

Introduction

RusalkaSoft Performance takes the data already being generated by the instrument system on your sailboat and uses the power of personal computers to present that data in more effective and easier to understand ways.

RusalkaSoft Performance is optimized to run on multi-screen computer systems. The ideal set up is a waterproof monitor visible to the helmsman in the cockpit running the wind vectors screen and a second display at the navigations station below decks.

Set Up

NMEA Set Up

To use RusalkaSoft you need to get information from your instrument system into your computer. Marine instruments are networked together with a protocol called NMEA 0183 (National Marine Electronics Association). This protocol is quite limited in its capabilities. To make the most of it you will need a device called a NMEA multiplexer ([google it](#), you'll find a few of them). We've had good luck with the ShipModul brand. The multiplexer combines all the NMEA data into one stream and then allows that data to be fed to a

computer either via serial port, USB or Bluetooth. We would strongly suggest that you get a multiplexer that supports filtering, GPS's in particular put out far more data than is needed by most applications.

To function with all features and functionality RusalkaSoft only needs to see the following NMEA strings:

VWR, VHW, RMC, DBT, HDG

We would suggest that you filter out all other strings than those necessary.

Generally to get full support you will need some kind of integrated instrument system (that generally has wind instruments, a knot meter and a depth gauge), a GPS and something with a fluxgate compass (either an autopilot or a something like a KVH Sail-comp, sometimes you'll find them in the integrated instrument system).

By not hooking up the GPS, you will only lose the features on the GPS Data display

By not hooking up a compass you will lose, absolute wind direction, course and wind direction strip charts, compass data, and opposite course data.

Strip Chart Scale

The strip chart scale sets the time frame in minutes for the strip charts in the system

Depth Alarm

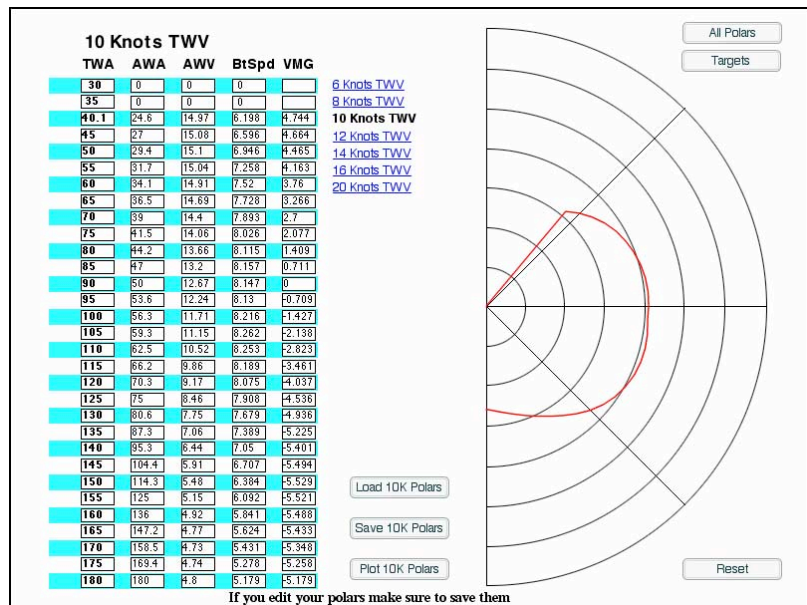
This sets the depth that triggers the depth alarm.

Polar Utility

The Polar Utility is a freeware program that we distribute to build the polar and target data files that RusalkaSoft uses. It also allows you to graphically see your polar data.

External files

RusalkaSoft Performance requires a number of external files to function properly. There are seven polar files and two target files, these files must be in the same folder as the



