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British inter-war aerial photogrammetric mapping in the MENA region: archives, access and research potential

Michael Fradley 

The use of aerial photography in the Middle East and North Africa region stretches back to the First World War. While historic aerial photography has continued to be utilized in research in the region, there has been only limited consideration of different photographic sources. This paper will focus on the use of aerial photography by British forces in the MENA region for photogrammetric mapping missions in the period from the First World War through to the start of the Second World War, when large areas were surveyed via the capture of overlapping vertical photographs. The discussion will cover the survival and archiving of these collections, as well as current issues of access, as well as their overall archaeological potential, particularly as an early source of earth-observation data, comparable to more recent satellite imagery archives.

Keywords Aerial photography, photogrammetry, digitized archives, cartography, Jordan

Introduction

The use of historic aerial and satellite imagery as a tool for identifying archaeological sites is a well-established methodology, particularly in regions that have subsequently been subject to significant agricultural or built settlement development. This paper looks at the development of access to this form of imagery data covering the Levant region, and the value of an open platform, such as the Endangered Archaeology in the Middle East and North Africa (EAMENA) database, for providing digital signposting to this material. Focusing particularly on photography produced by the British Royal Air Force (RAF) in the inter-war period (1918–1939), this paper will explore the background and archival history of historic aerial photograph collections, particularly imagery taken as part of comprehensive photogrammetric mapping missions, highlighting how important this work is for tracking down and opening access to these important datasets.

Background

The EAMENA project, based at the universities of Oxford, Leicester and Durham, is a major study of archaeological sites and their condition across the region. The project primarily uses recent, open-access satellite imagery for its analysis, but also utilizes historic aerial and remote-sensing imagery where available. While some use has been made of imagery from the First World War, particularly along the Western Front, most research has focused on archives from the Second World War and later (see Hanson and Oltean 2012). The imagery is used to identify and interpret archaeological sites, and where multiple imagery dates are available, to monitor changes to the condition of those sites. Any aerial or satellite imagery can be useful in informing this analysis, even that captured relatively recently, due to the rapid rate of landscape change in many parts of the MENA region.

Data created by this process is housed on a tailored Arches-based platform that can be openly-accessed on application (Ten Harkel and Fisher 2021; Zerbini 2018). While the primary datasets are heritage data records relating to specific archaeological sites and landscapes, the platform can also hold geo-located

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information records including photography. The EAMENA project was developed as a sister project to the Aerial Photographic Archive for Archaeology in the Middle East (APAAME), and the EAMENA platform is linked to parts of the photographic archive of the Aerial Archaeology in Jordan (AAJ) project, the latter made up of aerial photographs of archaeological sites in Jordan taken since 1997, as well as bringing together historic photograph collections (Bewley and Kennedy 2012). The APAAME collection includes the digitized archives of the UCL Institute of Archaeology's Crawford collection of RAF aerial photographs, covering archaeological sites across the Near East from the 1920s and 1930s, and the 1938–1939 RAF photographs used by Aurel Stein, primarily covering Jordan, now held by the British Academy (Banks 2015; 2017). The latter collections were digitized as the culmination of Professor David Kennedy's work to bring together dispersed archives of historic aerial photography for the region.

This collecting of historic images has been continued by the EAMENA project, initially as a means of obtaining high resolution imagery of Palestine, which was covered by resolution restrictions in the US, known as the Kyl-Bingaman Amendment (Zerbini and Fradley 2018). While the latter issue has been partially remedied (Whitebloom 2020), developing further access to historical aerial photograph collections would be of clear benefit to the wider project in terms of developing long-term analysis of landscape change and its impact on heritage preservation in the region. This initiative included, investigating a range of archives across the UK, the launch of a public appeal for photography in private collections and further research into the development of aerial photography by British forces in the region, as a means of understanding what may have happened to much of its output, particularly photography predating the Second World War (Bewley and Fradley 2017; Fradley 2020). Initial research through the Discovery catalogue system of The National Archives (TNA), highlighted repeated references to the use of aerial photographs in maps produced by British forces in the Middle East and North Africa in the inter-war period, leading us to explore the history of British aerial mapping in the MENA region.

Photogrammetry in the Near East during the First World War

Aerial photography was used, for a variety of purposes, across the British-controlled mandates and

colonial territories across the Middle East and North Africa during and after the First World War. Their use could include observation, intelligence gathering, reporting on the effectiveness of artillery and aerial bombardment and, at mapping level, the construction of vertical mosaics and the more complex use of overlapping photogrammetric photo sets to construct topographical mapping.

