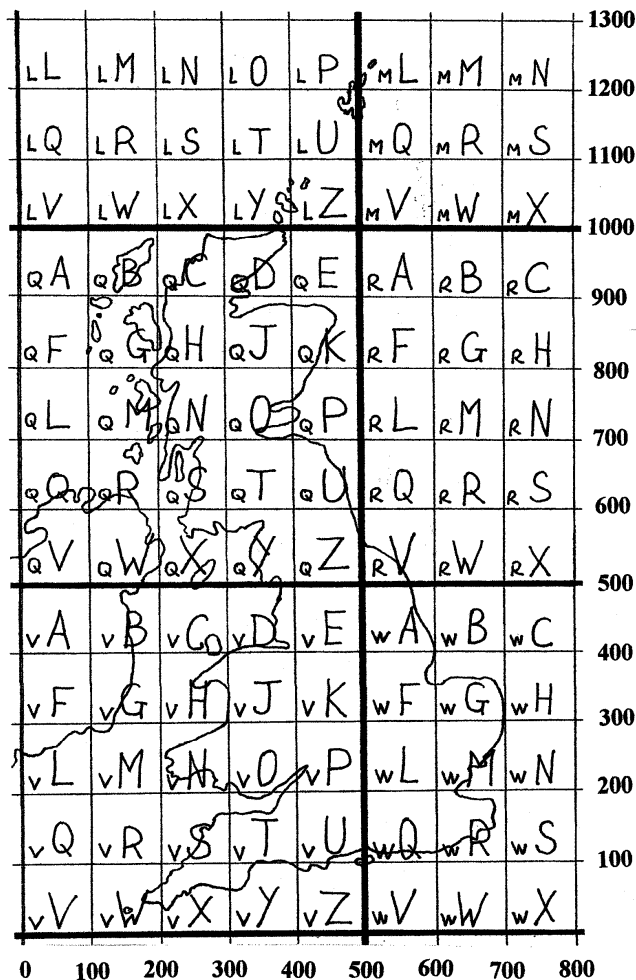


STRAIGHT TO THE POINT RIGHT ON TIME

by John Penny

This article is one local historian's solution to the thorny problems of location and time often encountered when using World War Two military and civil defence documents.

Any local historian attempting to investigate the events of World War Two in their area will undoubtedly have need to delve into the vast collection of military and civil defence files held at the Public Record Office at Kew. Although the majority of these are typewritten and fairly easy to decipher, one problem will quickly become apparent, as any attempt to plot the map references quoted in the documents on to current Ordnance Survey sheets will prove fruitless. The difficulty arises from the fact that contemporary military maps of the United Kingdom employed WOFO Cassini projection, introduced by the War Office in 1927 and used throughout the Second World War by the Army and RAF, but not by the Royal Navy. Although it was very convenient for plotting surveys, there was a north-south exaggeration of a scale such that it was unsuitable for maps extending more than 200 miles from the central meridian. In 1938, to overcome this problem, it was abandoned by the Ordnance Survey in favour of Transverse Mercator projection, at which time the National Grid was also introduced, the system that is in use today.



The British Modified Military (Cassini) Grid

Introduced in 1927 and used by the Army & RAF throughout World War II

Figure 1

A great deal of confusion can be caused when first encountering WOFO Cassini grid references as they bear a strong resemblance to those produced when using the O.S. National Grid. In both systems all grid lines are given values in metres related to an arbitrary origin at the south-west corner of the gridded area, ensuring that all such values measured east and north are positive. Additionally, as the kilometre grid values of both are repeated in every 100

kilometre square, to eliminate the possibility of ambiguity a unique reference is created by identifying each such square with a pair of letters, the first of which indicates the 500 kilometre square within which the 100 kilometre square is located. One clue that a grid reference is quoted using the WOFO Cassini system is that it used a lower case letter to indicate the 500 kilometre square, employing only l,m,q,r,v or w, whereas the convention adopted by the National Grid involves the use of either H,J,N,O,S or T in the upper case (ie vT in the Cassini system or ST in the National Grid).

In spite of the similarities, conversion is not an altogether straightforward affair and this has led most people to employ the traditional method of visually plotting between old and new sheets. However, this is an awkward, time consuming and inaccurate technique and wartime military maps of Britain are relatively difficult to find locally, usually only being available in specialist national collections. As a number of multi-page charts listing several hundred WOFO Cassini grid references were discovered in local Anti-Aircraft Command records, a rapid and much more accurate method was obviously required and a mathematical conversion which could be easily carried out on a pocket calculator, or personal computer, seemed to be the obvious answer.

