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ShipTrax

An in-depth look at the top of
the range ShipTrax 3D

AirNav Systems
Innovation in Ship Tracking Solutions **3D**

Dual-Channel AIS Receiver with Tracking Software
High performance Ethernet, USB and Serial AIS Decoder

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AirNav ShipTrax has been a long time coming but this month Mike Richards takes an in-depth look at the top of the range ShipTrax 3D maritime universal automatic identification system receiver and decoder system.

ShipTrax comes from AirNav Systems, an American company that has been involved in aircraft tracking systems for many years. In addition to use by enthusiasts, you will often find AirNav displays at passenger terminals and other public places. The introduction of ShipTrax sees the company move into the world of maritime vessel tracking and those familiar with AirNav products will see a very similar style employed for the interfaces and presentation. The ShipTrax package provides everything you need to start monitoring the marine universal automatic identification system (AIS) including a year's subscription to the ShipTrax network, so you have access to data from ShipTrax users all over the World.

In the Box

ShipTrax is a complete universal automatic identification system (AIS) package and all you need to add is a PC! At the heart of the system is the dedicated dual-channel receiver that is housed in a smart extruded aluminium case. The supplied USB cable provides the power and data connection to the PC, so it must be connected to a powered port.

Because AIS is a VHF based service, antennas are critically important and a small mag-mount whip antenna is supplied. This antenna is fine for getting started and excellent for mobile use if you drive out to a local port or vantage point. However, for serious base station operation you will need either a dedicated marine band whip antenna or a general-purpose discone located as high and clear as you can manage.

ShipTrax



In addition to the hardware, there was a CD-ROM with the ShipTrax software, receiver drivers and a 71-page manual in portable document format (PDF).

Getting Started

Installation and setting up was well covered in the Tutorial section of the PDF manual and the first step was to install the ShipTrax software from the CD-ROM, which was a straightforward menu driven process. Once complete, I plugged in the ShipTrax receiver and followed the prompts to install the essential drivers. With the basics complete, it was time to run the ShipTrax software. Before the software would run, I had to enter the username and password using the activation code that's printed on the CD-ROM sleeve. This provides access to the software and the ShipTrax network. It's important to note that you can only install ShipTrax on a single PC. If you need to move ShipTrax to another PC you will have to contact the AirNav support team to reset your activation code.

The next step was to enter my home station details. This is important because ShipTrax uses this location setting to support a number of features. There

were several ways to input your location but the most accurate is to enter your latitude and longitude because this is so easy to get from a variety of internet sources.

Next, I had to configure the ShipTrax software to communicate with the ShipTrax receiver. This was simply a case of entering the number of the virtual Com Port that was created when the drivers were installed. I made a note of the Com Port during the installation process but you can easily find this using Windows Device Manager. Ticking the box marked Receive Serial Port Data on the main screen completed the software setup.

As I mentioned earlier, antennas are critical for AIS reception and so for this review, I used my discone antenna at home and the ShipTrax supplied antenna when out in remote locations (parked of course!).

Although there is a complete absence of controls on the receiver box, there is a set of three light emitting diodes (LED) to provide assurance that all is well. The green LED indicated power while the blue and white LEDs flickered whenever an AIS signal was received. The blue LED was primarily to show USB activity

while the white LED indicated that an AIS signal had been received – in normal operation they both flash together.

Viewing Ships

With the configuration complete, it was time to start looking at local ship movements. ShipTrax 3D provides a number of mapping options including coastal outlines, OpenStreetMaps, satellite images and Google Earth 3D plotting. You can also create your own outlines to overlay on top of the maps, so there are plenty of options available.

In its default state, ShipTrax displays all plots on a simple coastal outline map as shown in Fig. 1. The map can be easily repositioned by dragging with the mouse; zooming was best done using the mouse wheel. The toolbar includes icons that activate overlays to the basic map to add roads, cities, rail routes and so on but there was very little content available for anywhere outside America. A better option was to use the OpenStreetMap or Satellite display. These two options download map images on demand and provide a very detailed view of the local area. Both of these options rely on the availability of open source mapping services and there have been some recent problems with availability, resulting in loss of service or slow response times. Although the problems are inconvenient, you can circumvent them by downloading images of all your local ports at a range of zoom levels and saving these to your hard drive. The maps are then available for use whenever you need them, thus avoiding any download delays. I've shown a typical OpenStreetMap view in Fig. 2. The 3D version reviewed here also includes a Google Earth plug-in that plots all the received ships on a Google Earth 3D map. This option worked extremely well and zooming and scrolling were particularly impressive. The Google Earth plug-in also included a comprehensive range of user adjustable options so it was easy to configure the display to my preferences. I've shown a view of tankers moored at the local oil refinery in Fig. 3 plus a shot of the busy Eastern Channel in Fig. 4.