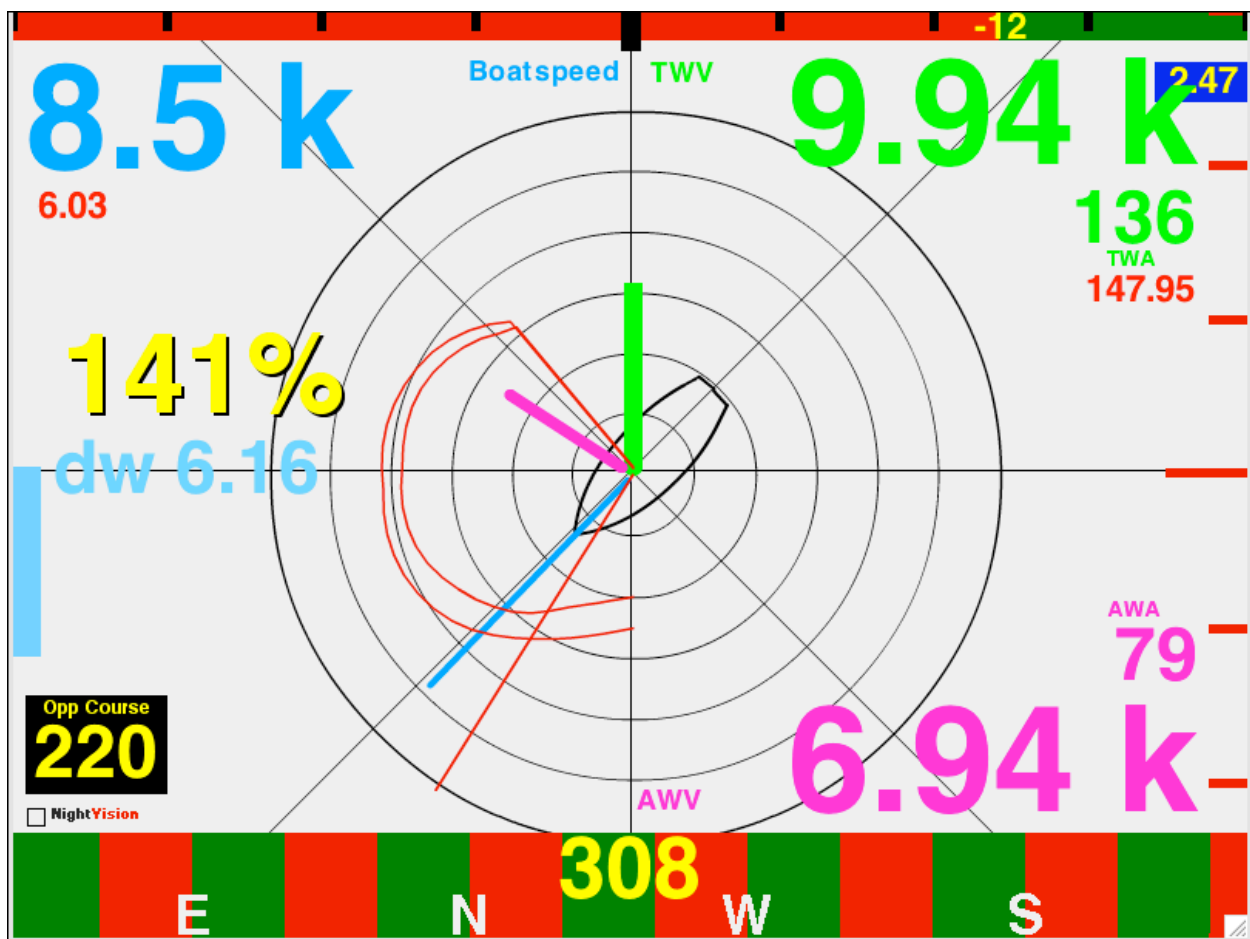
RusalkaSoft application. These files are created and edited by our Polar Utility Tool.

Displays

Let's examine at each of the functions of RusalkaSoft

Wind Vectors Screen

This is the main screen that should be positioned where the helmsman should can see it. There are a wide variety of features in this display that present an enormous amount of valuable data to the driver.



Boat Speed

Your boat speed is color coded **blue**. Your boat speed is numerically represented in the upper left hand corner of the display. Your boat speed is graphically represented by the blue vector that rotates along with the boat outline in the display. The length of the vector is proportional to boat speed (the rotation is proportional to true wind angle, more on that shortly).

True Wind

True wind data is color coded **green** and is in the upper right hand corner of the wind vectors display. True wind speed is the large scale number on top, true wind angle is the smaller scale number just beneath it. True wind angle is also represented by the rotation of the boat outline. True wind velocity is represented by the vertical green velocity vector. This data is computed from your boat speed and your apparent wind data.

Apparent Wind

Apparent wind data is color coded **magenta** and is in the lower right hand corner of the wind vectors display. Apparent wind speed is the large scale number on the bottom, apparent wind angle is the smaller scale number just above it. Apparent wind angle is also graphically represented by the magenta velocity vector. The length of the vector indicated apparent wind velocity, the rotation of the vector represents apparent wind angle. This data comes directly from your wind instruments.

