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UXBs and UXOs: acronyms that might go bang!

Two new websites are delivering information about the Blitz from archived mapping. One aims to provide risk assessment on unexploded ordnance and bombs at UK sites for commercial use, the other aims to educate the general public – both share the use of geographic information at the heart of the service. Our editor, Robin Waters, decided to take a closer look.

UXBs and UXOs are acronyms that might go bang, and together with spatial analysis techniques provide a preliminary unexploded ordnance risk assessment. Bomb Sight, on the other hand, is a free access website aimed at the general public and has been created by the University of Portsmouth and funded by JISC, which provides higher education and research funding for digital technology.

Our publisher has also lent me a copy of ‘The London County Council Bomb Damage Maps 1939-1945’, which was published in 2005 by the London Topographical Society. Taken together these tell a fascinating story about the Blitz and about other attacks on London as well as the enemy or friendly munitions that might be found elsewhere in the UK.

Friends and foes There are two main sources of UXO risk in the UK – ‘friendly’ activity by our own military (and our allies) and bombs and other projectiles dropped during both world wars. Ministry of Defence activities that could have left UXOs include munitions left by training exercises, ineffectively cleared dumps and defensive installations. The latter include decoy sites, anti-aircraft batteries, airfields (possibly with pipe mines laid under their runways) and other military installations. The locations can be determined from various historical maps and records.

Bombing during WWI was relatively light but during the Blitz (1940/41) and the rest of WWII there were many thousands of bombs dropped on London alone as well as later strikes by V1 flying bombs and V2 ballistic missiles. Local authorities were responsible for recording bomb hits within their boundaries and also for recording the damage to buildings so caused. Although many unexploded bombs (UXBs) were recorded and dealt with at the time, it is assumed for the BombRisk service that the likely density of UXBs is directly related to the density of recorded bomb hits and damage.

There are detailed Bomb Census Maps compiled for London now held in the National Archives (www.nationalarchives.gov.uk), see figure 1. There are also very detailed 1:2500 Bomb Damage Maps covering the London County Council (LCC) area that record damage throughout the war and include the specific locations of all V1 and V2 impacts. Unfortunately, these very detailed maps can only be viewed by visiting the London Metropolitan Archives and are not available on the web.

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However, they have been compiled at a scale of 1:5500 into a large book by the London Topographic Society with a very detailed description of how they were created and of the derived statistics, although this book is now out of print. The “Blitz” is generally recognised as the period from September 1940 – when the Luftwaffe switched from attacking airfields during the Battle of Britain – to May 1941 when Hitler ordered his air force to the Eastern Front for the attack on the Soviet Union. There was a second “baby blitz” in early 1944 with conventional bombing before the V1 offensive between June and September 1944 and the barrage of V2s, which continued from September 1944 to March 1945.

BombRisk According to the Construction Industry Research and Information Association (CIRIA) over 15,000 items of ordnance were found on construction sites in the UK between 2006 and 2009. Current CIRIA
guidelines recommend a review of potential sources of UXO as part of the planning process (www.ciria.org).

‘Unexpected UXO encounter on a project not only exposes personnel to risk but it can also lead to delays and increased project costs. Such a UXO discovery can lead to a knee-jerk reaction to UXO risk, potentially incurring unnecessary cost or in some cases inappropriate UXO risk mitigation measures,’ says Phil Baptie, senior project researcher at BACTEC.

BombRisk.com was developed by FIND and BACTEC to provide preliminary risk assessment satisfying phase one of CIRIA’s “best practice” recommendations. It is designed to enable a non-UXO specialist to identify a site, get an on-line assessment of exposure to the potential risk from UXO and to identify whether or not a more detailed study is required.

Creating an online, easy-to-use website to deliver on these goals was no easy task. It involved collating the best available data on UXO in the UK; digitising these disparate data sources into one fully geo-referenced database; creating an algorithm to determine risk factors; creating an automated report populated with risk maps, distances from potential UXO sources; and publishing this information as a PDF document that could be ordered from an e-commerce website.

Assessing UK UXO risk  The primary function of BombRisk is to determine whether or not a detailed risk assessment is required for a site. This risk is directly related to the proximity of the site to identified and located risk factors, the risk decreasing with distance. To calculate the complex and overlapping risk ‘surfaces’ from the individual data points and areas, GIS technology was employed.

The system looks at the risk scores from both air-delivered UXBs and from British/Allied UXO. For UXO, risk rating “contours” were placed around potential sources or indicators, which reflect the potential risk from that source. For example, a historic military airfield site would be given a higher score than the location of a WWII pillbox, and would cover a larger geographic area. BombRisk takes multiple risk “landscapes” and assigns a combined potential risk value from UXO for a particular site that ranges from “negligible” to “high” (see figure 2). In the same way, the system also produces a risk score that relates to an assessed level of risk from air-delivered UXBs (see figure 3).

Report generation and assessment While the calculation of the overall “BombRisk” for a site uses some sophisticated software, it is important that the

BombSight: The Public Interest

Bomb Sight does not claim to be as comprehensive as BombRisk but uses maps of the London WWII bomb census, taken between October 1940 and June 1941 and until now only available to view in the Reading Room at The National Archives. The locations of the bombs have been combined with geo-located photographs from the Imperial War Museum and geo-located memories from the BBC’s WW2 People’s War Archive.

Zooming on this map gradually resolves the red dots into individual bomb impacts that can then be clicked for further details, pictures and news including first-person stories from survivors at the specific site, collated by the BBC. The examples show an overview for the first night of the Blitz with the time that the bombs dropped and a close up of Westminster for the entire period with the detail for one bomb near Parliament.

There is also an associated Android app that gives users an augmented reality view. When pointing their phone at a street scene, it uses the phone’s camera and GPS to display the bombs that fell nearby.

Above: Figure 5 – Bomb Sight showing bombs on Westminster during the whole of the Blitz.

Left: Figure 4 – Bomb Sight showing First Night of the Blitz - 7th September 1940.
The London Topographical Society, founded in 1880, is a publishing society which concentrates exclusively on books and sheet material illustrating the history, growth and topography of London. In 2012 we published a fully illustrated catalogue of the 2007 British Library exhibition of London maps and in 2013 we shall be publishing the A to Z of London in 1682 based on William Morgan’s map, complete with index and references (www.topsoc.org).

delivery of the report is in a format that does not require the recipient to acquire or use such complex tools themselves. The report contains explanatory text, bespoke mapping, data tables and recommendations all of which are derived from online spatial databases using the bespoke software tools enabling real-time analysis.

Once the risk profile has been generated for a site, the highest risk rating from either the WWII UXB or Allied and British UXO risk assessments is used to recommend more detailed investigation. Thankfully, most UK sites can be screened out by the report, with no further UXO related research or work required.

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Company Background: FIND
FIND is an advanced online mapping tool for businesses claiming to hold the largest instantly accessible map and data library available. Ordnance Survey maps and aerial photography can be viewed, annotated and printed or exported to GIS or CAD formats for technical uses.

Company Background: BACTEC
The BACTEC (Battle Area Clearance, Training, Equipment and Consultancy) Group of companies is comprised of a number of leading Explosive Ordnance Disposal, (EOD (Bomb Disposal)), Mine Action companies operating worldwide from strategically located offices. The Group Head Quarters is located with BACTEC International Limited in the UK, with offices/branches located in Australia, Cambodia, Iraq, Lao PDR and Mozambique. BACTEC has been providing unexploded ordnance (UXO), landmine clearance and bomb disposal services globally since 1991 and to date has carried out Unexploded Ordnance disposal contracts in over 45 countries.