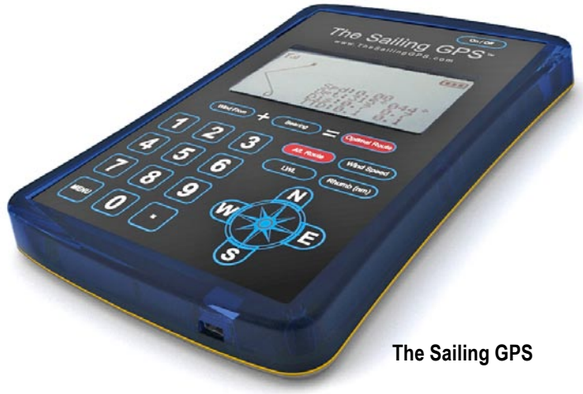
The Launch of a New Navigation Era for Sailors

Comparing a $14 smartphone app to an $800 GPS chartplotter...



The Sailing GPS

by Craig Summers, Ph.D.

It was only a decade ago that having GPS and perhaps a satellite phone on board was a revolutionary improvement over celestial navigation, sextants, and dead reckoning. But now the era of smartphone "apps" (applications) is causing a new paradigm shift. There are app stores for Blackberry, Android and iPhone smartphones.

In this article, we start from the bizarre position that a $14 smartphone app can have sailboat navigation functions that are not available in any of the expensive $800+ GPS chartplotters.

For example, whether racers or cruisers, all sailors want to know their ETA. Also the boat speed, and the distance to the waypoint. Unfortunately, ETA on standard GPS units was designed for powerboats, and does not account for sailboat tacking. That is why it may go blank when you stay on a tack too long. It views that as cross-track "error".

Using Velocity Made Good (VMG) to gauge your progress towards your waypoint while tacking upwind is also problematic. VMG decreases all by itself the longer you stay on a tack. It is like driving down the highway in a car at a constant speed, while the speedometer deflates all the way down to 0, even though your speed hasn't changed. Not very useful. Probably even a safety hazard.

This was detailed in a previous article (GAM, May-June 2009 issue). In this follow-up, as the developer of the SailTimer software, we outline two innovative new products. There is a new SailTimer app available now for the iPhone (which has a GPS) and iPod Touch (no GPS). The SailTimer software is also at the heart of a forthcoming dedicated handheld called The Sailing GPS.

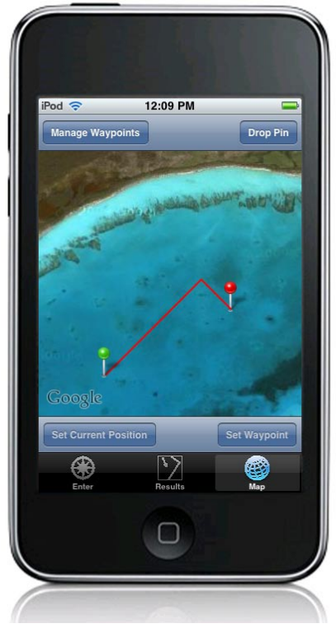
Whether for long passages, short day-sails or for racing, it is important to be able to determine the best heading upwind. Sailing off the wind increases boat speed but lengthens the distance to the destination. Heading too far upwind shortens the route but slows down the boat. So how are you supposed to know the best tacking routes to get there fastest? SailTimer software shows the best tacking angles, along with the tacking distances and arrival times.

Unlike all of the current brands of GPS chartplotters, SailTimer is unique in recognizing that sailboats often zig-zag to their destination, which affects the distance and travel time. Sailors of boats large and small can now have a correct method to know when they will make landfall or be home for lunch.

SailTimer iPhone App

It is still hard to believe that a little device in your pocket about the size of a deck of cards could run low-cost programs for sailboat navigation, tides and even hydrographic charts. For sailors using iPhone and iPod Touch, the SailTimer app displays optimal tacking angles, and accurate tacking time to your destination. No complicated marine electronics to learn or install. Just go to IndepthNavigation.com with either a Windows or Macintosh computer, and click to download the app from iTunes. Done.