The techniques and technology of aerial photography advanced rapidly during the First World War, leading to a massive output of photographic negatives and prints (Boyd 1928: 384). Included in this advancement was the application of existing photogrammetric techniques to an air photography context, as a means of constructing topographical maps, principally to map areas of enemy territory and to aid artillery direction (Macleod 1929). While the construction of photographic mosaics was an established alternative for creating relatively accurate depictions of conditions on the ground, they could lack precision and topographic information, while the photographic elements could also be misinterpreted. There were, however, many methodological hurdles to overcome in constructing accurate topographical maps from aerial imagery, and air survey continued to be seen as a limited, secondary option to ground survey, both during and after the war (Collier and Inkpen 2001).

Research focusing on later wartime developments, culminating in the Third Battle of Gaza (e.g., Collier 1994; 2014; Gavish and Biger 1985), is relatively well established, as is some analysis as part of the wider developments of mapping in Palestine under the British Mandate (Gavish 2005). In archived correspondence, Colonel Stewart Newcombe, a Royal Engineer who worked alongside T. E. Lawrence in supporting the Arab Revolt, implied that the developments of these techniques began on the Gallipoli campaign (TNA: OS 1/11/2; Birkett-Rees 2016), possibly followed by further experimentation by British forces in Egypt, although these were largely deemed technical failures in terms of accurate map construction (Collier and Inkpen 2001).

Following the movement of forces to what is now Saudi Arabia, including C Flight of 14 Squadron RAF in 1917, a little-analysed mapping mission was undertaken around the area of Rabegh and Yenbo (TNA: WO 303/458). Although this mission resulted in the construction of a complete map at 1:500,000 and represented the first British large-scale mapping in the region, this work has received little attention, which is, perhaps, surprising given the link to T. E. Lawrence. From an archaeological perspective

it is disappointing to note that none of the photography taken during this operation is known to survive, as it would represent some of the earliest aerial imagery of Arabia. It is not known if further mapping missions were undertaken in this part of Arabia during this campaign. For example, contemporary aerial photography of Mecca, as a tool for reconstructing the form of the holy city at this time, would be of particular interest.

It is generally accepted that following the end of the First World War, British investment in aerial mapping tailed off dramatically, particularly as issues remained over the accuracy and cost-effectiveness of the developed methodologies at the time. This inter-war period will be discussed in the next section, but it is worth pausing at this stage to highlight the awareness of the archaeological potential of the photographs taken during this period, including those involved in photogrammetric mapping experimentation. On the Western Front, O. G. S. Crawford had begun his work as a pioneering aerial archaeologist, and as discussed below, his work impacted the preservation of early aerial imagery of archaeological sites in the Near East. The value of this photography, including the potential of imagery captured for non-archaeological purposes, was flagged by those who had served in the Middle East on their return to the UK. Newcombe promoted the value of aerial mapping in a series of papers in the post-war years, but also highlighted the archaeological value of the imagery in his correspondence with Charles Close (Newcombe 1920: 206; 1921a: 279; TNA: OS 1/11/12). There is no record of Lawrence showing an interest in the archaeological potential of aerial photographs, in spite of his archaeological background. However, the botanist Hugh Hamshaw Thomas, who served as RFC/RAF intelligence officer on the Palestine Front and who took a leading role in managing the photograph output, wrote very effectively about the value of photography for archaeology and other disciplines (Thomas 1920).

The inter-war period (1918–1939)

Archaeologically, photogrammetric sets of aerial photographs are particularly useful for projects such as EAMENA, as they provide comprehensive vertical coverage of large areas and are optically comparable with the satellite imagery, constructing long-term understanding of landscape change and its impact on the heritage environment. Earlier missions are, therefore, important in terms of providing an earlier perspective on that landscape: technologically, the lower maximum altitudes obtainable by aircraft of

the period provide particularly detailed imagery, although this is, in part, offset by the lower versatility of the cameras available. These factors highlight the importance of these datasets compared to more recent output from declassified and military satellite imagery. If we consider the impact on archaeological research in the region following the availability of the US CORONA mission series since their initial release in 1996, and the more recent use of declassified material from the US U2 aerial reconnaissance flights (Hammer and Ur 2019), then access to the extensive coverage of earlier RAF photography from the First World War and inter-war period (1914–1939) will, most likely, provide opportunities to further advance understanding of the archaeological landscapes of the MENA territories where the RAF operated.

