



# GPX Routes

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# My Background

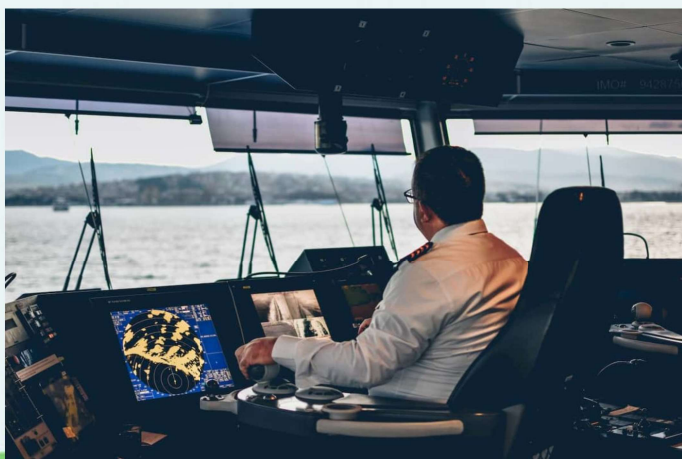
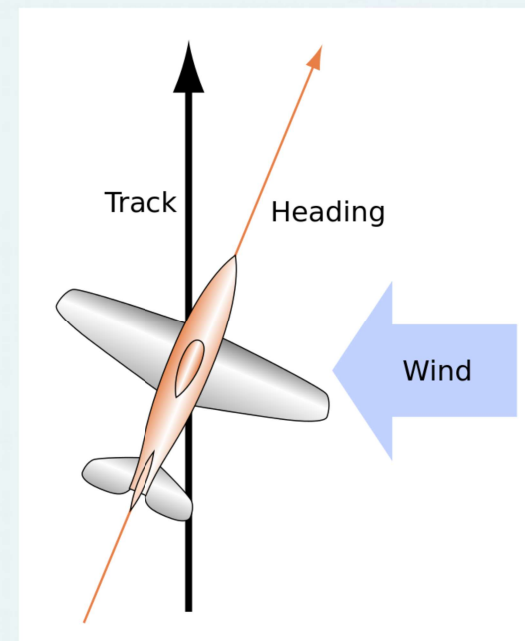
- I've always been interested in maps
- As Scout we'd have many day/night treks over Salisbury Plain
  - Army parachute drop
- During 'O' levels I did an evening course in coastal navigation – thoughts of joining the navy
- In 1981 I found myself driving hundreds of miles across the Libyan desert
- Then when we started safariing in 1995 I started to geo-tags our photos
  - Initially printed thumbnails on scanned maps
  - Then for copyright reasons I produced my own maps from open source databases – DEM for contours and Digital Map of the World for others
  - At this time I started using a GPS logger, as my memory wasn't as good and we travelled over many of the same tracks
  - The raw data maps were not good for large scale maps, so migrated to GE
  - But on-line slideshows needed live links to Google's servers and internet connections weren't as good as today, so now use open source (OpenStreetMap) maps through Mapbox
- So I think I know a little about maps and navigation, possibly more than the average amateur



# Lesson wrt Navigation

First any true navigator is continuously verifying their position, no matter what tools they use.

- Ships navigators have to contend with cross currents – compass heading is different to their direction and use radar & sonar to assist in coastal waters.
- Airplane pilots generally have satnav built-in to their instrument panels but are forever referring their ground position to maps. They cannot rely on their magnetic bearing because of cross winds and adverse weather may confuse the satnav.







# Navigation on Land

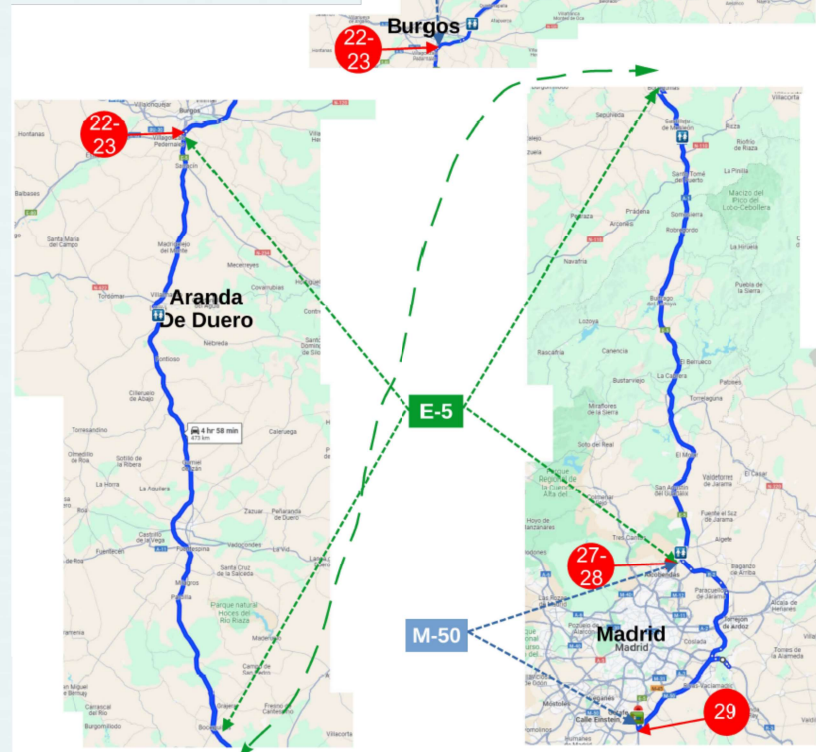
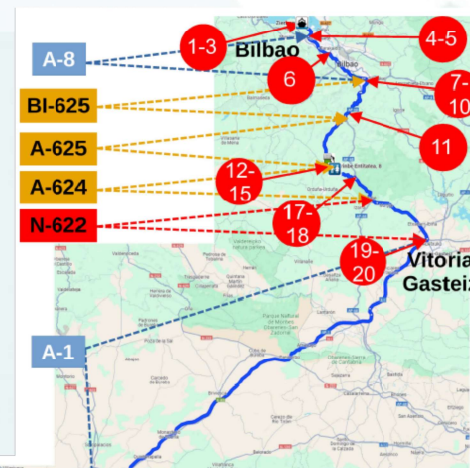
- It isn't any easier on land either. In desert locations, you have very few landmarks to follow. Examples: flares; tyres; pylons; rigs; radio masts
- Mark Thatcher wouldn't have been lost for c. a week if it was that easy (some with long memories will remember)!





