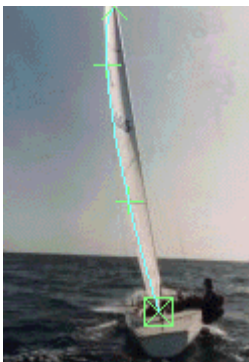
[Definition of Leech Section Parameters](#)

Digitise Leech Twist

When the **Digitise Leech Twist** command is selected, the sail image is displayed and the user is prompted to “Click on clew and head of sail, then click on intermediate leech points”. Move the mouse to the clew of the sail and then press the left mouse button. A  symbol will be shown at the point selected. Next select the head of the sail - a  symbol will be displayed. Next, select intermediate points along the leech - a  symbol will be displayed at every point selected.

After you provide the first intermediate point, the program calculates and displays a fitted curve. You can add further intermediate points so as to make the fitted curve fit the image on screen.

At this stage the image could look something like this:



If you wish to **delete points**, this is done by:

- (a) moving the mouse pointer over the point you wish to delete,
- (b) press the right mouse button,
- (c) the following window will appear:



- (d) select the “Delete Point” option.

If you wish to **move the sail clew or sail head points**, this is done by:

- (a) move the mouse pointer to the place you wish the sail clew or sail head point to be,
- (b) press the right mouse button (the window shown above is displayed) and
- (c) select the “Move Clew” or “Move Head” option.

Once you are happy with the digitised image (and the quality of the fitted curve), you are ready to **analyse the results**. Select “Analyse” from the **Leech** Menu (or right-click the mouse and select Analyse).

During the digitisation process, several special features of the program can be used to aid the digitisation process:

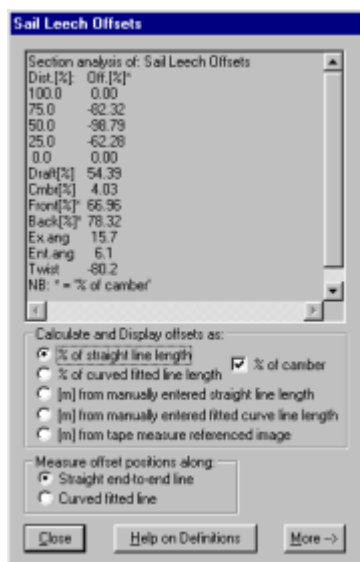
- You can zoom in and out of the image by pressing the PAGE UP and PAGE DOWN keys
- The overlaid graphics can be turned off and on by pressing CTRL+H.
- If the overlaid graphics are hard to see (probably because the graphics are the same colour as that appearing in the image), select **Options** from the **Leech** menu to change the colours used.

Please note:

- The program can only be as accurate as the points which you select so please select the points carefully.
- With this tool, it is important that the clew of the sail is the first point selected.

Analyse Leech

When the **Analyse Leech** mode is selected (either by selecting “Analyse” from the “Leech” menu or by right-clicking the mouse and selecting Analyse) the Sail Leech Offsets dialog box is displayed (shown below reduced size):



Of primary interest is the listing of leech twist offsets and curve section parameters. This information can be selected (using the mouse), copied (CTRL+INSERT) and pasted into another application.

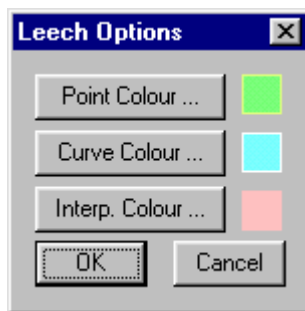
This window is very similar in function to the analysis window for mast and draft stripe analysis. Please refer to the common [Parameter Analysis Dialog Box help page](#) for more detailed information on the functions of this dialog box.

Further information:

[Parameter Analysis Dialog Box help page](#)

Leech Options

The leech options dialog box (shown below) is displayed when **Options** is chosen from the **Leech** menu. This dialog box allows the user to select the colours used for the overlaid graphics. This could be used if one of the default colours clashed with the colours occurring in the yacht image.



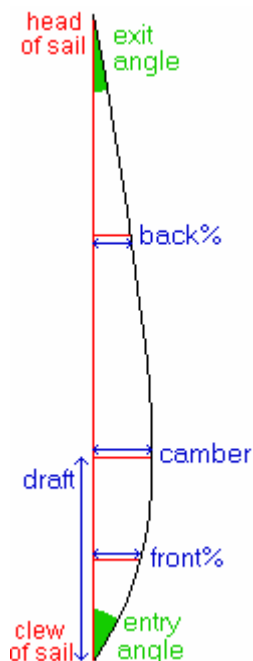
Show/Hide Leech

The mast overlay graphics can be hidden or shown using the **Hide Leech** / **Show Leech** command in the **Leech** menu. This command can be used at any time.

A short cut key CTRL+H can also be used but this only applies to the mast graphics when the leech analysis is the current tool.

