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“Is there an optimum size for
topographic maps”

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The Charles Close Society was founded in 1980 to bring together all those with an interest in the maps and history of the Ordnance Survey of Great Britain and its counterparts in the island of Ireland. The Society takes its name from Colonel Sir Charles Arden-Close, OS Director General from 1911 to 1922, and initiator of many of the maps now sought after by collectors.

The Society publishes a wide range of books and booklets on historic OS map series and its journal, *Sheetlines*, is recognised internationally for its specialist articles on Ordnance Survey-related topics.

Is there an optimum size for topographic maps?

Richard Oliver

In 1993 Chris Board published an article on ‘Neglected aspects of map design’.¹ These included sheet layouts, covers and folding, but made only passing reference to one concern of this article: the percentage of paper on which topographic maps are printed that is taken up with the actual area of the map, as opposed to marginalia – or just blank paper. The other concern is whether there is an optimum size for topographic maps.²

This article is purely concerned with paper maps: the disadvantage of a relatively limited area of mapping that can be viewed satisfactorily at once on mobile devices is offset by the virtually unlimited scope both for extent of mapping and extent of any necessary explanation and guidance. For many users, this writer included, paper mapping has a basic functionality, of the ability to take in at a single view a large area at a high resolution that, by the very nature of the compactness of mobile devices, no ‘app’, however sophisticated, can have. Further, paper maps do not depend on an electricity supply for viewing.

‘Map efficiency’

One way in which the ‘efficiency’ of a map can be assessed is the ‘cartographic design’: its ability to convey to a reader the information in lines, points, areas and text that has been encoded into it. Another, the subject of this article, is the amount of information about the area depicted, as encoded within the neat line, as compared with explanatory matter: the percentage of the paper that is occupied by the map proper as opposed to borders and marginalia.

For any particular map series, given that the symbol set and standard footnotes, etc, are unchanged, the larger the sheet of paper used the greater is the advantage to the map-user, as a higher percentage of the paper is used for the map proper. Let it be assumed that a 1-cm border is used, and that a further 0.5-1.0 cm is needed as a handling edge. An A1 sheet is 85 × 58 cm (4872 sq cm): a map of 80 × 50 cm (4000 sq cm) inside the neat line occupies 82.1 per cent of the paper. This leaves 2 cm each to left and right, 3 cm at the top and 5 cm at the bottom, or 2 cm at the top for series and sheet name and number, and 4 cm at the bottom for legend, scale bars, grid-box, metadata and any other needed marginalia.³ On a A0 sheet of 116 × 84 cm a size of 112 × 76 cm (8512 sq cm) within the neat line is possible, with an increase of about 38 per cent in the space available for legends, etc: even so, the actual map area occupies 87.4 per cent of

¹ C. Board, ‘Neglected aspects of map design’, *Cartographic Journal* 30 (1993), 119-22.

² In what follows dimensions are horizontal preceding vertical, and are quoted to the nearest 0.1 centimetre, with areas to the nearest square centimetre. Map areas have been obtained as far as possible from the nominal dimensions, in order to circumvent problems of distortion after printing. Percentages are given to the nearest 0.1 per cent. Data has been obtained from maps accessible to the writer in Exeter.

³ ‘Legend’ is here defined as what on some mapping, eg the one-inch Fifth Edition, is the ‘Reference’, ie the guide to symbols and conventions. It is not here taken to include the guide to referencing.

the paper. Conversely, on A2 paper, 58 × 42 cm (2436 sq cm), a map area of 54 × 34 cm (1836 sq cm) gives a figure of 75.4 per cent.

Total efficiency is achieved if the map covers 100 per cent of the paper. This implies a double-sided map with no margins, legend, metadata, scale or sheet numbers or other identifiers, though if the map carries a metric grid the scale might be implied by grid figures on the map face. In practice this does not happen: double-sided mapping is still the exception, and legends and other marginalia continue to be provided. Although double-sided mapping can offer much better value for money, there is the disadvantage that reversing it is impracticable in a car and can be awkward out of doors, quite apart from the increased wear on the folds. The apparent success of double-sided publication with the OS 1:25,000 *Explorers* is probably due to an effective monopoly.

