

Approaches to Web Access to Aerial Photos Held at the NMRC

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Abstract

The National Monuments Record Centre (NMRC) holds the largest collection of aerial photographs in England. While a remote co-versearching service operates, the collection's location in Swindon (Wiltshire) limits direct access to the resource. An online catalog with a GIS-based system of coversearching is planned to enable greater access. Methods of managing the data to provide a resource for professionals but also accommodate the wider public with little experience of aerial photos will be discussed. Consideration of current online systems used for presentation of aerial photo data and other large datasets will be explored in order to ensure best practices is adopted in the design of the application. The impact on the working practices of those handling aerial photo enquiries at the NMRC will also be explored.

Introduction

The 2004 National Monuments Record (NMR) Review produced figures demonstrating that the aerial photograph collection is the NMR's most used resource (English Heritage 2004, Appendix A). The associated public consultation exercise revealed provision of aerial photograph information online as being one of the most desired improvements to NMR services (English Heritage 2004:Appendix A). For this reason the second phase of the NMR Programme includes presentation of what is currently an internal database, Photonet, as an online resource (NMR Programme Brief 2005:6). This paper considers approaches to presentation of such data by reviewing existing online resources and identifying users' needs. The impact that access to this data may have on working practices at the NMRC will also be considered.

2 Managing the Data

As a public body the National Monuments Record must provide resources for all comers despite it being mainly used by professionals working in heritage or a related field (English Heritage 2004:Appendix A).

2.1 Presentation Issues

Many more websites presenting aerial photograph data are available than those discussed in this paper. The examples used here have been selected in order to demonstrate the broad range of methodologies being used for their presentation of good practice, as well as to discover potential pitfalls.

Ways to Access the Data: Grid References and Civil Administration Areas. While those of us who use maps

and GIS regularly as part of our work do not think twice about using coordinates or national grid references, the general public, in the UK at least, frequently has no experience in finding a location this way. Acceptability testing for the Timescape Wiltshire project (Shalders 2001) demonstrated that non-specialists when asked the initial question "where do you want to look?" will answer with a place name. In the UK, respondents usually name a village or town. The next dilemma is working out which parish, district, or county in which that village or town is located. Providing both map reference and place name search tools is desirable in order to achieve maximum access to the data.

Avoidance of the need for either a place name or a specific map reference has been achieved by several websites that offer aerial photograph data. While these have varying degrees of success, elements of the methodology may provide solutions for the NMRC's planned project.

The Australian Geoscience website (Government of Australia 2005) provides an interactive map that allows the user to choose a block from the national grid on which to search. The map displays territory boundaries and summary location information for grid squares when moused over. Australia is a big place; achieving an accurate result requires resorting to alternative maps that give greater detail. A search for aerial coverage of Coff's Harbour, for example, was quickly rewarded as the location is significant enough to feature in a grid square name.

The Norfolk County Council (2005) E-map Explorer also starts users off with a map of the entire area covered. Norfolk being somewhat smaller than Australia proves less problematic for searching, but as the initial map is small and uses a grid of kilometer squares, it can take several attempts to get the cursor in the right spot. The alternative search options of postal (zip) code and national grid reference are offered, though the latter did not work consistently at the time of testing. Offering postal codes may prove adequate

for use by those residents in the area being under search. The test use carried out for this paper used the scenario of a researcher seeking aerial coverage of a monastic grange site in the parish of Lessingham. Finding the full postal code for the site proved impossible. A grid-reference-based search found no coverage. However, a search by parish name did find coverage.

A similar approach has been taken by the Royal Commission for Ancient and Historic Monuments in Scotland (RCAHMS) with the Airphotofinder website (RCAHMS n.d.). It should be noted that this website was developed as a prototype for sharing aerial coverage data between the British Royal Commissions and as such has had only a “soft” launch to the public. That said, the accessibility of the location tools does much to recommend the site. Zooming from the map of all Scotland with high-level information brings greater detail, ensuring the user has found the right location. The national grid is used throughout. This site offers more than Geoscience or the Norfolk E-map Explorer (Norfolk County Council 2005) in its use of zoomed-in mapping, allowing the user to be sure the area selected is what is wanted. There are alternative “ways into” the data, such as place name and grid reference offered with the “zoom to” function. This site is notable for offering a range of aerial photographic collections alongside the map, presented in layers controlled by the user. The detail for the photographs selected is given after the photograph has been selected.