In terms of attempting to locate and contextualize these photogrammetric missions, it is necessary to understand how the technology and its application were being used by British forces during this period. It quickly became apparent that, although research had been undertaken on technical developments during the First World War, analysis of the inter-war period was far more limited. At a general level the inter-war period was marked by a major reduction of investment in aerial mapping techniques, which were seen as deficient in comparison with ground survey in a peacetime environment; a situation that was rapidly reversed following the outbreak of the Second World War (Boyd 1928: 223–24; Clough 1952). In the UK, an Air Survey Committee, established in the early 1920s, undertook a limited amount of research and observation on activities by colonial offices, and provided some contact with parallel developments in India, Australia, Canada and the US (Collier 2006). Analysing the records of this Committee has revealed a more complex, innovative narrative in the Middle East, including a little-explored period, from 1928–1934, when aerial mapping advocates exploited political and commercial developments in the region to undertake a series of experimental missions.

Aerial mapping applications did not immediately come to an end at the close of the First World War. Mapping continued in Iran, with surveys undertaken over Hamadan and Qazvin in late 1918 and early 1919 by 30 Squadron and 72 Squadron respectively, although these should possibly be seen in the context of ongoing experimentation in India (TNA: WO 302/552; MEC: GB165-0095). Newcombe discussed his work on the mapping of Damascus in October 1919 (TNA: OS 1/11/2), and was evidently keen to promote the potential of these techniques,

including their potential for identifying undocumented archaeological sites (Newcombe 1920: 206). Newcombe also pushed forward a pioneering mapping project along the course of the Nile, from Aswan to the Cairo Barrage, as a means of supporting the management of seasonal flooding (Newcombe 1921b: 55; TNA: OS 1/11/2). The surviving logbook of Flt Lt P. J. Barnett MC (later Wg Cdr), then of 47 Squadron RAF, shows that this mission was undertaken in September 1920, resulting in 1200 overlapping glass plate negatives (Simon Heighway pers. comm.). This seems to have been followed by two further surveys, as a third survey of the Nile is recorded in 1922, in the first published report of the Air Survey Committee (Air Survey Committee 1923: 112–19; TNA: ADM 212/65). These surveys do not appear to have been used in the construction of any published map of the Nile, although given the repeated survey exercise, it is suggestive that an unpublished working draft was developed.

After a lull in British-led activity in the mid-1920s, a significant advance was made following the work of Martin Hotine, Research Officer of the Air Survey Committee, in developing the ‘Arundel’ radial line method of photogrammetric mapping (Hotine 1927; 1929). Although these could be tested on a limited scale in the UK, as with the namesake test in Arundel and further testing on upland landscapes around Stonehaven, there was little appetite for extensive work, beyond input to map revisions for existing map sheets, in a country that was already well-mapped by accurate ground survey. This created a need to find a test environment outside the UK and led to a shift of focus to areas under British imperial control (TNA: ADM 212/65). In 1928 Hotine undertook the successful aerial survey of Malta and Gozo with Francis Cator of the RAF; a location possibly linked again to Newcombe, who was appointed Chief Engineer of Malta in 1929 (Collier 2014: 283). Cator went on to lead the survey of Aden and the Lahij Valley to the north, where the RAF had taken command in place of the India Office (TNA: ADM 212/65).

Following the success of the Malta operation, the Air Survey Committee were able to engage with a range of other projects in the region, beginning with their new Research Officer, John Salt, leading an aerial survey of the Suez Canal Training Area in 1930 (TNA: WO 181/256). This was followed by Reginald Llewellyn Brown leading two surveys, in late 1930 and early 1931, in conjunction with the planned development of a railway linking Haifa and Baghdad; the construction project was later aborted.

In correspondence with Brown, Macleod stated that the future of mapping policy rested on the success of the Baghdad–Haifa Railway missions, highlighting the importance of these experiments in the view of the leading figures in the Air Survey Committee (TNA: WO 181/60). This latter project consisted of mapping runs across the north-eastern section of the Jordan Valley and a more extensive coverage of the lava deserts east of Āzraq. While the Āzraq section was undertaken as an experimental mission, it was deemed a useful exercise by the railway company and six of a planned sixteen 1:50,000 maps were drawn up (General Staff, Geographical Section 1933a). Possibly due to the lack of clear topographical markers, the cartographers systematically recorded visible archaeological sites such as stone structure clusters and kites, including the orientation of the latter, arguably making them amongst the first comprehensive archaeological maps of Jordan’s eastern desert (Fig. 1). Brown had some appreciation of the archaeological value of aerial photography, at least retrospectively, noting the work of O. G. S. Crawford, although Brown mistakenly placed Crawford on the Mesopotamia front during the First World War (Brown 1975: 522).