An example of a map with minimum marginalia is the Cassini *Carte de France*, of which publication began in 1756: the sheets as first published have only a sheet number, scale bar and corner co-ordinates, and the map area occupies about 80 per cent of the total area of the paper. The individual sheets of the OS 1:2500 first edition of 1855-70, when publication was by parishes, have only parish names, sheet number and scale bars, but in most instances are supplemented by separate title sheets which include the date of publication and the name of the Royal Engineer divisional officer supervising the work.⁴ Later 1:2500 mapping tends to have a comparatively good percentage of map area to total paper: Berkshire/Wiltshire sheet 19.9/17.9 of 1880 has a map area of 96.6 × 64.4 cm (6221 sq cm) and a total printed area of 99.3 × 68.8 cm (6832 sq cm), on paper 106.2 × 71.8 cm (7625 sq cm), giving 81.6 per cent of paper covered by the map, and 89.6 of paper covered by the total printed surface; a copy of Bedfordshire sheet 33.5, published in 1924 but printed after 1954, has a printed area 101.5 × 71.2 cm (7227 sq cm) on paper measuring 104.6 × 73.8 cm (7719 sq cm), giving 80.6 per cent of paper covered by actual mapping.⁵

Given that it is necessary in practice to symbolise some information on maps, especially smaller-scale maps, the optimum symbols are those that are self-explanatory. This perhaps explains the lack of legends on many 'early maps'. Instead there is pictorial suggestion: thus on the OS one-inch Old Series, of which

⁴ The title information, particularly on early (1855-60) issues, is sometimes printed in a blank area falling outside the parish. Kingswear parish, published on Devon 128.13 in 1865, was unusual, if not unique, in that the whole parish fell within a single 1:2500 sheet, which included the title. This title-sheet has received a wider circulation than most, as part of it is reproduced on a foldout at the back of CR Potts, *The Newton Abbot to Kingswear Railway (1844-1988)*, Headington: Oakwood Press, 1988.

⁵ The paper sizes used for large-scale maps were fairly but not absolutely standard, and there were minor variations across the decades: thus for example six-inch Devon 93 SW was printed in 1892 on paper 58.4 × 44.9 cm, whereas in 1951 Devon 80 NE was printed on paper 57.2 × 42.7 cm. The standard sizes within the neat lines for OS County Series mapping were 36.0 × 24.0 inches (91.5 × 61.0 cm; 5582 sq cm) for 1:1056 (five-foot) and 1:10,560 (six-inch) full sheets, 18.0 × 12.0 inches (45.7 × 30.5 cm; 1394 sq cm) for 1:10,560 quarter-sheets, and 38.016 × 25.344 inches (96.6 × 64.4 cm; 6221 sq cm) for 1:500, 1:1250 and 1:2500 sheets. (An indicator of a post-1954 printing of a County Series sheet is a printed price of 10/-).

publication began in 1805, agglomerations of tree-symbols suggest woodland, 'tufts' suggest rough-surfaced, uncultivated ground, and close dotting or speckling suggest sandy areas. Legends were included on the county index sheets to the Irish six-inch (1:10,560) from its beginning in 1833, but only reached the one-inch in 1886, and then only on newly-published sheets and to explain symbols such as roads, boundaries and other varieties of line that were not necessarily obvious in meaning. In 1894 this was expanded to include further non-pictorial symbols introduced at the behest of the Baker Committee, which had reviewed military mapping of Britain in 1892.⁶ Woods only start to be explained on coloured one-inch maps in 1901, and other land-cover on the one-inch in 1914. Bartholomew likewise only explained some of their symbols – initially mostly the road classification – on their half-inch (1:126,720) series, and even on their 1:100,000 published from 1975 the cross for church was omitted from the legend.

Another way is to assume that either (a) symbols for a multi-map national series should be something that is 'part of everyone's education', or (b) provide a separate symbols card. These were provided for, amongst others, GSGS 3907 and 3908 (the one-inch of Great Britain) and GSGS 4069 (the 1:500,000 air map of Great Britain) during World War II. A card was also produced for the post-war civil 1:25,000 Provisional Edition.

A complication arose from 1914: reference systems and grids came into general use, which needed both to be figured in the margin and their working explained to the map-user. This increased demand on paper and therefore in principle reduced the amount available for actual mapping.