ShipTrax Network

As part of the ShipTrax package, you get a one year subscription to the ShipTrax network. This provides access to ship reports from users connected to the network and is a valuable source of

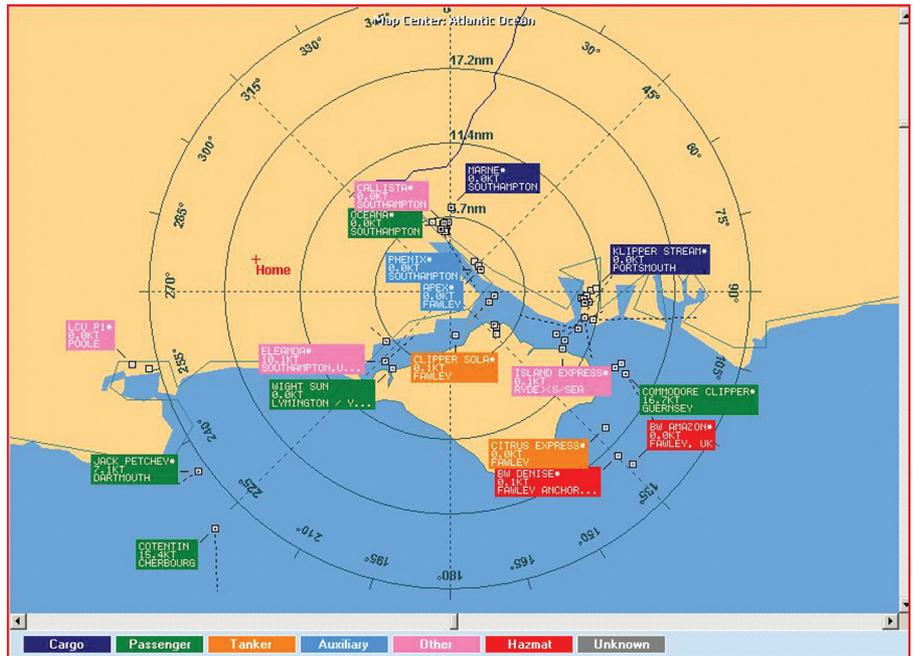


Fig. 1: ShipTrax using the default mapping system.

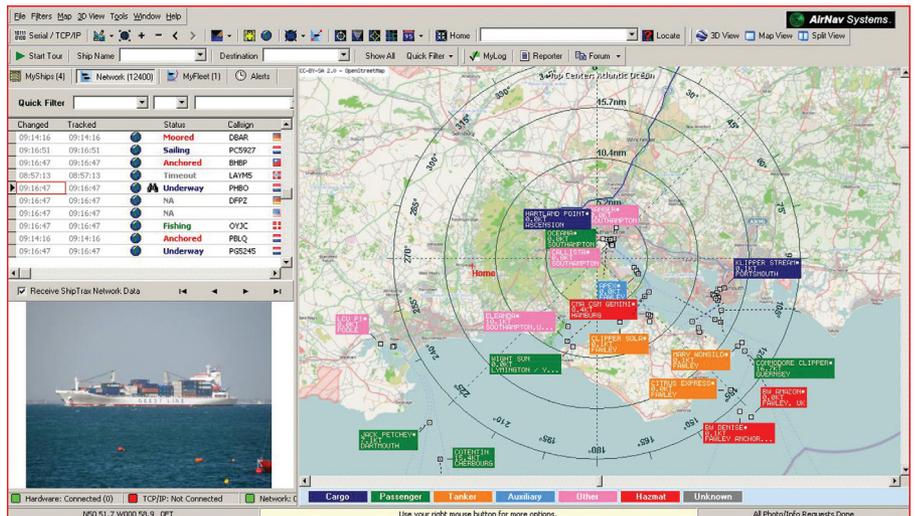


Fig. 2: ShipTrax with OpenStreetMaps loaded.