Definition of Leech Parameters

The section parameters calculated and shown in the parameter analysis dialog box are defined as follows:



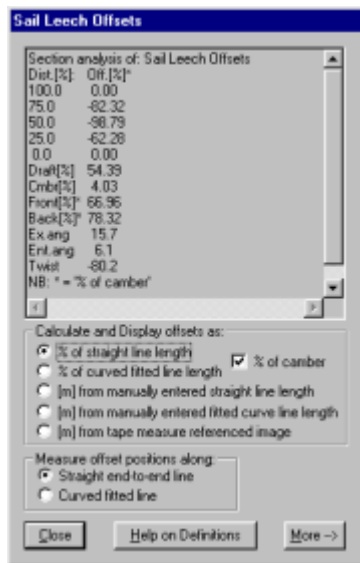
- In the results list: **Dist.** refers to the **distance** from the clew of the sail (up the straight line between clew and head) and **Off.** refers to the **offset** at that location. 0% is the clew of the sail and 100% is the head of the sail.
- The **CAMBER** is the maximum offset.
- The **DRAFT** is the position along the straight line between **clew** and **head** of the maximum offset.
- **FRONT%** is the offset value half way between the **camber** and the **sail clew**.
- **BACK%** is the offset value half way between the **camber** and the **sail head**.
- **Camber, draft, front%, back%** and **offsets** are expressed as either:
 - (a) a percentage of the straight line distance between the sail clew and head, and/or
 - (b) a linear distance measurement.
- **ENTRY angle** is the angle (in degrees) between the straight line and the tangent of the curved line at the clew of the sail.
- **EXIT angle** is the angle (in degrees) between the straight line and the tangent of the curved line at the head of the sail.
- **TWIST** is the angle (in degrees) between the straight line and the vertical axis of the photograph.

See also:

- [Parameter Analysis dialog box](#)
- [Sail Stripe Parameter Definitions](#)
- [Mast Parameter Definitions](#)

Parameter Analysis Dialog Box

The parameter analysis dialog box (shown below reduced size) is displayed when the “**Analyse**” command is chosen from either the **Mast**, **Stripe** or **Leech** menus.



The first item of interest in this window is the listing of analysis results. The analysis results include: offsets (calculated from the clew/base/luff as either (a) a percentage of the section length or (b) a length in metres if a reference is given) and several other standard sectional parameters (Draft, Camber, Entry Angle, etc). (See the Section Parameter Definitions page for the [Mast](#), [Leech](#) and [Sail Stripes](#) for a full list and description of these parameters).

The analysis results in this window can be selected (using the mouse) and copied (CTRL+INSERT) for use in another program (e.g. paste into notepad).

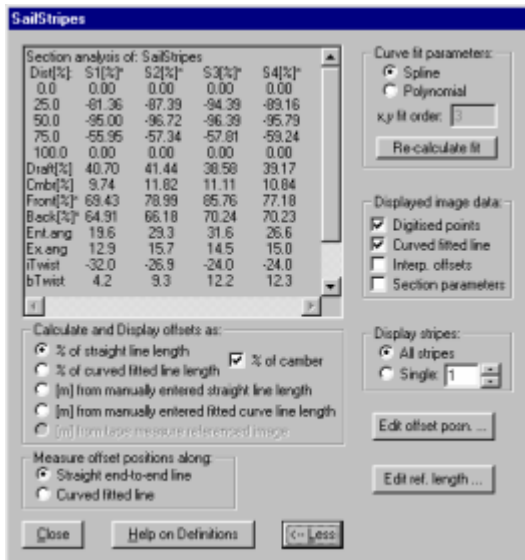
On the lower half of the window the user is given the option to calculate (or non-dimensionalise) the offset values with respect to the straight end-to-end line length or the curved fitted line length and as either a percentage or a length in metres (see below for setting the reference length). The user is also given the option to display parameters in metres based on a scale factor calculated when you tape measure reference an image (NB: be careful of perspective error). Select the appropriate radio button for the calculation method you wish to use.

The user is also given the option of selecting how percentage parameters are displayed - either as a percentage of the camber size or as a percentage of the chord length. Click the **% of camber** checkbox to select percentages to be displayed as a percentage of the camber.

The user can also select the way in which the position of the offset measurement locations are calculated - either measured along the straight end-to-end line or along the curved fitted line. Select the appropriate radio button for the calculation method you wish to use.

Three buttons on the bottom of the screen allow you to:

- Close** (or dismiss) the window,
- Access **Help** for this page, and
- Access **More** analysis customisation options. If the More button is pressed, the analysis window expands to reveal more functions. (shown below reduced size)



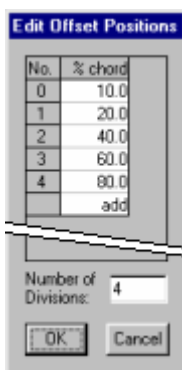
The “**Curve fit parameters**” area (top right) allows the user to select the technique used to calculate the curve fit. In most cases a spline has been found to give very good results, however the user is given the option of using a polynomial (with user selectable order) to calculate the fit. If the curve fit method is changed, press the “Re-calculate fit” button to immediately use the new method.

The “**Displayed image data**” area (right centre) allows the user to select the type of overlaid graphics which are displayed on the sail image. Click on the appropriate tick box to display or hide the following graphics items: (a) Digitised points (b) Curve fitted line (c) offset measurement locations and (d) section parameter locations (i.e. draft, front %, back %).

The “**Display stripes**” area (right lower-centre) only appears when draft stripe analysis is being performed. This area allows the user to select whether overlay graphics are displayed for all of the stripes or just a single stripe.

The “**Edit Ref. Length...**” button brings up a window which allows you to enter the reference length (either straight line or along the curve) for when you want the offsets to be displayed in metres.

The “**Edit Offset Posn.**” button brings up a windows which allows the offset measurement locations to be edited. When this button is pressed the following window is displayed:



The user can **change offset positions** simply by double clicking the appropriate number and entering a new number via the keyboard.

The user can **add offset positions** by double clicking on the add entry.

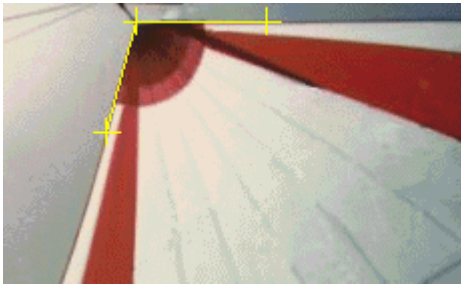
The user can **delete offset positions** by selecting the entry you wish to delete and press the BACKSPACE key.