Maps can be divided into two broad categories: those usually supplied folded with a cover of some sort, and those supplied flat. Most 'consumer' mapping is of the first sort: large-scale cadastral-type mapping and military mapping are invariably of the second sort. The usual way, at any rate in Britain, is to provide a separate cover; an alternative is an envelope or plastic sleeve. The other method is an integral cover: this can be either printed as effectively a part of the printed area that includes the map, or it can be printed on the reverse. This in turn is related to folding. Nowadays most maps use a fold which appears to have been invented nearly simultaneously in several European countries in the mid-1930s, and is known in Britain as the Bender fold: this is the fold familiar from the British and Irish 1:50,000 series, and has the advantage that any part of the map can be examined without opening more than four panels at once. It also has the advantage that a suitably-sized flat sheet can be Bender-folded 8×4 using binary folds, or hand-folded in a more sophisticated way using marginal marks.⁷

⁶ *Report of Committee on a military map of the United Kingdom*, unpublished, printed at War Office, 1892 [A.237]. There is a copy in the Royal Geographical Society at Z.72/4 and another at p.639 in The National Archives (TNA) WO 33/52.

⁷ An example of this is a note on GSGS 5070, BAOR Road Map, 1:500,000, Edition 4, 1975: 'TO FOLD ROAD MAP FOR USE IN VEHICLE (Folding points are shown by red diamonds in the margin) Fold top and bottom edges horizontally to meet at the centre, map facing outwards. Then fold the map vertically into eight equal parts in concertina fashion so that Legend box faces outward. Finally fold the map horizontally in half with Legend outwards. Any part of

Excess baggage? The Popular and the Landranger compared

What happens in practice can be illustrated by reference to two well-known series: the one-inch (1:63,360) Popular Edition of England and Wales, and the 1:50,000 *Landranger* series of Great Britain.⁸ As designed, both were intended to be issued both paper-flat and folded in covers.⁹ A folded copy of Popular Edition sheet 40, as issued on publication in 1923, has a map area of 68.6 × 45.7 centimetres (27.0 × 18.0 inches: 3135 sq cm), a total printed area of 71.8 × 52.6 cm (3777 sq cm), and a total paper area of 77.5 × 53.0 cm (4108 sq cm); the map area occupies 76.3 per cent of the total area of paper and 83.0 per cent of the printed area, and the printed area occupies 91.9 per cent of the paper: there are notably blank areas in the left and right margins.¹⁰ By later standards the method of folding used is unlikely to be judged convenient. *Landranger* sheet 113 of 2016 has a map area of 80.0 × 80.0 cm (6400 sq cm), a total printed area of 97.2 × 86.6 cm (8418 sq cm) and a total paper area of 89.0 × 100.0 cm (8900 sq cm): the map proper occupies 71.9 per cent of the total area of paper and 76.0 per cent of the total printed surface, which in turn occupies 94.6 per cent of the total paper area. The user of the Popular Edition is therefore carrying 23.7 per cent, or nearly one quarter, of paper that either explains the other 76.3 per cent, or else does nothing at all. The user of the *Landranger*, 90-odd years later, does worse: 28.1 per cent of the ‘map’ is not mapping anything.¹¹ Both maps have separately printed covers: up to about 1930 the Popular was issued with thin covers pasted directly onto the back of the map, and thereafter with hinged card covers, which continue to be used on the *Landranger*. If the hinged covers are taken into consideration, then the 1938 issue of Popular sheet 40 has a mapped area of 63.0 per cent of cover and paper combined, compared with 66.7 per cent for the

the map is then visible after unfolding twice.’ Actually the result is a 8 × 4 Bender fold, but the principle could easily be developed for, say, a 10 × 4 or 12 × 4 Bender.

⁸ The Popular Edition of Scotland included a minimum one-inch overlap onto adjoining sheets, and so the standard size was 28.0 × 19.0 inches. The Popular Edition of England and Wales is studied thoroughly in Yolande Hodson, *Popular maps*, London: Charles Close Society, 1999, but the *Landranger* still awaits even an outline study, which would be useful despite the series showing no signs of demise. As far as practicable the *Landranger* is described in terms of current practice.

⁹ It should be noted that Popular Edition sheets, like other OS small-scale maps, that were to be folded were trimmed before covers were added, and so a paper-flat sheet would have a rather higher ‘inefficient’ percentage. Paper-flat issues of the *Landranger*, before these were discontinued other than for print-on-demand issues, were always the same as for folded sheets.

