Satellite navigation

NAVIGATION PART THREE

Okay! Let's first of all clear up what we call it, and why. Hoover is the name of a company, yet it has become synonymous with the vacuum cleaner. Similarly, GPS is the name of the American Government's satellite system used for navigation, yet it has incorrectly become synonymous with similar systems developed by other countries. The European Union has a system called Galileo; this will be fully operational in 2014 and all hand-held satnavs are already using data from this system. China has Compass. Russia has GLONASS. The correct term given to all of these systems, including the American GPS, is Global Navigation Satellite Systems (GNSS), and the devices we use to receive the signals from GNSS to navigate with are called satnavs. Therefore, for full clarity we shall call them mountain satnavs, as that's what they are.

YOUR NAVIGATION MASTER

Lyle Brotherton (left) is one of the world's leading navigation experts. The author of *The Ultimate Navigation Manual*, pb Collins, he trains Search & Rescue teams plus Special Forces across the world. He is also a member of a Scottish Mountain Rescue Team. Read more about Lyle at www.micronavigation.org

MYTH BUSTING

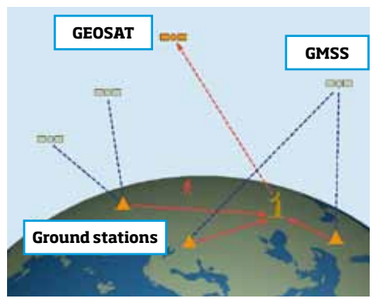
They're too complicated *NO!*
All hand-held satnavs receive signals, just like a radio, from satellites that orbit the earth. The satellites transmit low-powered microwave signals, which travel by line of sight and will pass through all weather systems and materials such as glass or plastic but will not transmit through most solid objects like buildings, mountains or water... or indeed you!

From these signals your satnav can calculate where each satellite is, and then it simply triangulates your location from the known positions of these satellites (in much the same way you do when using a compass to triangulate) and displays this as a grid reference, a mark on its electronic map, or both.

It's expensive to get started *NO!*
We are going to show you how for about £50 you can access this multi-billion-dollar system and use all of the essential navigational features to find your way.

It's difficult to use properly *NO!*
Whether you have spent £600 on a high-end satnav with full Ordnance Survey mapping or £30 on a second-hand basic unit they all provide the same level of accuracy and the necessary directional data.

It replaces a map and compass *NO!*
That is like saying the Kindle has replaced books; it hasn't, it's simply another way of performing the same task in a more convenient way. But because batteries can fail and software crashes, we must *always* carry a map and compass as backup.



WHY A MOUNTAIN SATNAV BELONGS IN YOUR SACK

The most basic hand-held satnav will work:

- anywhere in the world (there are some limitations at the Earth's poles)
- on any terrain – from magnetised rock, to on the water and in the air
- in any weather, with no loss of accuracy

And they provide you with:

- a very accurate position, displayed as a grid reference, of your exact location
- your height above sea-level (elevation)
- the direction you are heading (your bearing)
- time and date
- a record of how long and how far you have been travelling (trip time and distance) and even your walking speed

With EVERY unit you can:

- mark and store a current location (called a waypoint or a point of interest) and navigate directly back to it from anywhere in the world
- project a waypoint of your choosing and then navigate directly to it from anywhere in the world
- plot a route (a series of waypoints) and then follow it

GET STARTED IN STYLE... FOR £50!

The Garmin eTrex H was introduced in 2007. It was an instant success and as a consequence there are lots of them about. You can buy a good second-hand one on eBay for around £35-40. It is incredibly powerful and is as accurate as brand new handheld satnavs, and of course it provides you with all of the navigational information listed previously. The way to tell the eTrex H apart from the basic models is that on the top of its screen it has HIGH SENSITIVITY written in red.

▲
- use to scroll up menu
- on map page used to zoom out

▼
- use to scroll down menu
- on map page used to zoom in

ENTER
- pressed once brings up menu screen for page displayed
- used to choose menu items
- pressed and held for 2 seconds creates a waypoint

PWR
- power on/off
- if momentarily pressed backlight comes on

PAGE
scrolls through the five screens

This banner designates this unit is an eTrex H model.