Velocity Made Good (VMG)

VMG is on the left hand side of the screen and is color coded **cyan**. This is your progress either into or away from the wind. It is represented both numerically and graphically. The graphical representation is the vertical component of the boat speed vector. This data is computed from true wind angle and boat speed

Polars

The polar diagram for the current wind conditions is overlaid in **red** over your velocity vectors. Actually we usually overlay two polar diagrams allowing us to bracket the wind speed and allowing you to see your current range, instead of trying to figure out if the wind is a little above or a little below the current polar. Below 6 knots true wind speed and above 20 knots true wind speed a single polar diagram is shown.

These are in the same scale as the blue boat speed velocity vector. this allows you to see in real time how your boat speed is comparing to your polar data. If the end of the boat speed velocity vector is right on the red polar curve you are currently sailing your proper polars.

Compass Strip

There is a analog/digital compass strip across the bottom of the display. This is similar to looking at the front edge of a traditional compass card.

Opposite Course

The opposite course indicator tells you what course you would be sailing if you were to tack or jibe and sail at the same true wind angle on the opposite tack.

Targets

When going downwind a target angle is overlaid in **red** on the vector diagram. When going upwind the angles are close enough that this information is better presented elsewhere.

Targets are numerically represented. The target boat speed is displayed in red immediately below the current numerical boat speed display. The target true wind angle is displayed immediately below the current numerical true wind angle display.

Target Speed Steering Guide

On the far right side of the screen is the target speed indicator. The driver's goal is to keep the blue indicator in the middle of the scale. Your target speed is in the vertical center of the screen. If the indicator is above the middle the boat is above target speed, if the indicator is below the middle, the boat is below target speed. The scale is in knots. Each tick is one knot.

Target Angle Steering Guide

Across the top of the wind vectors display you'll find the target angle steering guide. This lets the driver see graphically and numerically which way to steer and how much, to be driving the optimum target angle for the current wind conditions. Steer the boat so that the strip is equal parts red and green. If there is more red steer left, if there is more green, steer right. The difference between the target angle and the TWA is indicated by the number within the strip. Each tick on the scale is 5 degrees.

Percentage

Immediately above the numerical VMG display is your target percentage. This is your current boat speed divided by your target boat speed for the given wind conditions. 100% means you are at your target speed, over 100% means you are above targets, below 100% means you are below targets.