¹⁰ As was usual on coastal sheets of the Popular Edition, the magnetic variation is inside the neat line, in a sea area: the printed area on an inland sheet would be about 72.5 cm left to right, or a total printed area of 3813.5 sq cm. This does not affect the percentage of paper occupied by the map in relation to the sheet of paper as a whole.

¹¹ *Landrangers* covering areas to which the Welsh Language Act applies have been issued with an additional Welsh legend on paper 112.5 × 89 cm: the map proper occupies 63.9 per cent of the paper.

Landranger.¹² In other words, unless drastic cropping is resorted to by the user, about a third of the ‘map’ carried is not mapping at all.

Are there more ‘paper-efficient’ maps?

Carrying about rather more paper than is strictly necessary is both a burden on the traveller, and an unnecessary extravagance in the use of paper and the resources needed to produce it. Before enquiring into why this is so for the Popular Edition and the *Landranger*, it is worth considering some other maps which appear to offer rather more map for area of paper.¹³

Amongst the most efficient must be the Institut Géographique National’s 1:100,000 *Carte de France*: an integral cover, a compact legend and ‘bleeding edges’ contribute to the map covering 93.3 per cent, and the printed area 100 per cent, of the paper. These are large sheets – paper 122.0 × 89.2 cm – but a result nearly equal is obtained by Croydecycle, despite a standard paper size of B3 (50.0 × 35.5 cm: 1775 sq cm), by printing back-to-back: their 1:100,000 *Exmoor & Taunton*, which uses bleed edges and as far as possible eliminates ‘redundant’ sea areas by using them for ‘marginalia’ and supplementary town plans, achieves 91.2 per cent of paper used for ‘real mapping’. Croydecycle’s walking maps, usually at 1:12,500, are similarly compact, but IGN’s 1:25,000 series is more typical of the average: despite a ‘bleed’ integral cover, the map area occupies no more than about 64-65 per cent of the total paper and print areas.¹⁴ Some early twentieth century OS mapping is also quite efficient, at any rate if the rather bulky covers are overlooked: half-inch (1:126,720) sheet 14 of 1908 has a map area and a printed area covering respectively 82.3 and 87.1 per cent of total paper area, and the one-inch Third Edition Large Sheet Series 39 of 1908, has a map area occupying 83.9 per cent of paper area. These both have a map area the same as for the Popular Edition: 68.6 × 45.7 cm. Even Third Edition coloured small sheet series sheet 42 of 1907, handicapped by including the same marginalia as the Large Sheet Series sheets that quickly superseded it, but with a map area of less than half – 45.7 × 30.4 cm – has a map area of 73.8 per cent of the paper. Both the small- and the large-sheet versions of the coloured one-inch Third Edition have incomplete legends, showing no more than 25 symbols if

¹² In 1923 the standard-sized Popular Edition sheets, such as 40, were folded 8 × 3; in 1930 or 1931 a 7 × 3 fold was adopted with the introduction of hinged covers, and the area to which the paper was trimmed was altered. The 1938 issue of Popular sheet 40 has a paper size of 75.8 × 60.2 (4563 sq cm) and two hinged covers, each 10.9 × 19.0 cm (414 sq cm). The 1:50,000, as first issued in 1974 – before it was titled *Landranger* – had a printed area of 96.9 × 85.0 cm (8737 sq cm), or 92.5 per cent of total paper area.

¹³ Weight of paper is not discussed here, as in principle any map can be printed on any suitable paper with any backing or surface treatment to render it more robust. The ‘efficiency’ applies equally comparing a one-inch Popular Edition printed on Place’s waterproof paper with a laminated ‘OS Active’ *Landranger*.

¹⁴ This series is on graticule sheet lines, so the width of the sheets decreases gradually from south to north. Sheet 0715-O, one of the more northerly sheets, printed in 2009, has a map area of 53.1 × 80.0 cm (4248 sq cm) and a total paper area of 99.1 × 67.1 cm (6650 sq cm).

unfenced roads are excluded.¹⁵ This is only partly due to not including certain classifications, notably of roads, used on the Popular Edition. It would have been possible to include a more comprehensive legend on the standard landscape-shaped Large sheets without increasing the printed area, but not on the portrait-shaped ones, and this applies also to the Popular Edition.

