Exercise Tally Ho!

Archaeological Project Report

For the Recovery of Spitfire P9503 at Lidbury, near Upavon Wiltshire under the Protection of Military Remains Act (1986)

Site Code: P9503UP

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Non technical Summary:

On October 27th 1940, towards the end of the Battle of Britain, Spitfire Mk1a P9503, piloted by Pilot Officer Paul Baillon, was shot down by return fire from a German bomber. The Spitfire crashed close to Lidbury camp on Salisbury Plain where it remained for over 70 years. In September 2013, an archaeological team – as part of Operation Nightingale – excavated this site to recover the remaining elements to establish the nature of the crash, the survival conditions of materials, and to set standards for future excavations and guidance notes. All material will be incorporated in a re-construction of the aircraft to commemorate the pilot who was killed later it the war.

Contents

Introduction:

Many recoveries of crashed air frames have not been accomplished archaeologically, nor have they reported on their findings. Such a phenomenon was experienced by the Channel 4 archaeological television programme 'Time Team' in the United Kingdom. In 1999, they followed the excavation of a B17 Flying Fortress at Reedham (Taylor 1999). On a site largely excavated by machine, they found clashes between methodologies were soon evident - 'Already the differences in working methods between the aviation excavators and the TIME TEAM archaeologists were beginning to clash' (ibid, 61) and that 'and so to the excavators, it made no sense to dig carefully around the remains with small trowels or to record each layer carefully as the archaeologists, led by Phil, were doing...' (ibid, 61). The Time Team felt that methodologies needed to change if as much evidence and information as possible from the crash site were to be retrieved 'The fact that the enthusiasts had done so many other excavations of aircraft did not really prove anything, because they had always tackled their sites so roughly. If they had used archaeological methods, they might have drawn different conclusions' (ibid, 61).

What was interesting too is that the report on their work contained no archaeological references in the bibliography; this was truly a new facet of archaeology. This situation had changed somewhat by 2004 and the next Time Team foray into aviation recovery (Ely, 2005). Here the desktop even included an element of geophysical survey prior to excavation work, but even then there was no finds list in the report, nor any archaeological bibliography. The report's author, Kerry Ely, state the aim that 'Aviation Archaeology is a relatively new genre, therefore, it is hoped that this excavation will set new precedents in the excavation of crashed aircraft' (Ibid, 10, 3.33)

Although the upper-most part of the archaeological palimpsest, 20th Century conflict archaeology is still important and should still be recorded properly - one only has to look at the profusion of military titles and to the commemoration of military anniversaries to note the interest in the subject within the country. If archaeology, as Mortimer Wheeler once famously said, is all about 'Digging up People', then it matters not whether deposit be 70 years or 7000 years, they should be recorded correctly.

Through his role within the Ministry of Defence, the author has for some years assisted the Joint Casualty and Compassionate Centre (JCCC) with scrutiny of applications made under the Protection of Military Remains Act (PMRA) to recover components from military aviation crash sites. As part of this work, an increased element of 'archaeology' has been added to the application process with a request for the provision of a Project Design (and subsequent excavation report) to be submitted to the local historic Environment Record (HER). This additional requirement was included following negotiations between MOD, English Heritage and the Association of Local Government Archaeological Officers (ALGAO).

English Heritage has already issues a series of guidance notes for groups intending to carry out recovery work (guidance note on military aircraft crash sites) but this is currently under revision. The author has discussed this aspiration with Vince Holyoak and Wayne Cocroft of English Heritage and we have agreed to examine the potential for also updating a series of pro-forma project designs and report templates which can be utilised by these groups, in addition to providing a couple of case studies of best practice to illustrate the potential of such partnership work.

Since 2011, a programme of archaeological fieldwork undertaken, in part, to assist with the recovery of Service Personnel post Afghanistan/Iraq has been run. This programme, entitled 'Operation Nightingale', has now assisted on two aircraft recovery projects; that of a Stirling (R9313), at Lurgashall in Sussex and a Liberator (AL595) near Lyneham in Wiltshire. Both projects illustrated the advances in understanding of the events which could be obtained with relatively little input. It is thus our aspiration to run two recoveries (one British, one German) from project inception and desktop study level through to conservation and display. Essential for this was that the site location should be on the MOD estate which would not only enable the projects to be controlled and policed more simply, but also facilitate the potential for local barrack accommodation and military equipment support. The recovery of air frames has been popular with participants on Operation Nightingale involving, as it does, clear military ethos. The service persons have also been able to impart their military knowledge on these projects, adding to the overall understanding of the sites.

This document sets out to identify the legislative and policy background to the overall project, 'Exercise Tally Ho!', and to report on findings in a format which would be familiar both to archaeologists and at the same time also logical to those recovery groups which may not have come from a traditional archaeological background. All components within the report are consistent with those elements required for inclusion by the Institute for Archaeologists (IFA) within such documents. It is hoped that, through this innovation, future work by recovery groups increase both their recording and reporting on their results.

Legislation, Policy and Plans

Legislation

All military aircraft crash sites in the United Kingdom (UK), its territorial waters, or British aircraft in international waters, are controlled sites under the Protection of Military Remains Act 1986. It is an offence under this act to tamper with, damage, move or unearth any items at such sites, unless the Ministry of Defence has issued a license authorizing such activity. As such, anyone wishing to recover a military aircraft, or excavate a military aircraft crash site in the UK is required to obtain a license from the Joint Casualty and Compassionate Centre (JCCC), part of the Service Personnel and Veterans Agency (SPVA). Further to this, The Ministry of Defence reserves the right to deploy its representatives to witness any excavations approved under the Protection of Military Remains Act. On occasions, it has been the author of this paper to whom this duty has fallen. This project design is thus designed to augment this arrangement in providing further guidance to applicants, several of whom will be involved in any recovery projects.

Within the Notes for Guidance of Recovery Groups issued by JCCC, one clause relates specifically to the archaeological component of projects:

Requirements of Local Council / Sites & Monuments Records Officer

9. The Ministry of Defence licences aviation archaeology under the Protection of Military Remains Act 1986. Applicants should be aware that local Councils may have their own requirements in respect of archaeological activity within their area. In particular, Council officials (the Sites and Monuments Records Officers or Historic Environment Records Officer), may ask you to provide them with a project design, or project outline for the work you intend to carry out; depending on the wider historical significance of the location. The Council can also ask you to submit a report to them at the end of the excavation, detailing the results of the dig and the location of any historical artefacts found.

Policy

English Heritage (2002) has set out guidelines for those wishing to excavate such crash-sites under license. The guidance also considers the case for curation, and even in some instances for protection by means of cultural heritage statute above that of the PMRA. It states that 'all crash sites should be considered of historic significance and the information they contain should not be needlessly destroyed or removed without adequate record' (Ibid, 2). The guidance goes on to suggest that 'In the majority of cases, even for nationally important sites, excavation and recording will be the appropriate response, and close attention should be paid to the methodology adopted. In part this will be determined by the circumstances of the crash and the nature and extent of deposits but, in conjunction with contemporary documentary sources, excavation should aim to recover as much information as possible about the circumstances of the loss. Sampling should take into account the distribution of surface debris in relation to subsurface remains; together these are strong indicators of the point or points of impact. Records of all excavations and field surveying should routinely be made available to the local Sites and Monuments Record (SMR), and to the National Monuments Record. Excavation of any aircraft crash site should be undertaken in accordance with the Institute of Field Archaeologists' (IFA) *Code of Conduct*, and should comply with its *Standard and guidance for archaeological excavation*. (English Heritage, 2002, 7)

Further to the legislative background, and policy backing, there has been an increasing focus on the material remains of events of the 20th Century within documents which examine areas of priority in terms of archaeological research. The National Heritage Protection Plan of English Heritage includes much by way of military ethos. Aviation, is a part of this:

Plans

'4E2 TWENTIETH-CENTURY MILITARY HERITAGE

The evidence base for 20th-century military heritage is extensive; a small number of priorities remain to be addressed to develop understanding of significance and permit informed protection of the most important. All are affected by piecemeal losses and lack of knowledge. Action should focus on Ministry of Defence disposals, First World War heritage, and specific themes such as communications, temporary airfields, aircraft crash sites and Cold War installations'.

It goes on to state that:

Aircraft Crash Sites

It has been estimated that around 10,000 military aircraft were lost during the 20th century over the United Kingdom. Of these only about a fifth are recorded on heritage databases. Although various wartime records of these losses do survive, their precise location was often poorly recorded or in the 21st century is no longer immediately obvious.
This project will use local Historic Environment Records and volunteers to improve the record of the positions of crash sites. This improved information will allow greater respect to be shown to crash sites threatened by development proposals.
The English Heritage guidance note on military aircraft crash sites will also be revised and reissued.

Following on from the initial consideration of the importance of crash sites, an action plan was proposed:

Protection Result 4E2.2: Enhanced protection for surviving significant 20th-century military sites

Methodology	Outcome	Output
3. National assessments significance of poorly represented installations, sites and complexes, to include: First World War, Cold War, Civil Defence, Military Communications, Temporary Airfields and Aircraft Crash Sites 4. Selection of relevant sites for designation, and feed-through of information to appropriate authorities 5. Publication of key thematic reports to assist in future evaluation and assessments	Higher profile and better national protection of more ephemeral but significant military heritage assets	Reports, appropriate designations and enhancements of HERs

The project highlighted in this document aims both to provide higher profile to military remains (both to a military audience and also to wider civilian stakeholders). The site will result in substantial reports, inclusion with the HER of Wiltshire, setting possible best-practice models for future investigative groups, and assistance to Statutory Bodies nationwide with regards improved guidance notes and project design templates. It is interesting to note that, although many 20th Century military categories are dealt with in depth in the South West Archaeological Research Framework, little is written on crash sites. Indeed the sum of information is:

Submerged archaeology and aircraft crash sites
Underwater archaeology is active in the South West and some aircraft crash sites have been listed (http://www1.somerset.gov.uk/archives/hes/downloads/swarf_14.pdf). (Further to this is the study of Aviation crash sites at sea by Wessex Archaeology, partners in 'Operation Nightingale' http://blogs.wessexarch.co.uk/aircraftcrashsitesatsea/files/2008/03/aircraft_crash-sites_at_sea_report.pdf).