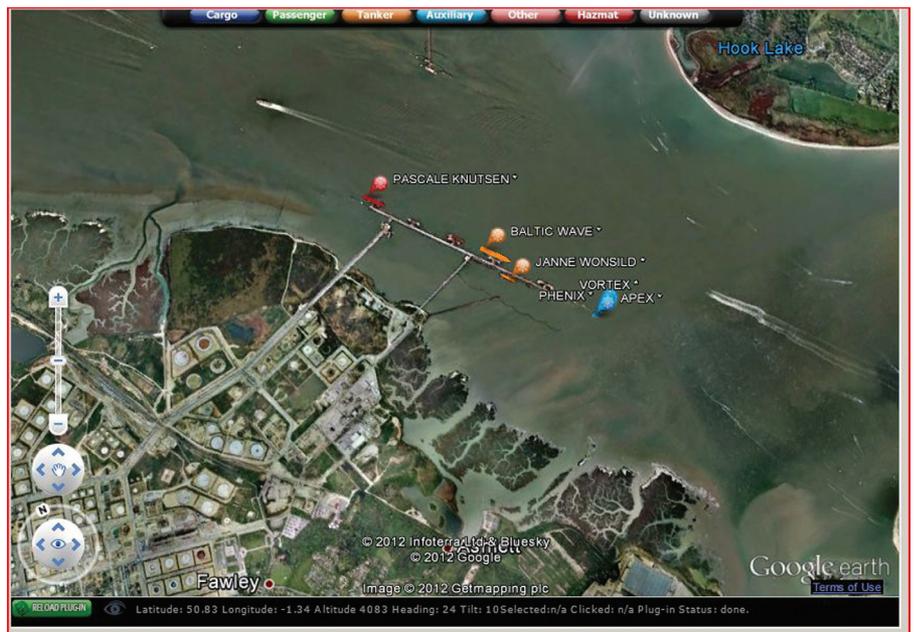


Fig. 3: 3D view of the oil terminal at Fawley.



Fig. 4: A 3D view of the busy Straights of Dover.

information if you want to track ships beyond the range of your local receiver. At the time of writing, the network included comprehensive coverage of the North American coast, Europe, Mediterranean, Far East and patchy coverage of the rest of the globe. There was certainly very good coverage of all the busiest waterways. AirNav has worked hard to achieve this level of coverage in such a short time and still offer free ShipTrax systems to listeners in remote areas as part of their strategy to extend the network.

During most of the review period there were more than 12,000 vessels visible via the ShipTrax network. All reports received via the network are subject to a five-minute delay, so that the servers can

process the inevitable duplicate reports and deliver a tidied-up report back to the network.

To one side of the main mapping screen are a set of tabs where you can view and select the ships that you want to monitor. The two main choices are MyShips for ships received via the local receiver and Network for those received via the ShipTrax network. If you don't want to see network information you can turn it off by un-checking a tick-box on the Network panel. In each of the ship tabs, you can see details of the latest AIS message from each ship and these contain a host of useful information about the vessel and its speed, course, destination and so on.

To view a particular ship on the map

you double click on the listing and the map automatically repositions to show the ship's location. The ability to view such a large range of vessels over most of the world makes tracking vessels a delight.

In addition to showing all the essential details of the ship, the lower panel provides a photograph of the ship. Although photos are not available for every ship, I found that the majority of ships around the UK coast had photographs available.

Vessel Tracking

If you have an interest in a particular ship or group of ships, you can use ShipTrax to monitor those ships and alert you when the ship meets specific criteria. The ships can be specified by name or by their International Maritime Organisation (IMO) number and you can set the alert to trigger when the ship is within a pre-settable range of any location you care to name in latitude and longitude or your home location. In response to an alert, ShipTrax can be set to do one or all of the following: play a sound, display a popup message, send an e-mail or run an executable file!

Should you have a particular interest in a group of vessels you can bring these all together under the My Fleet tab, which makes them far easier to monitor. I found this useful when watching particularly busy locations like Southampton docks. When building up your fleet list you don't have to remember the callsign and so on. This is because you can right click on the ship's name, IMO and so on and copy/paste