Enter the angles of the wind and your destination, and presto: you get the optimal tacking angles. Add the distance to the destination and you can tell your overall tacking distance. And if you add your boat length, you can even tell how long it is going to take to get there. Even on an iPod, with no GPS.



You can also Go To waypoints on Google Maps with the SailTimer app. That is a handy way to determine your tacking distances and times. When you have internet, can see your tacking route in an aerial photo from Google Maps. The SailTimer app also includes a large speed display in knots.

Birth of The Sailing GPS

Having the SailTimer app on a smartphone is a handy low-cost backup that you always have with you, although it is hard to view in direct sunlight, is not waterproof, is awkward to mount near the helm, and does not support all SailTimer functions. What about making a dedicated GPS for the SailTimer functions, that is designed for use in a marine environment?

You cannot talk about manufacturing marine electronics, without reference to China. Sailing has only started to catch on in Asia, as a result of the 2008 Beijing summer Olympics. There has been no history of recreational small boat sailing in China. There, yachting has been only a pastime of the wealthy. But the cultural, economic and recreational changes in China are another sign of the times.

The plastic and electronics manufacturing for The Sailing GPS has been a major effort, involving software developers in North America, and an electronics design team in China. Plastic injection molding is all but gone from North America. Developing The Sailing GPS from scratch around the SailTimer software has been an ambitious project that has been headquartered in Canada, and therefore it is fitting to have the story first published in GAM.

Since cruising sailors can now take a laptop on board for email, marine weather reports or watching movies, it may be harder to justify investing in a big-screen GPS chartplotter to be mounted out in the cockpit at the helm. We can make the same argument about netbooks displacing laptops, and smartphones displacing netbooks. Other than having a full-sized keyboard and screen, a smartphone is easier to bring and store safely on board. Plus smartphones can do nearly all of the standard computing functions of your computer, including email, web browsing, and social networking.

That evolution in hardware has been part of the logic behind the development of The Sailing GPS. This is a waterproof handheld device that can be easily mounted in the cockpit with velcro. (No wiring

required, since it runs on rechargeable batteries.) You can take it forward to the bow, or take it in the dinghy. It is back-lit for night viewing, and readable in direct sunlight. It can be used as a wireless GPS antenna with a laptop running chartplotter software safe and dry down at the nav station in the cabin.

To operate The Sailing GPS, enter the directions of the wind and your destination, and the optimal sailing angles will be displayed. To get additional information on times and distances to arrival, you can add information such as the linear distance (the "rhumb line") to the waypoint, your boat length, and the wind speed. Currently you need to manually enter the wind speed, but for those lucky enough to have an anemometer on board, we are working on a future version that automatically receives data such as wind speed via on-board NMEA data exchanges between marine electronics.

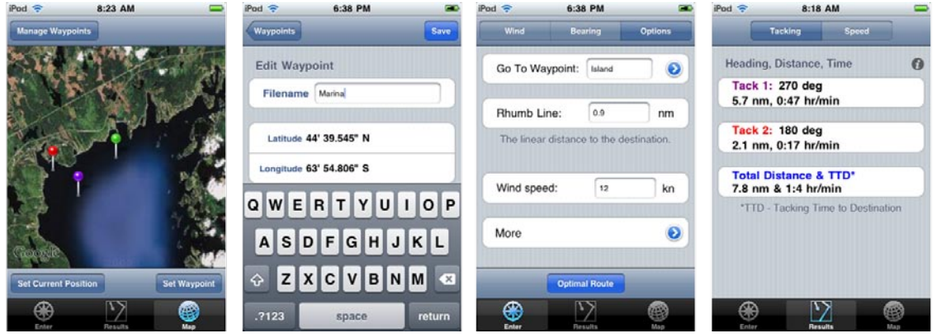
The Sailing GPS has two basic display modes. In the Standard View, the tacking angles are displayed along with the speed, distance and arrival time. In the Compass Display mode, the heading is always up, and the N for North goes around the circle depending on the direction the boat is heading, just like a compass. You can also see the boat speed in both displays, or can display the speed in knots full-screen for viewing from a distance -- if mounting on the mast and viewing from the wheel, for example.