This indicates that the subject is still little known, even though the events were a comparatively short time ago, and are actions that still inspire much local interest.

This document thus sets out the component elements of the recovery of a Battle of Britain airframe within the above context: Spitfire P9503 of 609 (West Riding) Sqn Royal Auxiliary Air Force at Upavon, Wiltshire.

Spitfire P9503

Background

On the 27th October 1940, Spitfire P9503 of 609 (West Riding) Sqn Royal Auxiliary Air Force, piloted by P/O Paul Baillon, was brought down by return fire from a German aircraft. It crashed to the south of Upavon airfield at approximately NGR SU165 535. P/O Baillon bailed out successfully and was able to file the following combat report:

"I followed the leader into a separate quarter attack and opened fire at 500 yards closing to about 70 yards with a 5-6 second burst. Oil spurted over the whole of my windscreen and I broke away to the right. I climbed for a few seconds and as the cockpit became filled with oil and fumes, and my visibility forward was nil, I bailed out. The machine landed one mile south of Upavon aerodrome and was completely destroyed. I landed nearby uninjured"

During excavation work, the team was shown a letter written by Paul to his wife (and Rosemary Baillon's mother) Peggy, he recalled the episode -

'I had a bit of excitement today when 3 of us went up after a lone raider. We found him and went into the attack in turn from the rear. I had to turn away after firing at him continuously for 5 seconds because my oil tank must have caught a bullet from him, and, as oil spread right over my windscreen reducing forward visibility to nil I felt I had to do something about it and broke away.
I went on for a bit, climbing all the way, and I came to the conclusion that I couldn't possibly land the machine because I couldn't see a thing in front of me; so I decided to jump for it – which I did with great success.... it was all very exciting for a first engagement, especially coming down by parachute which really was not at all unpleasant'

Yet again – we were faced with no direct evidence for the exact fate of the aircraft other than it crashed.

The Operations Record Book for 609 (West Riding) Sqn Royal Auxiliary Air Force (R.A.F. Form 540) makes the following comments on the day's flights: "Green Section F/O. T. Forshaw, P/O. P. A. Baillon and F/O. P. Ostaszewski.) pursued and fired upon an elusive enemy bomber, believed He.111 or Ju.88 near Andover with uncertain results. The E/A. was believed by the Controller to have been shot down, but this report was not confirmed. Baillon received return fire which damaged his oil system compelling him to bale out near Upavon. His machine landed near C.F.S. and burnt up"(National Archives Record AIR/27/2012).

Spitfire P9503

Spitfire P9503 had served throughout the Battle of Britain and had brought down an enemy aircraft on October 15th 1940 when flown by Fl Lt John Dundas DFC and bar. This aircraft, a BF110, was the 99th aerial victory for 609 (West Riding) Sqn Royal Auxiliary Air Force – the first Spitfire Squadron of the RAF to gain 100 'kills' in the Second World War. Fl Lt. Dundas was killed on the 28th November 1940 just after having shot down the leading Luftwaffe ace, Helmut Wick, over the English Channel. Co-incidentally, Wick had just shot down and killed P9503's former pilot P/O Paul Baillon in the same engagement (see Ziegler, 1971, 167).

Figure 1
Left: P/O Paul Baillon, the pilot of Spitfire P9503 when it was shot down © Rosemary Baillon,
Right: his grave in Bayeux © Richard Baillon

609 (West Riding) Sqn Royal Auxiliary Air Force

The website for the current incarnation of 609 Squadron states that "609 Squadron was formed at Yeadon in 1936 as a bomber squadron, although we were converted to fighters in 1938. In 1939, we were mobilised with just two Spitfires and a single Battle because of a shortage of aircraft.

Our record from the Second World War is very distinguished. We were the first Spitfire squadron to achieve 100 air-to-air 'kills' and were also responsible for the first confirmed kill by an American airman. We went on to pioneer the use of the Hawker Typhoon in the ground-attack role, and performed this vital and dangerous work until the end of the war" (http://www.raf.mod.uk/rafreserves/rolesandsquadrons/609westriding.cfm). The motto of this Squadron, which flew from Middle Wallop and Warmwell in Hampshire in this part of the war, and their motto is 'Tally Ho!' – hence the name of this exercise.

Paul Baillon

Paul Abbott Baillon was born at Upton, Northampton on 1st April 1914. He was educated at Ratcliffe College and joined a firm of solicitors, qualifying in July 1938. He joined the RAFVR as an Airman u/t Pilot in September 1938 and trained at 6 E&RFTS Sywell. Called up on the outbreak of war he completed his training at 1 ITW Hastings, Cranwell FTS and 7 OTU Hawarden. He joined 609 Squadron at Middle Wallop in September 1940. In a letter to Paul's widow on the 8th December 1940, George Titley (also a pilot in 609 Squadron) wrote that 'I found Paul a grand fellow' (Rosemary Baillon, *pers. comm*.)

Desktop Strategy

The project aspired to undertake the following elements as part of desktop research prior to any intrusive fieldwork

- Operational Diary research (and National Archives investigation)
- Literature review
- Archive research with the Air Historic Branch, RAF
- Air photographic checks within the National Monuments Record (NMR) of English Heritage in Swindon
- Historic Environment Record (HER) Consultation
- Walkover survey
- Walkover survey with metal-detectors to look for aluminium (note that each reading will be flagged and recorded but not dug)
- Geophysical survey to encompass magnetometry and ground-penetrating radar

Operational Diary Research

This research was undertaken by the author, by Mark Khan, and by Cpl Paul Turner (6 Rifles) and was used in both project design and also the subsequent report. Although there are elements that are pertinent to the crash and its cause, the location was rather vague. Greater specifics are usually given in intelligence reports provided on enemy aircraft.

Literature Review

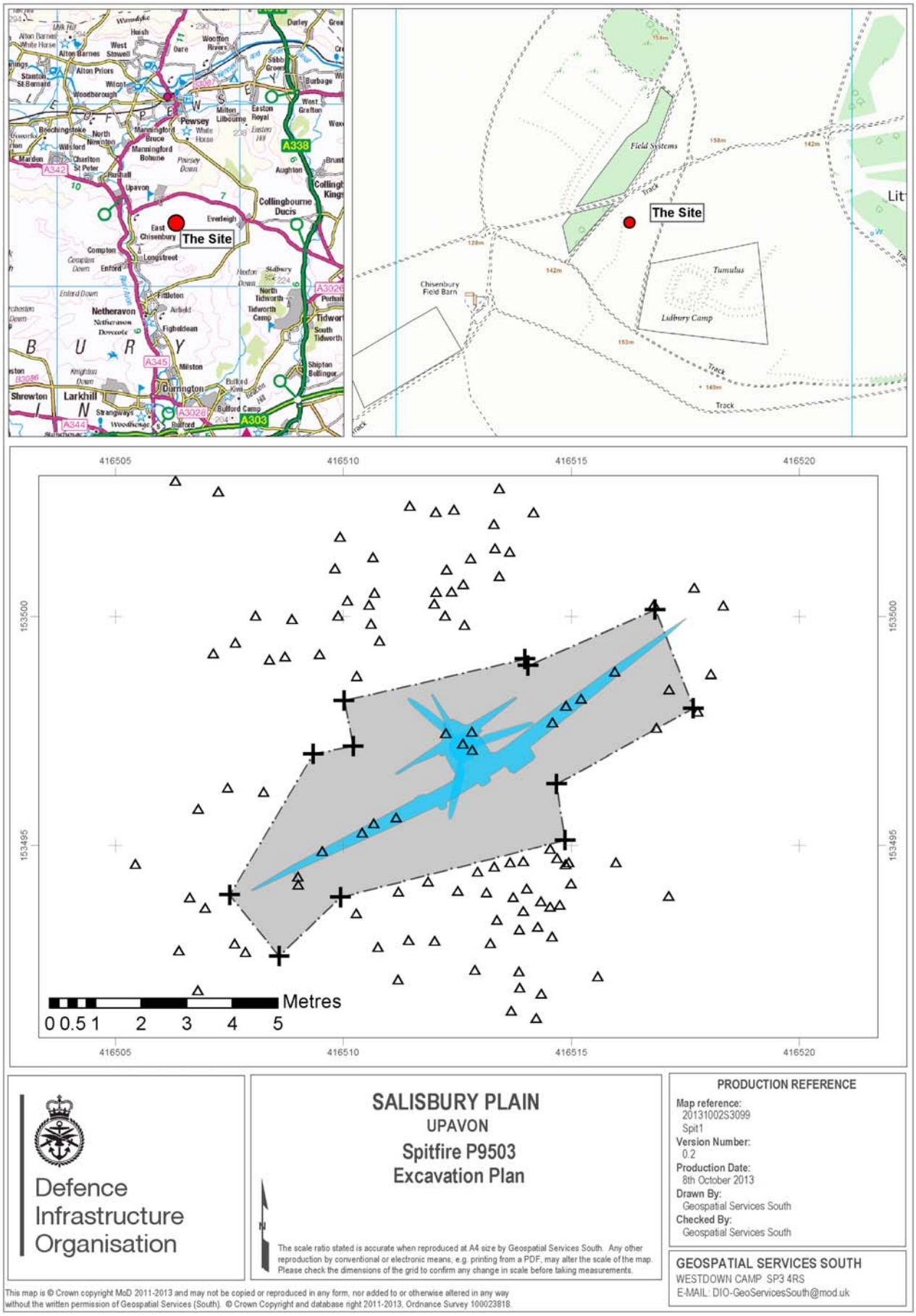


Figure 2: Site Location Plan

Perhaps the best source of information on 609 (West Riding) Sqn Royal Auxiliary Air Force is Frank Ziegler's 1971 work. It has proved useful in providing Squadron background and on the fate of the various crewmen but is also not able to illustrate the crash site any further than being close to Upavon (Ziegler, 1971, 167).