The OS's first use of the Bender fold was on the one-inch *New Forest* sheet of 1938, which incorporates many of the features intended for a new standard one-inch series on metric grid lines that eventually emerged as the New Popular Edition. There is a striking contrast in 'paper efficiency' between the flat and folded versions of this map. The flat version has a map area 64.7×72.6 cm (4697 sq cm), and a printed area of 67.8×80.0 cm (5424 sq cm) on paper 76.7×93.7 cm (7187 sq cm): the map and the total printed area occupy 65.7 and 75.5 per cent respectively of the total paper area. For sheets issued folded drastic trimming was resorted to: the headings at the top of the map, which were effectively duplicated by the cover, were cropped completely, leaving map area and printed area occupying respectively 84.8 and 96.0 per cent of the remaining paper, though it must be admitted that the map area is 78.5 per cent of the combined area of paper and cover. The untrimmed paper size can presumably be explained by the use of an existing stock size: the New Popular Edition, produced from 1940 onwards, was more economical, with a standard flat paper size of around 69.5×83.3 cm (5789 sq cm).

The earliest use by the OS of an integral cover on a 'standard series' published map was on 1:25,000 sheet 856, issued in 1960. Folded copies are folded 9×6 : the leftmost column of panels is occupied by the cover in the lower half and is blank in the upper half. These areas were cropped from copies issued flat. The total map area is 80×60 cm (4800 sq cm), on paper 101.0×76.3 cm (7706 sq cm): this gives an effective map area of no more than 63.0 per cent, similar to later folded issues of the one-inch Popular Edition. The post-1980 issues of the 1:25,000 Second Series, *Pathfinder*, also with an integral cover, have a mapped area of 68.0 per cent. Integral covers were tried on some *Landranger* sheets in 1979-84, but proved unsatisfactory for some reason that does not appear to have been publicised.¹⁶ Integral covers were used by the Ordnance Survey of Northern Ireland for their analogue 1:50,000 First Series, starting in 1978, but hinged covers were adopted for the digital *Discoverer* series, begun in 1998. As a result the mapped area of paper dropped from 71.5 per cent to 67.2 per cent, if the card cover is included, though the proportions were practically unchanged if the cover is excluded. The Ordnance Survey of Ireland have always used integral covers on their digital 1:50,000 series: the first, 'Preliminary Edition', sheet, 78, produced in

¹⁵ The count rises to 28 on coastal sheets, where the legend includes the symbols for lighthouse, lightship and beacon.

¹⁶ Note, '1:50,000 integral covers', *Sheetlines* 14 (1985), 20; note, '1:50,000 paper covers', *Sheetlines* 44 (1995), 61: the latter lists 11 sheets (40, 65, 103 (two versions), 119, 125, 132, 142, 150, 186, 197, 204). The writer's reaction at the time was that the integral covers looked 'cheese-paring' and 'cheap', quite apart from any questions of functionality.

1988, has a 'paper efficiency' of 72.3 per cent, but the standard series, published from 1993, only achieves 63.9 per cent.

At the other extreme are those maps which, for one reason and another, have a very poor 'paper efficiency'. This is sometimes due to the use of standard paper sizes. That favoured by the OS for one-inch 'small sheets' or 'quarter sheets' printed from copper was about 61.8 × 46.2 cm (2855 sq cm): a standard one-inch New Series sheet measured 45.7 × 30.5 cm (1394 sq cm), giving a map occupying no more than 48.8 per cent of the paper, and it was left to map sellers to truncate the margins when preparing the maps for sale folded. One reason for such an excess of paper was the need to provide handling edges for printing from copper, though this is certainly not the only explanation.¹⁷ Mapping on graticule sheet lines produced in the Federal Republic of Germany in the 1980s is nearly as 'inefficient': 1:50,000 sheet L1922 of 1983 has a map area of 43.7 × 44.3 cm (1936 sq cm), 47.3 per cent of the total paper area and 53.1 per cent of the total printed area. A large part of the 'marginalia' is a trilingual legend.

It is worth noting that the usual OS practice after 1945 well into the 1960s was to use Quad Crown size presses for a variety of small-scale maps. The maximum paper size possible was about 45 × 33.5 inches (114.3 × 85.1 cm): the one-inch Tourist sheets approached this, using paper 107.8 × 85.1 cm, but the 1:250,000 Fifth Series used markedly smaller paper, 90.2 × 76.2 cm.¹⁸ From the mid-1960s rather larger presses were installed, enabling a standard size of 100.0 × 89.0 cm for the new 1:50,000 series, developed from the later 1960s, and up to 127.5 × 94.0 cm for the 1:250,000 and 1:25,000 *Outdoor Leisure* series in the 1970s and 1980s. On the face of it, maximum press efficiency suggests that the maximum practicable size of paper should be used.

