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# Application of Radio Mobile to 'Fox Hunts'

Using the Radio Mobile software to make it easier to plot accurate bearings.

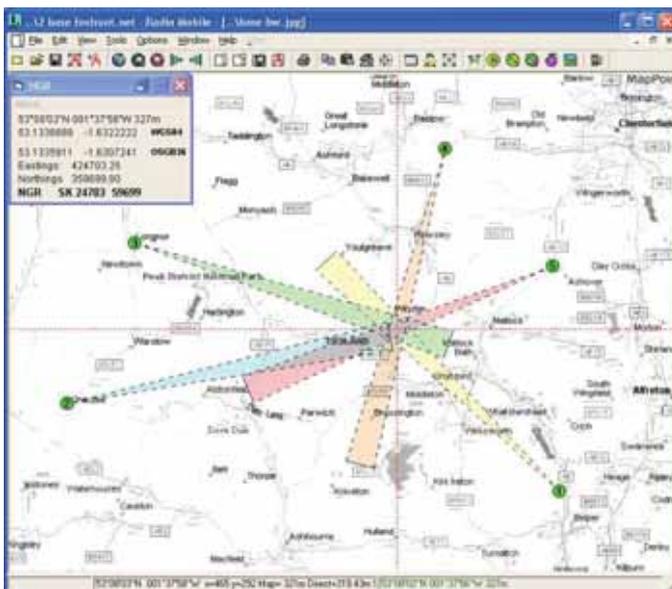


FIGURE 1: Simulated bearing plots from five locations

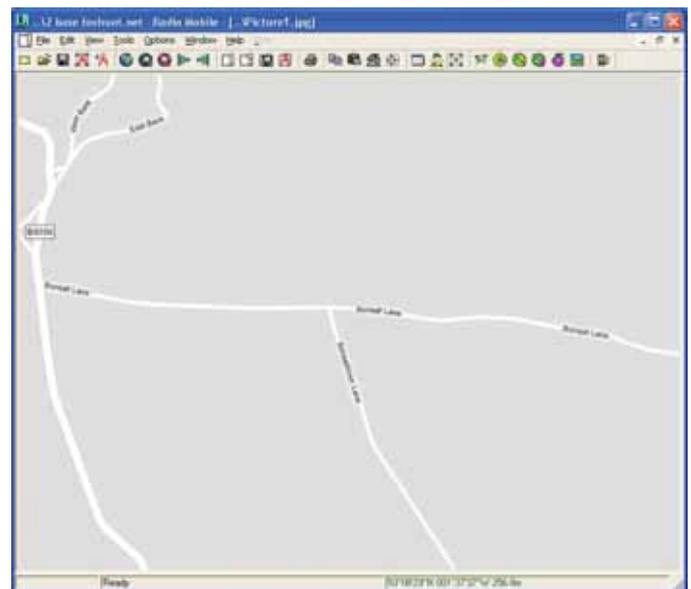


FIGURE 3: Area merged with new data

**RADIO MOBILE.** Roger Coudés 'Radio Mobile' program is an extremely powerful radio propagation prediction package for VHF, UHF and microwave frequencies. Whilst it does have a fairly steep learning curve, it is well worth the effort for anyone trying to work out propagation issues in those bands. A detailed introduction to Radio Mobile appeared in the October 2006 RadCom [1], in which its basic operation was described. Without wishing to go over the same ground, it's worth pointing out that Radio Mobile uses topographical data from the Shuttle Radar Topography Mission, giving it access to a high resolution height map on a 90m matrix. This, plus some complex mathematical modelling, enables the program to make very accurate predictions based on real-world equipment performance. Best of all, Radio Mobile is freeware, and can be downloaded free of

charge from [2]. New users will benefit greatly from the quick-start installer and instructions at [3].

Radio Mobile continues to evolve as its users make suggestions to the author. Recently, a new module has been added which can help planning VHF fox hunts.