Franks also simply itemises the incident as 'Patrol, bailed out over Andover, 1150, after combat' (Franks, 2008, 97).

Air Historic Branch

Sadly the Air Historic Branch (AHB) was also unable to provide much in addition to the diaries already examined. AHB was able to state that 'The oil and hydraulics were damaged irrecoverably during a dogfight over Andover and the pilot bailed out close to Upavon….there is no ac loss card as there is no record of where the ac actually came to rest' (AHB pers.comm).

Air Photograph Search (Annex 1)

A search of both oblique and vertical air photographs held by the English Heritage Archives - formerly the National Monuments Record (NMR) - in Swindon did not reveal any data relevant to the crash site. The crash took place in 1940 and the earliest subsequent photographic coverage was in 1945 and thus it was likely that any scarring would have covered over in the intervening period. Local monuments such as the Chisenbury Field barn, and Lidbury Iron Age Camp were visible and thus the process of identifying the relevant areas was not too difficult.

It was noted that even when the location of a crash site is known precisely, and contemporary aerial photography present, it is still not always easy to discern such features (see for example, Saunders, 2012, p25 for a 1940 example of Spitfire P9374).

Historic Environment Record (HER) Consultation

Discussions with the HER Officer for Wiltshire, Faye Glover, confirmed that there were no details on this crash site. The supposed location is close to Lidbury Camp, Associated Trackways and Bowl Barrow, on Littlecott Down (SM 10043 – NGR SU 16465307). The site does not lie in an area denoted as being archaeologically sensitive in the Sensitivity Mapping GIS layers established by English Heritage/Wiltshire Council Archaeology Department/Historic Environment Team, MOD. This said, the site lies on Salisbury Plain and thus there still remains potential for non aviation-related cultural heritage deposits. These would need to be considered within this project design.

Walkover survey

The author visited the site on several occasions both individually and with stakeholders such as Cpl Paul Turner from 'Operation Nightingale' (see below). No air frame or crater was visible in this area. There are scattered elements of scrub in what is otherwise SSSI grassland. Some fired blank ammunition of 21st Century vintage has been seen, along with vehicle tracks from training exercises. There were no major groupings of disturbance plants such as nettles in the area other than close to a modern vehicle hide some 100m to the south west of the supposed crash NGR. This area of disturbance is not that of the crash site. It should be noted that the area is not ploughed and thus there was no potential for an informative 'field-walk' in the traditional archaeological sense.

Metal Detector Survey (non-intrusive)

The author took a Foerster magnetometer to the region and there were major readings in the presumed area of the crash site. This will be backed up by a further, measured metal detection survey. During the first day of any fieldwork project, as part of the site gridding exercise, a non-intrusive metal detecting survey took place to examine the presence of aluminium. Each reading was flagged and the location plotted, this was intended to illustrate the debris field and possible direction of impact if the aircraft did not come down vertically.

Figure 3: Locating the Debris Field

Geophysical Survey
A magnetometer and ground-penetrating radar survey was carried out by Mr Peter Masters of Defence Academy/Cranfield University on Friday 7th June 2013. This was hugely successful both in determining location and also depth of the deposits.

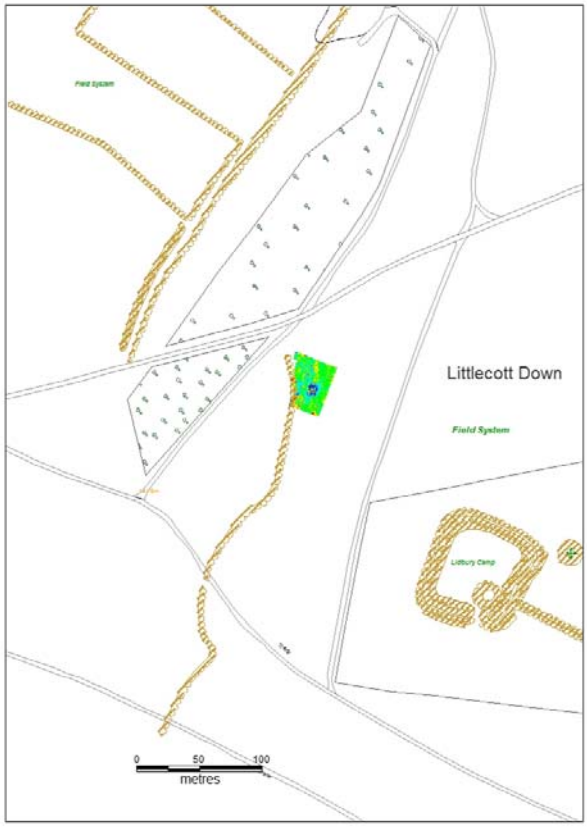


Figure 4: Location of impact of Spitfire P9503 showing the efficacy of magnetometry. © Peter Masters

Project Aims and Objectives

Research aims

Following all the above survey components and location of the crash site, the project aspired to recover the air frame. Critical to this is to have a robust set of questions to answer, and project aspirations to fulfil. For Spitfire P9503 those questions were as follows:

- At what depth are the remains?
- In what condition are the remains?
- What was the precise cause of the crash?
- With what mixture of ammunition was the Spitfire armed?
- Is there any surviving evidence for the engagement which caused the crash?
- Although very unlikely, can one glean any information at all about the German aircraft involved?
- Does the ground-truthing of excavation refine geophysical survey techniques?
- What were the final moments of the airframe?
- What does the archaeological recovery of the airframe add to our knowledge?
- How can these techniques inform revised crash guidance?
- Is there any other (non air-crash) archaeology in the immediate vicinity and how was this affected by the events of 1940?

Project Aspirations

'Operation Nightingale' was established to provide Cultural Heritage opportunities to service personnel post-Afghanistan/Iraq to assist with their recovery process. Since its inception in 2011 this most successful project has investigated a series of archaeological sites. The directors of this work have seen how much military archaeology engages participants and inspires their imagination. Thus far Operation Nightingale has assisted with the recovery of Stirling R9313 at Lurgashall in Sussex and Liberator AL595 at Lyneham in Wiltshire. This project however presented the opportunity of managing the complete recovery programme as the sites lies on MOD land. To this end, Exercise Tally Ho provided the perfect framework for a military/civilian covenant programme with civilian volunteers and students working alongside serving military personnel and veterans.

The work took place within a framework (below) that should assist English Heritage with their re-issuing of guidance notes to recovery groups, providing a best-practice model whilst also furnishing recovery opportunities to service personnel. As such, the results have been sent to Vince Holyoak and Wayne Cocroft as a case study for the guidance notes, and to Will Holborow of the Government Historic Estates Unit (GHEU) for their Biennial report on the Care of the Government historic Estate. Following fieldwork, these results ware also being used to inform management regimes of such crash sites on the MOD estate with the report also being sent to Wiltshire Council. Their Historic Environment Record (HER) Officer, Faye Glover, has liaised for some while with the author on the need to augment the HER with the 20-21st Century components of the archaeological palimpsest as the Council is currently not well furnished with this important data. The site lies next to a small copse of trees which are utilised as a training feature on the military estate. Anecdotal evidence suggested that this wood was known locally as 'Spitfire Wood'. Following the archaeological excavation, the wood is to be renamed 'Baillon Wood' after the pilot of Spitfire P9503. This annotation will be included on all future iterations of the military training area map.

This project has always considered that suitable conservation of artefacts, long-term curation, and dissemination of results are critical. To this end, Cranfield University/Military Academy Shrivenham offered support of their archaeological materials team. They provided an on-site expert with XRF kit, Dr Kelly Domoney, and also advised on conservation requirements – assisting the team's finds team of Cpl Paul Turner and Sjt George Pas (both of 6 Rifles). Further conservation of materials has been undertaken by volunteers at Wessex archaeology co-ordinated by Laura Joyner. An inventory of all components recovered was, as a condition of the PMRA license, provided to the Joint Casualty and Compassionate Centre (JCCC). From this list, the RAF Museum Hendon considered whether any of the items were such that they would wish to hold in their museum collection but this proved not to be the case. Thus the entire artefactual assemblage has been signed over by the project team to P/O Baillon's old school, Ratcliffe College, as they will utilise all of these components in their Spitfire rebuild project as part of their commemoration of the pilot. They have undertaken to guarantee long-term conservation and display of these items (see http://ratcliffe-college.co.uk/wp-content/uploads/2013/10/ratcliffespitfirebullitenautumn20131.pdf for the latest progress report on this project). All elements of corroded aluminium which cannot be conserved or utilised in the project will be included in an art project. The only exception to the above curation strategy were the elements of personal equipment – namely the components of the flying helmet left behind in the aircraft by P/O Baillon when he bailed out. As is policy of JCCC, these were signed over to the pilot's daughter, rosemary. Furthermore, a shard of the armoured glass of the cockpit was presented to her as an item that her father must once have looked through – she had never met him. This sort of proximity to events one is excavating is a most powerful experience. Indeed, an earlier excavation of an aircraft, by the Time Team in 1999, encountered a very similar experience: 'other - and even more telling - objects included the armour plating that would have formed the back of the pilot's seat and a piece of thick perspex from the front cockpit window. As it gradually dawned on everyone that Warren Pease would have looked out of this window and that this was the seat in which he had died' (Taylor, 1999, 63). The artefacts assisted in providing detailed information about the Mk1a Spitfire whilst a Help for Heroes work placement from Tedworth House, Nick Richardson (Royal Navy) examined all the .303 browning ammunition to examine how the aircraft was armed for this encounter in the Battle of Britain.