A number of surveys began in the following years, starting with a survey in 1933–1934 of western Ābīan in the Aden Protectorate, undertaken alongside a border survey of Somaliland. Political boundaries became predominant as the broad boundaries of the Sykes-Picot Agreement required fixing on the ground, with surveys between Saudi Arabia and the Transjordan and the Kuwait Neutral Zone taking place in 1934. A survey of Hammar Lake in Iraq was flown in the same year, following an earlier (1928) private-sector (irrigation project) survey of 1050 square miles along the Tigris, to the north and south of Baghdad, by the Aircraft Operating Company (Air Survey Committee 1935: 151). This, however, marked the end of documented experimentation with extensive photogrammetric mapping in the Middle East until the eve of the Second World War, when the trend was rapidly reversed. Other poorly-documented missions may also have taken place, for instance further work in Egypt around the military training areas near Suez and Cairo (Fryer 1933: 117; General Staff, Geographical Section 1932; 1933b; TNA: OS 1/133). The offices of the Survey of Egypt and Survey of Palestine may also have used these techniques, although from as early as the 1920s there were clear suspicions from the British side over intelligence-sharing with these offices (TNA: WO 181/256). Surviving personal

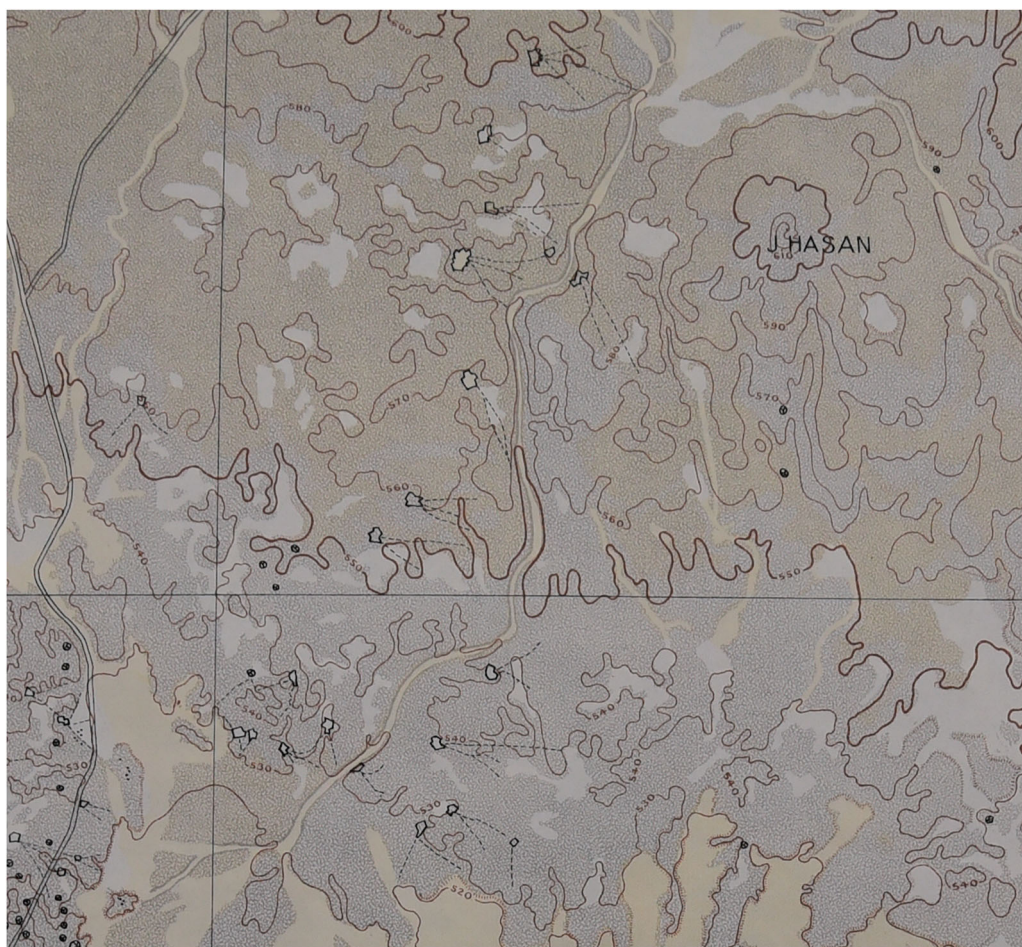


Figure 1 An extract from the 1:50,000 map sheet series of the Azraq lava fields, depicting desert kites and their orientation, as well as settlement remains shown as circle/cross combinations (General Staff, Geographical Section 1933a).

accounts make it clear that the Survey of Palestine were using aerial photography (MEC: GB165-0187), at the very least to revise mapping, but clear documentation of that use does not appear to have survived partition in 1948. British-linked oil companies were also involved in using aerial photography, possibly for targeted geological analysis (Scanlan 1987).