# Use of Satnav

- I don't generally use satnav - I only need it in the last mile.
  - Recently I had to find 2x car dealerships – one in Mansfield and the other in Nottingham, distances of c. 100 miles. I checked with Google Maps before I left, put the destination into my satnav (Maps4Me - just in case) and drove to both without ever having to refer to it.
- I wouldn't use satnav on long journeys where you are using main roads with few junctions
  - I would rely on printed maps and written directions – such as Spain, Zierbena to Madrid is c. 288 mls with only 24 directions/instructions – about 4 an hour
  - I use GPX routes simply to track our position





# Use of Satnav (cont.)

Other users of satnav:

- Get lost in unknown territory
- Turn to satnav
- Put their destination in
- Follow the route.

Anyone who blindly follows their satnav deserves to get into trouble.

This is far from our scenario







# Reality – Our Routes

We:

- Are planning a trip for other users.
- Will have selected a route using whatever means at our disposal: maps; Google Maps; Streetview etc.
- Prepare some rudimentary directions (Tulip diagrams etc.)
- Drive the route to confirm it is viable
- Supplement the routes with real-life features, such as: service stations, toilets; POIs; hostelrys we may wish to use etc.

Only then will we prepare the final route plans, before circulating them.







# Benefits

- Mobile phone app to supplement the Tulip diagrams for runs
- Why?
  - Aid single drivers without navigators – police frown on driving distractions such as maps (or Tulip diagram sheets)
  - Single drivers often drive in 'convoy' behind someone with a navigator – police frown on this as not considerate to other road users
  - Mis-directions – see many drivers turning round – I did on Autumn Leaves Run when I couldn't see my odometer
  - Navigators may get travel sick if burying their heads in sheets
  - Navigators want to see the countryside

Purists will hate it - but this is to supplement what we already produce - they don't have to use it!



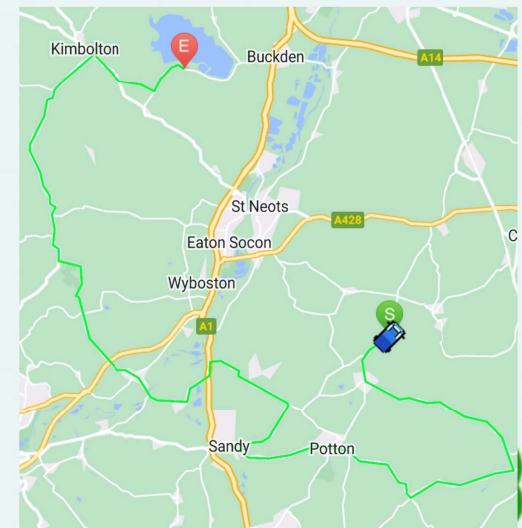


# GPX File Format

File format caters for:

- Waypoints - single points of Lat/Long used for:
  - POIs
  - Landmarks
  - Georeference photos
- Routes
  - Series of waypoints used for point-to-point navigation
- Tracks
  - A record of a track. Many 'breadcrumbs' – every 150-200 yds or so depends on logger's settings

One file may contain any or all types of information.