The results of the excavation have been reported to the HER and the project will look to publish both in the Wiltshire Archaeological and Natural History Magazine, and also in popular publications such as 'Britain at War' and 'Current Archaeology'. The excavation received widespread media coverage too both television (BBC 1) and radio (BBC Wiltshire and BFBS) as well as in the written press (Daily Mail) – see links. This is part of an on-going media relationship held by Operation Nightingale.

Previous work on this site

A license to examine the site was issued in 1985, prior to the Protection of Military Remains Act (1986). This was only undertaken by hand and thus there remained the potential for major components still to be present on site. The area is situated on chalk and hence it was always presumed that a crash into this sub-strata would have endured that any airframe material would thus have lost a great deal of structural integrity.

Results of 2013 Excavation

Team Composition

The team was led by the author (Richard Osgood, M.Litt, AIFA FSA) and will be composed of personnel on 'Operation Nightingale'. These included Riflemen experienced in the recovery of crash site elements accompanied by members of the Royal Air Force. 609 (West Riding) Sqn Royal Auxiliary Air Force (under Flt Lt Alfie Hall) also sent personnel to assist in the endeavour. Experienced crash-site investigators (contemporary RAF and historic experts – including Andy Saunders, Gareth Jones, and Tony Dyer) also assisted fieldwork to examine some of the research questions posed above and to identify recovered artefacts and their significance. All archaeology was supervised by a professional archaeologist. All equipment was provided by Air Movements Wing (AMW) of the Royal Air Force, and by 6th Battalion The Rifles, whilst other logistical support was given by ASOC of the Royal Air Force at Trenchard Lines, Upavon.

Recording

During the fieldwork, written recording of the recovery and finds was carried out, with Richard Osgood taking the lead role in this aspect of the project. Photographs will all be in digital format, with scale and are included on a CD as part of the project archive. A section drawing (1:10 scale) of the main excavation crater was produced but has not been included in the reporting process as it was not hugely illuminating. All major finds appear in plan and with levels recorded. Parts with serial numbers are related to the inventory of components of a Mk1a Spitfire obtained from the RAF. Small finds were photographed with scale in situ where appropriate. All site plans were at 1:20. In addition to specific site and artefact photographs, general site shots will also be taken.

All elements of airframe, engines or systems were excavated as far as possible, provisionally identified, recorded and photographed *in situ* before lifting.

Timings

The programme ran for a week in September 2013.

Licenses required

The site lies on SSSI and thus assent for the work was required and obtained from Natural England (license issued by Sarah Grinstead)
An MOD TAEM 100/1 form consenting to work and de-confliction with military training was required and obtained (license 1894)
Permission under the PMRA 1986 was required and obtained from the JCCC within MOD (license 1746)

Fieldwork Methodology

Following the above desktop elements, the excavation team set out an area some 4x4m for excavation, sited over the strongest geophysical returns, information received on the 1985 work, and a close examination of vegetational cover and disturbance. All stripping was carried out by hand with turves being set aside to be replaced later (the area, as mentioned, is SSSI). The extent of land to be stripped was determined following survey results and is illustrated in Figures 2. Previous examples of Spitfire crashes have demonstrated that the impact area can be relatively confined (a circular area of c2.5m diameter once elements left on the surface such as wings are discounted). An example of this is illustrated in the existing English Heritage Military Aircraft Crash sites guidance (guidance note on military aircraft crash sites page 6 – this also notes that the particular crash compacted the airframe from 9m to less than 1.5m and a similar experience on the chalk was expected). All subsequent work was also done by hand even though an RAF low-loader was present in the event that major airframe components which needed mechanical removal from the excavation and transportation to the point of curation and conservation were required. This proved not to be required but should still be part of project designs on other fieldwork projects.

Beneath the turf line, the initial central excavation square (Trench 1) had a disturbed uppermost layer (**Layer 001**) which was composed of a mid brown soil with much by way of metallic inclusions and pieces of armoured glass and Perspex. Some fragments of the airframe still retained the original colour paint of the Spitfire with brown and green external upper-most colours, red from around the guns, light green from the underside and a darker green for cockpit interior. Some silver paint was also seen. There was little by way of chalk of flint within this layer which was probably backfilled from the 1985 investigation.

On trowelling this layer back and examining other metal-detector readings over the area, the crash impact crater was clearly visible within Trench 1. Below **Layer 001** was **Layer 002** which also had much by way of Spitfire inclusion and with more aluminium oxide matrix, hence the requirement for the excavation team to wear face masks. This seems to be a layer which was not reached by the 1985 work but which had been disturbed – perhaps by an RAF recovery team in 1940. At around 1m in depth, part of the pilot seat and fuel gauge were seen.

Layer 002 lay above **Layer 003** which was the primary fill of the chalk crater and contained the reduction gear and propeller weights from the Merlin Engine. Both were indicative of a high impact crash in a near vertical dive.

To the south west of Trench 1, a separate area, Trench 2, was opened over other large signals – this was stripped of turf and then trowelled. Distinct linear areas of metallic finds were seen and which joined Trench 1. Two groupings of munitions and gun components were found and the fact that the pitot tube (for measuring the airspeed) was found sticking up vertically added to our belief that the aircraft had crashed vertically. The linear spread of finds corresponded to a wing of the aircraft and, as the pitot tube of a Mk1a Spitfire was only present in one wing, this was the port wing which had impacted perpendicular to the ground surface. Only one layer, **Layer 101**, was present in Trench 2.

Figure 6: Pitot tube in situ illustrating vertical nature of crash

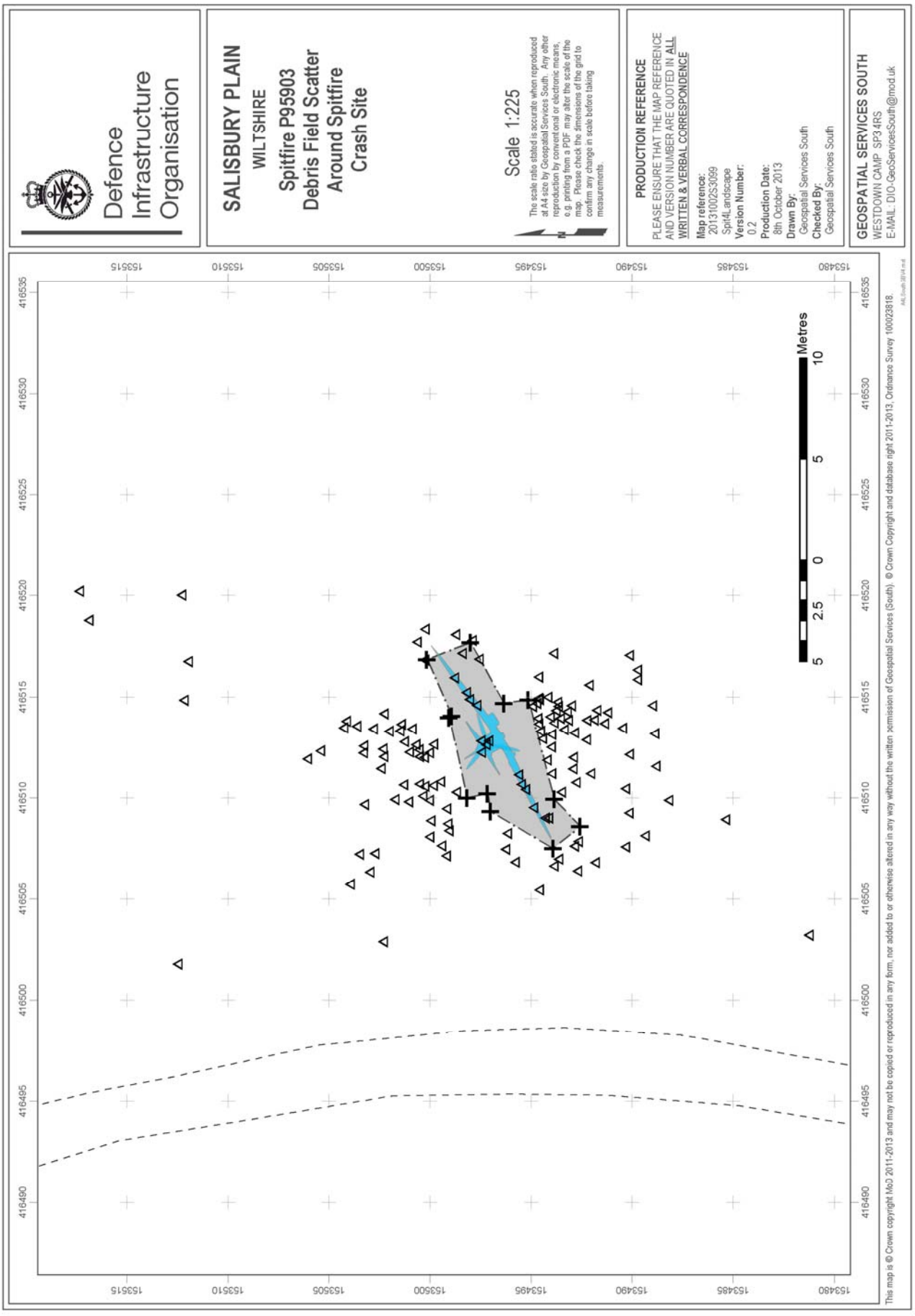


Figure 5: Location of crash site excavation trench, debris spread around it (each triangle = crash-related find), and superimposed silhouette of a Spitfire for reference