The French Institut Geographique National (IGN N.d.) has opted to use the names model, based on the smallest pan-French civil administration unit, the commune, as the primary means of location on their map and aerial photograph website. Overall, this works well as communes tend to be smaller than UK parishes, averaging some 10.7 km squared (www.answers.com/topic/commune-in-france), allowing a whole commune to be displayed at one time at a scale appropriate to the aerial photography requested. The only search offered is by commune. A search intending to find aerial coverage of the chateau at Nantes requires the user to know its location within the commune as the map displaying the flight plans is at too small a scale to view such details.

The websites considered indicate that provision of a grid system large enough to allow users to see a base map with location information offers a quick and easy way into a coversearch and is a sensible way forward. Provision of links to larger-scale mapping with a further selection via a tighter grid may resolve the issue of clarity. It is clear that presenting more than one way into the data is required in order to meet the needs of both local and national users. While local users are likely to know their postcode, those working from elsewhere are able to find the parish name and national grid reference on alternative mapping. Guidance on finding parish and NGR information should be included in help pages or “wizards.”

Understanding What Is Presented (or Attempting to Please All of the People All of the Time). The reports produced by the NMR’s internal aerial photograph data management system are complex and require considerable

explanation. Through working with data drawn from various NMR users, it has become evident that even professional archaeologists are not necessarily aerial photography experts and require guidance on receipt of a coverage report. Careful thought must be given to what is presented in online results and to what extent online help can answer related queries.

The majority of online resources considered here present non-stereoscopic, vertical aerial photographic data only. This type of image equates most easily with maps, allowing display of the “footprint” of the aerial photograph on appropriately scaled maps. Presentation of data such as scale and camera position, which may be of concern to the professional user, requires explanation for the majority of users.

The IGN website (IGN N.d.) provides an initial list that includes data on date, scale, and the percentage of the run within the target area. A comprehension of scale is key to ensuring the run chosen will be at a great enough scale to show the information required. This website displays the selected results geospatially, the most clearly of all those considered, showing firstly the center point of each photograph in a run, then, on user selection of a center point, the area covered by that photograph. The joy of this is that even someone who has never used an aerial photograph before can see exactly what area will be covered by the selection. The risk is that the information on the scale of capture might lead to disappointing choices.

The Geoscience aerial photo service presents the user with flight data including scale, camera position, and the name given to the flight path. No explanation of these data is given. In contrast to the IGN site, the reference for the image required must be noted using pen and paper from the scanned flight diagram of the selected flight path. A footprint is not offered. The scans are of highly variable quality; on some densely printed urban maps, such as those covering Sydney, the flight plots are hard to see. The search results include stereoscopic cover and a note explaining which photographs from a run are needed to view stereoscopically is provided but this does not include an explanation of *why* these are needed or *how* to view such photographs.

The Norfolk E-map Explorer provides a view of two aerial photographs at the end of the search, which is a rarity. These can be compared with and overlain on a choice of historic maps. For the non-specialist user or the student with a burgeoning comprehension of the use of aerial photographs this is a valuable extra tool. There are clearly limitations for the professional user: a limited choice of photographs, and the enlarged view cannot be seen as a single screen view. The search for coverage of the Lessingham monastic grange found one aerial photograph of Lessingham parish from a possible two returned photos. Unsurprisingly, the photograph covered only part of the parish; fortunately, it was the part with the required site on it.

The risk of presenting full vertical coverage in a single view is best demonstrated by the Airphotofinder site. The mass of lines and dots presented proves off-putting to most new users. Tools to view each collection separately are offered but without overt instructions on how to use the tools.

It is worth noting that Airphotofinder was the only

website in the study to attempt the presentation of oblique aerial photograph data. Despite this being a project website rather than a polished product ready for release to a wide-ranging audience, there are elements from which lessons can be learned. Only the center point of each photograph is plotted; obliques taken at particularly acute angles would generate rhomboid footprints, sometime covering tens if not hundreds of miles. The data structure is brief, as in the verticals, but clean. Sadly, the data are incomplete for the oblique collections.