# Application

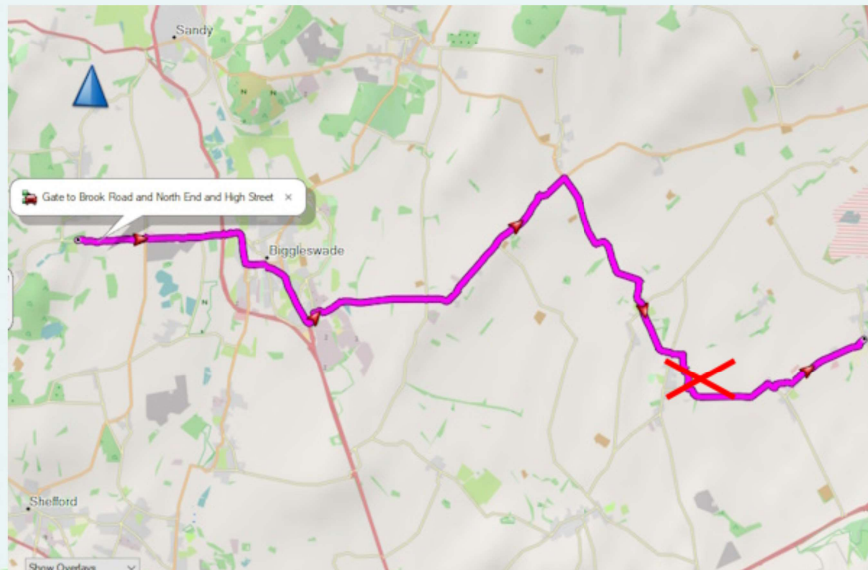
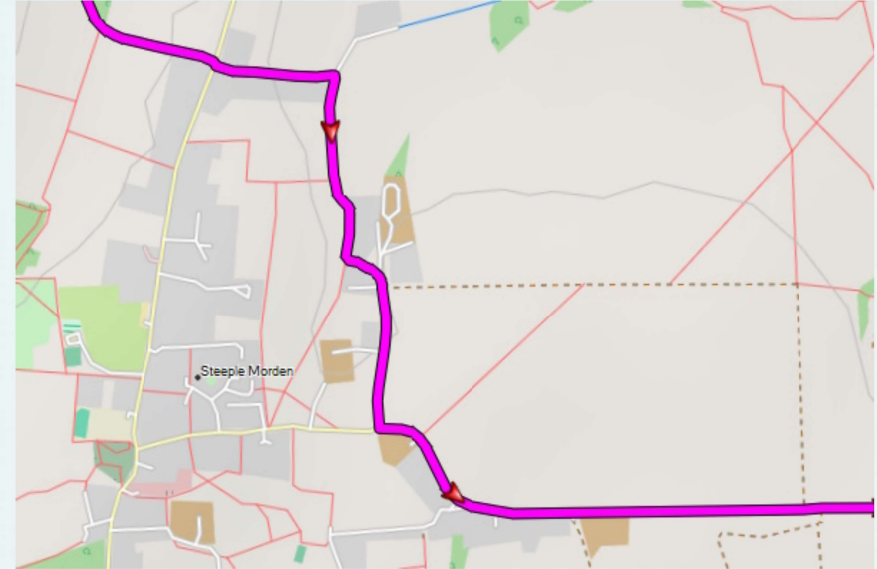
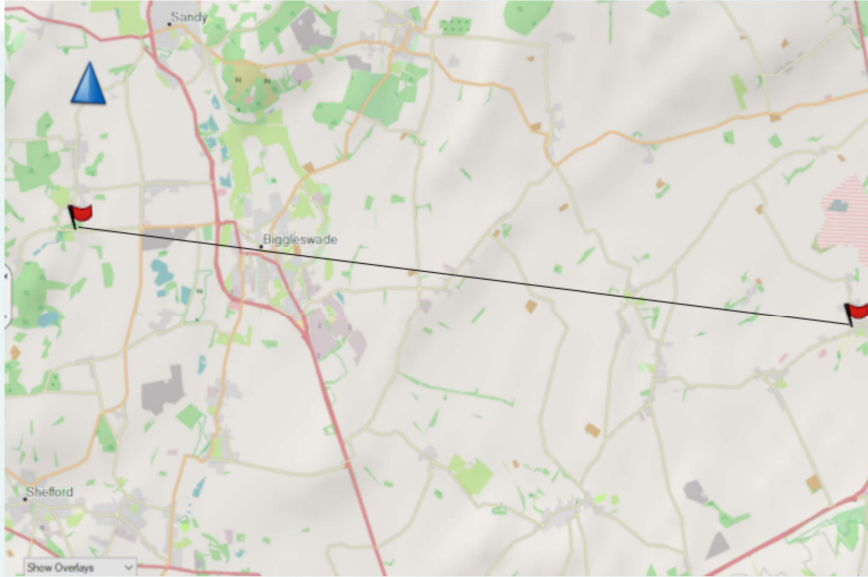
- On the face of it we need 'routes' (& 'waypoints')
- But, each satnav app has its own algorithms for determining optimum routes
  - Even the same app could use different filters
  - As with any navigation system the route selected needs to be checked vs. reality
- So we want a 'route' changed to a 'track' & use this for navigating – a feature of Garmin's desktop app BaseCamp
- And, waypoints for: ~~signposts; landmarks; re-fueling & toilet stops; pubs & cafes; hazard warnings; POIs~~