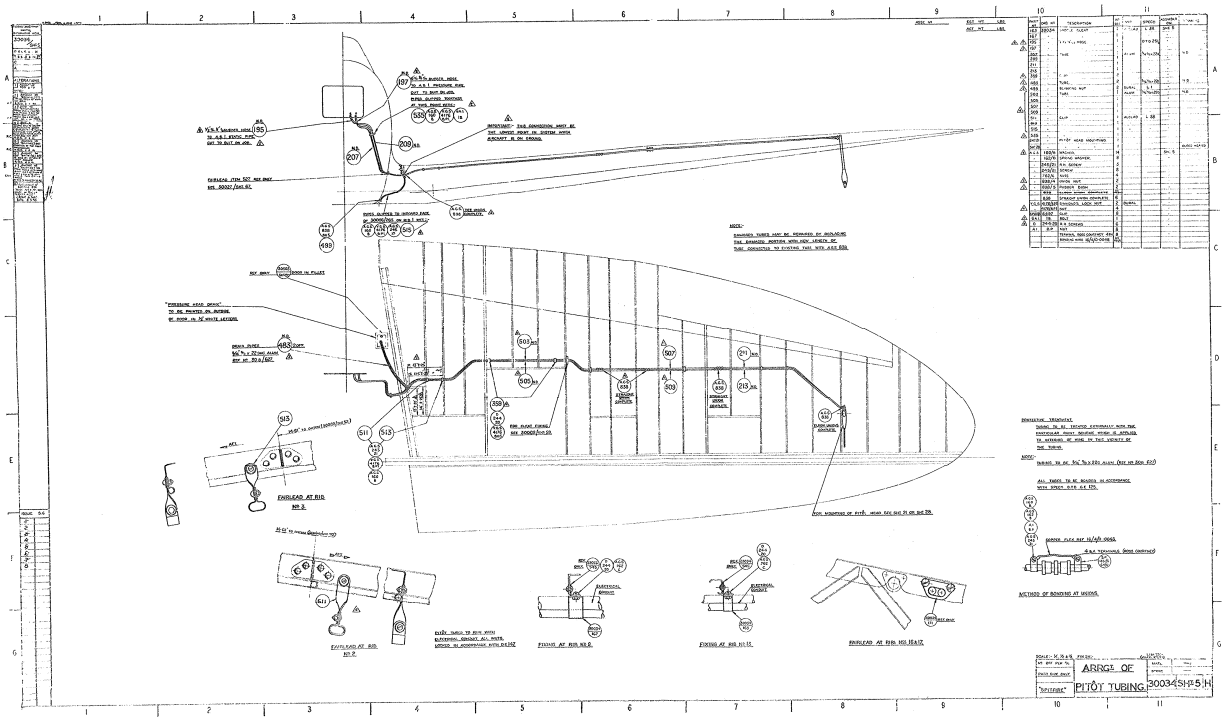


Figure 7: Original Blueprint drawing of the Mk1 Spitfire illustrating position of pitot tube (from Dominic Berry)

The team looked for the starboard wing of the aircraft in Trench 3 to the north east of Trench 1. As similar pattern to Trench 2 was found with a linear spread of metallic small finds just below the turf representing this wing. All finds from this area were denoted as having derived from **Layer 201**.

Figure 8: two impact marks of gun clusters in the starboard wing, Trench 3 (forms layer 201)

Layers 003, 101 and 201 were undisturbed and presumably were equivalent to one another as the immediate impact locations of Spitfire P9503. Layers 001 and 002 represented re-deposited impact crater fill.

Figure 9: Plan of crash site excavation with Spitfire silhouette as guide

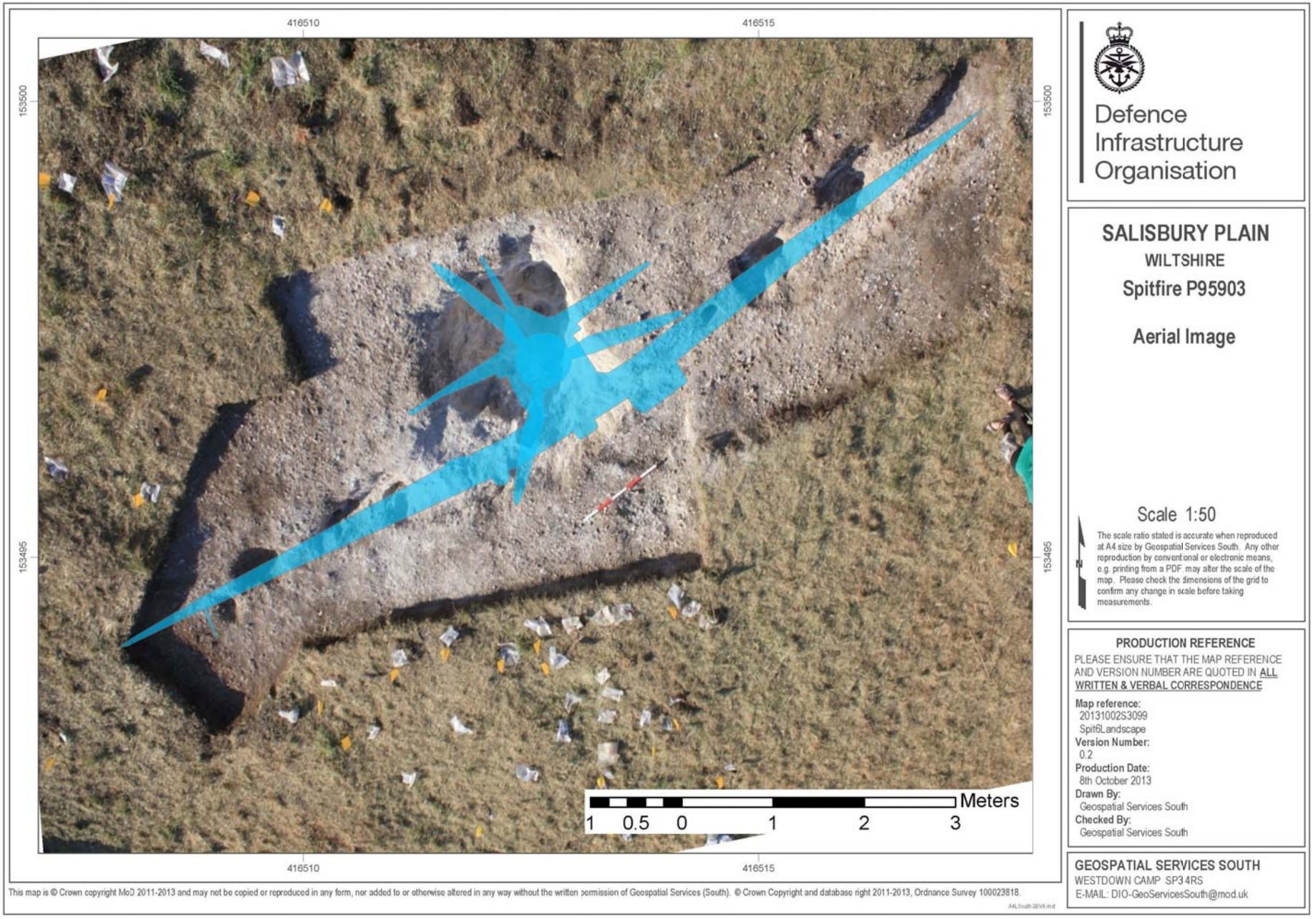


Figure 10: Aerial photo of excavation site, with Spitfire silhouette as guide

Artefacts

An inventory of all artefacts was created as one of the conditions of the PMRA license. As these were recovered from an archaeological excavation, the finds were single context-recorded and 3-D spot located too. The identifiable objects were assigned a unique small find number, and were recorded onto Excel sheets to be included as part of the site archive. Bulk corrosion was simply recorded by area and not retained.

Conservation

- Only immediate stabilisation was carried out on site.
- With the permission of JCCC, recovered items of engine and airframe will initially be taken to a suitable location by the applicants and then steam-cleaned to remove the worst of the soil contamination and then coated with WD-40 to aid preservation. Subsequent cleaning will be carried out by hand at Wessex Archaeology prior to preservation and eventual display.
- Individual small items were bagged according to standard archaeological practice for the materials concerned as set out in publications such as “First Aid for Finds” [Watkinson and Neal, 2001].
- Where appropriate bags were perforated to allow circulation of air.

No unrelated archaeology was discovered or identified by on-site archaeologists, and thus the need to inform Wiltshire Council did not arise. On completion of the excavation the site was back-filled with top soil replaced appropriately and turves relaid.

Figure 11: The impact crater of Spitfire P9503 with 1m scale. Note central crater (engine and fuselage) with port wing (gun clusters and pitot tube impact) to the left, and starboard wing (gun clusters impact) to the right. All bags and yellow flags around the excavation indicate some of the debris field

Small Finds:

By George Pas, Paul & Nick Richardson
With contributions from Andy Saunders, Tony Dyer, Gareth Jones and Kelley Domoney

All finds were excavated by hand and, when recovered from one of the three impact areas of the crash, were assigned a unique small find number. These were then given initial conservation attention and then identified by the authors with assistance from Messrs Saunders, Dyer and Jones all of whom are experts on Spitfire airframes. Selected items were also analysed for their materials composition by Dr Kelly Domoney of Cranfield University using an XRF machine. A metal detecting survey examined the immediate locale of the crash to establish the debris-field spread and thus perhaps the direction of the impact. All finds were present either in the turf, or within the top 5cm of topsoil. These were retained and each separate find was surveyed in using DGPS equipment. An assessment of these finds (all given an ‘A’ prefix to their SF number) established which were related to the crash, and which were more recent such as modern SA80 Rifle rounds. The latter were thus removed from the survey data to validate the accuracy of the debris field.