Your Boat is Unique

Unlike Velocity Made Good, SailTimer operates whether the boat is moving or not. Before you leave the dock, you can project how long it will take to tack to a waypoint, based on the tacking distances and projected boat speed on each tack.

Of course, the better the speed estimates are, the more accurate the estimated arrival times will be. Polar plots are a kind of circular graph that are the standard way to show boat speed on all points of sail. Until now, there have been two basic sources for this information for specific boats. Boat manufacturers may publish polar plots for specific models (as long as it doesn't show faults in the boat's performance). Alternatively, velocity prediction programs allow you to put boat characteristics into a simulation, to project the boat speed in different wind conditions. For a fee of $325 each, US Sailing can simulate speeds this way for different models of boat.

In both the SailTimer app and The Sailing GPS dedicated handheld, there are default polar plots for a range of wind speeds and directions. To project your travel time, you can then enter the current wind direction and wind speed. Further capabilities such as entering custom polar plot values at different wind speeds for your boat, or using real-time anemometer data, are available in laptop chartplotter software running SailTimer such as those from MacENC.



Waypoints and optimal tacking routes from the SailTimer app for iPhone and iPod.

com and NavSim. com. However, even two of the exact same model of boat may have very different speed profiles. Perhaps one vessel has new sails and a slippery hull, but the other is weighed down with cruising supplies and anchors. For the ultimate way to get the most precise projections for speeds and arrival times, The Sailing GPS therefore has an ability like artificial intelligence, to learn your individual boat's performance on different points of sail. It saves a running average of many values when you are on the same heading and speed for a certain amount of time, to ensure that the data is as accurate as possible for each wind speed and wind angle. It can then use the unique performance profile for your individual boat for more accurate projections of your arrival time.

In retrospect, we have seen an evolution in boat building over the past century, from the Sparkman & Stephens and Herreshoff yacht designs of the 1930s, to plywood runabouts in the 1950s, to a diverse assortment of fiberglass boat manufacturers in the 1960s and 1970s that have now been consolidated into a handful of major manufacturers like Beneteau in France.

The network of GPS satellites were launched between 1989 and 1994. Not much has changed with GPS functions from any manufacturer since then. But now we have the first GPS that knows that sailboats tack back and forth when heading upwind. It can actually learn your boat's unique performance profile. And if you want a low-cost version that you can carry around in your pocket -- there's an app for that. GAM

For more information and a YouTube clip showing how easy it is to get the optimal tacking angles, visit IndepthNavigation.com

and the gales of November come early...

Gordon Lightfoot from "The Wreck of the Edmund Fitzgerald".

The Fitzgerald went down on Lake Superior, a few miles northwest of Whitefish, in November of 1975. All hands were lost.

I remember it well because I was on a Canadian freighter, a few miles southeast of Whitefish, at the time. I was a young man, near the beginning of my sailing career, and as most youth ... I was fearless.

As we stood by the lifeboats that black night, and the winds howled, and the seas crashed our port beam.... I remember being in total awe of this force of nature. Though knowing that I was totally powerless, and in the hands of a greater force, I never became blind to the experience. It was an adrenalin rush that no amount of narcotics could enhance ... or diminish. God ... I was fearless.

Nearly 35 years have passed, many seas crossed, and many a storm encountered. My youth has passed ... and my lack of fear has been replaced by a deep respect of this force. This being said, the rush, and awe, has never waned, or become less addictive.

I'm sure there's a story in there somewhere ... a tale of youth, the sea, and possibly, refusing to grow up. Then again, the knowledge, and joy, that I will be around to welcome my great granddaughter, Lili Labelle, to this world in January, may have a hand in these reflections.

Come sit on my knee and I'll tell you a tale of the sea.....

MK, Nov.09