After some fruitless searching, the Royal Engineers' Mapping and Charting Establishment at Feltham, in Middlesex, provided the breakthrough by supplying a formula with an accuracy of + or - 200 metres (or + or - 2 in the units of an 8-figure 100 metre grid reference) anywhere in the UK, suitable for use with a simple 4-function calculator:-

If Ec and Nc are the components of an 8 figure WOFO Cassini Grid Reference, expressed in units of 100 metres, then the corresponding components of the National Grid Reference (Eng and Nng) are:-

$$\text{Eng} = \text{Ec} - 420 - 0.00011 \text{ Ec} - 0.01145 \text{ Nc}$$

$$\text{Nng} = \text{Nc} - 245 + 0.01133 \text{ Ec} - 0.00064 \text{ Nc}$$

Where Eng = Eastings National Grid; Nng = Northings National Grid; Ec = Eastings Cassini; and Nc = Northings Cassini.

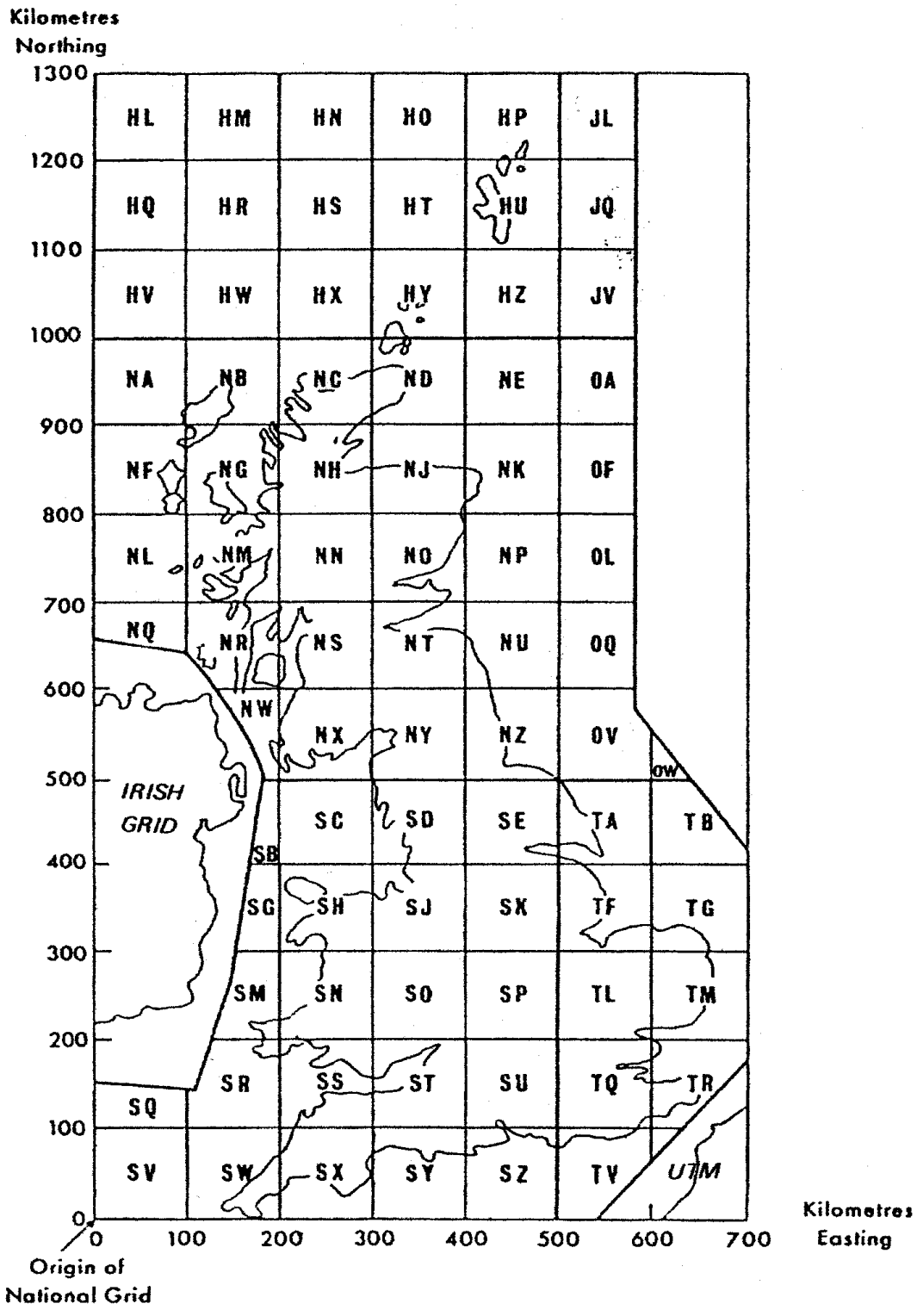
However, as we have seen, it is common practice with both the WOFO Cassini and National Grid to express the first digits east and north in a standard 8-figure grid reference by letters, so before any attempt can be made to undertake a calculation the letters must be converted back to their correct numerical values and replaced in their appropriate positions. In addition, as the various formations producing documents became further removed from the higher echelons, their reporting techniques tended to become more parochial, resulting in the omission of the letter representing 500 kilometre square, and as the area of responsibility became even more localised, even that assigned to the 100 kilometre square. Thus, for example, the 8-figure grid reference 42051906, usually represented as vU205906, might well appear as U205906 or just 205906. Care is therefore required to ensure that the approximate area under discussion is correctly identified before attempting a grid reference conversion. Where either, or both, of the 500 or 100 km squares letters are omitted, reference to a

map of the UK showing the position of the Cassini grid squares will enable the missing letters to be recovered (see figure 1).