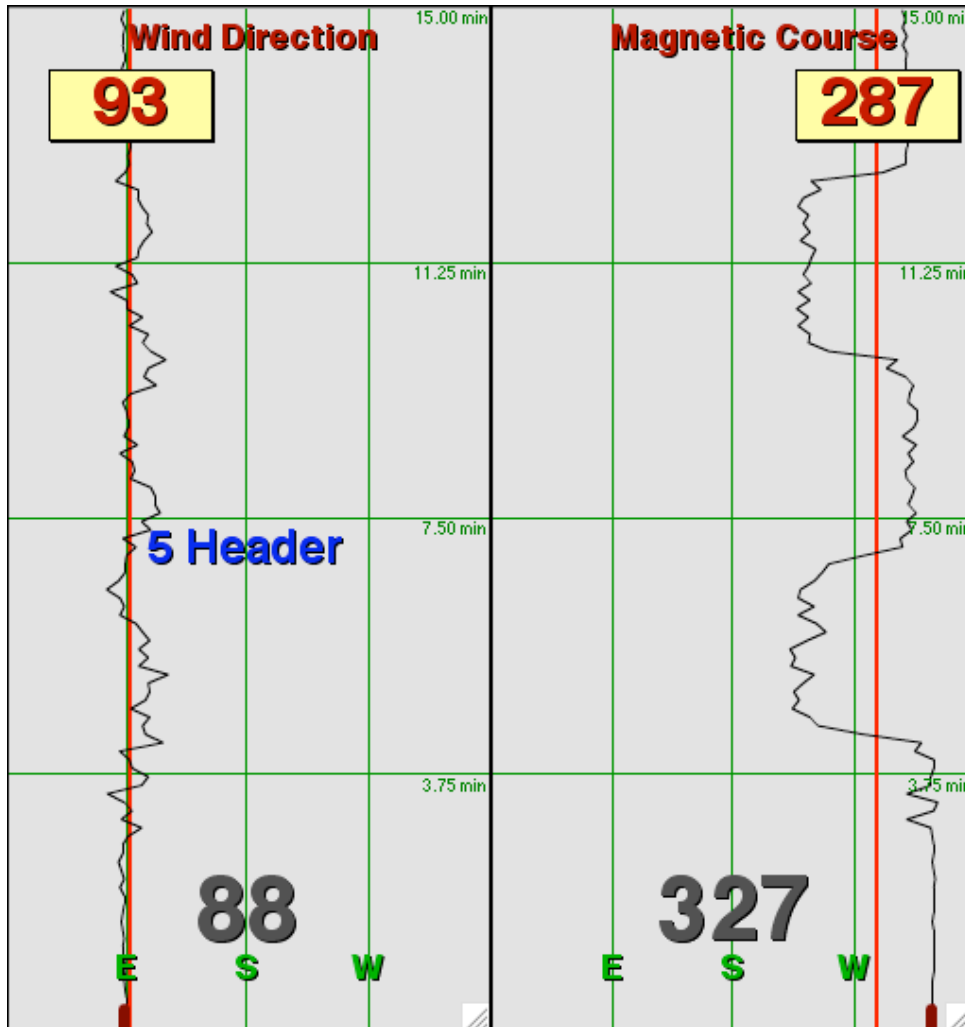
NightVision Toggle

In the lower left corner of the display is the night vision toggle. This switches the display between daylight mode (black on white) to night mode (white on black). Night mode is much less bright and should help preserve the crew's night vision.

Other displays

Course Strip Chart

This chart shows course (in the x-axis) vs time (in the y-axis). The further down the graph you are the more recent the data. The chart also has an average line.



Wind Direction Strip Chart

The wind direction strip chart shows the wind direction (not wind angle) over the recent past (the time scale is configurable on system start).

Let's look at the various features of this display.

Current True Wind Direction (in degrees)

Historical wind direction graph

Wind direction is in the x-axis, time is in the y-axis. The further down the graph you are the more recent the data. This view is very useful for spotting periodic trends on how the wind is shifting (and help you to guess when it's shifting again).

Average Wind Direction

This is the average direction the wind has been blowing over the timeframe of the graph. The average wind direction line is included give a visual indication of how far from the average the wind is and has been .

Header/Lift Indicator

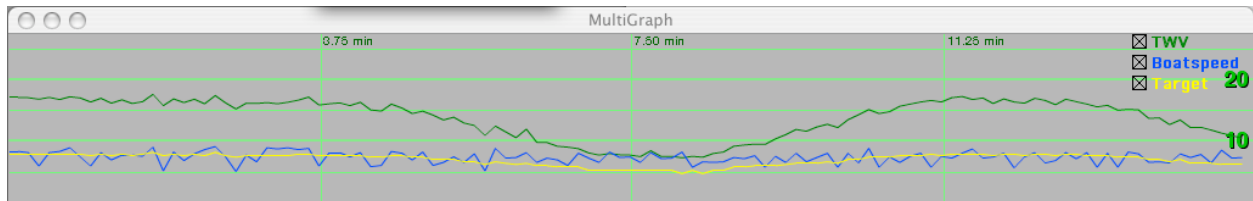
This is the difference between the current wind direction and the average wind direction.

For example, in the current graph the current wind direction is 88 degrees, over the past 15 minutes, the average wind direction is 93 degrees. So the wind is 5 degrees to the right of average. If we're on port tack we're sailing on a 5 degree header, if we're going upwind, this is bad and we should tack (if we did the indicator would say 5 degree lift).

MultiGraphs

The multigraph plots related types of data (true wind velocity, (in green) boat speed (in blue) and target boat speed (in yellow)) on the same graph.

The true wind speed graph is useful for spotting cyclical trends in wind velocity. Combined with the wind direction graph one can also tell if shifts or puffs are likely to be headers or lifts.



Analog/Digital Hybrid Displays

Boat Speed

This gauge indicates boat speed through the water.



Wind Speed

This gauge indicates true wind speed.



Wind direction

This gauge indicates wind direction. To work this gauge needs both wind instruments and compass data inputs.