**REPLACING THE MAP.** In a Radio Direction Finding 'Fox Hunt' event, radio bearings of the hidden 'fox' are taken from a number of locations, and when plotted from two or more locations on a map, give an indication of the location of the hidden station.

This may be achieved using an OS map, protractor and rule, but with the advent of laptop computers, a more accurate method can be implemented in mobile stations by using Radio Mobile.

Whilst the Radio Mobile program is in fact a comprehensive propagation simulation package covering the frequency range of 20MHz to 20GHz, one of its major attributes is the ability to generate elevation maps of any area, and then overlay road and aerial photographs as required using data downloaded from the internet. This data for a given area can be archived on a CD, or stored on the computer hard drive, and then used with the laptop in a remote location

where internet access is not available.

By connecting a GPS unit directly to the laptop, an accurate location of a mobile station can be shown, and then a 'locator unit' placed at that position on the map. It is also possible to utilise APRS data from a number of other stations to show their locations on the same map area if required.

**PLOTTING:** Figure 1 is an illustration of a plot for five locations placed on a road map of the Peak District, where bearings for the hidden station had been made. There was an estimated uncertainty of 2° in the bearings taken, and this is represented by the 5° colour wedges defined on the bearing plots from each location.

The settings for the plots shown in Figure 1 are made on the 'Fox Hunt' pane of Radio Mobile, where up to six separate units can be selected as sources for the bearings (Figure 2). If the plot width is set to 0°, a single accurate bearing line will be drawn with a defined length.

Radio Mobile uses the WGS-84 datum for its latitude and longitude entries as shown at the bottom of Figure 1, but a cursor coordinate converter to the OSGB-36 (National Grid Reference) datum can be seen, which in this case is giving the NGR of