Following the initial finds work, all ammunition was separated to be the subject of a separate study to determine the composition of munitions types assembled by the armourers in this phase of the battle. This work too place in a work placement at Westdown Camp.

As the fieldwork took place on a Defence training area, the team was under the overall supervision of an Ammunition technical Officer (ATO) from Fargo.

No finds which were earlier than the 1940 crash were recovered, and thus no archaeological deposits which were pre-20th Century were affected by the fieldwork.

A complete list of the small finds is present below (Annex 2), with significant, identifiable, components being separated out for further comment. Photos are (c) Peter Masters apart from where stated otherwise.

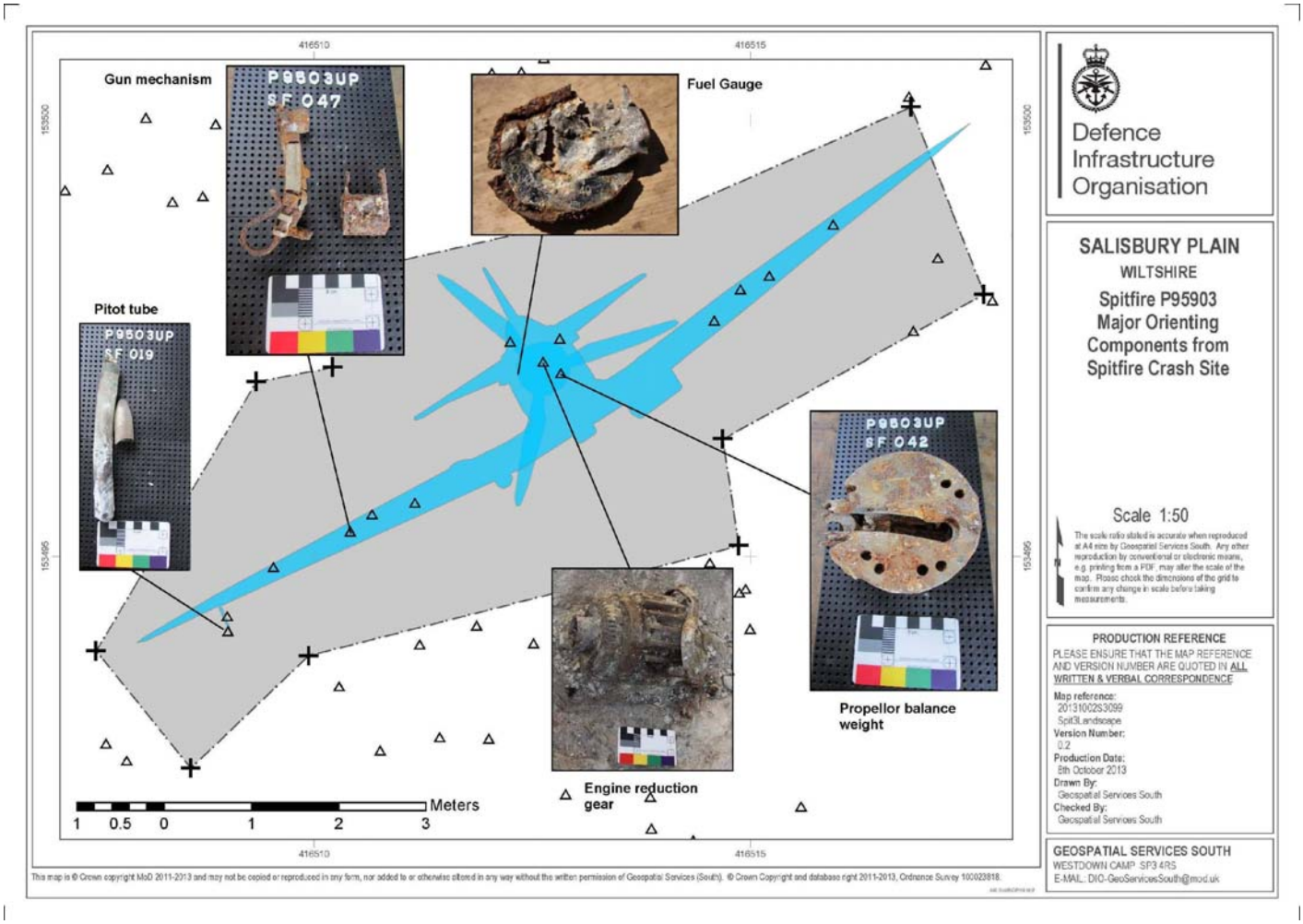


Figure 12: Location of some of the major finds within the excavation area

Cockpit

SF 002, Tr1 Layer 001. Cockpit Clock

The remnants of the cockpit clock were broken into three individual components. The face, hands and mechanism have not survived.

SF 011, Tr2 Layer 101. Canopy release lever

	
SF 011 from the excavation of P9503 in 2013. Note that the lever is stamped 30030/315. The standard serial prefix for Supermarine is '300' and hence aircraft parts stamped with this number are readily identifiable.	Canopy release from the 609 Squadron Mk1 Spitfire in the RAF Museum in Hendon. The artefact type we recovered is located just below the trim of the canopy. The Spitfire at Hendon was present in the engagement over the Isle of Wight which proved fatal for the pilot of P9503, Paul Baillon.

SF 012, Tr1 Layer 002. Fuel dial

This dial is situated in the lower right of the instrumentation panel in the Spitfire cockpit

SF 027, Tr1 Layer 002. Cockpit Label. A linear gauge which is rectangular in form and descending from 5 in units down to 0. This is the fuel pressure gauge.

SF 028, Tr1 Layer 002. Wooden component – possible seat fragment

© George Pas

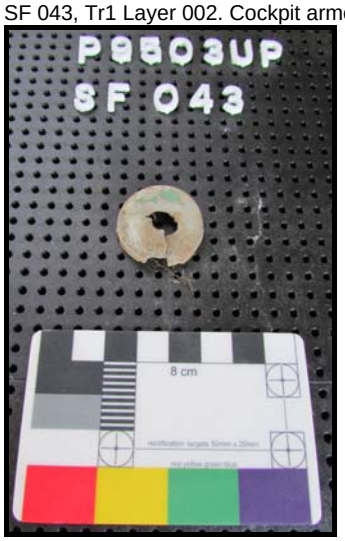
SF 029, Tr1 Layer 002. Flap selector. Remnant of inscription reads [DO]WN

SF 029 from P9503 as recovered in 2013

Flap selector in ‘Up’ position in the 609 Squadron Mk1 Spitfire at the RAF Museum in Hendon

The flap selector is situated in the lower left section of the instrumentation panel of the Spitfire.

SF 043, Tr1 Layer 002. Cockpit armour fixing



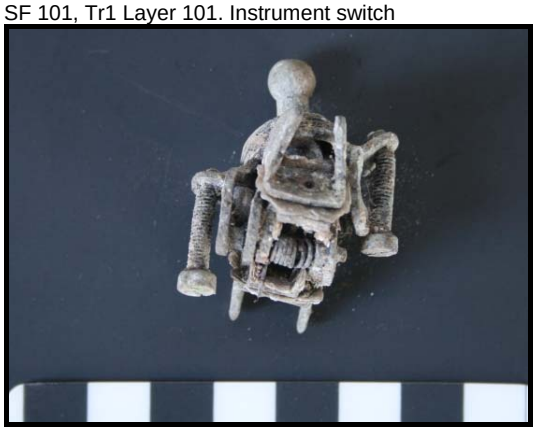
© George Pas

SF 075, Tr1 Layer 002. Turn and bank indicator

 (c) George Pas	
SF 075 as recovered from P9503 in 2013	Turn and bank indicator (lower right dial) in 609 Squadron Mk1 Spitfire at the RAF Museum in Hendon. Note SF 075 is the central boss of this dial from which the indicator needles extend

SF 100, +. Glass instrument lens. c8mm circular green lens with flat base and convex top
NOT ILLUSTRATED

SF 101, Tr1 Layer 101. Instrument switch



Possibly the switch for the magneto.

Not given SF numbers – large quantity of Perspex of the canopy, and armoured glass of the front windscreen

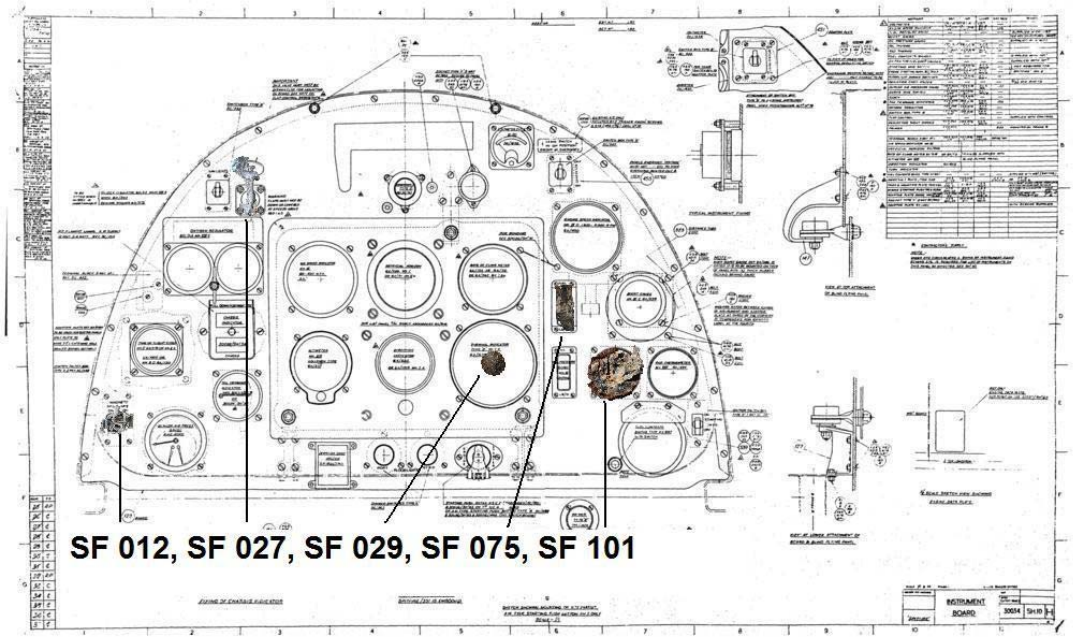


Figure 13 : Locations of cockpit finds

Airframe

SF 014, Tr1 Layer 002. Quick release Cowling Fastener

This was one of a number of cowling and panel fasteners that were recovered on the excavation. Several of these still had the original paint scheme adhering to the external face.