Aerial mapping in the Middle East in the inter-war period appears to have been stalled by issues of funding, delivery and lack of confidence in its value when compared to ground survey (e.g., Macleod 1929: 572; Winterbotham 1923: 132; 1924: 85). While those pushing from the Air Survey Committee were able to piggy-back on various mapping projects in the Middle East during the period 1928–1934, there was, in general, a lack of pragmatic management and resources to see the projects through, while the Committee itself did not meet from 1934–1937 (TNA: CO 730/158/18; AIR 2/1229; OS 1/133). Issues of cost were at the forefront of discussions over the viability of aerial survey from

the end of the First World War, with Newcombe's (1920) early work clearly asserting the economic viability of this approach. Nevertheless, questions of who would pay for aerial photographic missions were raised frequently and projects that did run were undertaken on very limited budgets (e.g., TNA: CO 730/158/18). Similar economic constraints hung over archaeological missions requesting RAF support, as Stein discovered when preparing for his Limes survey of Transjordan (TNA: CO 831/36/5; CO 831/41/4).

Linked to the financial constraints was the issue of the surveyors' capacity to deliver the final paper maps required. The negatives from the 1928 mission to Aden were sent on to the School of Photography at RAF Farnborough in the UK, where the prints were developed, but no map was ever constructed. The 1934 survey of the boundary line separating the border of Transjordan and Saudi Arabia resulted in little more than a sketch map (General Staff, Geographical Section 1934). Missions required a

lead who could ensure projects were seen through to completion, something rarely possible with these piecemeal projects. The aerial mapping advocates also appear to have made only a vague case for the resulting map scales, which may not have tied in with the expectations of other stakeholders. The RAF in particular seemed unhappy about contributing to projects that generally focused on medium-scale mapping, rather than the large scale they required for navigation (TNA: WO 181/71). As a result, there seems to have been limited wider appetite for the use of aerial mapping in a peacetime context. In spite of this situation the Baghdad–Haifa Railway surveys were relatively successful from a practical perspective, although they had little impact on wider perceptions regarding the value of aerial mapping because the railway construction project itself was cancelled. The Jordan Valley survey resulted in two 1:50,000 (General Staff, Geographical Section 1933c) and nine 1:24,000 sheets (General Staff, Geographical Section 1931), while six of a planned 16 sheets were published for the Āzraq area, which is impressive given that it was initially undertaken as an experimental project. It is perhaps no surprise that the survey lead, R. L. Brown, was made Director of Survey in the Middle East during the Second World War: investment and technological advancements saw aerial mapping installed as a standard mapping technique during the war and through into the later 20th century (Clough 1952).

Preservation and access

While at first glance the history of aerial mapping in the Middle East may seem a distraction from archaeological research on the Levant, it is presented here as a means of more effectively identifying and utilizing aerial photo resources for the region. Efforts have already been made to catalogue the photographic repositories across Europe (Cowley and Stichelbaut 2012), but only limited comparable work has been undertaken for the Middle East and North Africa (e.g., Kennedy and Bewley 2010). Bewley and Kennedy (2012) provide an important summary of the archaeological uses for aerial photography in Jordan and the wider region from the First World War onward, but they do not discuss broader issues of photograph production by the RAF and others.

This paper has focused on the inter-war period, in part because British aerial photography from this period is rarely found in the principal archives, leading to a generalized assumption that RAF photo collections from this period were destroyed once they were deemed no longer to be of military

value. Material from the Second World War onwards is now principally held at the National Collection of Aerial Photography (NCAP) in Edinburgh. The survival of this material was aided by clearer guidance on long-term preservation within the military, and the creation and value attributed to centralized intelligence divisions. For the MENA region relevant material exists principally in the archives of the Mediterranean Allied Photo Reconnaissance Wing (MAPRW), Joint Air Reconnaissance Intelligence Centre (JARIC), Defence Geographic Centre (DGC) and the Directorate of Overseas Surveys (DOS), although there are practical and financial barriers to accessing this material, particularly the JARIC collection. There are also large numbers of aerial photographs dispersed across the UK National Archives (TNA), for instance the output of 20 Training Wing RAF, operating in Egypt from 1918–1919 (TNA: AIR 1/2046/204/375/31-7), as well as in the UK Hydrographic Office and material deposited in the Historic England Archive. Small private collections can also be found in various small museums and archives across the UK, particularly military and aerospace institutions, while many more photographs may survive in private collections.