In summary, it would appear that it is reasonable to aim at a map and marginalia so laid out that the map proper occupies at least 80 per cent of the paper when folded.

Causes of 'inefficiency'

Some of the causes of 'inefficiency' have been hinted at above. A fundamental difference between the Popular Edition and the *Landranger* is in the layout of the marginalia. The Popular has borders with series information and sheet number and title in the upper border, legend, scales and other marginalia in the bottom, and supplementary scale bars to left and right. The *Landranger* was originally designed so that the whole of the marginalia of the civil version was concentrated on the right-hand side of the paper. This was modified after 1980 when the mapping was produced to a joint civil-military specification that involved the addition on the civil version of what had always been on the military version: three extended scale bars of statute miles, nautical miles and kilometres. Within the overall printed area of its margins the standard landscape-shaped format of

¹⁷ The sizes of plates for 'quarter sheets' varied: that for Old Series 91 SE in use in 1878 measured 51.2 × 36.3 cm; that for New Series sheet 286 in use in 1893 measured 57.8 × 42.7 cm. By no means all of this is accounted for by more extensive marginalia on sheet 286.

¹⁸ Memorandum on printing machines, n.d. [March 1960], 26E in TNA OS 1/1192.

the Popular has considerable ‘white space’, which ‘closes up’ on portrait-format sheets. The *Landranger*’s map area is square, and the borders can be absolutely standardised.

Map frames and borders can occupy a remarkably high proportion of space. On the 1:50,000 *Landranger* the border is 2.5 cm wide, that is 825 sq cm, or 9.3 per cent of the total paper area; on both the Irish 1:50,000s the border is 2.25 cm wide, occupying about 7.6 per cent of the paper on current OSNI issues and about 6.9 per cent on current OSI issues. Another way of putting it is that the border on the *Landranger* occupies an area equal to about 12.9 per cent of the mapped area. In contrast, the border on the one-inch Popular Edition is about 1.23cm wide, or about 1 cm if the outside framing is discounted: including the redundant framing, this gives a border equal to 9.1 per cent of map area, or 7.4 per cent if the framing is discounted. (See figures 1 and 2.) The comparison is more in the Popular’s favour than might at first appear, as the map area of the *Landranger* is over twice as great: 6400 sq cm compared with 3135 sq cm. A 1.0 cm border on the *Landranger* would be equal to about 4.1 per cent of the mapped area. Both borders include the same information: distances to towns outside the map, completion of names, latitude and longitude values, and grid figures.¹⁹



Figure 1. The upper left corner of GSGS 3907 sheet 54, Second War Revision, printed 1942. This is a military derivative of the one-inch Popular Edition: the two-inch alpha-numeric squaring of the civil version has been replaced by figures for the military grid.

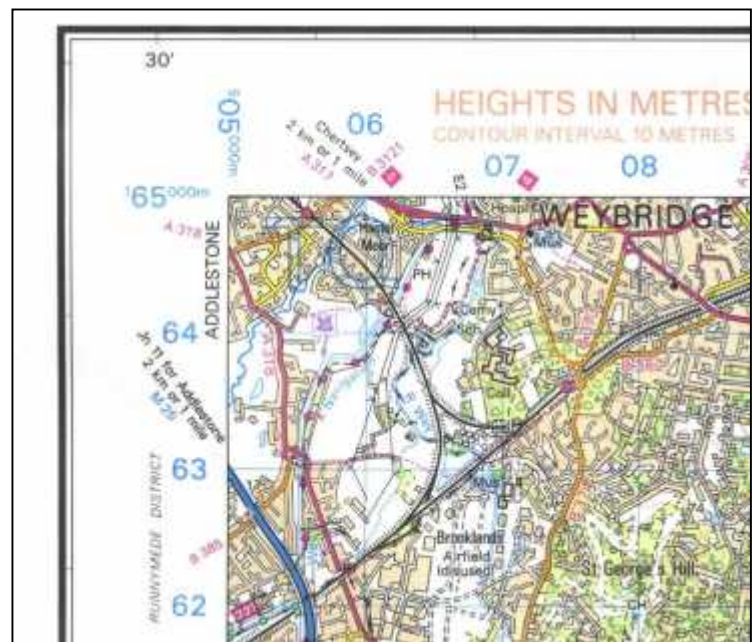


Figure 2. The upper left corner of 1:50,000 *Landranger* sheet 187, printed 2016. The grid figures are similarly sized to those on the extract in figure 1