At the bottom of the window, the “**Number of Divisions**” item allows the user to manually set the number of offset positions which exist. When a number is entered into this box, the program recalculates all of the offset positions such that they are all evenly spaced between 0 and 100%

Further information: [Exporting analysis data](#)

Protractor Tool (Angle Measurement)

The Protractor Tool allows the measurement of angles in yacht sail images. This function only works optimally when the plane of the angle measurement is perpendicular to the camera axis. The tool provides a measure of angle in degrees. Shown below is an example of the protractor tool being used to measure spinnaker head angle.



The Protractor Tool is activated by selecting “[Angle: Measure](#)” from the **Tools** menu.

Further information:


[Angle: Measure](#)

[Angle: Display Previous](#)

[Tools Options](#)

Angle: Measure

The process to measure an angle in an image is as follows:

- Select **Angle: Measure** from the **Tools** menu (or click the  toolbar button or press CTRL+A)
- Move the mouse to the first arm of the angle to be measured and press the left mouse button.
- Move the mouse to the apex of the angle to be measured and press the left button.
- Move the mouse to the second arm of the angle to be measured and press the left button.
- A dialog box (shown below) will then appear displaying the measured angle.



- If you wish to assign a label to this measurement (for later use) type a name for this measurement in the Label box. (See the [Measurement Labels](#) help topic for more information.)
- Press **Close** to dismiss the dialog box.

If you wish to redisplay the previously measured angle, select the “[Angle: Display Previous](#)” command from the **Tools** menu.

Further information:

[Angle: Display Previous](#)

[Tools Options](#)

[Measurement Labels](#)

Angle: Display Previous

The **Angle: Display Previous** command from the **Tools** menu redisplay the previously measured angle. The angle overlay graphics are redisplayed and the results dialog box is also redisplayed (as shown below reduced size).



Press the **Close** button to dismiss the dialog box.

Further information:

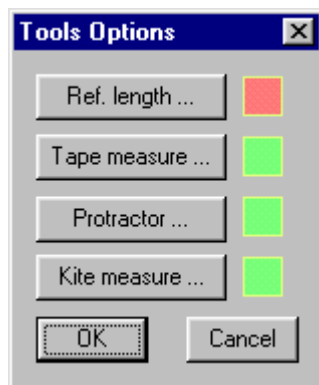
[Angle: Measure](#)

[Tools Options](#)

[Measurement Labels](#)

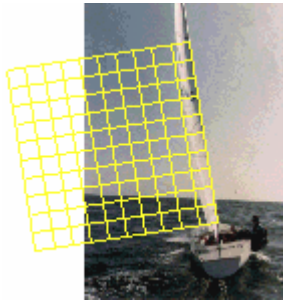
Tools Options

The Tools Options dialog box (shown below) is displayed when the **Options** command is chosen from the **Tools** menu. This dialog box allows the user to select the colours used for the overlaid graphics commands available from the Tools menu. This could be used if one of the default colours clashed with the colours occurring in the yacht image.



Grid Overlay Tool

The Grid Overlay Tool allows the overlay of a user definable grid over the loaded yacht sail image. The grid overlay tool provides a number of advanced features which allow the analysis of single images and the comparison of multiple images. The image below shows an example of the grid overlay tool being used:



The Grid Overlay Tool is activated as follows:

- Select “Define Primary Axis” from the **Grid** menu.
- Using the mouse, select two points which define the primary axis of the grid.
- The grid will then be displayed as shown in the image above.

The grid can now be customised in a number of ways:

- The grid can be moved using the Translate command.
- The grid can be resized using the Resize command.
- The grid can be rotated using the Rotate command.
- Individual gridlines in the grid can be moved using the Move Gridline command.
- The Options command allows all of the defining parameters of the grid to be edited numerically.
- The grid can be copied from the current image and pasted onto another image using the Copy and Paste commands.
- Finally, the grid overlay graphics can be turned on and off with the Show/Hide Grid command.

Further information:

Define Primary Axis

Translate

Resize

Rotate


Move Gridline

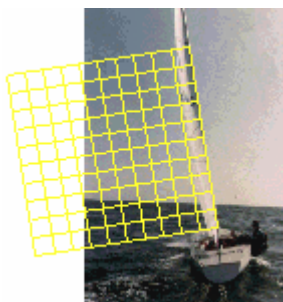
Options

Show/Hide Grid

Copy and Paste

Grid Define Primary Axis

The **Define Primary Axis** command in the **Grid** menu is used as the first step to overlay a graphical grid over the current yacht sail image. Shortcut alternatives are to press the  toolbar button or press CTRL+G. When this command is selected, the user is prompted to select the end points of the primary axis of the desired grid using the mouse. A graphical grid is then drawn on the screen as illustrated below:



The user can select the direction in which the grid is drawn by way of noting the sequence in which primary axis end points are selected - the grid will be drawn to be left if the bottom end point is selected first and the grid will be drawn to the right if the upper end point is selected first.

The user can subsequently use the other Grid tool commands to manipulate the overlay grid.

Further information:

[Translate](#)

[Resize](#)

[Rotate](#)

[Move Gridline](#)

[Options](#)

[Show/Hide Grid](#)

[Copy and Paste](#)

Grid Translate

The grid can be moved (translated) around the screen using the **Translate** command in the **Grid** menu.