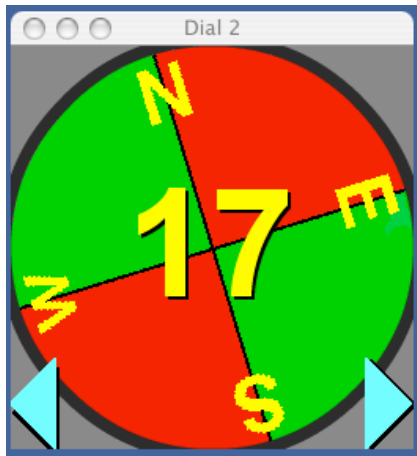


Depth

This gauge indicates depth. It provides both a digital and an analog representation of the depth beneath the transducer. When the depth alarm is triggered the numbers turn red.

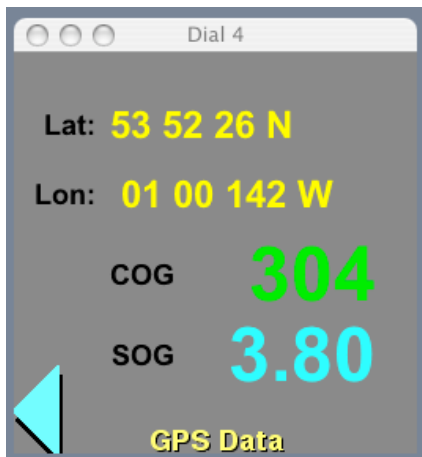
Compass rose

This gauge indicates course, it is a top down view of a compass card.



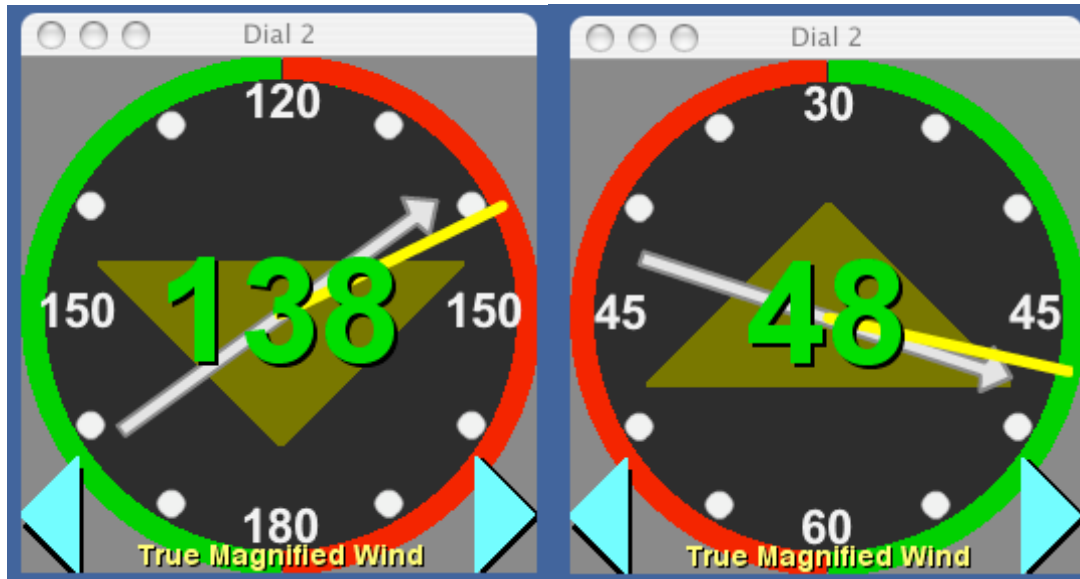
GPS Data

The GPS data window displays data from the GPS. It support Latitude and Longitude in addition to course over ground (COG) and Speed over Ground (SOG).



Magnified Wind

This gauge indicates true wind angle, but the scale is magnified to make it more clear. In addition target wind angle data is displayed. This gauge has three modes, upwind, downwind and reaching. Let's look a little more closely at this gauge and targets in general.



How to use targets in RusalkaSoft

Targets speeds and angles are great tools for maximizing your performance both up and downwind. RusalkaSoft offers representations of your target data that should make using your targets much easier.

First let's look at using target wind angles while going downwind. The goal is to optimize downwind VMG. In lighter winds if you head up a bit your boat speed increases, but you'll sail further to get downwind. Going downwind you want to sail the optimal angle between boat speed and short distance, this changes as wind speed changes (generally the higher the wind speed the deeper angle you can sail).

When you're going downwind RusalkaSoft does several things to help you sail your optimum angle.