GLOSSARY OF TERMS

You only need to understand four terms to use one of these devices effectively:
Waypoint – a location that you record and store on your satnav. You can navigate to a waypoint from anywhere in the world.
Route – a series of waypoints joined together for you to follow. These can be marked in transit or by plotting and entering them using free mapping software and downloading them to your satnav before departure.
Track – a record of exactly where you have walked. A track log contains hundreds of track points, which at any time you can simply follow back (it's called Trackback) or display on your computer at home.
Location – your current position, which can either be displayed on electronic mapping and/or described as a grid reference.

ONCE YOU HAVE YOUR SATNAV...

1 When you have your satnav you will also need to buy the leads to connect to your computer, so you can update it to the current firmware, then download and share your waypoints, tracks and routes on Google Earth or one of the free Ordnance Survey-based web mapping programs.
These cables (£8.99 on eBay) require a serial port on your computer. If you don't have one you will also need to buy a USB to RS232 adapter cable (£2.28 on eBay). A serial port has nine pins sticking out and is not to be confused with the external monitor connector, which has holes for 15 pins.

2 When you first receive your satnav, attach a lanyard so you don't lose it; and make it long enough so that when it is secured to your rucksack you can hold it out at arm's length. See a video of how to do this at www.lfto.com/navigation

3 Insert fully charged batteries (use pre-charged rechargeable batteries to save money) and go to Garmin's website and install its free application WebUpdater. This lets you update your unit without using your Internet web browser and check every couple of months for new updates.

CONFIGURING YOUR eTREX

The eTrex H has five screens that are displayed in this order:

1 Satellite screen

From this screen, press the **ENTER** button then select the following from the menu: **ADVANCED SKYVIEW,** and hit enter. The hit enter again, and select **ORIENT SKY NORTHWARD.** Then select **SETUP DISPLAY**. Set the light timeout to 15 seconds and the contract slider bar to midway. The satellite screen will now show you how accurately it is reporting your location and where all of the satellites it is tracking are in the sky.

2 Map screen

This does not have Ordnance Survey mapping like expensive models, so when using an eTrex H you must always have a printed map of the area you are in (even using mapping models you must always carry one as backup anyway). This screen is where your waypoints, tracks and routes are displayed in relation to where you are. Select **ORIENT MAP AHEAD** on this page's menu screen – again, accessed by hitting **ENTER**.

3 Compass screen

This device has a digital compass

Reset **MAX SPEED** and **RESET TRIP,** plus **STOP NAVIGATING** if the unit was left in this mode.

4 Data screen

You can customise the five boxes on this screen from a choice of 32 headings, from sunrise time to your current bearing. Select **CHANGE FIELDS** and from top to bottom pick the following, so it looks like the screen at the bottom of p44:

1 TIME–TOTAL How long you have been on your walk
2 TRIP ODOM How far you have walked
3 TIME OF DAY
4 SUNSET
5 LOCATION Your grid reference

5 Main menu screen

Here you manage your waypoints, tracks and routes and you set the satnav to display either imperial or metric numbers. Most importantly you set it to your local map grid, in this case Ordnance Survey British Grid.

In **SETUP** under the following headings change them to these settings:

TIME TIME FORMAT = 24 HOUR
TIME ZONE = London
UNITS POSITION FRMT = British Grid
MAP DATUM = Ord Srvy GB
UNITS = METRIC
NORTH REF = MAG
ANGLE = DEGREES
INTERFACE I/O FORMAT = ?????????
SYSTEM WAAS (This stands for Wide Area Augmentation System and is part of the American GPS. It will improve your unit's accuracy. If your unit offers you EGNOS, part of the European Galileo system, select this as well/instead.

<< missing detail?

NAVIGATING USING YOUR SATNAV

If this is the first time you 've tried satellite navigation outdoors, choose an area that is safe and where you won't get lost. A park is ideal.

TECHNIQUE 1 Creating a waypoint

This is the single most important satnav technique. Satnavs can only receive the signals from the satellites if they have an unobstructed view of the sky, and we ourselves are a big obstruction. In addition, there are different types of antenna (aerials) that work best in different positions. The good news is that there is a simple fix for both of these obstacles.

1 Stand directly over the spot or object you want to create a waypoint for.

2 Hold the satnav at arm's length and head height, and tilted at 45°.

3 Look at the satellite screen and check the stated accuracy – if this is improving (the number is getting smaller) then wait until it settles.