SF 022, Tr2 Layer 101. Gun shroud with red paint

SF 096, Tr1 Layer 001. Datum line marker

 (c) George Pas	
SF 096 – a datum line recovered from the excavation of P9503 in 2013	One of the Datum lines *in situ* in the RAF roundel on the 609 Squadron Spitfire at the RAF Museum Hendon.

Labels

SF 005, Tr1 Layer 002. Engine firing order plate

With annotation 'FIRING ORDER, AUNIT - 1635, BUNIT -6542

SF 009, Tr1 Layer 002. Data plate with some written elements visible

Wording includes '…AIRING,…L FLOWS, …YLENE,…ININ

SF 023, Tr1 Layer 002. Radio transmitter data plate

Script reads 'Transmitter receiver, Type T.R. 1133, Ref No. 10D/?3, AM, Serial 543

SF 027, Tr1 Layer 002. Cockpit label from possible fuel pressure instrumentation
NOT ILLUSTRATED

SF 037, Tr1 Layer 002. Tail assembly data plate

Annotation reads 'FOLLAND AIRCRAFT, HAMBLE, SERIAL….68/56067, DATE 02/40, 00027/SB 2…, FL26, AID. This indicates the manufacture of the tail assembly by Folland's of Hamble, near Southampton. The Folland works manufactured the majority of this portion of Spitfires throughout the war.

SF 074, +. Label of Engine Compressor. Marked 'REPLENISH WITH OIL OD72 EVERY 10 HOURS'
NOT ILLUSTRATED

SF 083. Tr3 Layer 201. Data plate from bottom tail plane

(c) George Pas

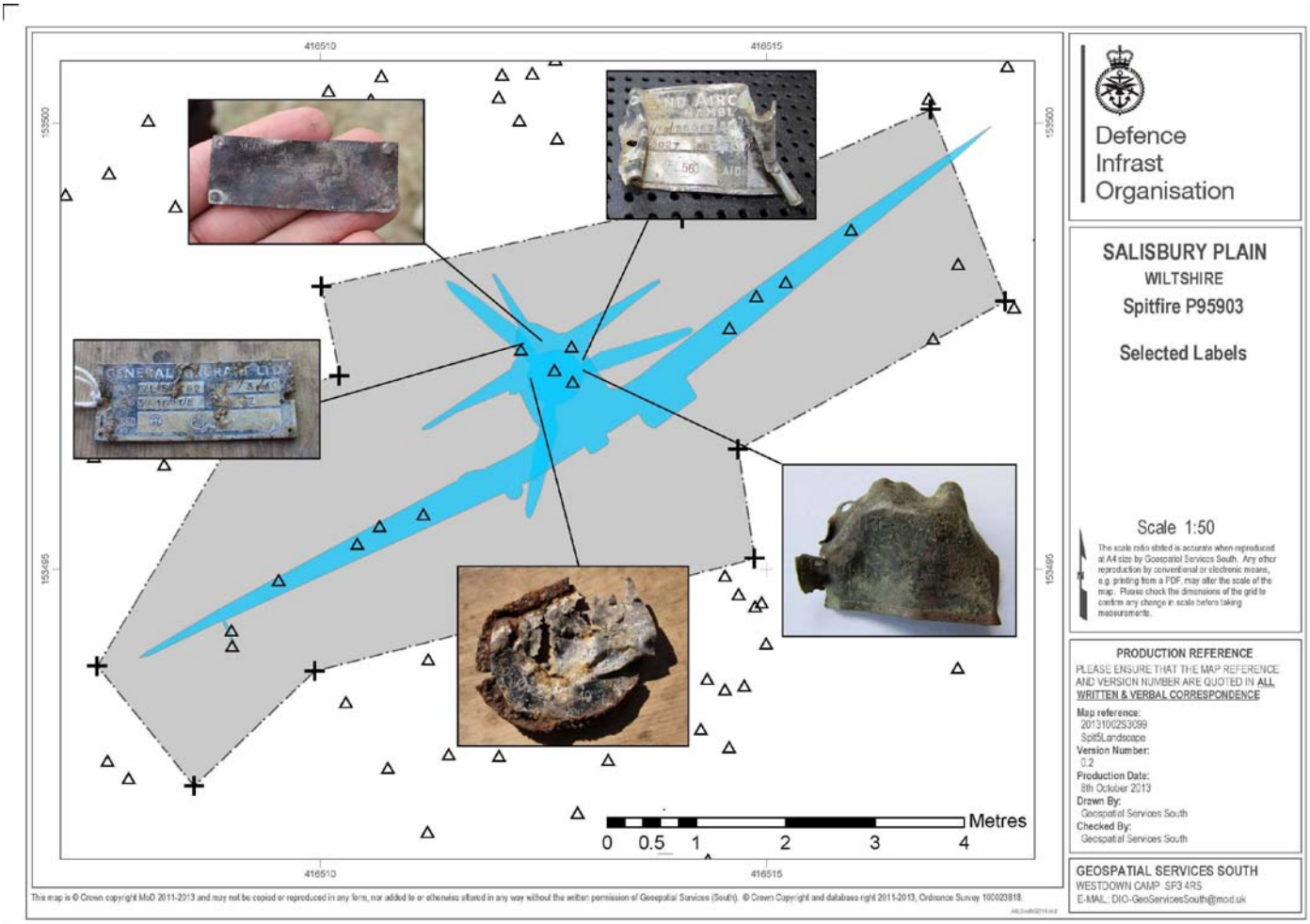


Figure 14: Location of Dials within the excavation area

Pilot's Equipment

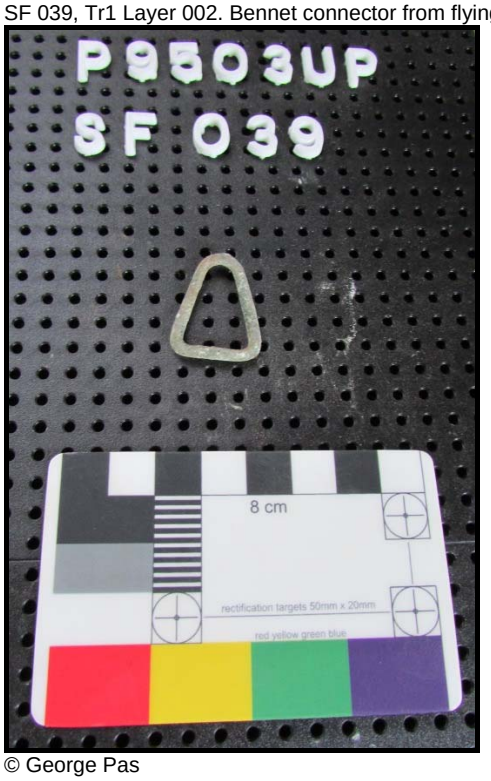
SF 030, Tr1 Layer 002. Pilot's Harness Strap End

© George Pas

SF 038, Tr1 Layer 002. Pilot's flying helmet microphone plug

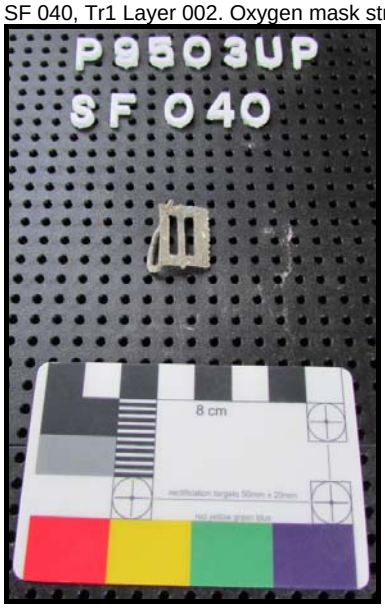
© George Pas

SF 039, Tr1 Layer 002. Bennet connector from flying helmet strap



© George Pas

SF 040, Tr1 Layer 002. Oxygen mask strap tightener



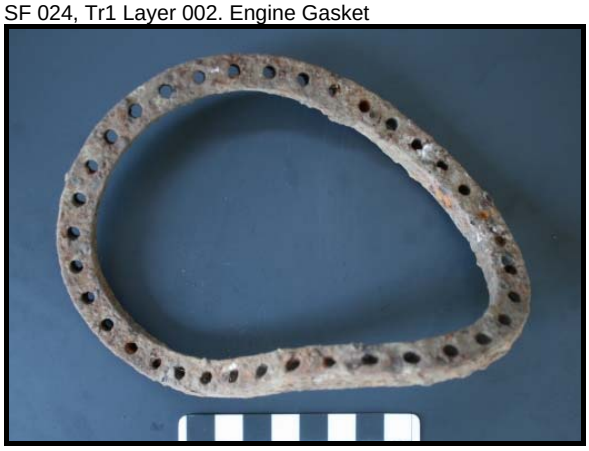
SF 051, Tr1 Layer 002. Flying Helmet buckle
NOT ILLUSTRATED