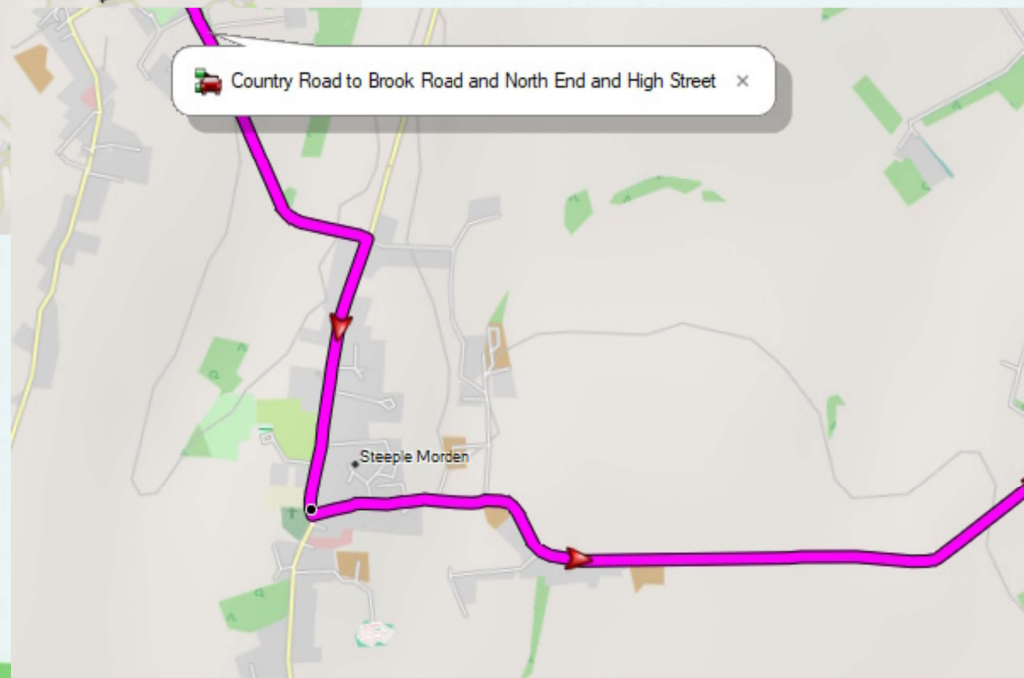
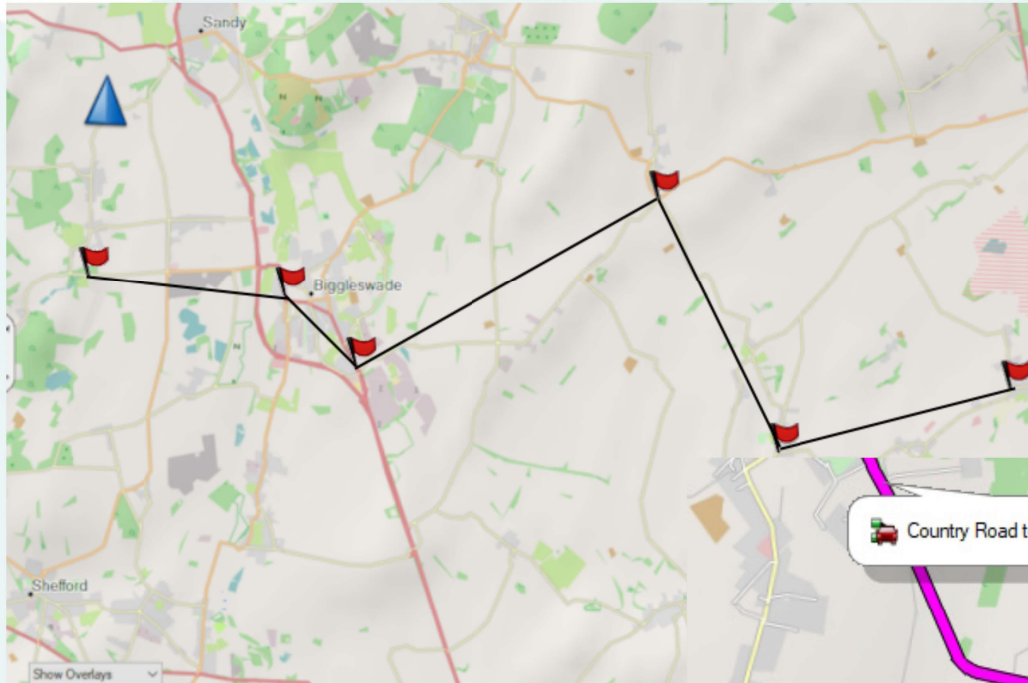
# A Simple Route