4 On the same screen look at the satellite geometry, which in simple terms is how well they are spread around you. If they are all clustered above you, or to one side, the accuracy will be low. If you can see a satellite on your screen which would change this and your receiver is not obtaining a good signal from it (the strength bar is low or empty) it may be obscured by a tree or other obstacle, so move your position slightly. Sometimes rotating the position you are facing by 180° has an effect. See a video explaining this at **www.lfto.com/navigation**

5 Press and hold the **ENTER** button for 2 seconds.

6 Name your waypoint by scrolling to the number in the flag box and press **ENTER**. Pressing **ENTER** again you can choose A-Z or 0-9 to name your waypoint. Let's simply call this one A1. Scroll to the speech bubble with OK in it and press **ENTER**.

You have now created a waypoint that you can navigate back to at any time from anywhere in the world!

TECHNIQUE 2 Navigating to a waypoint

A satnav will only take you in a straight line back to a waypoint and takes no account of mountains, canyons, rivers, oceans or any other obstacles whatsoever! This is why you must use either a printed map or a digital one installed onto your satnav for practical purposes. At its barest, think of your unit as a fishing rod: the object you've hooked is the waypoint, and wherever you are as you walk around it, the fishing line always goes straight to it.

1 On the main menu page select **WAYPOINTS**.

2 Scroll down to A-D and you will see your waypoint A1.

3 Press **ENTER** to highlight your waypoint.

4 Press **ENTER** again and select **GOTO**.

5 The compass screen appears with an arrow. Start walking in the direction of the arrow. It may initially point you in the wrong direction, but this is because the eTrex needs to be moving for its compass to work. It will soon correct itself after a couple of metres' travel.

6 Follow the arrow and as you do you will see the distance you have to go to your waypoint counting down, plus how long it will take you to get there and your current speed.

7 When you are just under 10m from your waypoint your satnav will prompt you saying **ARRIVING DESTINATION**. Stop looking at your satnav screen and now look for the spot/object you marked.

8 Press **ENTER** and select **STOP NAVIGATION** when you have actually arrived.

TECHNIQUE 3 Creating a route

By joining together waypoints that you have created, you create a route that you or other people can follow. To practise this technique, move around a large area and create a set of waypoints, for instance at a gate, a bridge, a bench and at a café (GT1, BR1, BN1 & CA1).

1. On the main menu page select **ROUTES**.
2. Scroll down to **NEW ROUTE**.
3. By pressing **ENTER** twice you will be prompted to choose a waypoint from a list of the ones you have created. Select them in a logical order.
4. When you have entered all of them scroll to **FOLLOW**.
5. You will now be prompted to indicate which way you want to follow them (so when you are at the end you can come back!).
6. The compass screen appears with the arrow, and you follow this in exactly the same way to each waypoint on your route. As you approach each waypoint your eTrex will show your distance to it, and a few metres before you reach it the compass pointer will turn to the next waypoint on your route.
7. Press **ENTER** and select **STOP NAVIGATION** when you have arrived at your destination.

If you now go to the main menu screen and check your **ROUTES** you will see that your satnav has automatically saved this route for you to use at any time in the future. You can store 10 such routes on your eTrex H.

Expert tip!

By default all satnavs give waypoints numbers; but after a short while it is easy to forget which number relates to what, so it's much better to name them using abbreviations such as GT = gate, ST = stream, RD = road etc, then you can have GT1, GT2 and so forth.

TECHNIQUE 4 Creating a track

This feature records a track log while you are moving that, at any time, you can follow back along the same path. It is one of the most useful features, especially in poor visibility.

1. On the main menu page select **TRACKS**.
2. Scroll to **CLEAR** and delete the current track.
3. Scroll down to **SETUP** and switch the recording to **ON** and change the **INTERVAL** to **DISTANCE** with a value of 10m (shown as 00010.0m on the screen).
4. Start to walk off in any direction, making occasional turns until you are around 100m from your start point.
5. On the **TRACKS** screen select **SAVE**.
6. You will now be given a choice of various names; select the nearest time to now.
7. The **MAP** screen appears with your track and where you are on it. You can watch the screen and follow your progress on it, or if you prefer, swap to the **COMPASS** screen.

The eTrex H stores 10,000 track nodes, so at a recording interval of 10m it will record your path for 10km. If travelling further, simply set your recording interval to a greater distance.

TECHNIQUE 5 Using your satnav to find your position on the map

You have already set the last field on the Data screen to **LOCATION**. This displays your location in the local grid reference system, and on the Main menu you set this to Ordnance Survey GB. You need to be able to take a grid reference for this; check out last month's **Trail** to see how.