The websites reviewed indicate that most clarity is provided to the user where coversearch results are presented as a mixture of maps and flight information report data. Using a range of mapping to allow greater detail to be displayed as the user refines a query as on the Airphotofinder website should enhance the ability to find the correct location.

Presentation of flight data that all users can understand remains a challenge. The IGN basic listing from which a flight is selected for viewing before presentation of a map resolves a lot of the problems of an initial map display of a forest of lines as might be returned by Airphotofinder. However, the presentation of this information as map layers on the same site allows a reasonable degree of clarity. Manipulation of the data layers requires clear explanation. Selectable center-points which then highlight the photograph's footprint would confirm the certainty that the correct coverage had been achieved. Whether the flight data are displayed after the photograph is selected or before, clear explanation of the terms used must be provided.

2.2 Existing Audiences

Existing audiences fall into two broad groups, internal users and external users. While this paper will focus on the external users, the internal audience requires some consideration for the impact of its demands on the resource.

Internal Audiences. Internal users, those people who work for English Heritage, currently access aerial photograph information in a similar way to the general public, via a coversearch request made to the Enquiry and Research Services team. Projects such as the NMR National Mapping Programme and the Monument Protection Programme rely on aerial photographs as a primary data source. In cases of urgent need, such as the Silbury Hill subsidence, aerial photographs provide the most immediate source of information. The increasing internal usage is demonstrated by the rising number of internal queries: in 2001-2002, 8% of aerial photograph queries were internal; by 2004-2005, this had risen to 10%. It is intended that the majority of internal queries will use the Web query service in the same format that it is provided to the public.

External Audiences. The majority of queries for information made to the NMRC are from the general public. The typical user is white, middle class, and between 25 and 44 years of age (English Heritage 2004, Appendix A). Of these, the largest user group consists of people who use heritage resources professionally: conservators and educators. The

second largest group of enquirers are from the elements of the commercial sector concerned with conservation, environment, and planning (English Heritage 2004:13). Of all queries made, some 40% are for aerial photograph information (English Heritage 2004, Appendix A) (Table 1). However, a small but significant number of queries about aerial photographs are made by people who use the collection once for a very specific purpose such as resolving a boundary dispute. Thus, any online resource must cater to the needs of this wide range of users.

Table 1. English Heritage NMR Enquiry and Research Services figures for aerial photographs, 2002-2005.

Date	Enquiries Made
2002-2003	3,312
2004-2005	3,757

As noted above, a solid user base for the aerial photograph collection already exists. However, the location of the NMRC in Swindon limits the number of enquirers who can visit to check through the results of a coversearch. The desire for aerial photograph information online reflects this situation.

At present, any refinement of a remote query has to be managed through a combination of telephone and email. Surveys indicate that 92% of NMR users have Internet access but telephone remains the most common means of contacting the NMR (English Heritage 2004:15).

Working from the initial coversearch report, the user's requirements are narrowed down by the specialists in Enquiry Research Services. It is intended that some of this work can be reduced by enabling the user to begin the process of refining the query prior to contacting the NMRC.

2.3 New and Hard to Reach Audiences

The 2005 "Heritage Counts" survey found that heritage is a highly valued resource and that people from across society want greater access to it (English Heritage 2005:93). An earlier survey revealed a third of the population wish to know more about their local area (English Heritage 2003:14). Producing the aerial photography dataset online will provide a resource, which alongside other planned online datasets such as the monuments index, will provide access to all who want it.

The NMR continually strives to encourage new groups to use its resources (English Heritage 2004:14); the aerial photograph collection is no exception. Ensuring that the data are available in accessible formats for new users as well as providing a service for experienced users will be one of the main challenges of this project. Of the 64% of adults in the UK who use the Internet, 86% are doing so from home (ONS 2005): the obvious way to attract new users is through provision of resources online. Even so, the "build it and they will come" philosophy does not work; careful use of promotional activities to engage potential users is vital (Morris 2005).

Work with the NMR Education and Outreach Office to create a focus group of non-specialist adult users has provided an understanding of what a non-specialist user wants from the planned service but also created a new group of users for the aerial photograph collection. This group is mainly composed of retired people with an interest in local history but without a formal education post-16 years of age (UK minimum school-leaving age).