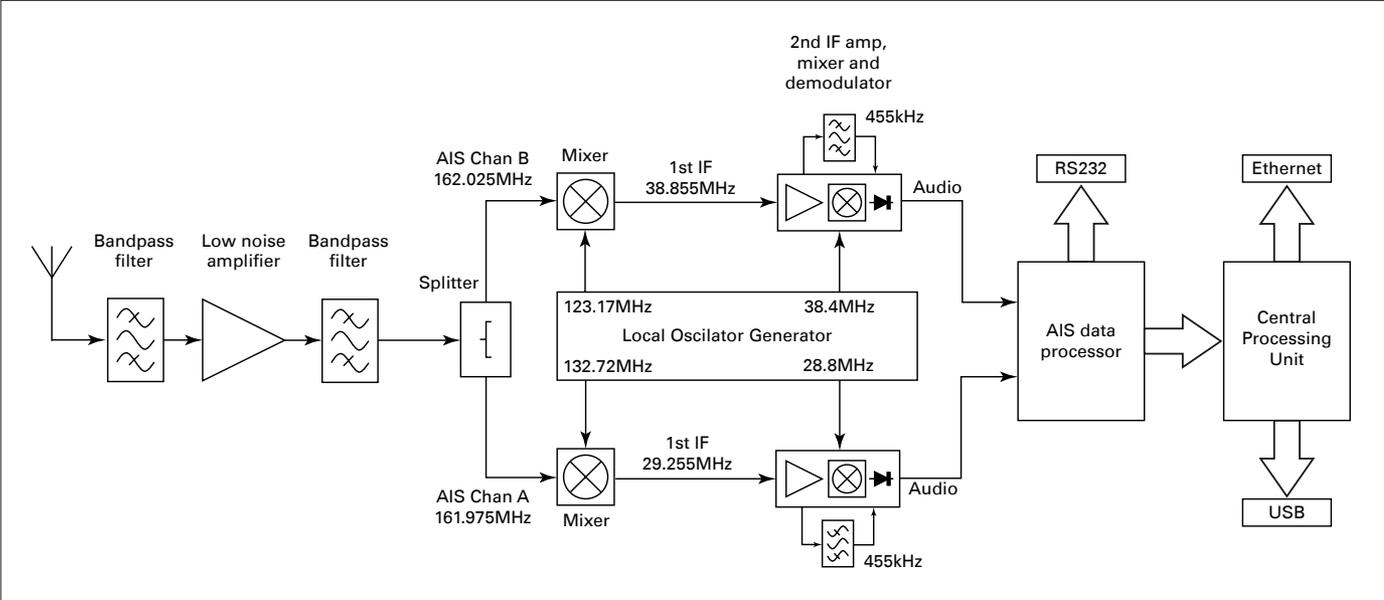


Fig. 5: A simplified block diagram of the ShipTrax dual-channel receiver.

the details into the MyFleet configuration screen.

There was also a filtering system that could be used to filter the display to show a particular ship or all ships bound for a specified location.

Receiver in Detail

The ShipTrax receiver is a sophisticated design that features full dual-channel reception, so it can handle the simultaneous reception of both AIS channels. I've shown a simplified block diagram of the receiver in **Fig. 5**.

The signal from the antenna is initially passed through a low noise RF amplifier with band pass filters at its input and output. The filters provide protection from strong out-of-band signals.

Immediately following the RF amplifier, the signal is split and fed to two identical mixers. However, these mixers employ different local oscillator frequencies giving first intermediate frequencies (IF) of 29.255 and 38.855MHz respectively. The use of different IF frequencies for each AIS channel helps reduce the risk of interference between channels.

After further filtering, the first IF signals are passed to separate FM IF amplifier/mixer/demodulator integrated circuits to produce independent demodulated audio signals. The main IF selectivity is provided by 455kHz ceramic resonators in the second IF chain.

The demodulated audio is then passed to a dedicated commercial AIS decoder produced by CML Microcircuits. This chip decodes the audio AIS signals and provides a National Marine Electronics Association (NMEA) formatted data feed to the RS-232 socket and the PIC central processing unit that manages the USB port, Ethernet port and other parameters of the ShipTrax receiver.

As you can see, the ShipTrax receiver is a true dual conversion, dual-channel receiver that promises great performance and should ensure that no AIS transmissions are missed. Dual-channel reception is particularly important with AIS because ships alternate their transmissions between the two AIS channels, so a single channel receiver will only receive half the number of messages as a dual-channel system.

The use of dual-channels is particularly useful in busy waterways because you stand a much better chance of avoiding interference and radio collisions if you utilise the signals from both channels. Dual-channel also gives a much better

NAM	IMO	USI	LEN	BEA	DRA	CGT	GSA
LIBERTAS SUR...	7	235060403	013	004	1.5	50	1
MAAS VIKING	9457165	235069074	193	028	6.1	79	14
MANFRED	9433444	305259000	130	021	6	71	5
JD EIK	9125138	259940000	148	023	7.7	82	10
MATADOR 3	9272137	246300000	072	032	2.9	0	16
MERLE	8918306	236298000	080	011	4.2	70	4
MERWEDIJK	9242986	245448000	132	020	6.3	70	10
MILADY	9319430	236307000	085	012	5.5	70	6
OLMA	8004806	312012000	080	016	8.5	70	5
ODSTERSCHE...	5347221	246011000	049	007	3	36	3
MSC MYKONDS	8613308	240266000	000	000		70	0
PRIDE OF ROT...	9208617	244980000	214	032	5.6	61	16
RT MAGIC	9190066	245464000	030	012	6.5	52	3
RUYTER	9085467	245231000	082	012	5.1	33	10
SAMSKIP PION...	9322566	304922000	141	022	7.1	70	18
SMIT JAPAN	8521464	245082000	029	009	3.6	52	3
SMIT RUSLAND	7800497	245087000	029	009	3.7	52	7
URALS STAR	9309435	636091119	254	044	11.7	80	30
VIGOROSO	9191943	236451000	100	017	6.4	70	9

Fig. 6: ShipTrax database explorer.