¹⁹ The grid figures, in the strict sense, only appear on the post-1931 military version (GSGS 3907) of the Popular Edition: the civil version has squaring instead. Earlier military issues of the Popular Edition carry full co-ordinates at 10 km intervals, in a style that is more effective than elegant.

The most striking contrast between the Popular Edition and the *Landranger* is in the treatment of the legend. On the Popular Edition this occupies 22.8×2.3 cm (52.5 sq cm); on the *Landranger* it occupies 10.8×56.0 cm (605 sq cm), or nearly twelve times the area. It could be argued that the comparison is not strictly just, as an area on the ground 1 cm square at 1:63,360 is equivalent to 1.56 cm square on the 1:50,000, but even with an increase in the Popular's legend by 1.56 to 81.9 cm, the *Landranger's* legend still occupies more than seven times as much paper. Admittedly, the *Landranger* employs far more symbols: the Popular's legend shows about 52, the *Landranger* between about 150 and 170.²⁰ This vagueness is accounted for by an element of duplication in the *Landranger*, for example for bridges and earthworks in various contexts, or by using the same basic symbol for two superficially different features, notably 'aqueduct' and 'viaduct'. It must also be admitted that, whilst the Popular's legend includes most of the symbols used on the map, it excludes a few, for example coastal slopes and making the coniferous/non-coniferous distinction of woodland. The *Landranger* legend includes all the symbols used on the map, and also many of the abbreviations, even when, such as 'Ho' and 'Fm' these would seem sufficiently obvious not to require elucidation.²¹ Even when duplication is allowed for, the *Landranger* has to carry the burden of public rights of way, cycle routes, tourist information and symbols for features which either did not exist when the Popular Edition was being designed, such as heliports and motorways, or else were not mapped, such as spoil heaps. The *Landranger* also includes grid-working and other 'technical' information which the civil version of the Popular does not.

It is hard not to conclude that the *Landranger's* legend shows signs of a version of Parkinson's Law: in this case, the legend expands to fill space available. Even if the *Landranger* employs more area symbols, it surely ought to be possible to condense the symbols into no more than about four times the area that the Popular's symbols would occupy at 1:50,000 scale, that is about 320 sq cm, or an area of 10.8×29.6 cm.

Other marginal information on the *Landranger* includes trademark, series, sheet name and number – some 86 sq cm, of which about 42 per cent is 'white paper' – 'Customer information' (mostly 'small print' in standard-sized print), 'Technical Information' (including an adjoining sheet diagram: is this really 'technical?'), and grid-working. Some of this seems worth compressing into 'smaller type'.

²⁰ The original design for what became the Popular Edition, exemplified by the legend on the two *Aldershot* sheets of 1914, included two classes of steep gradients (soon reduced to one) and a symbol for 'Heath and Moor' (omitted after 1921); added later were symbols for youth hostels and electricity transmission lines; and from 1934 the road classification was modified. The count for both Popular and *Landranger* is complicated by questions such as whether the 'unfenced road' symbol should be counted once or as many times as there are road classifications.

²¹ Up to 2015 only 9 abbreviations were explained: now it is 18, and even then the still perplexed are told 'See our website for full list'.

An optimum size for a folded map?

In his 1993 article Chris Board described some styles of folding, but did not venture to analyse sizes. Later nineteenth and earlier twentieth century publicity for topographic maps often advertised them as ‘folded for the pocket’, so this may perhaps be taken as guidance. Figures 3 and 4 show respectively Ordnance Survey of Ireland 1:50,000 Preliminary Editions (folded size 12.3 × 17.5 cm) and an Ordnance Survey of Great Britain 1:25,000 Explorer (folded size 13.3 × 23.8 cm) in the same sports jacket pocket: the one is ‘pocket-sized’, the other decidedly not. Figures 5 and 6 show the same maps open for navigation in the front seat of a car: the OSGB map – the same size as the 1:250,000 *Travel Map* series – fits awkwardly.