The British Air Ministry held their own archive of aerial photography at Farnborough, from at least the First World War; unfortunately, this collection of glass plates began to deteriorate at some stage in the later 1920s and much of it was discarded at Farnborough, around seven tons of glass negatives according to Frederick Laws, himself an important pioneer of aerial photography then based at Farnborough, with the surviving material sent on to the newly-established Imperial War Museum. This material survives as the ‘Box Collection’, principally made up of material from the Western Front (Cowley *et al.* 2012), but also includes a small portion of material from the Mediterranean, suggesting it was part of a larger ‘global’ archive. The loss of a large part of this archive in the 1920s was lambasted by O. G. S. Crawford, who described it as a ‘holocaust’, earning a stinging rebuke from Frederick Laws who saw it as the result of unavoidable deterioration (TNA: OS.1/384).

In spite of this loss of the First World War archive, there is evidence that a new archive was built up at Farnborough. In discussions over military support for Stein’s proposed Limes survey of Transjordan, it was suggested that Stein visit the archive in case any of the photography could be of use (TNA: CO 831/36/5; CO 831/41/4). If Stein did visit the archive,

he chose not to use any of the photography; the surviving British Academy collection from his project consists solely of photography from his fieldwork in the late 1930s. It is not clear how 'open' the Air Ministry archive was to non-military use. Lt. John Salt, the Research Officer for the Air Survey Committee, made the case, at a talk to the Royal Aeronautical Society, for a similar open library of aerial photography for non-mapping purposes, citing what he saw as the more progressive Canadian model, where publicly-funded aerial photography was openly-accessible, but there is little to suggest the Air Ministry approved or implemented such a model (Salt 1932: 1198). In planning the development of a unique Near Eastern aerial photograph collection for the British Museum in 1929, O. G. S. Crawford chose to visit RAF stations in the Middle East to make his own, peculiarly eccentric, choices of photographs and mosaics for the region, rather than drawing on any Air Ministry archive at Farnborough, possibly because the archive was still relatively limited following the demise of the original 'Box Collection'. Interestingly, Crawford's acquisitions during his 1929 expedition included photography taken in the early 1920s, indicating that RAF bases were also retaining at least a partial archive of their photographic output.

The fate of this second inter-war Air Ministry archive is unknown and may have been lost as part of subsequent transfers of the RAF School of Photography to new locations, before settling at RAF Cosford in 1965. When it comes to opinions about the fate of early aerial photograph archives it is assumed, particularly as temporary and permanent overseas RAF bases were closed across areas of British occupation, and following a general protocol to destroy sensitive material no longer required, that photographs were burnt or otherwise discarded. In many cases this assumption may be correct, but this has created a situation in which researchers are unwilling to invest in tracking down earlier aerial photograph collections, instead relying passively on accessing only readily-accessible archives. Even when a photograph collection is documented as having been destroyed, it may not be as complete as implied. A single negative may have been used to produce multiple prints, as per the multiple phases of map construction from aerial mapping missions. For instance, on the Palestine Front, 16,163 negatives were registered in the period 1 January 1917 to 31 October 1918, with around 266,700 prints issued from negatives in the same period (TNA: AIR 2/98). Reinforcing the point, when the EAMENA

aerial photograph appeal was launched, we were contacted by a former RAF navigator who offered his personal collection from the Middle East. He had also worked on an extensive formal mapping survey of the Aden Protectorate, but believed that the photographic output of these missions had burned in a fire at their base in Aden. This, however, was not the case, as we were, at that time, working on a digitized collection of some 15,000 prints from these missions held at the Bodleian Library; the original negatives are also known to survive and are held at the NCAP. Archives could be broken up and dispersed at any time, for instance plans made in 1931 to transfer copies of photographs and map sheets from the Baghdad to Haifa Railway survey to the Royal Engineers training section in Longmoor (TNA: WO181/60).