The procedure for moving the grid is as follows:

- From the **Grid** menu select **Translate**.
- Move the mouse pointer to anywhere on the yacht sail image.
- Press the left mouse button and drag the grid to the desired location by moving the mouse.
- Release the left mouse button when the grid is in the desired position. (The program then automatically exits from the translate mode).

Further information:

[Define Primary Axis](#)

[Resize](#)

[Rotate](#)

[Move Gridline](#)

[Options](#)

[Show/Hide Grid](#)

[Copy and Paste](#)

Grid Resize

The Grid Resize command allows the size of the grid to be increased or decreased.

The procedure for resizing the grid is as follows:

- From the **Grid** menu select **Resize**.
- If you wish to resize both X and Y axes at the same time move the mouse a corner of the grid, otherwise, if you wish to resize only the X or only the Y size of the grid move the mouse to the middle of one of the side edges of the grid.
- Press the left mouse button and drag the grid to the new size by moving the mouse. (It should be noted that opposite side or corner from the selected side or corner is maintained fixed during the resizing process).
- Release the left mouse button when the grid is the desired size. (The program then automatically exits from the resize mode).

Further information:

[Define Primary Axis](#)

[Translate](#)

[Rotate](#)

[Move Gridline](#)

[Options](#)

[Show/Hide Grid](#)

[Copy and Paste](#)

Grid Rotate

The Grid Rotate command allows the orientation of the grid to be changed.

The procedure for rotating the grid is as follows:

- From the **Grid** menu select **Rotate**.
- Move the mouse to the point on the screen you would like to be the rotation centre and click the left mouse button. A ● symbol will be displayed to indicate the rotation centre. (The rotation centre can be placed anywhere on the screen but it probably makes more sense to put the rotation centre at the centre of the grid or at one of the corners.)
- Move the mouse to anywhere on the screen and press the left mouse button and drag to rotate the grid.
- Release the left mouse button when the grid is at the desired orientation. (The program then automatically exits from the rotate mode).

Further information:

[Define Primary Axis](#)

[Translate](#)

[Resize](#)

[Move Gridline](#)

[Options](#)

[Show/Hide Grid](#)

[Copy and Paste](#)

Move Gridline

The Move Gridline command allows the position of individual gridlines in the grid to be changed.

The procedure for moving gridlines is as follows:

- From the **Grid** menu select **Move Gridline**.
- Move the mouse pointer over one of the gridlines. (Either direction gridlines can be selected but not the borders of the grid.)
- Press the left mouse button and drag the gridline.
- Release the left mouse button when the gridline is at the desired location. (The program then automatically exits from the 'move gridline' mode).

Further information:

[Define Primary Axis](#)

[Translate](#)

[Resize](#)

[Rotate](#)

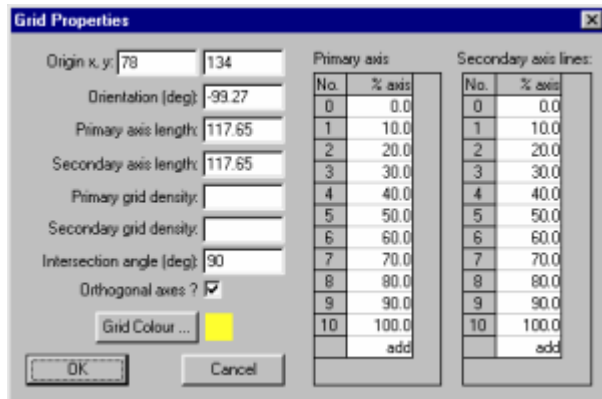
[Options](#)

[Show/Hide Grid](#)

[Copy and Paste](#)

Grid Options

The Grid Options command allows all of the defining parameters of the grid to be edited numerically. When the Grid Options command is selected, the following dialog box is displayed:



The various fields and buttons in this dialog box have the following functions or meanings:

Field/Button	Function
Origin x,y	The position of the origin of the grid (in image pixels)
Orientation	The orientation (angle) of the grid in degrees
Primary axis length	The length of the primary axis (in image pixels)
Secondary axis length	The length of the secondary axis (in image pixels)
Primary grid density	The density of the primary grid
Secondary grid density	The density of the secondary grid
Intersection angle	The angle at which the primary and secondary axes intersect
Orthogonal axes	If ticked, the intersection angle of the grid axes will be forced to 90 degrees.
Grid Colour	The colour of the grid graphics can be changed by pressing this button
Primary Axis lines	A mini spreadsheet showing the position of the gridlines
Secondary Axis lines	A mini spreadsheet showing the position of the secondary axis gridlines.

Further information:

- [Define Primary Axis](#)
- [Translate](#)
- [Resize](#)
- [Rotate](#)
- [Move Gridline](#)
- [Show/Hide Grid](#)
- [Copy and Paste](#)

Grid Show/Hide

The grid overlay graphics can be hidden or shown using the **Hide Grid** / **Show Grid** command in the **Grid** menu. This command can be used at any time.

A short cut key CTRL+H can also be used but this only applies to the grid graphics when grid is the current tool.

Further information:

- [Define Primary Axis](#)
- [Translate](#)
- [Resize](#)
- [Rotate](#)
- [Move Gridline](#)
- [Options](#)
- [Copy and Paste](#)

Grid Copy and Paste

An overlay grid (including all of its customised parameters) can be copied from one yacht sail image file to another. This can allow the comparison of two yacht sail images.

The procedure for copying a grid from one image to another is as follows:

- Select the Yacht Sail Image you wish to copy the grid from. (You could do this by selecting the desired file from the **Window** menu.)
- Select **Copy** from the **Grid** menu.
- Select the Yacht Sail Image you wish to copy the grid to. (You could do this by selecting the desired file from the **Window** menu.)
- Select **Paste** from the **Grid** menu.
- It may then be necessary to realign, rotate or resize the grid to align it with the new image. The Grid Translate, Rotate and Resize tools would be used for this purpose.

