

ORDNANCE SURVEY – MAPMAKING AT ITS PEAK

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There is a basic human urge driving people onwards and upwards both metaphorically and in reality. An increasing number of people seek solace and fulfilment in the solitude, raw beauty and challenge of high places. Reaching the summit may be in no small way attributable to the information provided on an Ordnance Survey map.

This year, the nation's mapmaker is celebrating its Bicentenary, proud to have been mapping Great Britain for the past 200 years. Many people take its maps for granted but they have been described as "the best in the world" and it is interesting to cast an eye back over the busy productive years it has been in existence.

And it is to Scotland that we turn for the very beginning of it all. The Board of Ordnance – a large department of state responsible for the defence of the realm, and from which we take our name – initiated a national mapping programme in 1791. But Ordnance Survey's formation owes much to the prowess and foresight of Major General William Roy, a well known surveyor, engineer and archaeologist from Carlisle who died, sadly, before Ordnance Survey got off the ground. In his earlier career, Roy had been responsible for the production of a military map of Scotland following the Jacobite Rebellion in 1745. His beautiful hand-drawn map of the Highlands at the scale of one inch to 1,000 yards was in response to the army's highlighted need for clear, accurate mapping. The Battle of Culloden had been fought with hopelessly inadequate mapping; Roy's new map emphasised routes of communication and the lie of the land.

Roy subsequently worked on the measurement of a base line on Hounslow Heath (today the site of London's Heathrow Airport), a project sponsored by George III and the Royal Society to link up the Royal Observatories of Greenwich and Paris. Roy used a three foot theodolite for this surveying task, a wonderful piece of equipment built by Jesse Ramsden, the leading instrument maker of the day. Roy, as he established the Hounslow Base Line and went on to measure the lines and angles dependent upon it, was laying the firm foundations for the creation of the national survey of which he had long dreamt. But it was not until 1791, one year after his death, that the purchase of another Ramsden theodolite by the then Master General of the Board of Ordnance, the Third Duke of Richmond, really inaugurated the national mapping organisation that today is so pleased to be looking back over 200 years of mapmaking progress.

Based in the Tower of London for the first fifty years of its life, Ordnance Survey grew and developed in those early times. When Napoleon threatened to invade England from France, the whole mapmaking activity moved to the South Coast to ensure that the army had accurate maps of those counties thought to be most at risk. The very first Ordnance Survey map – a one inch to one mile map of Kent – was published in 1801. The threat of invasion never materialised but as

the subsequent more formally organised programme of survey and map production gathered momentum, so it became increasingly obvious that accommodation in the Tower was no longer adequate for the nation's cartographers. A severe fire in October 1841 accelerated the search for a new home and by the very end of that year Ordnance Survey had moved itself, lock, stock and theodolite, to new premises in London Road, Southampton. And Southampton has remained its home for the last 150 years. The present complex of offices was opened by The Queen in May 1969 and then, for the first time ever, all the varied processes of mapmaking were brought together on one site, practically under one roof.

So how are maps made today by the surveyors and cartographers belonging to the Government Agency with the military-sounding name?

The very same principles of mapmaking – measuring lines and angles to give every topographical feature its own related position – that Major General William Roy advocated more than 200 years ago are still very much in evidence. Accurate measurement and detailed survey are very much the order of the day, but whereas the early military surveyors trudged across marshes and up mountains with heavy theodolites, metal rods and chains – taking weeks if not months to complete their task – today the entirely civilian OS surveying fraternity can come up with instantaneous measurements and positions using satellites and high-technology electronic distance measuring equipment.