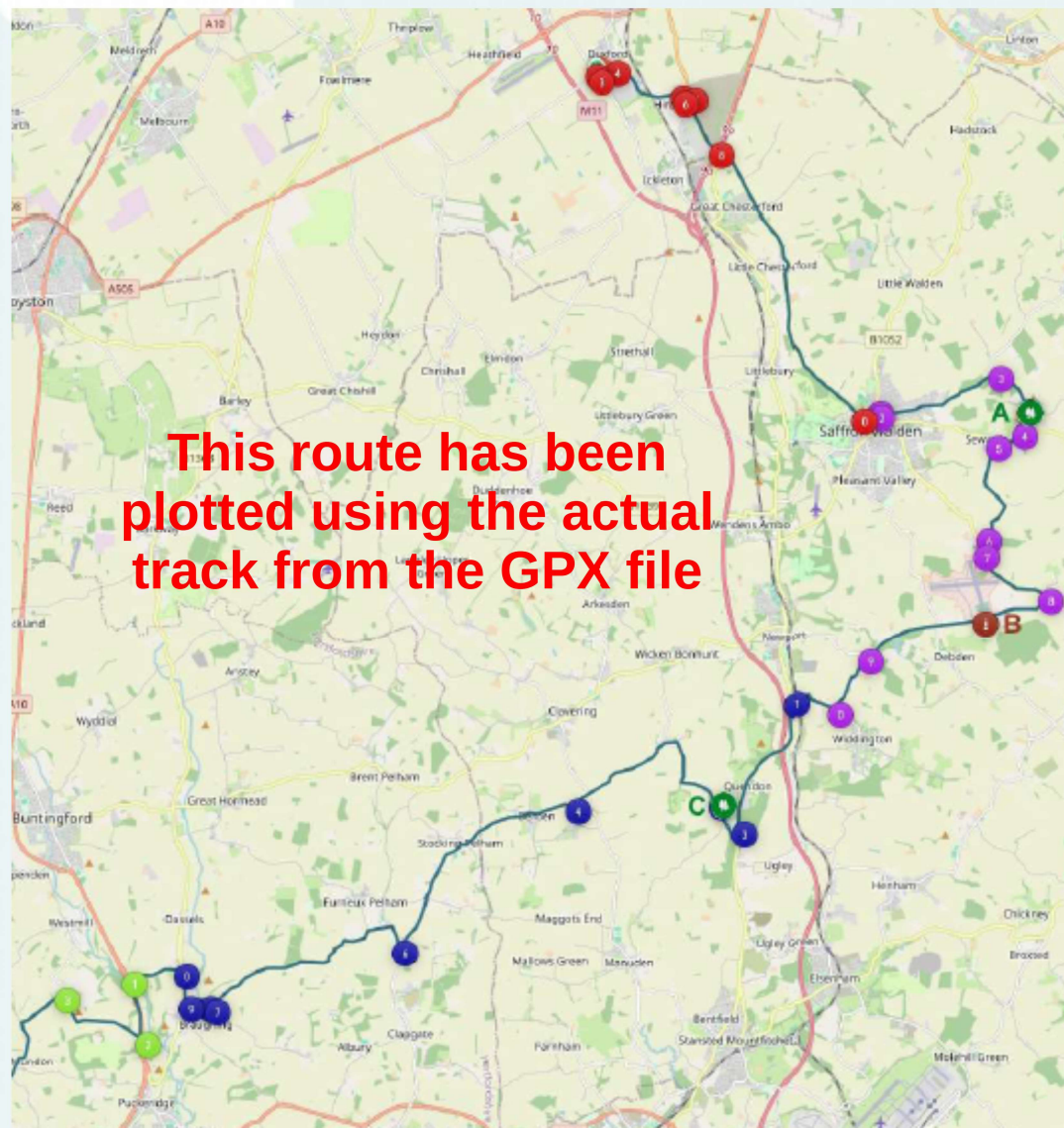


# Corrected Route





# Sample 'Tulip' Diagram



This route has been plotted using the actual track from the GPX file

Duxford to deHavilland Aircraft Museum – 63mils/2:10

Map Icon	Dist. (mi)	Where; Feature;Instruction;Roadsign	Tulip Diagram
	0/0	<b>Duxford</b> ; <u>Cafe 19</u> ; Turn right out of community hall car park	
	0.07/0.07	<b>Duxford</b> ; <u>T-junction</u> ; Turn left at the road	
	0.1/0.17	<b>Duxford</b> ; <u>Crossroads</u> ; Turn left before grass triangle. The Plough will be ahead	
	0.25/0.42	<b>Duxford</b> ; <u>Sharp left bend at church</u> ; Turn right before memorial, give way and turn right again into Hinxton Road;	
	0.65/1.07	<u>Railway crossing</u> ; 1 <sup>st</sup> one is no longer used but take care at the 2nd	
	0.24/1.31	<u>Ford</u> ; Take care	
	0.23/1.54	<b>Hinxton</b> ; <u>T-junction @ #99 (after turn)</u> ; Turn right; <i>Blue cycle sign to Ickleton 2 mls</i>	
	0.07/1.61	<b>Hinxton</b> ; <u>Junction @ #79</u> ; Turn left into Hunts Lane (narrow & easily missed)	
	0.13/1.74	<b>Hinxton</b> ; <u>T-junction</u> ; Turn right at main road	
	0.15/1.89	<b>Hinxton</b> ; <u>Roadworks (currently 2 roundabouts)</u> ; Follow signs for Saffron Walden	
	0.6/6.81	<u>Treble roundabout under A11</u> ; Go straight on; <i>B184 Saffron Walden</i>	
	1.84/4.41	<b>Little Chesterford</b> ; <u>Roundabout</u> ; Take 2nd exit (straight on); <i>B184 Saffron Walden</i>	
	2.47/6.88	<b>Saffron Walden</b> ; <u>Crossroads after Eight Bells PH</u> ; Turn left into Castle Street; <i>Churches</i>	
	0.25/7.13	<b>Saffron Walden</b> ; <u>Crossroads @ #74</u> ; Turn right into Castle Hill	
	0.06/7.19	<b>Saffron Walden</b> ; <u>Roundabout</u> ; 1st exit into Ashton Road	
	0.67/7.86	<b>Saffron Walden</b> ; <u>Roundabout (not at turn to store)</u> ; Take 2nd exit (straight on)	
	1.11/8.97	<u>Junction on sharp left bend</u> ; Turn right; <i>Sewards End</i>	
	1.01/9.98	<b>Sewards End</b> ; <u>T-junction opposite village hall</u> ; Turn right	
	0.47/10.45	<b>Sewards End</b> ; <u>Junction just before national speed limit sign</u> ; Turn left into Cole End Lane	