Figures 3 and 4 (top). Five Ordnance Survey of Ireland 1:50,000 Preliminary Editions in a coat pocket - but for the flap being up, the only evidence of them would be a bulge - and 1:25,000 Explorer sheet in the same pocket.

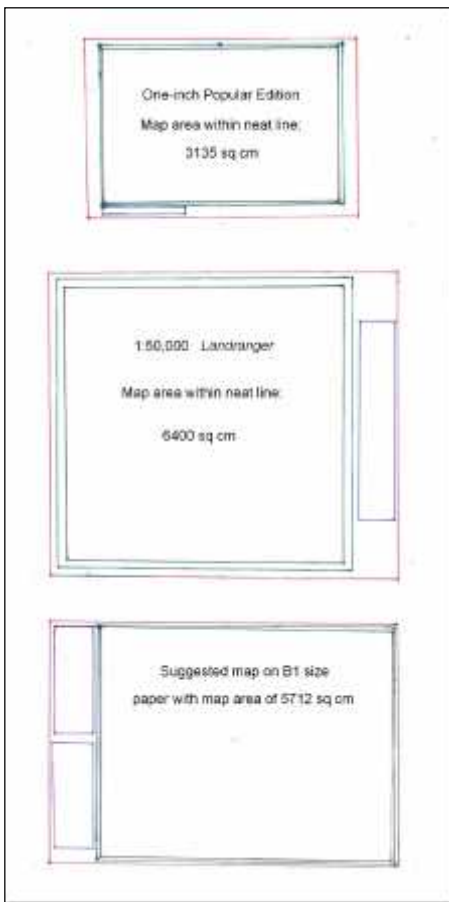
Figures 5 and 6. Ordnance Survey of Ireland 1:50,000 Preliminary Edition and Ordnance Survey of Great Britain 1:25,000 Explorer in the front passenger seat of a car.

A suggested map

A hint of what might be possible is provided by OSI's 1:50,000 Preliminary Edition sheet 78 of 1988. The paper area is nearly, but not quite, B1 size: 98.7 × 67.3 cm, compared with 100 × 71 cm for B1. The legend occupies 162 sq cm and

includes some 37 symbols: churches and triangulation points are shown on the map but omitted from the legend, though they could easily have been fitted in.²² The style of the map is decidedly 'basic', with uncased roads; foreshore is not shown. To this writer's mind it is an extraordinarily pleasing map, the ultimate in simplicity, and a challenge in both cartographic and in real-world terms.²³ It is suggestive, in size of paper, integral cover, minimalist content, and a minimum of 'white paper', of an alternative approach to that embodied in the *Landranger*. It is possible to conceive of a map designed along the following lines:

-) Paper size: B1
-) Folding: 8×4
-) Mapped area within neat line: 84.0×68.0 cm (5712 sq cm: 1428 sq km at 1:50,000, 357 sq km at 1:25,000)
-) Border: 1.0 cm in width
-) Legend: to be down either the left-hand or the right-hand side of the map: the upper half to be occupied by an integral cover, including indications of adjoining sheets, and the lower half to be occupied by the legend and any other necessary explanatory matter



This gives a map area of 80.4 per cent of total paper. An alternative is A0 size paper, 116×84 cm (9744 sq cm), folded 10×4 , and with a map area 102.0×80.0 (8160 sq cm), giving a map occupying 83.7 per cent of the total paper area.

A diagram of paper usage by the Popular Edition, the *Landranger* and the suggested map on B1 paper is given in figure 7.

An 'ideal' map?

The investigation in this article suggests that, if there is an optimum size for a topographic map, it is a map area of 84.0×68.0 cm, printed on B1-size paper, folded 8×4 . This makes good use of paper, and folds into a convenient space. It would impose some constraint on the content of the legend, which in turn raises the question of whether there is optimum map content. That can be addressed on another occasion.

Figure 7. The relative sizes of the OS one-inch Popular Edition and 1:50,000 Landranger, and a suggested map suitable for B1 size paper. Black denotes neat lines; green denotes outer limit of border and frame; blue denotes legend areas; purple the area allocated to integral cover; red the edge of paper.

²² Sheet 56, Preliminary Edition, dated 1989, has a modified legend, with 50 symbols.

²³ An alternative view is that it is riddled with 'silences', notably as to tourism and other indications of consumerism.