Future work will include collaboration with the education sector: secondary, tertiary, and informal. Training days, a teachers' handbook entitled "Aerial Photography" (English Heritage 2002), and provision of teachers' packs tailored to individual requirements are already proving a success in increasing schools' usage of the collection. It is intended that the online resource will compliment these resources by allowing students to retrieve information for themselves for work in several subject areas, notably history, geography, and citizenship, as well as information technology (IT). With use of the national aerial photography collection woven into the curricula of many schools, it is to be hoped that youngsters will return to this resource throughout their lives whether for professional or general interest use.

Using organizations with Internet provision such as public libraries and village/community IT centers through talks and courses as well as conventional paper advertising has proved a successful means of presenting new digital resources (Shalders 2001:14). Many other methods of spreading the word are well known. The benefits of working with other heritage resources such as national and local archives, relevant local authority services, and museums by providing information and webpage links cannot be underestimated. Newer methods of Web promotion such as list announcements, blogs, and newsfeeds, matched with paper publications including newsletters, will also be used to entice users to the new service, as well as the more conventional use of keyword and search-engine methods.

3 Proposed Solutions

3.1 Universal Requirements

As is recorded in a range of resources across the Internet, there are certain key heuristics in any successful website which will garner success. Those described by Jakob Neilson a decade ago still form the core of many good websites and have been adapted to the purposes of this project (Neilson 1996). However, ten years is a long time in Internet terms, and other considerations, borne of this writer's experience of other Web projects, also merit inclusion.

Being Honest. The prime requirement can be described as "The Honesty Imperative." At the outset, a website of this type must be clear about what it offers. There is a huge risk that users coming across references to this sort of resource are going to anticipate extensive, extravagant online access and possibly download facilities for all the aerial photographs in the NMR collection. The collection holds over 2.75 million aerial photographs; very few of these have

been scanned, though the majority of new material is born digital. It is beyond the scope of this phase of the project to digitize the entire collection. Success of this phase may lead the way to a gradual presentation of digitized resources in subsequent phases. It is likely that images will be used in explanatory sections of the website. Presentation of a range of online galleries is an aspiration of the project, which must be made clear to users. Similarly, it is vital to be sure that the technology to run the site as billed really works. The frustration of the non-functioning tools such as the national grid reference search on the Norfolk E-mapper site may well lose users permanently.

Well-written introductory texts, clear guidance for users, and correct information about what to do to get extra help or further information should make clear what can be achieved with the resource and thus nurture user confidence.

Ensuring User Confidence. The user must have confidence that the data are valid. Where this is found not to be the case, the user is unlikely to return. In that instance, the catalog on which the Web service will be based is maintained to the highest standards of data control. The data management entry system in use since 1987 has been designed to eliminate errors through integrated checks during the cataloging process. Where older data not entered under the current system or from collections inherited from outside the NMR are referred to, levels of accuracy must be made clear.

Adoption of Accepted Data Standards. This paper has already considered the options for presenting geographical data for searching. It is preferable that both options described above are offered; these must be founded in the established national grid and the county, district, parish nomenclature. Likewise, use of the National Monument thesaurus and MIDAS terminology will ensure maximum success for searches. Methodologies for structuring the data such as Dublin Core will be adopted.

Accommodating Fluid Users. It is far easier, when creating guidance for users, to assume that all in a particular group have the same knowledge or that their skills are static. It is more useful to see users as having fluid needs: their expectations changing as they grow familiar with the resource. For this reason, help, guidance, and a glossary must be offered across the application at a variety of levels with the user able to move easily from basic to complex assistance and back again.

3.2 Multi-entry Approach to Searching

As discussed above, there are several existing groups within the user population for the existing aerial photography coversearching service. These have been identified from the types of queries currently received by the Enquiry and Research Service at the NMRC. They form the basis for a series of core user types which will be offered at the commencement of a query.

Professional Users/Skilled Amateurs. While many of

these will comprehend some or all of the report generated from a coversearch, it is unlikely they will be aware of the steps to carry out such a search. Knowledge of archaeology, history, or aerial photography does not guarantee knowledge of the workings of a Web resource. For this reason a step-by-step wizard should be offered to users, although they may opt not to use it. Some assumptions, such as the users' abilities to search by national grid references and comprehension of map scales will differentiate the facility for this group from others proposed.