FIGURE 2: The Radio Mobile Fox Hunt Control Pane

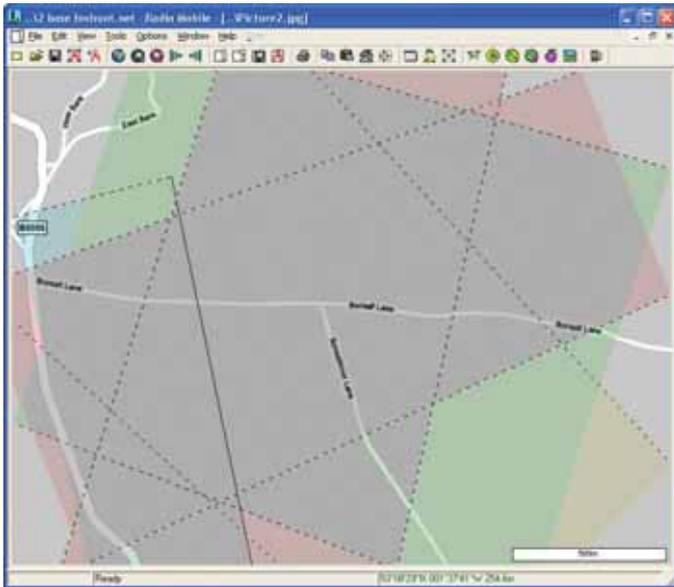


FIGURE 4: Zoomed bearing plots

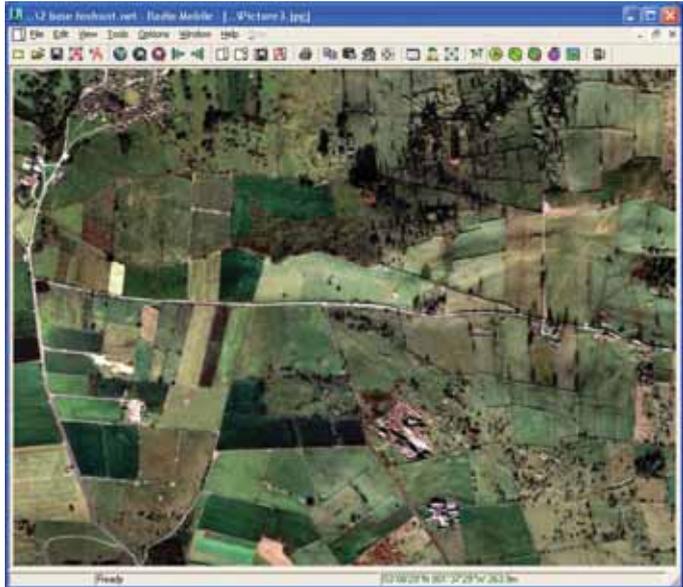


FIGURE 5: Aerial photograph of the area in Figure 4

the cursor crossing point. Roger Coudé provided the program links for this converter which was designed by Jeff, G8HUL, who has also written a similar Irish Grid converter. One point to note is that if GPS units are used to locate the mobile stations, they have to be set to the WGS-84 datum, otherwise their locations could be in error by a possible 200 metres.

**ZOOMING.** The plot shown as Figure 1 is a first location which is obviously too coarse to locate the hidden station accurately. To improve the resolution of the plot, an area round the bearing crossings can be selected with the mouse, and a zoomed image produced.

The first image from the zoom will be of low resolution, as it is just an enlargement of the screen area, but this picture can then be merged with the higher resolution road data to give the detail required.

Figure 3 shows the improved resolution road image which has been forced to greyscale in the program to improve the visibility of the overlaid bearing plots.



FIGURE 5: The plot over a merged OS map

The Fox Hunt Pane retains the setting made earlier, so on opening it once more and pressing 'Draw', Figure 4 is produced over this zoomed area.

You will also notice that a distance scale can be added, as seen at the lower right of this illustration. The National Grid converter still operates on the zoomed image, but was omitted for clarity.

**ADDING MAPS.** Whilst the final weapon in the Fox Hunt cupboard is the ability to show access roads and feature details, it is also possible to superimpose an aerial photograph of the area of the plot as shown in Figure 5.

Obviously the results rely on the skill of the operators in making their bearing measurements, but Radio Mobile can relieve the required paperwork and produce better plot accuracy in cramped conditions. If you have access to OS mapping software, it is also possible to import, and datum reference, an OS map of the area into the program to make use of the added detail as Figure 6.

The area of the Peak District used in the pictures for illustration, were generated from my Base Network. This was produced by the 'Quick Start' installer available below, but it is very easy to generate maps, road overlays and aerial photographs in the program for any required area.

Radio Mobile is an extremely versatile program which offers the amateur propagation planning facilities which were undreamed-of by professionals just a few short years ago. Using it to plan fox hunts is just a single sub-application: it's excellent for many other tasks including repeater coverage planning, checking the likely radio

paths from a new QTH, and even comparing your received signal strengths with the theoretical figures for any given transmitter.

For a full description of the operation of the program, and its many other features with associated screen shots, please see the references below.



**IF YOU WANT TO KNOW MORE ABOUT ARDF,** also known as radio orienteering, then this is the book for you. Titterington, Williams and Deane have together produced a treasure-trove of information which

covers everything from the history of ARDF to planning and taking part in events. There are even constructional features for building your own ARDF transmitters and receivers.

This highly readable book is well illustrated and conveys the authors' huge enthusiasm for the sport. It also serves as an excellent and well rounded reference work. You can read a full review of *Radio Orienteering – The ARDF Handbook* in the April 2007 RadCom, and it is available from the RSGB Bookshop, priced at **just £8.49 for members.**

#### REFERENCES

- [1] 'An introduction to Radio Mobile', Ian Brown, G3TVU, *RadCom*, October 2006
- [2] Roger Coudé, VE2DBE, Radio Mobile home page at: [www.ve2dbe.com/english1.html](http://www.ve2dbe.com/english1.html)
- [3] Radio Mobile 'Quick Start' installer and Program reference guide at: [www.g3tvu.co.uk/Radio\\_Mobile.htm](http://www.g3tvu.co.uk/Radio_Mobile.htm)