Further information:

[Define Primary Axis](#)

[Translate](#)

[Resize](#)

[Rotate](#)

[Move Gridline](#)

[Options](#)

[Show/Hide Grid](#)

Tape Measure Tool

The Tape Measure Tool allows relative measurement of lengths in yacht sail images. The tool works by the user first defining a reference length in the image - such as the height of the mast or the width of the transom. The program then uses this reference length to calculate the scaling factor for the image. The user is then able to measure items in the yacht sail image.

It should be noted that because the yacht sail images processed by this program are only two dimensional, the program is unable to correct for perspective error in images. The user should be aware that perspective error will affect the measured distance when it is not in the same plane (perpendicular to the camera axis) as the reference length. ([more information...](#))

The Tape Measure Tool is used as follows:

- Select “[Tape: Set Reference Length](#)” from the **Tools** menu and define the reference length.
- Then select “[Tape: Measure](#)” from the **Tools** menu and measure an arbitrary length in the image (note that the result is not perspective corrected).


Further information:

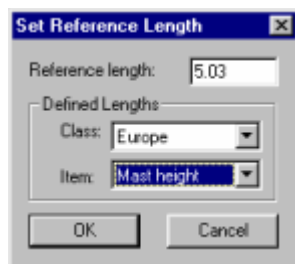
[Set Reference Length](#)
[Show/Hide Reference](#)
[Measure](#)
[Display Previous](#)
[Options](#)

Tape: Set Reference Length

The **Tape: Set Reference Length** command in the **Tools** menu initialises the tape measure tool so that measurements can be made in the image.

The Tape Measure reference length is set as follows:

- Select **Tape: Set Reference Length** from the **Tools** menu (or press the  toolbar button or press CTRL+R).
- Using the mouse, select two points which define a known reference length in the image.
- The “Set Reference Length” dialog box (shown below reduced size) will appear from which the user should specify the length of the chosen reference. The user can choose from a set of pre-defined lengths or manually enter the length.



The user can then use the [Tape Measure](#) command to measure lengths in the image. The user can hide the graphics indicating the chosen reference length by choosing [Tape: Show/Hide Reference](#) from the **Tools** menu.

Further information:

[Show/Hide Reference](#)
[Measure](#)
[Display Previous](#)
[Options](#)

Tape: Show/Hide Reference

The tape measure reference overlay graphics can be hidden or shown using the “**Tape: Hide/Show Reference Length**” command in the **Tools** menu. This command can be used at any time.

A short cut key CTRL+H can also be used but this only applies to the reference length graphics when “Tape: Set Reference Length” was the last used tool.

Further information:

[Set Reference Length](#)

[Measure](#)


[Display Previous](#)

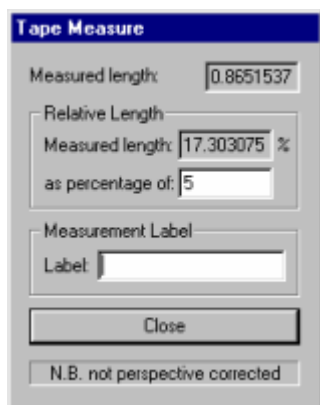
[Options](#)

Tape: Measure

The **Tape: Measure** command in the **Tools** menu is used to make measurements in the image. It is necessary to set a reference length in the image before measurements can be made.

The Tape Measure Tool is used as follows:

- Select **Tape: Measure** from the **Tools** menu (or press the  toolbar button or press CTRL+T).
- Using the mouse, select two points which determine the length you wish to measure.
- The “Tape Measure” dialog box (shown below reduced size) will appear which shows the calculated value of the measured length.



- If you wish to express the measured length as a percentage of another length (e.g. stripe depth as a percentage of stripe length), enter the reference length in the “as percentage of” box. The measured length will then be calculated as a percentage of the entered length.
- If you wish to assign a label to this measurement (for later use) type a name for this measurement in the Label box. (See the [Measurement Labels](#) help topic for more information.)
- Press **Close** when you have finished with this dialog box.

Further information:

[Set Reference Length](#)

[Show/Hide Reference](#)

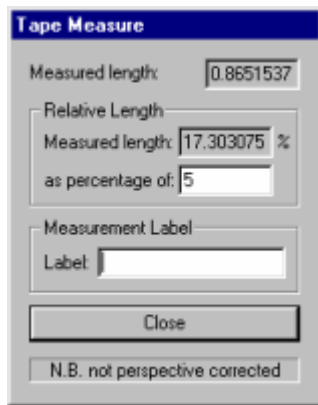
[Display Previous](#)

[Options](#)

[Measurement Labels](#)

Tape: Display Previous

The **Tape: Display Previous** command from the **Tools** menu redisplay the previously measured length. The tape measure overlay graphics are redisplayed and the results dialog box is also redisplayed (as shown below).



Press the **Close** button to dismiss the dialog box.

Further information:

[Set Reference Length](#)

[Show/Hide Reference](#)

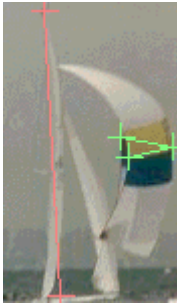
[Measure](#)

[Options](#)

[Measurement Labels](#)

Spinnaker Flying Distance Tool

The Flying Distance Tool allows the estimated measurement of the flying distance of a yacht's spinnaker from a yacht sail image in which the leech and luff of the spinnaker are almost coincident. The flying distance is the straight line distance between points on the luff and leech of a flying spinnaker. This function requires that: (a) a reference length be set in the image using the tape measure tool, (b) the locations of the luff, leech and camber point stripe on the spinnaker be digitised by the user and (c) the distance around the curve be entered by the user. The diagram below shows an example of the flying distance tool being used to measure spinnaker flying distance.