Educational Users. Teachers and students from 11 years of age to undergraduate are all included within this group, but it also includes "life long learners" who may be engaged in formal or informal learning. Information to complement the "learning packs" already available to teachers will be offered as well as a "wizards" for new users at different stages within the school curriculum and at undergraduate level. It is hoped that users in this group will progress to more complex usage of the data as their education advances alongside the predicted upsurge in e-learning provision (Butcher 2006). The option to access all levels of explanatory notes will be offered.

One-off Specific Queries. One-off queries range from those seeking an aerial view of their home, to people requiring information to settle legal disputes concerned with property boundaries, to those who are just curious. While these people may only use the service once, their experience should be a positive one as a website's best advertisers are its happy users. There is also the hope that having had a successful time, these users will be inspired to visit again. A step-by-step process accompanied by a Frequently Asked Questions (FAQ) section is intended to move the user towards the desired outcome. A series of models of common queries may be offered. It is possible that these users will be presented with limited lists of five images that best meet their requirements; this would be sent to an NMR specialist who would select the best match for the user.

Casual Browsers. This group's needs may be met to some extent by the popular Viewfinder website (viewfinder.english-heritage.org.uk), which provides themed galleries based around all the NMR's photography collections, terrestrial and aerial. However, the argument for an aerial-photograph-specific gallery is strong. This would complement the searching facilities by providing an alternative introduction to the world of aerial photographs. Aerial photographs of popular historical and archaeological sites could be displayed as digital galleries. Linkage to the searchable areas of the site should be prominently presented to encourage further exploration.

Progressing Users. It is to be hoped that those who start using the online service as casual or educational users will return and use the system again, advancing to more complex methods of searching and with greater comprehension of the listing reports generated by their queries. For this reason, consistent style and approach will be required across the website.

4 Impact on Working Practices

The likelihood that the members of the public, in all their guises, will be able to conduct their own searches for aerial photographic cover and will inevitably have an impact on the way Enquiry and Research Services at the NMR works, especially in the nature of enquiries made. By providing people with the means to conduct their own coversearches and offering online guidance to what the returned results mean, many users will contact the NMR Enquiry and Research Services Team at a different stage of their query.

4.1 The Experience of the Other British National Monument Records

The National Monuments Record of Wales online database service, Coflein, and its Scots equivalent, CANMORE, although not directly comparable with what is being planned for the NMR aerial photographs collection, do offer experiences of changes in working practices in the area of responding to public queries and thus have relevance in assessing the impact of presenting data for querying online. Garnering the benefit of their experience will ensure that any pitfalls encountered can be avoided and any positive outcomes incorporated.

Indications from the figures available for CANMORE are that Web access to resources has not hampered the speed with which the public is assisted as a result of queries that originated online (RCAHMS 2006). While the Royal Commission on the Ancient and Historical Monuments of Wales Annual Report indicates 89% user satisfaction with information service responses, data are not broken out on origins or types of queries (RCAHM 2002:15). Neither of those NMR organizations has published reports that identify the specifics of how the nature of enquiries or their management has been changed by provision of online resources, but conversations with colleagues from the Welsh NMR indicate that following an initial upswing post-launch, the numbers of enquiries stabilized at the previous level. The change has come in the nature of the queries; it appears that users are approaching the physical resource better informed, and thus queries can be more complex.

4.2 What Happens Now?

It is hoped that the go-ahead to begin work on Public Photonet will be given in autumn 2006. By that time, work with user groups will be well underway and will inform the specification for the website. The second phase of the NMR Programme includes presentation of the aerial photograph data online. This phase is due to start in 2007, subject to approval of funding. It is hoped that the first version of the website will be live and available for use testing and general use in 2008.

5 Conclusions

Provision of access to this resource will meet one of the major demands identified during the 2004 NMR Review: learning from the experience of other online aerial photographic resources. In addition, the incorporation of the latest Web-based GIS technologies should enable the NMR to create a dynamic resource. Through consideration of the views of potential users and the application of the heuristic framework presented here, the planned delivery of this Web application will form an intrinsic part of the NMR's online resources facilitating the widest practical range of users.

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