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LAKE ONTARIO
OFFSHORE RACING

NAVIGATION

with New Wireless App & Crowdsourcing Technology

By Craig Summers

All sailors need wind information. The marine weather forecast and even a GRIB overlay of wind barbs on a map is just a coarse estimate of what the winds will be like in your location at any specific time. You can't set your sails based on

Wireless Wind Instrument

that. You really have to feel what the wind is like yourself or use a masthead anemometer and wind gauge, to evaluate your tacking angle. But those methods haven't changed in centuries, and do not provide tactical data; they leave it to you to guesstimate your optimal tacking angles and tacking route. To win a race or arrive exactly when expected, low-cost new technology is evolving that can show you live wind zones up ahead and use your boat's polar plots to determine your optimal tacks.

The wireless *SailTimer Wind Instrument* uses Bluetooth to transmit to a smartphone/tablet or to the *SailTimer Air Link* which can connect on NMEA wiring to your GPS chartplotter or multi-function display. The Wind Instrument works with a range of chartplotter, wind gauge and performance apps on Android and iOS, including: OpenCPN, SailRacer, AFTrack, SeaNav, MID Wifi, Sail Buddy, iRegatta and *SailTimer*. The Wind Instrument continues to gain new features as more apps support it

AirLink

and add new functions. You can wake up tomorrow, and it can do things that it did not do today. Because tablets and phones can have an internet connection, the Wind Instrument also gives you the option to crowdsource wind data to live online wind maps. Although it has mostly been used on keelboats, the wireless Wind Instrument is suitable for boats of any size. It is submersible, so even a dinghy sailboat can now have full chartplotting and

wind electronics. Smart phones are everywhere now, so you can have GPS, a great chartplotter app and wind electronics in trailerable centerboard boats and small multihulls where electronics were never possible before.

If your boat already has a wired anemometer, it can be wired into the *SailTimer Air Link*, which can retransmit all incoming NMEA 0183 data on wifi. Sail Buddy is an iOS app that can receive these wifi transmissions. It has a clean, simple display for both iPhone, iPad and even Apple Watch. It gives you a simple display of boat speed, course, wind speed and direction, and water depth. In the other direction, the *SailTimer Air Link* can receive Bluetooth transmissions from the *SailTimer Wind Instrument* and send the wind data on NMEA wiring to your GPS chartplotter or autopilot. The Air Link's wifi can connect to your marina or boat wifi for an internet connection. Then you can be at home or office and check wind conditions and temperature on your boat remotely. That has never been possible before.

## Crowdsourcing: *Free Live Wind Maps and Race Tracking*

When traveling down the road with a smartphone, your speed can be shared to traffic flow maps as in the Waze app or Google Maps. Sailors also can crowdsource, sharing wind and GPS data to live wind maps. This opens up new capabilities for sailboat navigation and performance analysis. Live wind maps are much better than weather forecasts. More than 15 million data points are available at *SailTimerMaps.com*, with recent wind data. Orange pins on the map can be clicked to see graphs of recent wind conditions at that location. This crowdsourced data can be viewed in any web browser, and uses free worldwide Navionics marine charts.

Crowdsourcing also opens up new possibilities for making races available live online, or for saving them to replays for performance analysis later. All that is needed is an internet connection on each boat. Only small text data is transmitted, for minimal data costs. Click on a wind barb to see live wind graphs and numerical displays. If out of cellular range, it is also possible to store the wind and GPS data until later wifi access.

Race officials can also use crowdsourced wind maps for setting upwind marks. There are graphs and large numerical displays for race officials at *SailTimerMaps.com*, for viewing recent or averaged wind conditions.