The Flying Distance Tool is activated by selecting "Measure Flying Distance" from the **Tools** menu.

Further information:


[Measure Flying Distance](#)

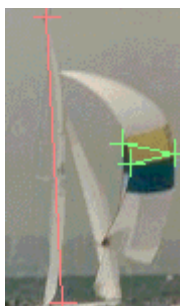
[Display Previous](#)

[Options](#)

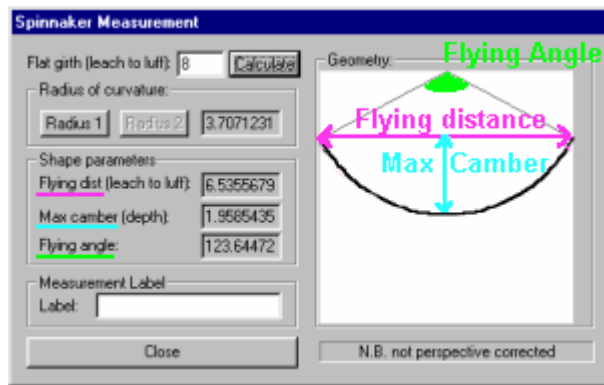
Kite: Measure Flying Distance

The process to measure the flying distance of a spinnaker in an image is as follows:

- Firstly ensure that a reference length has been set in the image using the Tape Measure Tool ([Tape: Set Reference Length](#) from the **Tools** menu).
- Select **Kite: Measure Flying Distance** from the **Tools** menu (or click the  toolbar button or press CTRL+F)
- Move the mouse to the luff of the spinnaker and click the left mouse button.
- Move the mouse to the apex of the spinnaker and click the left mouse button.
- Move the mouse to the leech of the spinnaker and click the left mouse button. (at this point the display would be something similar to the image shown below.)



- A dialog box will then appear (as shown below) displaying the analysis of the flying distance. Enter the leech to luff distance and press **Calculate**. The calculated parameters (including flying distance) will then be displayed.



- In some instances there will be two solutions to the calculation of flying distance - press **Radius1** or **Radius2** to select the most appropriate solution.
- If you wish to assign a label to this measurement (for later use) type a name for this measurement in the Label box. (See the [Measurement Labels](#) help topic for more information.)
- Press **Close** to dismiss the dialog box.

It should be noted that the calculated results of this tool are not perspective corrected. This tool also makes the assumption that the shape of the flying spinnaker is an arc of a circle.

If you wish to redisplay the results of a previous flying distance measurement, select the [Display Previous](#) command from the **Tools** menu.

Further information:

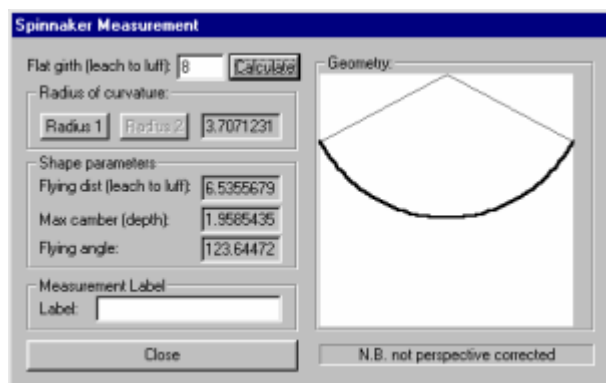
[Display Previous](#)

[Options](#)

[Measurement Labels](#)

Kite: Display Previous

The **Kite: Display Previous** command from the **Tools** menu redisplay the results of the previous flying distance measurement. The flying distance overlay graphics are redisplayed and the results dialog box is also redisplayed (as shown below).



Press the **Close** button to dismiss the dialog box.

Further information:

[Measure Flying Distance](#)

[Options](#)

[Measurement Labels](#)

Image Measurement Labels

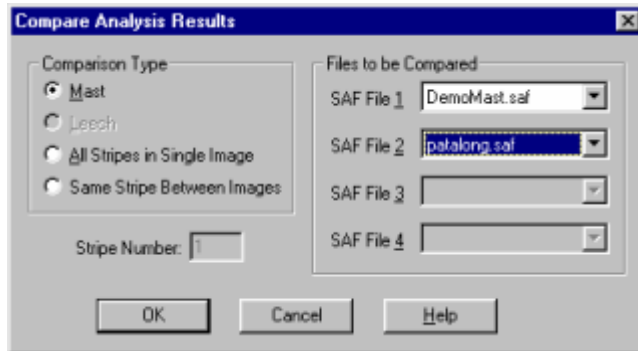
The SailTool program allows the collation of labeled image measurements performed with the Protractor, Flying Distance and Tape Measure tools. When you perform a measurement with any of these tools, a results dialog box appears which contains a Label edit box. If you type a name into the Label box, the measurement will be stored for later use. The measurement labels will be displayed in the results frame, will be exported into a text file when the File Export command is used and saved in the “.saf” file when the File Save Results command is used.