# GPX Apps - Discarded

- Desired features:
  - There are many GPX apps - preferably free
  - But we want apps that don't need to use mobile data (I'm a skinflint, but mobile data cannot always be relied on in country lanes)
  - So must be able to pre-load map files
- Some tested:
  - ~~Routes has voice instructions for tracks – similar to satnav, but as a cycling app you are already on a turn before it has completed the instructions. Waypoints are simply shown on map, but user has to select them for text info.~~
  - ~~GPX Viewer simply buzzes close to waypoints, which are momentarily shown at the bottom of the screen. User can click the icon for text info. Navigation simply traces the route, there are no turn-by-turn displays or voice instructions.~~
  - ~~Beeline has a navigation screen similar to satnav highlighting most turns. No waypoint info & the free service has no voice instructions. After a few days I was prompted to apply for an account.~~
  - ~~Komoot seems to give voice instructions & visual map navigation like satnav. Doesn't seem to show waypoints so does it interpret them at all? Have to purchase maps!~~
  - ~~Maps4Me will import GPX files – but won't navigate from them.~~





# GPX App - Best

## OSMAnd

- Appears to be an OpenStreetMap app
- A full satnav app, showing turn-by-turn and also giving voice commands
- Designed to work offline. Free app allows for 6 concurrent regional maps - **but each download will decrease the count - even deleting maps never recovers the count** – so fine if you only ever drive across a few regions – otherwise re-install it!
- Also imports GPX tracks & waypoints. **Route needs to be tied to roads** to use most features of navigation, otherwise it simply lists bends. So roundabouts are listed as 'turn left, turn right and turn left', rather than 'roundabout take 2<sup>nd</sup> exit'.
- Even waypoints are vocalised - just what we need?
- If you subscribe the desktop can be used for planning & the app will record your track.

Sample video



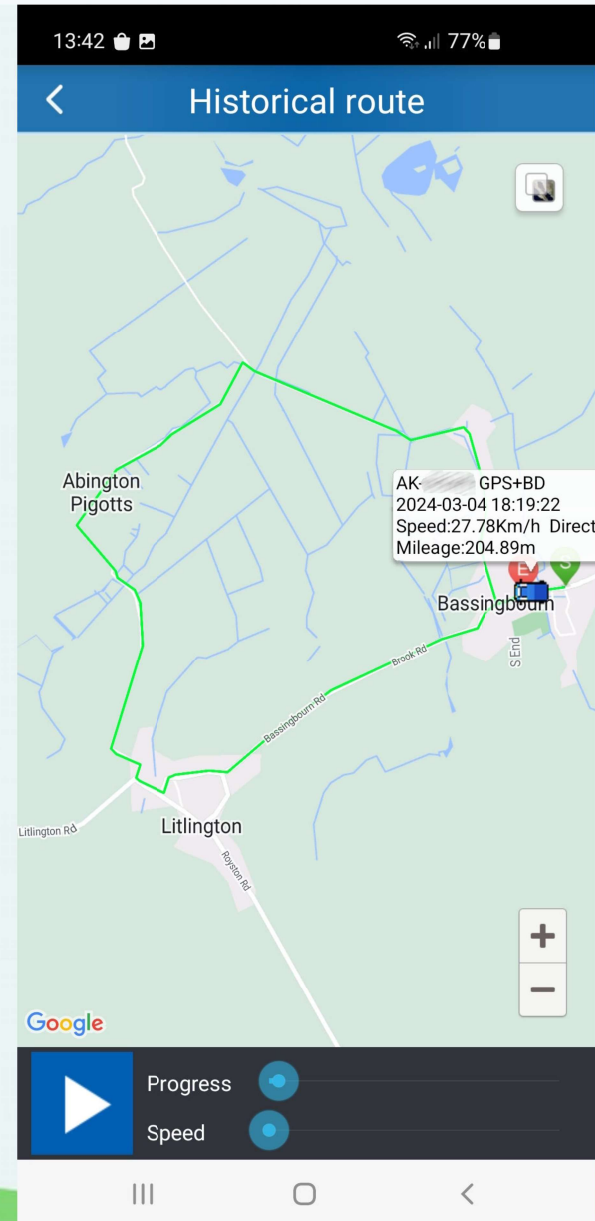




# Route of the Video

The previous video was created early in my experience and I no longer use many of the 'GPX waypoints' – those I manually insert in to the file.