Rather than manually anchoring mark buoys around a race course,

MarkSetBot uses small pontoon boats with autonomous navigation to drive themselves to the mark location and stay in position (www.MarkSetBot. com). Developed in Detroit Michigan, the MarkSetBot vessels also work well with crowdsourcing of wind maps and race tracking, for seeing and positioning the marks.
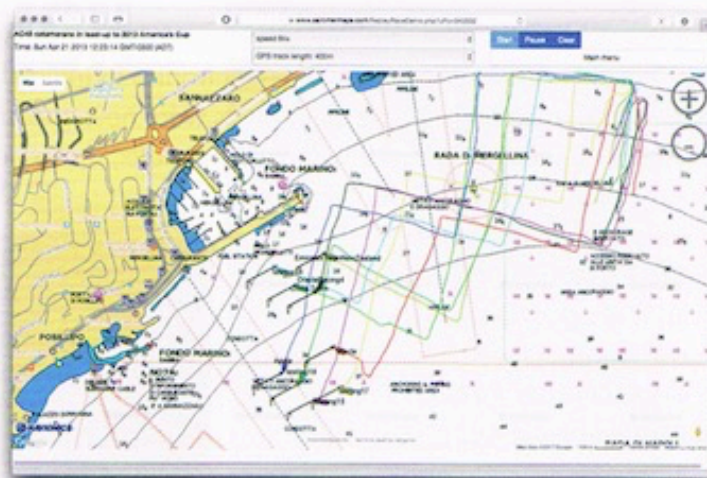
Crowdsourced Race

One of the limitations of crowdsourcing is that there may be areas with no data, or not enough users all the time. *SailTimer Inc.* is increasingly collaborating with data partners and meteorology organizations to handle the growing volume of wind data being crowdsourced, and to model this data to fill in the gaps. Traditional weather forecasts are based on observed data from stationary weather stations such as at airports. However, the *SailTimer* Wind Instrument is a connected sensor that moves around. That has never been possible before. One user sailing around on a weekend or all season can generate data covering a lot of locations. That historical data can tell us a lot about wind conditions in specific locations and around landforms. Even if there isn't a boat providing data in the lee of an island or in a channel at this particular moment, we may know from a user's previous visit exactly what the wind does in that location.

Polar Plots + Tacking Distance = Optimal Tacks

For generations of seafarers, there has been no way to accurately determine the best tacking angles upwind. The "Helmsman's Dilemma" is whether to head off the wind to pick up more speed (but with longer distance), or head more into the wind to reduce the distance to the destination (but at a slower speed). Ironically, low-cost sailboat navigation apps are evolving much faster than expensive GPS chartplotters, and can now provide a quick and easy solution for this problem. Sailboats tack to their destination, which affects the distance and travel time. But when a GPS chartplotter displays your "ETA" (Estimated Time of Arrival), it assumes that you are traveling in a straight line to the destination like a vehicle, aircraft or powerboat. The

free *SailTimer Charts Edition* app on iOS does calculate tacking distances to determine your optimal tacks and Tacking Time to Destination (TTD). (Android version also now in the works.) The *SailTimer* app can also learn your boat's unique polar plots; boat speed on all different wind angles and wind speeds. No GPS chartplotters do that. This allows the patented *SailTimer* app to rapidly calculate solutions to the "Helmsman's Dilemma". In the past, only sponsored race boats could afford to have a professional tactician on board. However, now the *SailTimer* app can run on the phone in your pocket, re-doing trigonometry calculations every second to determine your optimal tacks to get to the next waypoint soonest.

On boats old and new, from keelboats to racing dinghies and multihulls, it is now easy and low-cost to get a display of your optimal tacks and your Tacking Time to Destination in the *SailTimer* app. The only thing you need to enter is your waypoint, and presto: your optimal tacks are shown as a green line on a chart overlay. If you are sending data from the wireless Wind Instrument to your smartphone or tablet, any time the wind changes, your tacking results update automatically.