Report generated by AirNav ShipTrax 1.28
Advanced Ship Tracking Software
<http://www.airnavsystems.com>

Log Author: Mike Richards
Location: Ringwood
Country: UK

Generated at 2012/04/24 09:24:37 UTC
Valid for 2012/04/24
8 Ships Logged

Name	HMSI	IMO	Type	Country	Destin
WIGHT LIGHT	235064784	9446972	Passenger	United Kingdom	LYMING
GROUND STATION	2320722				
SWITZER BRISTOL	235011376		Tug	United Kingdom	SOUTH LYMING
* WIGHT SUN	235064777	9490416	Passenger	United Kingdom	POOLE
COTENTIN	228263800	9364978	Passenger	France	CHERBO
COTENTIN	228263800	9364978	Passenger	France	CHERBO
COTENTIN	228263800	9364978	Passenger	France	CHERBO
* JACK PETCHEY	235075328		Passenger	United Kingdom	DARTMO

Fig. 7: ShipTrax reception report generator.

chance of capturing a weak signal, so extending the range of the receiver.

For more information on the workings of AIS see my Decode column in this issue of *RadioUser*.

Advanced Features

In addition to the main plotting and tracking feature, ShipTrax has some more advanced options available. When setting up a new antenna system or when verifying the performance of your existing system the propagation rings are extremely useful. The rings are activated via the Maps menu and provide a plot of the range from the home location. It does this by checking all the messages received directly by the

ShipTrax receiver and plotting the most distant in each direction on the map. This can be very revealing and can quickly show up any antenna blind spots so you can experiment with different antenna locations. The data used to create the rings can be reset in between antenna changes via the Preferences menu.

For monitoring ship movements at unsociable times, ShipTrax includes a data recorder that can save time-stamped AIS messages to disk for replay later. Because the recorder only stores the message data, the disk files are small, so overnight recording uses a relatively small amount of disk space. The only downside of this feature is that you have to play back the recording in

real time – it would have been so much more useful to be able to adjust the playback speed.

To help check local activity, ShipTrax keeps a record of all the ships received by the local receiver in a local database (see Fig. 6) and this can be searched, viewed and edited via the File menu. Closely linked to the database is the Reporter tool (Fig. 7) that can be used to compile reports for submission to internet user groups and the like. The reporter makes this task very easy as you can set report dates and automatically e-mail the results to a list of recipients.

Network Connectivity

ShipTrax is supplied Ethernet ready which gives it great flexibility. Those seeking the best possible RF performance could locate the receiver in the loft very close to the antenna, thus keeping lossy RF cable lengths to a minimum. The receiver can then be accessed via your home Ethernet connection. Alternatively, you could connect the receiver to a Wi-Fi bridge

and connect it to your home Wi-Fi network.

The ShipTrax software includes the option to take data from your local network so the setup is relatively straightforward. It is also possible to remotely locate the ShipTrax receiver to a completely different location – perhaps your aunt lives in a high rise flat on

the sea front! Setting this up requires a bit more network knowledge but the ShipTrax receiver is fully configurable, so you can set IP parameters directly via a conventional serial port link and a terminal program.

Full details of the configuration process are included in the PDF manual.

summary

ShipTrax is a very capable AIS receiver/plotter combination which, when combined with the ShipTrax network, provides access to extensive monitoring. The supplied receiver is particularly good, offering true dual-channel reception of AIS signals with excellent sensitivity. One of the attractions of the ShipTrax offering is that the unit works pretty much straight from the box with minimal configuration.

ShipTrax is available from Waters and Stanton priced £489.95 for the 3D version and £399.95 for ShipTrax Pro (without 3D). Network subscription rates after the first year of free use are €59.95 per six months but there are other pricing options available.

Waters and Stanton also have a new 1.5 metre long base station antenna available at £79.95. The antenna comes complete with a mounting tube, mast clamps and has an SO-239 socket for connecting your own coaxial cable.

My thanks to Waters and Stanton for the loan of the review equipment and to AirNav Systems for their technical assistance.

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On our new website you will find:

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