Comparison of Analysis Results

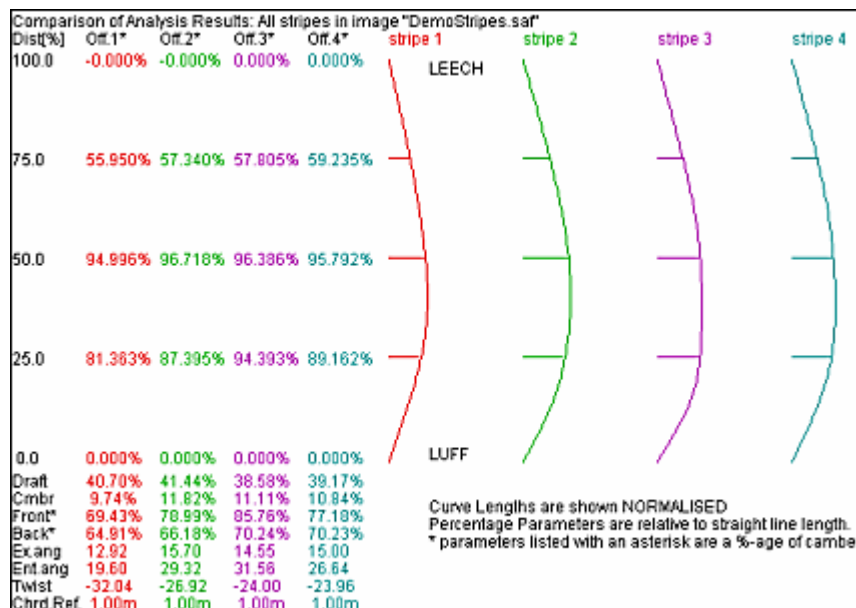
The SailTool program provides an analysis tool which allows the user to perform a side-by-side comparison of analysis curves. For example, if you have two images showing mast bend, this tool allows you to display the mast bend parameters and the graphical curve from both images side-by-side for comparison purposes.

This function is accessed as follows:

- From the **Tools** menu, select **Compare Analysis Results**.
- The “Compare Analysis Results” dialog box (shown below) is displayed:



- Select the type of Comparison you wish to perform by selecting one of the buttons on the left hand side of the dialog box: **Mast**, **Leech**, **All Stripes in a Single Image** or **Same Stripe Between Images**. (NB: if there are insufficient files loaded into SailTool to do a particular comparison, that particular option will be greyed out).
- On the right hand side of the dialog box, select the files you wish to compare. SailTool gives you a default selection of files which meet the Comparison Type selected in the previous step but you can select other files by clicking on the down arrows and selecting from the available files (with have already been loaded into SailTool).
- Press **OK** to generate and display the Graphical Comparison Window (shown below).



The Comparison window shows all analysis parameters for all curves from all images selected. A graphical representation of each curve is also displayed. Each set of analysis parameters and analysis curves are colour coded for easy interpretation.

Several features of this window can be customised by the user (display ‘%’ or ‘m’, display curves ‘relative’ or ‘normalised’, curves displayed ‘overlaid’ or ‘side-by-side’, etc). These functions are available via the **Compare: Options** item under the **Tools** menu.

See Also:

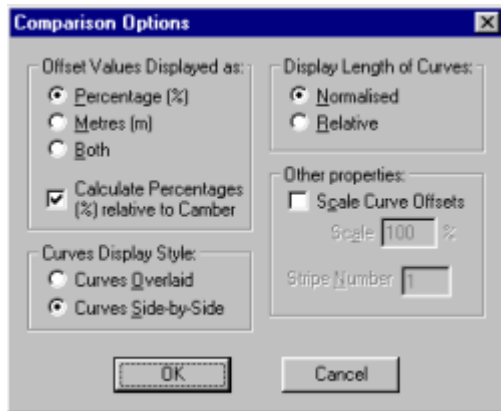
Comparison Options

How to display the next Stripe in the ‘Same Stripe between Images’ mode.

Comparison Window Options

Several features of the Comparison of Analysis Results window can be customised by the user as follows:

- From the **Tools** menu, select **Compare: Options**.
- The “Compare Analysis Results” dialog box (shown below) is displayed:



- Select how offset values are to be displayed in the top left hand corner. Measurements can be displayed in % or metres. Click the check box to calculate percentages relative to camber rather than as a %-age of the straight chord length.
- Select whether to overlay the graphical curves or display them side-by-side by selecting the appropriate button on the bottom left of the dialog.
- In the top-right hand box, select whether to display the curves all normalised to the same length or displayed to scale relative to their reference lengths (NB: Relative can only be selected if all curves have a reference length in metres).
- In the bottom-right-hand box, select whether to exaggerate the curve offsets by clicking the ‘Scale Curve Offsets’ check box and entering a Scale value.
- Press **OK** once you are happy with your selections or **Cancel** to abort your changes.

See Also:

Compare Analysis Results

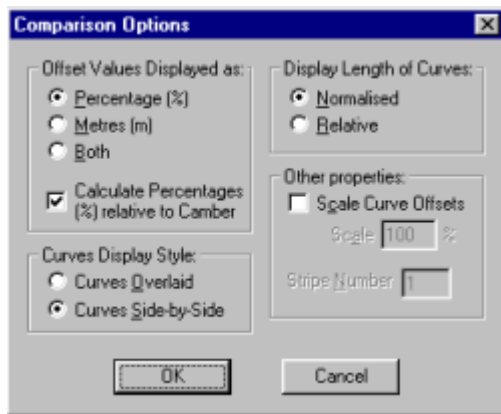
How to display the next Stripe in the ‘Same Stripe between Images’ mode.

Compare: Next Stripe

When the Comparison Tool is used to compare the same sail stripe between different images, the program allows the user to select which sail stripe to compare between images.

This can be done by selecting **Compare: Next Stripe** from the **Tools** menu (in which case if you are currently comparing stripe number 1 between all images, selecting this option will compare stripe number 2 between all images).