This screen shot is taken from my tracker app

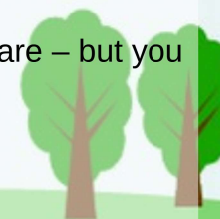
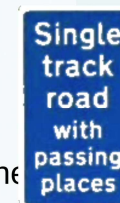




# Lessons Learnt

I have been using OSMAnd for over a year, but already have valuable lessons

- Don't have too many waypoints – in this case less is more.
  - Information & sensory overload, mask important turns (not on our country lanes but on longer journey such as Ireland)
  - No point listing every junction you go through without turns etc
  - Road warnings are unnecessary where there is adequate road signs
  - Don't add entries to give supplementary information such as road signs/road-number/town/mileages – can confuse the app
  - Only add info where it assists driving. Other info can be added to the paper routes:
    - POIs; tight turns (OSMAnd warns of these anyway); hosteleries, stores etc
- Text-to-speech doesn't recognise shorthand e.g. SP=sign post, SO = straight on, kms = kilometers, so enter waypoints in long hand (but from above we don't use these now anyway)
- Tie the GPX route to roads, so app knows about junctions, roundabouts etc
- OSMAnd allows you to view details of the route and shows the turn-by-turn instructions – so can add waypoints for turns it misses
- Mount your mobile phone on the dash to avoid the dreaded 'GPS signal lost' message - then you're dead in the water, unless you also track your Tulip instructions
- If go off track, then pause the track before the dreaded 'Recalculating the track'. It does eventually find where you are – but you may have missed some points
- Make sure you have a USB charger to hand – satnav apps drain the battery quickly
- 'Map' waypoint icons for the app that you are using for navigation





# Tie GPX to Roads

## Tied to Roads

**Total distance 45.8 mi, travelling time 1 h 19 m.**

366 m, 0:15	11. Turn slightly left and go	14.5 mi - 14.7 mi 18:22 - 18:37
244 m, 0:35	12. Turn left and go Station Road	14.7 mi - 14.8 mi 18:37 - 19:12
1.67 mi, 3:11	13. Roundabout: Take 3 exit and go	14.8 mi - 16.5 mi 19:12 - 22:23
142 m, 0:27	14. Turn right and go A1307 Cambridge Road	16.5 mi - 16.6 mi 22:23 - 22:50
7.38 mi, 15:08	15. Turn left and go High Street	16.6 mi - 24.0 mi 22:50 - 37:58
1.07 mi, 2:18	16. Turn left and go	24.0 mi - 25.1 mi 37:58 - 40:16
2.56 mi, 5:29	17. Turn right and go	25.1 mi - 27.6 mi 40:16 - 45:45
1.41 mi, 2:18	18. Turn left and go B1061 The Street	27.6 mi - 29.0 mi 45:45 - 48:03
0.48 mi, 0:59	19. Turn right and go Hall Road	29.0 mi - 29.5 mi 48:03 - 49:02
3.80 mi, 8:09	20. Turn left and go	29.5 mi - 33.3 mi 49:02 - 57:11
1.70 mi, 4:41	21. Turn right and go New England Lane	33.3 mi - 35.0 mi 57:11 - 1:01:52
0.36 mi, 0:58	22. Turn slightly left and go	35.0 mi - 35.4 mi 1:01:52 - 1:02:50
0.26 mi, 0:33	23. Turn right and go Cemetery Road	35.4 mi - 35.6 mi 1:02:50 - 1:03:23
3.56 mi, 7:38	24. Turn right and go	35.6 mi - 39.2 mi 1:03:23 - 1:11:01
3.55 mi, 4:39	25. Turn slightly right and go Bury Road	39.2 mi - 42.7 mi 1:11:01 - 1:15:40
1.63 mi, 1:50	26. Turn slightly right and go	42.7 mi - 44.3 mi 1:15:40 - 1:17:30
1.27 mi, 1:33	27. Turn right and go Westley Lane	44.3 mi - 45.6 mi 1:17:30 - 1:19:03
231 m, 0:17	28. Turn right and go A143 The Street	45.6 mi - 45.8 mi 1:19:03 - 1:19:20
1 m, 0:00	29. Turn left and go	45.8 mi - 45.8 mi 1:19:20 - 1:19:20