- The letters BNG in the bottom left of this box tell you that you are using the British National Grid.
- Above this the two letters describe the 100km x 100km box you are in and must always match to those on your map.
- The five numbers on top are your easting (this runs left to right on your map).
- The bottom five numbers are the northing (this runs bottom to top on your map).
- Therefore your satnav gives you a 10 figure grid reference, which describes an area of 1m².

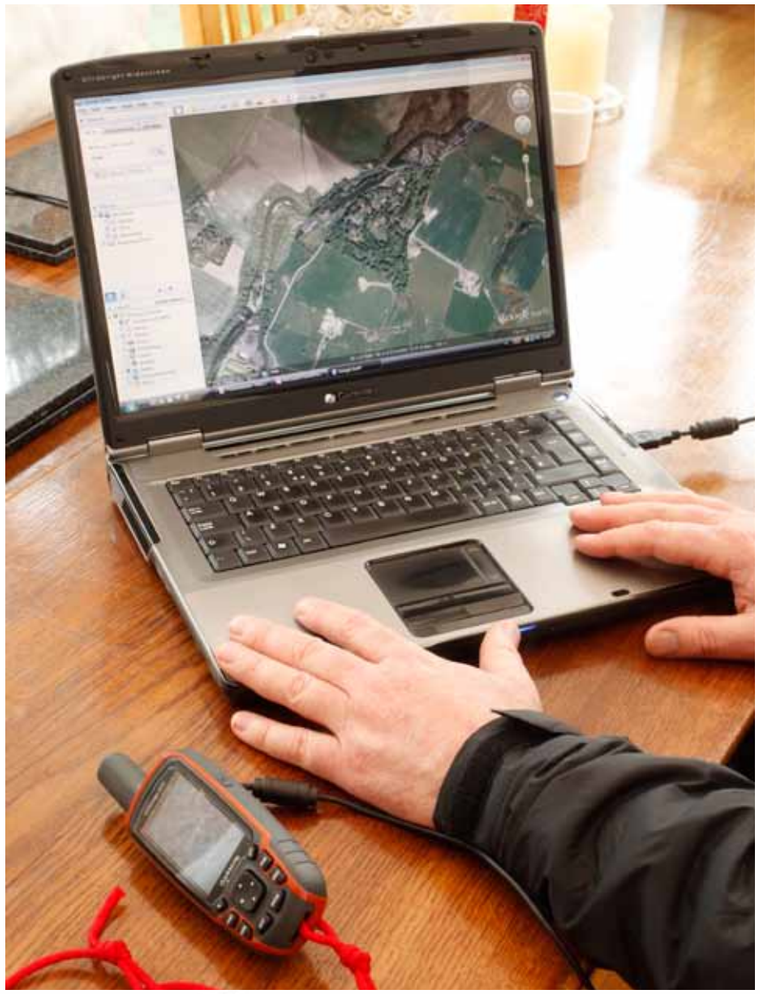
Expert tip!

Always remember to clear your track log at the beginning of your journey.

This is too small an area for you to identify on your map so we ignore the last digit on the top set of five numbers and do the same on the bottom set to give an 8 figure grid reference, for when we are using a grid reference tool. This places you in an area of 100m².

If you are using your compass roamer you can only use a six figure grid reference and to do this we ignore the last two numbers on each line. This places you in an area of 10,000m².

TECHNIQUE 6 Using Google Earth



Viewing your waypoints, tracks and routes on Google Earth and sharing them with other people is such good fun. It's a really valuable way of storing all of your data; also it could not be easier.

1. Connect your satnav to your computer and turn it on.
2. Open Google Earth and select from its menu bar **TOOLS/GPS**.
3. On the tab Import check these boxes:
   Garmin
   Waypoints
   Tracks
   Routes
   KML Tracks
   Adjust altitudes to ground height
4. Click the Import button and – hey presto! – all of your information is loaded onto Google Earth.
5. If you right click on any of your data displayed on Google Earth you are given a choice of actions from saving it to a personal folder to emailing it to friends.

Expert tip!

As you become proficient at transferring data from your satnav to Google Earth and vice versa, try one of the free mapping programs that use Ordnance Survey maps, such as www.maptogps.com

EXCLUSIVE VIDEO LESSONS ONLINE!

Join Lyle Brotherton for some special video tutorials on www.livefortheoutdoors.com/navigation

Lyle's off now, but...

Trail's navigation expert Lyle will be back soon, but for more of his expert insight, check out his superb *Ultimate Navigation Manual*, pb Collins, which is setting the standard for instructional texts worldwide.