In the WindVectors display it overlays the optimal angle over the vectors. This is the **red** line. Try to steer the boat so that the **red** line (target) and the **blue** line (TWA) line up. There are two other things on the Windvectors display that will help you. You will see an efficiency number on the left side of the screen (large yellow percentage). This represents the percentage of your target speed the boat is going. If you are over your target speed AND above your target angle you're not going at optimum VMG, head off until

you get to target angle. If you're above your target speed and BELOW your target angle, you're OK, but be careful, you might gybe. Additionally there are small red numbers near the TWA and boat speed displays, these are your targets for the current wind conditions.

Target speed Guide

On the far right side of the screen is the target speed indicator. The drivers goal is to keep the blue indicator in the middle of the scale. Your target speed is in the vertical center of the screen. If the indicator is above the middle the boat is above target speed, if the indicator is below the middle, the boat is below target speed. The scale is in knots. Each tick is one knot. The delta to the target speed is displayed in yellow in the blue indicator.

Target Angle Steering Guide

Across the top of the wind vectors screen you'll find the target angle steering guide. This lets the driver see graphically and numerically which way to steer and how much, to be driving the optimum target angle for the current wind conditions. Steer the boat so that the strip is equal parts red and green. If there is more red steer, left, if there is more green, steer right. The difference between the target angle and the TWA is indicated by the number within the strip. Each tick is on the scale is 5 degrees.

You can also use the boat speed vector to help you. Keep the end of **blue** boat speed vector on the **red** polar line and you should be going well.

The Magnified wind display can also help you sail the optimum down wind angle. When you're sailing below 120 TWA the magnified wind display switches into downwind mode. The scale in downwind mode is between 120 and 180 degrees TWA. The arrow indicator points at your current downwind angle. The display also overlays a target angle indicator. Again, the goal is to steer the boat so that the TWA indicator (the arrow) and the target indicator (the yellow line) line up.

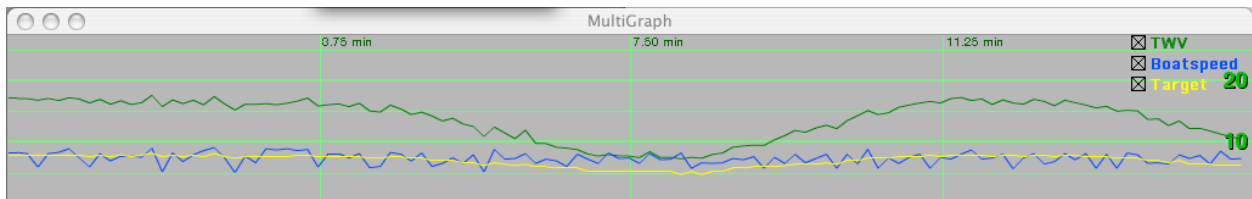


Going upwind it is best to steer to a target speed. The easiest way to use RusalkaSoft to help you do this is to get the boat trimmed right and then try to keep your performance percentage at 100%. If you're below 100% you're probably pinching, if you're above you're probably sailing too low and not pointing as well as you should.

The magnified wind display can also help you going upwind. Once again, the goal is to line up your target wind angle with your TWA.



The boat speed and targets speed graphs are useful for seeing if you've been sailing up to potential. If the blue line is above the yellow line you're above potential, if the blue line is below the yellow line, you're sailing below potential.



Data Logging/Playback

RusalkaSoft logs all data while it is running. Data is logged and time stamped once per second. You can play back the data by clicking the load log data button on the start up screen. VCR style controls allow you to play the data at normal speed, at 2X speed or backwards. Playing at 2X or backwards will create anomalous graphs on the strip charts.

When you quit the program the data is automatically saved to your hard drive. The data file names start with the date that the data was recorded. Data logs take up about 200K per hour of logged data.

You can also open the data files in a word processor, spreadsheet or statistics program to do advanced analysis of your performance.

The data files are 12 words, comma delimited and ordered in the following format:

LAT
LON
COG
SOG
V
AWV
AWA
TACK
CRS
TWV
TWA
TimeStamp

Simulator Mode

RusalkaSoft also includes a simulator mode that allows you to experiment with the user interface without having an instrument system hooked up. When you start up in simulator mode, RusalkaSoft opens a NMEA Spoofer display that allows the user to adjust AWV, AWA, boat speed, course and tack. It is possible to get some anomalous reading with the simulator that may put the vectors display in odd modes.

Contact:

If you have any questions, problems or feature requests feel free to drop us an eMail at eriks@rusalka.net .