The stripe number to be compared between all images can also be selected from the Comparison Options dialog box (shown below)



At the bottom right hand corner of the dialog box is the **Stripe Number** edit box. Select the stripe number you wish to display and press OK.

NB: this function is only relevant to the “Same Stripe Between Images” mode. This feature has no meaning in the Mast, Leech and All Stripes in Single Image modes and hence is greyed out.

See Also:

[Compare Analysis Results](#)
[Comparison Options](#)

Tips

A number of techniques and shortcuts help the process of sail analysis while using the SailTool program:

- Zoom in and out of the image using the PAGE UP and PAGE DOWN keys while selecting points to obtain greater accuracy of point selection.
- Use the keyboard shortcuts instead of the menus
- Use the toolbar buttons instead of the menus
- Enter commonly used yacht length parameters into the Yacht Class and Data fields.
- Be aware of the perspective correction limitations of 2D photography when performing length or angle measurements.

- Why are all sail analysis toolbar buttons and menus greyed out? These toolbar buttons and menus cannot be used when the results frame is the current frame - Click in the sail image window to activate the toolbar buttons and menus.
- Why is 'Select Font' greyed out? The Select Font command only works on the results frame text - select the results frame and then choose 'Select Font'.

Technical Limitations

In order for several of the tools to be used successfully and accurately, it is necessary for the yacht sail image to be taken from a particular location. If the camera isn't located at the specified position, the analysis results could be erroneous. The position requirements are as follows:

<u>Measurement</u>	<u>Requirement</u>
Sail Stripe Analysis (from ON boat)	The camera must be looking up at the sail from on the boat
Sail Stripe Depth (from OFF boat)	The leech and luff points must be coincident in the image.
Spinnaker Flying Distance	The leech and luff points must be coincident in the image.
Angle Measurement	The camera optical axis should be perpendicular to the plane containing the angle to be measured. (see Perspective Error for Angle Measurements below).
Leech Twist Measurement	The image must be taken such that the leech and luff of the sail are coincident.

There are also some technical limitations inherent in using uncalibrated two-dimensional cameras. The following text is offered to help the operator reduce the magnitude of any measurement errors. Some operator judgment will be necessary to avoid or reduce measurement errors since it is beyond the technical capabilities of the SailTool program to correct for these errors automatically.

Perspective Error

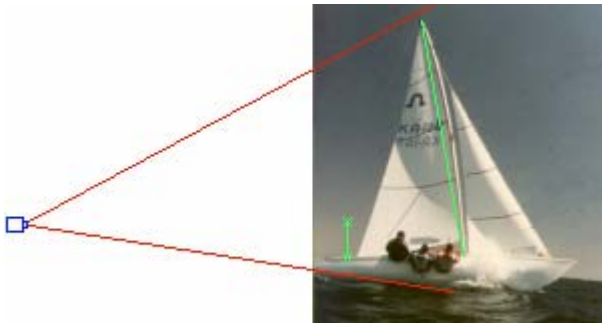
This program processes images which are only two dimensional, hence it is not possible to correct for size differences due to objects being at different distances from the camera.

An example of perspective error is shown below. In the following image a camera with a fairly wide angle lens is used to take a photo of the yacht from behind. Consider the situation where the mast is used as the tape measure reference length to measure a fictitious item of interest on the transom of the yacht. In this situation, because the two items (reference and measured) are at different distances from the camera (but the program has no way of knowing it), the measured result will be subject to perspective error. In this case the measured result would be approximately twice what the real result would be since the measured item is approximately half way between the camera and the reference length.



Two ways of reducing the effect of perspective error are to:

- (a) Use a reference length which is at approximately the same distance away from the camera as the item to be measured, and
- (b) Photograph the yacht from a greater distance (and use a longer focal length lens) (as shown below)



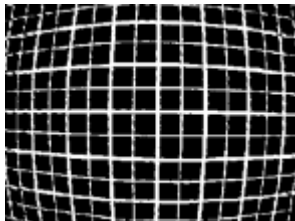
It should be noted that perspective error could be eliminated if the yacht was photographed using a calibrated stereoscopic camera and this program was modified to process stereoscopic images.

Perspective Error for Angle Measurements

Care should be taken when performing angle measurements that the plane defined by the angle being measured is perpendicular to the camera's optical axis. An error will result if the plane defined by the angle being measured is not perpendicular to the camera's optical axis. The amount of error will depend upon the angle at which the plane is to the camera's optical axis. This error is similar in some respects to the Perspective Error described above.

Lens Distortion

Some lenses (especially wide angle lenses) exhibit a lot of barrel or radial distortion. The image below shows an example of barrel distortion. The image below illustrates the photo of a rectilinear grid pattern which has been distorted by the camera lens. It should be noted how the size of the square in the centre of the image is larger than the size of the squares around the outside of the image. Different camera lenses will exhibit different amounts of lens distortion. The image below is a fairly extreme example.



With the presence of lens distortion, measurements in an image could be subject to error. The amount and type of error will however depend upon where in the image measurements are taken and the amount of lens distortion present in the image.

Technical Support



SailTool was developed by:

Centre for Marine Science & Technology
Curtin University of Technology
GPO Box U1987
Perth WA 6845
Australia

Phone: +61 8 9266 7380
Fax: +61 8 9266 4799
Email: info@cmst.curtin.edu.au
WWW: <http://www.cmst.curtin.edu.au/>

We have tried to make this help file as comprehensive as possible. If you find something that isn't covered by the help file that should be, please contact us for more information. Similarly, if you find any errors or faults in the SailTool program, please let us know and we will attempt to correct it.

If there are any additional features you would like to see added to SailTool, please contact us at the above address.

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