The *SailTimer* app on iOS is also one of the first apps to use Navionics' new mobile SDK. That means that high-quality vector charts can now be displayed in the SailTimer app, allowing you to zoom far in with no pixellation. These excellent charts have fast download, small file sizes, and

fast display. As we enter the age of crowdsourced wind maps, a further possibility emerges for solving The Helmsman's Dilemma. It is already pretty amazing that an ordinary sailor on a modest sailboat that may have been built decades ago can now use a free app on their phone to get their boat's polar plots and see their optimal tacks overlaid on Navionics vector charts. We are now also on the cusp of knowing the wind zones up ahead. For the first time, you will be able to plan your tacking route using data from your masthead Wind Instrument, and also from crowdsourced wind zones in front of you.

The Post-Screen World

   Unfortunately, mobile apps are difficult to navigate with if you can't see the screen out on the water, where the sun is bright and reflecting. Wearing sunglasses makes it worse. And if you turn up the screen brightness, your tablet/phone runs out of battery power and overheats. But there are hints at home and in the car that we are entering the post-screen world. You can connect your phone to the sound system in your car with Bluetooth to take calls and play music and podcasts. At home, Siri, Alexa and OK Google are all competing to connect us to intelligent systems without a keyboard. Sailing is also a good fit for a voice interface, for a number of reasons. You want to keep your phone/tablet safe and dry out on the water. You need your hands free for handling lines, and your eyes on the water and sails. Plus, no company makes a smartphone or tablet with a transflective screen like a calculator or e-reader that is just as easy to see in direct sunlight.

   As app technology continues to evolve, it could be very useful for sailors to use an audio interface. No expensive screens to buy, since it uses your existing smartphone or tablet. No more screen at all; the app just tells you the boat speed, tacking results and wind conditions in pre-set intervals. Amazingly simple.

   You can put your screen to sleep to save power and reduce heat, and put it someplace safe. Keep your hands free for sailing. There is already an audio interface in the *SailTimer Wind Gauge* on Android, and we are adding this option to the *SailTimer* tacking results in other apps. If you want to hear Audio Tacking at any time, just tap on the screen (even if it is off).   You can also ask for updates if wind and GPS conditions change a certain amount. What you hear: "Wind speed 7.8 knots. Boat speed 4.2 knots. Heading 192 degrees. Bearing starboard 17 degrees would save 1 hour 12 minutes." This is a simple message. But it is actually very sophisticated data. What other product can tell you your optimal tack, and how much time you can save by adjusting your heading?

This is a totally different approach. GPS chartplotters are waterproof and can be seen out on the water, but they are expensive and don't provide your optimal tacks and Tacking Time to Destination (TTD). A lot more people have marine navigation apps than GPS chartplotters, but apps are hard to see. An audio interface solves that. Whether with audio or visual interfaces, soon we may also be able to get optimal tacks through crowdsourced wind zones up ahead.
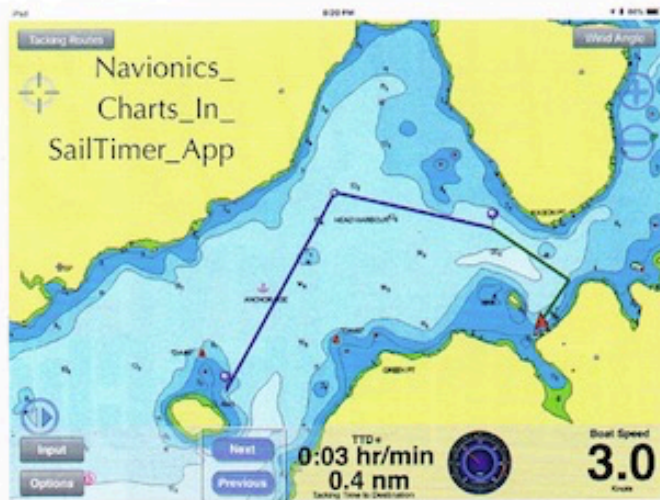
Craig Summers, Ph.D. is President of SailTimer Inc. out of Halifax, Nova Scotia. For more information on the various technology available visit www.SailTimerWind.com