It seemed unlikely that the photograph collections associated with the inter-war mapping missions described above had survived, given that they are not discussed in any current research on British aerial photograph archives. We were aware of these mapping missions via references on the resulting published maps held at The National Archives. Building on this information, we researched the background to these missions, and associated material held at The National Archives, as a means of locating any trace of the photography. In spite of low expectations, surviving prints from several of these missions were found in an MOD archive; access was provided to digitize part of the collection before it was transferred to the NCAP, at which stage time constraints and the cost of access prevented its use. With regard to print survival, in some cases multiple prints of a single negative survived, including three unused duplicates for the 1928 Aden survey, while in others only groups of prints containing every other photograph from a flight run were retained. In some cases entire missions were absent, notably the surveys of the Cairo and Suez training areas in Egypt.

The digitized imagery from the MOD archive discussed above is now in the process of being uploaded to the EAMENA database platform as geo-located, medium-resolution, imagery files, where they will be open-access to researchers (Fig. 2). More complete access to files will be provided for discrete research projects for more complex analysis.

For the Levant region, the two surveys undertaken ahead of the planned Baghdad–Haifa Railway provide two of the earliest comprehensive photographic surveys of the region. The survey of the Azraq lava fields provides a view of the landscape

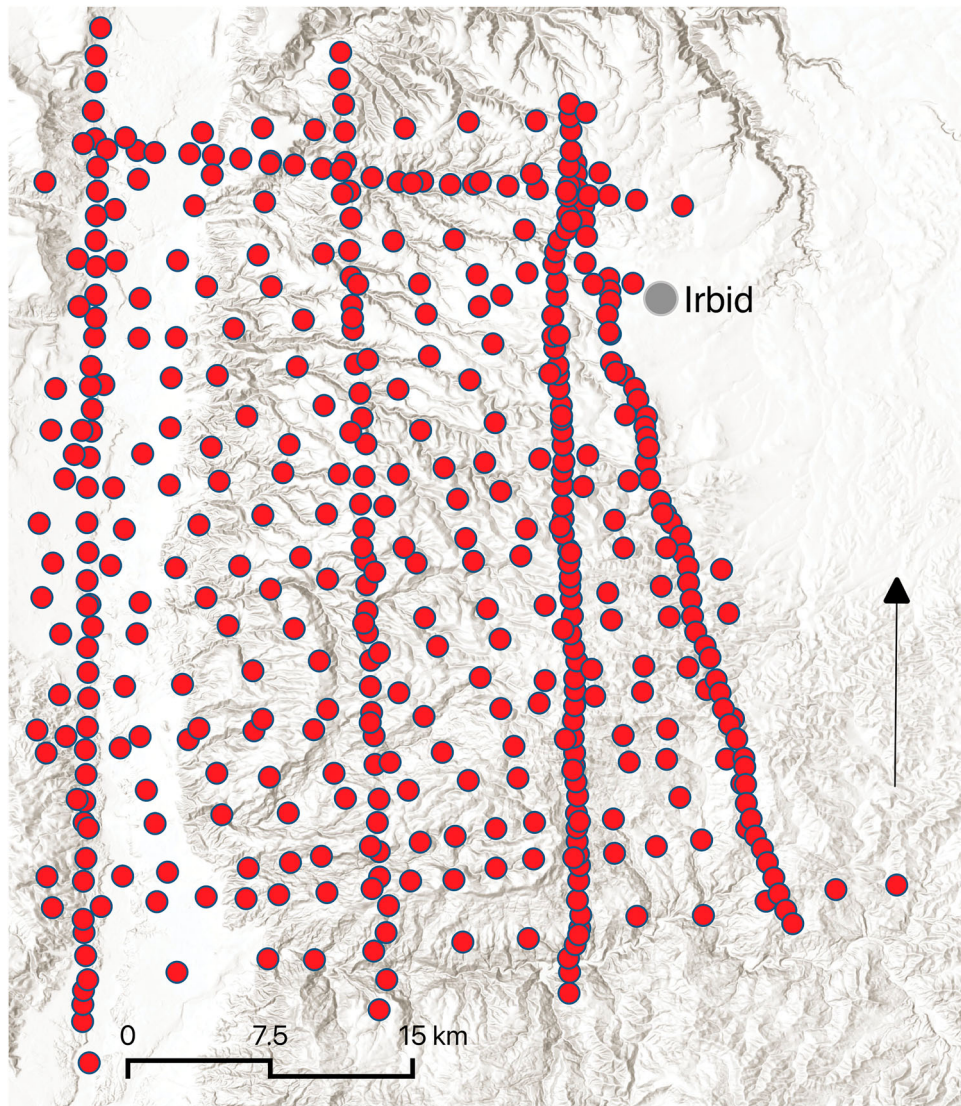


Figure 2 The distribution of centre points for the 1930 aerial photographs over the north-eastern Jordan Valley region. Basemap data: ESRI World Hillshade.

prior to the development of transport infrastructure across this area linking Jordan and Iraq. That this collection was also associated with what are arguably, if incidentally, some of the earliest archaeological landscape survey maps in the region, gives them an additional significance. The surviving print collection also covers much of the area covered by the full set of 16 1:50,000 maps planned by the British survey team. While this region has been repeatedly surveyed remotely in recent years using satellite and alternative aerial imagery sources (e.g., Hammer and Ur 2019), these 1931 images provide a unique early reference set for the area.