## NOT Tied to Roads

**Total distance 45.6 mi, travelling time 0 h 49 m.**

149 m, 0:07	19. Turn slightly right and go	14.5 mi - 14.6 mi 9:47 - 9:54
259 m, 0:12	20. Turn left and go	14.6 mi - 14.7 mi 9:54 - 10:06
40 m, 0:02	21. Turn slightly right and go	14.7 mi - 14.7 mi 10:06 - 10:08
238 m, 0:11	22. Turn right and go	14.7 mi - 14.9 mi 10:08 - 10:19
1.06 mi, 1:20	23. Turn slightly left and go	14.9 mi - 16.0 mi 10:19 - 11:39
0.29 mi, 0:22	24. Turn slightly left and go	16.0 mi - 16.2 mi 11:39 - 12:01
210 m, 0:10	25. Turn slightly left and go	16.2 mi - 16.4 mi 12:01 - 12:11
162 m, 0:08	26. Turn right and go	16.4 mi - 16.5 mi 12:11 - 12:19
49 m, 0:02	27. Turn sharply left and go	16.5 mi - 16.5 mi 12:19 - 12:21
2.97 mi, 3:45	28. Turn slightly right and go	16.5 mi - 19.5 mi 12:21 - 16:06
111 m, 0:05	29. Turn slightly right and go	19.5 mi - 19.5 mi 16:06 - 16:11
0.44 mi, 0:33	30. Turn slightly left and go	19.5 mi - 20.0 mi 16:11 - 16:44
124 m, 0:06	31. Turn slightly right and go	20.0 mi - 20.1 mi 16:44 - 16:50
255 m, 0:12	32. Turn slightly left and go	20.1 mi - 20.2 mi 16:50 - 17:02
1.45 mi, 1:50	33. Turn left and go	20.2 mi - 21.7 mi 17:02 - 18:52
0.59 mi, 0:44	34. Turn slightly right and go	21.7 mi - 22.3 mi 18:52 - 19:36
0.39 mi, 0:30	35. Turn slightly left and go	22.3 mi - 22.7 mi 19:36 - 20:06
1.21 mi, 1:31	36. Turn slightly right and go	22.7 mi - 23.9 mi 20:06 - 21:37
0.80 mi, 1:01	37. Turn left and go	23.9 mi - 24.7 mi 21:37 - 22:38

**Review the route before travelling so can add waypoints for turns it misses**



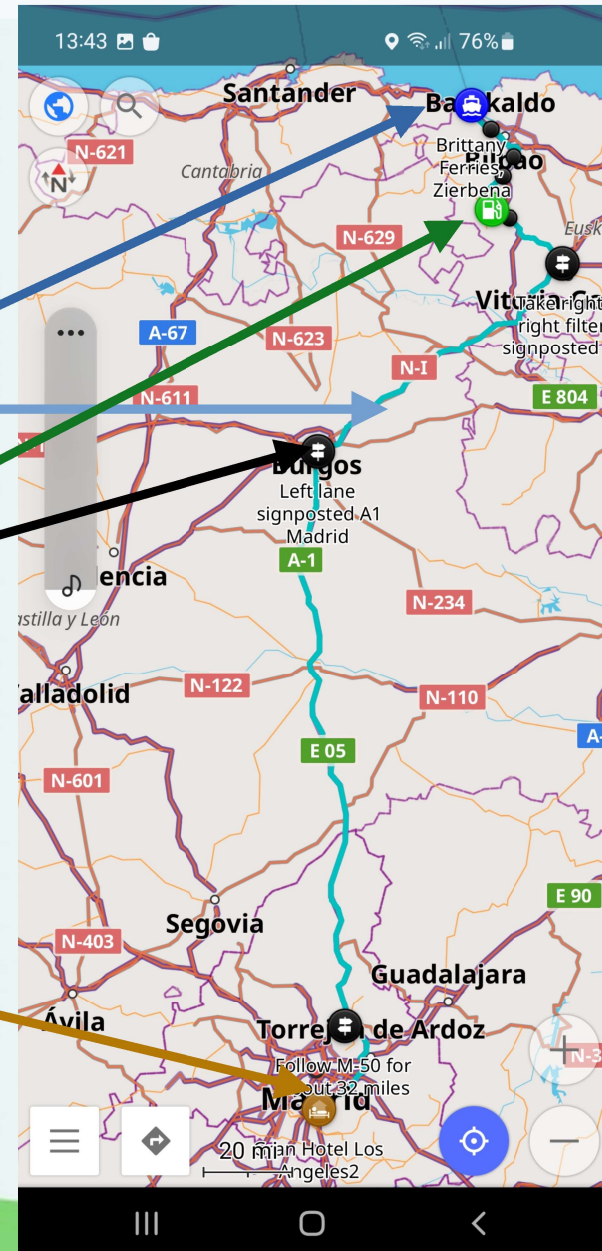


# Mapped Waypoints Icons

This screen shot is taken from OSMAnd App of trip planned to Spain – Zierbena to Madrid

Notes:

- Route is shown in light blue
- Waypoints for:
  - Port
  - Road turns
  - Fuel stops
  - Hotel
  - Comfort stops (not shown)
- These are the only useful waypoints







# Questions?

Email any questions to:  
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