A visitor today to Ordnance Survey's Southampton headquarters would find almost 2,000 men and women engaged in the various processes of mapmaking. He or she would find teams working in the Photogrammetric Services area operating mind-boggling machinery that can convert information from pairs of overlapping aerial photographs into map detail. Ordnance Survey has nearly a quarter of a million maps in its care, some of which are at such a detailed large scale that you can see bay windows and outbuildings and new extensions on individual properties. Revising all those maps takes some doing and the most cost effective way is to send up an aeroplane. Ordnance Survey currently uses a Piper Chieftain based at Blackpool which has been converted to take in its belly a huge camera the size of a television. This camera can capture a whole predetermined sequence of black and white shots from a specific height – depending on the scale of map being revised – and once processed these nine inch square photographs prove an essential part of the revision process.

But aerial photography can't provide a complete picture. Important features may well be hidden underneath shadows, or overhanging roofs or vegetation, and remarkably few British householders paint the name or number of their properties on the roof in letters or numbers large enough to show up in an aerial photograph. The completion of the revised map is down to the surveyor "on the ground" and teams of surveyors are based in locations up and down the country for that very purpose. There are somewhere in the region of 800 field staff located in 120 offices. In Scotland there is a regional headquarters in Edinburgh, and the surveying effort itself is organised through a network of offices located in other

key sites such as Inverness and Ayr, Glenrothes and Glasgow. Altogether there are 101 staff working for Ordnance Survey north of the border. The contrasting landscapes of Scotland are reflected in and related to the personnel distribution. Fifteen of those staff are involved in the constantly changing and developing city of Glasgow. In comparison only ten are working from the Inverness office to ensure that the wildly beautiful but largely unchanging 7,500 square kilometres of the Highlands and Islands are accurately mapped.

Once the aerial photography has been taken and the surveyor has completed his or her final detail, it's over to the draughtsman back at Southampton. Years ago this was a painstaking labour of love involving fine engraving on copper plate. Nowadays at Southampton you can still find cartographers poring over a light table and scribing detail for a revised sheet in the popular Landranger Series. Plastic "scribecoats" are the media used in place of the heavy copper plates and the draughtsman uses a fine sapphire needle scriber to make an impression on the plastic surface of one of the twenty five or so different components that together form a Landranger map. A full revision of one of these maps can take upwards of a year, and almost as soon as it has been printed it may well be time to start the process all over again. The task has been likened to the painting of the Forth Bridge.

But more and more Ordnance Survey maps are now computerised and the majority of cartographers are at work "digitising" the maps of Great Britain – converting them to computer readable format. Each feature is given its uniquely related set of co-ordinates so that it can be stored in the databank and retrieved whenever revision is necessary. Customers today may not want to buy a map as such – they may want to purchase OS digital data so that they can overlay their own information (pipelines or cables, for instance, in the case of the Utilities) on top of the map detail.

Once digital data has been databanked and structured, a whole new world opens out and the applications of this data in Information Systems are many. For instance, Ordnance Survey has taken the road centreline data for all major urban areas up and down the country and incorporated it within an in-car navigation system and although Ordnance Survey's remit is the mapping of Great Britain, the fact that 1992 heralds closer ties with Europe has not been forgotten. Funded by the European Commission is an exciting project called PANDORA (Prototyping a Navigation Database of Road Network Attributes). The research team involved with PANDORA comprises Ordnance Survey, the AA (who possess a wealth of information about roads – their width, bridge heights, classification and the number of lanes) as well as Philips Consumer Electronics and Bosch Mobile Communications, both of whom will be able to road test the database on their new in-car navigation systems. The aim is that the database will have a common specification so that no matter where in Europe you travel, you will be able to rely on consistent, accurate and current information.