The National Grid

Introduced in 1938 and currently used by the Ordnance Survey

Figure 2



Here is a worked example of a conversion:-

- 1) Charmy Down airfield, 3.5 miles north of Bath at vU205906 (Cassini).
- 2) Convert the reference to all-figures, using the Cassini grid layout map (figure 1). As the 100 km square vU is 400 kilometres east and 100 kilometres north, the full numerical reference is therefore 42051906.
- 3) The grid position conversion:-

Eastings (National Grid) = 3763 ie (4205 - 420 - 0.46 - 21.82).

Northings (National Grid) = 1698 ie (1906 - 254 + 47.64 - 1.21).
- 4) Replace the 500 and 100 km square numbers with their corresponding letters using the National Grid layout map (figure 2), where the square 300 km east and 100 km north will be found to be ST.
- 5) The Cassini grid reference vU205906 is therefore ST 763 698 on the National Grid.

Although this method, employing no more than a simple pocket calculator and the two sketch maps provided, certainly enables accurate conversions to be carried out, it is nevertheless a relatively slow procedure and is quite unsuitable for dealing with large batches of calculations.

To overcome this final problem a simple little DOS computer programme was written around the original Royal Engineers formula, it being designed to provide almost instantaneous conversions directly from a 2-letter, 6-figure WOFO Cassini reference to a current 2-letter, 6-figure National Grid position, thereby dispensing with the need to refer to any map except to insert missing Cassini 100 and 500 km letter references. This has proved to be the ideal solution and is available as "Freeware", on a disk for just £1 from John Penny, 104 Thingwall Park, Fishponds, Bristol, BS16 2AT.

The other difficulty encountered was that of the time difference which often existed in World War Two between Great Britain, which variously used Greenwich Mean Time, British Summer Time and British Double Summer Time, and Germany which employed Central European Time and German Summer Time.

Fortunately, however, a conversion table was eventually located in the Public Record Office and is reproduced below (Note: BST and CET = GMT + 1 hour: BDST and GST = GMT + 2 hours: all changes took place at 02.00 hrs).

| | | | | |
|---------------------|----|---------------------|------|-----|
| April 10th 1939 | to | November 19th 1939 | BST | CET |
| November 19th 1939 | to | February 25th 1940 | GMT | CET |
| February 25th 1940 | to | April 1st 1940 | BST | CET |
| April 1st 1940 | to | May 4th 1941 | BST | GST |
| May 4th 1941 | to | August 10th 1941 | BDST | GST |
| August 10th 1941 | to | April 5th 1942 | BST | GST |
| April 5th 1942 | to | August 9th 1942 | BDST | GST |
| August 9th 1942 | to | November 2nd 1942 | BST | GST |
| November 2nd 1942 | to | March 29th 1943 | BST | CET |
| March 29th 1943 | to | April 4th 1943 | BST | GST |
| April 4th 1943 | to | August 15th 1943 | BDST | GST |
| August 15th 1943 | to | October 4th 1943 | BST | GST |
| October 4th 1943 | to | April 2nd 1944 | BST | CET |
| April 2nd 1944 | to | April 3rd 1944 | BDST | CET |
| April 3rd 1944 | to | September 17th 1944 | BDST | GST |
| September 17th 1944 | to | October 2nd 1944 | BST | GST |
| October 2nd 1944 | to | April 2nd 1945 | BST | CET |
| April 2nd 1945 | to | July 15th 1945 | BDST | GST |
| July 15th 1945 | to | October 7th 1945 | BST | GST |

Remember also, in Britain a "blackout" was in force during World War Two, and from the summer of 1940 it lasted from half an hour after sunset to half an hour before sunrise.

To overcome the difficulties of obtaining contemporary almanacs to ascertain sunrise and sunset times in an historical context, the computer "Shareware" programme Astronomy Lab 2 (suitable for Windows 95, 98 and NT) was employed and found to be ideal. In addition, as it is able to provide a wealth of other astronomical data of use to the historian, a copy is included on the disk along with the Map Reference Conversion as well as a very useful little DOS "Freeware" Historical Calendar written by Bernd Kratz of the University of Kentucky, which is packed with handy information.

Editor's note:

I am grateful to John Penny for his detailed yet clear explanation of a simple stumbling block placed in the way of many local historians. Further evidence of John's work can be found on the excellent website of the Fishponds Local History Society at: <http://www.fishponds.freeuk.com/>