The 1930 survey of the eastern Jordan Valley is of more immediate archaeological value, covering the river valley from the Sea of Galilee in the north, to Wadi Zirqa in the south, and as far west as Irbid.

From his wartime experience, Hamshaw Thomas had identified the potential of aerial photography to study the irrigation channels on the eastern side of the valley (Thomas 1924: 35). Arguably, this potential was not utilized until the work of Eva Kaptijn in her study of the Zerqa triangle, using imagery from the survey missions of 680 Squadron RAF in the 1940s (the imagery from this mission is now held by the NCAP and the Hebrew University of Jerusalem) and taken prior to the development of modern intensive farming techniques in the valley (Kaptijn 2009). The 1930 photo collection provides an earlier perspective, under different ground conditions, of this landscape, with the potential to identify subsurface features in addition to the visible agricultural channels (Fig. 3). This is also the case in the rich agricultural hinterland of Irbid, which has been transformed



Figure 3 An aerial photograph (Run 21, Print 10279) taken over the north Jordan Valley where the River Jordan is joined by the Wadi El Arabon, 21 December 1930. Note the ink lines on the print added during the map construction process.

over the last century through the adoption of intensive agricultural practices.

As a concluding point it is important to note that, while these aerial photograph resources are of huge value to archaeologists and other users of earth observation techniques, they originated as a tool of colonial control by British forces. Satia (2006) makes the case that in the context of inter-war Iraq, air power and air control were an oppressive tool of control for British forces. The application of aerial photography in all its guises, whether for observation, operation reporting or for mapping, formed part of this process of control, oppression and exploitation (TNA: AIR 5/1219). Many of the mapping missions discussed relate to border clarifications that reinforced the Anglo-French divisions of the Sykes-Picot Agreement, while the railway surveys considered in this paper were part of a British-led initiative to economically exploit the

region. In correspondence regarding the various surveys preserved at The National Archives, non-British actors are virtually non-existent, and even Salt's vision of an open archive of photography, is likely to be an archive open only to British companies and residents. The work of the EAMENA project can, therefore, be seen as an attempt to find a benign re-purposing of these photographic collections through the collection and open-access policies outlined in this paper, although these efforts are equally open to critique.

Conclusion

Proactive research on the background and context of aerial photographic survey missions in the early 20th century, has the potential to transform our access to remote data and, subsequently, our archaeological understanding of a region. The work of the EAMENA project in this area has opened up access

to previously unidentified datasets, and through its open-access policy, the project will enable archaeological researchers and other users of remote-sensing data to build on these achievements. By challenging the assumptions that many of these photographic sets have been destroyed, it also raises awareness that some theoretically transformative ‘lost’ collections may still survive in some form, for example in private collections. The rediscovery of these datasets may prove transformative as a tool for reassessing the archaeology of these regions, as well as holding huge potential for other forms of geographical analysis. One can only imagine how transformative the rediscovery of the Nile surveys of the early 1920s could be with regard to archaeological understanding of that region, potentially providing an unparalleled view of a landscape that has been transformed by development over the past century.

There is a strong case for a more concerted effort to catalogue and improve access to aerial photograph collections for the MENA region held in the UK and internationally, particularly material produced by French colonial forces, as well as Vichy/German forces during the Second World War. As part of this process archaeologists can take the initiative to understand the context and archival history as a means of identifying and securing access to historical imagery for research purposes. The cartographic activities of British engineers in the region were poorly understood prior to the research outlined in this paper, and following through has paid dividends in terms of access, providing a range of research opportunities as these photographic data are analysed and open access to this material provided by the EAMENA database. The successful outcome of this project has only been achieved through lateral research on the background of British uses of aerial photography in the region. The potential remains for further important archives to come to light from private collections and uncatalogued archives.


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Abbreviations

MEC Middle East Centre, St Anthony’s College, Oxford, UK.

TNA The National Archives, Kew, UK.

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