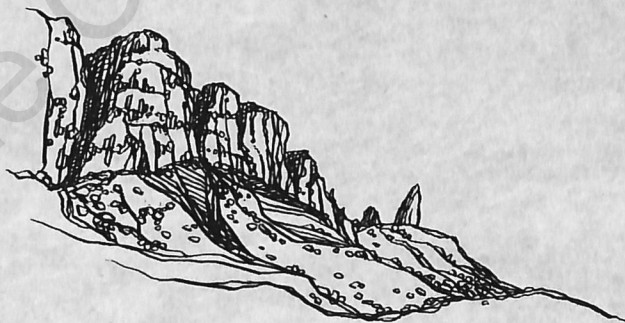
Having watched photogrammetrists and cartographers at work our visitor would also have been interested to visit the print floor to see the range of printing

presses, the largest of which is capable of turning out 8,000 small scale maps during an hour. Large scale maps are not printed in such vast quantities – they are very expensive to produce and are required by a much narrower range of customers. In some areas of the country these professional customers are able to purchase an individual plan, computerised and updated and produced to their very own specification. London-based customers for example can buy a printout of the very latest mapping information at whatever scale and covering whatever area they require. The days when you need to buy four maps because you just happen to live on the corners may well be numbered...

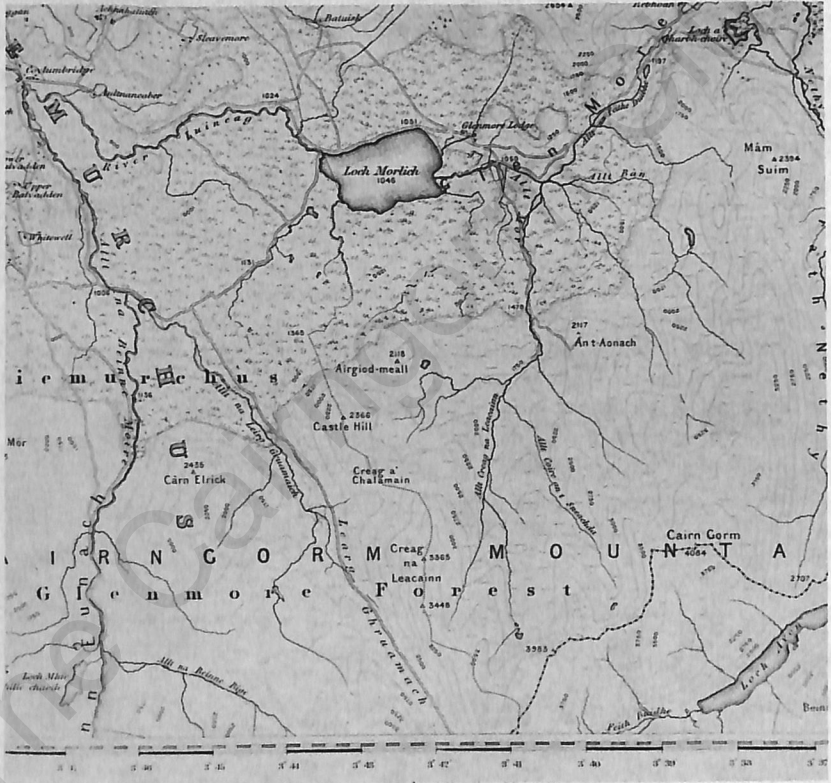
With so many different maps in its care Ordnance Survey keeps itself fairly busy. It juggles its carefully budgeted resources to try and ensure that up to date maps are the order of the day for all its customers, be they motorists or miners, archaeologists or adventurers. It produces maps for rambling, touring, education and administration and appropriately enough, in its Bicentenary year when many people want to spend time thinking about the history of the nation's mapmaker, it produces superb copies of its superseded maps. These incredible "snap shots in time" are invaluable to those researching the past and to those who want to see a location as once it was. Old hand-drawn Ordnance Survey maps provide an opportunity to wallow in nostalgia – and there are many Ordnance Survey fans who are appreciating how collectable some of the older editions of maps may be.

Peter McMaster, Glasgow-born Director General of Ordnance Survey, places a very considerable emphasis on the importance of the customer.

"We must listen to what our users say and service those needs," he says, "If they don't want our maps we can pack up and go home".



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Section of the Ordnance Survey first edition one inch Grantown Sheet 74, published in 1877.