SF 095, Tr1 Layer 001. Harness Strap end
NOT ILLUSTRATED

Major Components of Merlin Engine

SF 013, Tr1 Layer 002. Engine Valve

SF 024, Tr1 Layer 002. Engine Gasket



SF 026, Tr1 Layer 002. Engine Pinion – possible ?magneto cross shaft drawing gear

SF 032, Tr1 Layer 002. Constant Speed Unit

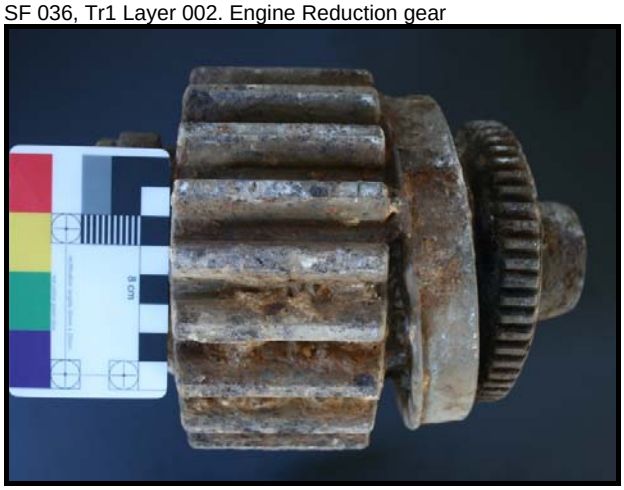
SF 033, Tr1 Layer 002. Vacuum Pump

© George Pas

SF 035, Tr1 Layer 002. Engine Bearings

© George Pas

SF 036, Tr1 Layer 002. Engine Reduction gear



SF 042, Tr1 Layer 002. 2 x Propeller Balances

The milled sides of these two artefacts had impacted (and left a cross-hatched indentation) upon the remnants of the spinner of the propeller unit which was painted black.

SF 076, Tr1 Layer 002. Spark Plug
NOT ILLUSTRATED

Miscellaneous

SF 019, Tr2 Layer 101. Pitot Tube

The Pitot tube was present in the port wing of the Mk1a Spitfire and wa used to measure air speed. Its *in situ* presence on the excavation enabled the team to precisely demarcate the area of the airframe and also illustrated the vertical nature of the crash..

SF 044, Tr1 Layer 002. Ammunition tray door fixings
NOT ILLUSTRATED

SF 045, Tr2 Layer 101. Wing edging with red paint (part of the gun port)
NOT ILLUSTRATED

SF 046, Tr2 Layer 101. Part of wing leading edge with red gun port fabric still adhering
NOT ILLUSTRATED

SF 047, Tr2 Layer 101. Browning machine gun components

Figure 15: Position of the Browning component from the excavation in relation to the overall gun assemblage. © Mark Khan

Ammunition **(See Annex 3)**
By Mark Khan, Nick Richardson, George Pas and Paul Turner

The cartridge cases of British .303 ammunition has always been stamped with a series of serial numbers and letters on the base. This provides useful information which can add to the project archive. For Spitfire P9503, the ammunition was seen to be a mixture of armour-piercing, incendiary and ball rounds, dating from 1937-1940 and manufactured in such diverse places as Kynoch (Birmingham), Woolwich and even Australia. Anecdotally, the final few rounds put into the guns were tracer variants to indicate to the pilot that his ammunition supply was imminently to be exhausted. The excavation team recovered no such rounds from P9503. All of the .303 cases were unfired though a couple had burned and exploded. The bulk of the ammunition was excavated from Trench 2 – in the area of the port wing.

Figure 16: Armourers fitting fighter aircraft with machine gun rounds on the Battle of Britain Memorial in London. 609 Squadron's crest and the name of Paul Baillon are both recorded here too.

Although this may not seem much, as the English Heritage guidance states 'Above would be the severely compacted airframe, sometimes containing the crew. Salvage crews could easily remove surface wreckage, and where it was known that crew members were unaccounted for strenuous efforts were made to recover their remains, a task made no easier by their depth, the large quantities of aviation fuel and the ever-present risk of fire. Once the crash site had been cleared and made safe the crater would be back-filled before the recovery crew moved on to their next task. As a result of contemporary recovery, even where archaeological traces remain, excavation of lowland World War II crash sites may yield on average only approximately 1 per cent (in weight) of the aircraft' (English Heritage, 2002, 3)

Additional aims

The project also ensured that the pilot's daughter, Rosemary Baillon, attended the excavation and the conclusion was marked by the fly-over of a Harvard trainer from Boscombe Down – the type of aircraft on which Paul Baillon would have accomplished his final phases of training.

Answers to Research Questions:

The project design posed some initial questions for the excavation team which we were to try to answer during our fieldwork programme. They are detailed below along with the answers we have derived from our results:

- At what depth are the remains?
  The remains were scattered over a large area, though the debris spread was evenly spaced around the crater. This phenomenon, alongside the shapes of the impact crater, indicated that the aircraft had been in a more or less vertical dive when it impacted with the ground. Finds were present immediately below the turf in both the debris field and impact locations. In the latter, finds continued to the secondary chalk at around 1.4m
- In what condition are the remains?
  There were some indications of burning (such as bubbling to canopy perspex) and the remains found were in poor condition, with much by was of aluminium oxide. Machine gun rounds were in good condition and some components such as data plates were also well-preserved. The excavation confirmed that much of the material from the crash had probably been recovered by RAF recovery teams in 1940 and that the 1985 project had also removed material to a depth of around 1m. Within this horizon, components which had not been deemed 'interesting' or 'useful' were retrieved by our excavation and formed part of the project archive. This included armoured glass, .303 rounds and elements of the 'skin' of the aircraft with original paint colouring on it. This was both brown and dark green (with light green interior and light underside). This was used by one of the team, Nick Richardson, in building a model of the aircraft with correct colour scheme, and also by the school project. It should be noted that on several Op Nightingale projects, some of the participants have made models of the elements that have been excavated, partly to assist in increasing dexterity, partly for catharsis, and partly for pure enjoyment.
- What was the precise cause of the crash?
  There were no clues as to the cause of the crash – simply that it crashed in a vertical dive; the central fuselage/engine area causing a major central impact crater, with the starboard and port wings and their associated gun clusters (four guns in each wing) causing more ephemeral impact marks (see Figures 9-11). The accounts of pilot and his colleagues remain the only evidence for events we have. It should be noted that this site had already been partially disturbed hence perhaps removing the opportunity to uncover the information that would have revealed the cause of the crash. The excavation team have liaised with the Portsmouth-based team responsible for air crash investigations to attempt to gain further insight into crashed using modern data techniques.
- With what mixture of ammunition was the Spitfire armed?
  The Armourers had fitted the Spitfire with a mixture of armour piercing, incendiary and ball. Although most contemporary accounts refer to the final few rounds being tracer (to indicate the imminent ammunition exhaustion to the pilot) no tracer was recovered. The ammunition was manufactured between 1937 and 1940 with some coming from as far away as Australia, indicating the full Empire effort of the war (See Annex 3)
- Is there any surviving evidence for the engagement which caused the crash?
  No elements of the encounter with the Luftwaffe aircraft were seen.
- Although very unlikely, can one glean any information at all about the German aircraft involved?
  Perhaps unsurprisingly, no German rounds were recovered, nor any damage to the Spitfire that could assist with this.
- Does the ground-truthing of excavation refine geophysical survey techniques?
  This was indeed very valuable. The largest of the readings in the magnetometer survey corresponded with the reduction gear of the Merlin engine (the largest component recovered) but with the guns and wings also giving a signal and the crater being verifiable. Peter Masters is to follow up this work with a subsequent survey of a Messerschmitt Bf110 in Dorset and will thus concentrate on the types of responses seen at Upavon.
- What were the final moments of the airframe?
  This is difficult to discern from the archaeological dataset alone, not least of which because it has not retained its integrity. This being said, the Spitfire was in a near vertical dive and caught fire to an extent after impact.
- What does the archaeological recovery of the airframe add to our knowledge?
  Although the site had been disturbed on probably two occasions (one on 1940, the other in 1985) we were able to derive some useful additional information about the Spitfire P9503. As the recovery was accomplished archaeologically, this enabled us to retain empirical data on how a Battle of Britain period Spitfire was armed, its crash site is now recorded for interrogation within the HER, and an innovative programme of conservation and display has been established to ensure that future generations will consider the role of the RAF in World War II. Furthermore, as the English Heritage guidance notes state, 'Crash sites constitute a unique archive of World War II and earlier military aircraft. Many aircraft preserved in museums have either undergone major restoration or are late production models which have been converted to resemble' (English Heritage, 2002, 3). We are also able to state that the aircraft crashed vertically and to have a collection of the original paint schema of a 609 Squadron airframe from the Battle of Britain. These techniques, applied to other less-disturbed sites would yield much information. Although the same components would have been retrieved by less archaeological techniques too, our project was able to recover elements that confirmed that at least part of the portion of the Spitfire was built at the Folland aircraft factory at Hamble. The programme provided an engaging opportunity to all participants. Those with military ethos found it a most cathartic and rewarding experience.
- How can these techniques inform revised crash guidance?
  All of the excavation work was accomplished by a small team, by and, over 4 days. There are circumstances (and particular geology) where no mechanical recovery elements are required. Although this takes longer than using JCB, the results are worth it – we were able to discern the last moments of the airframe and to illustrate the impact crater (and its splendid correspondence to the shape of a Mk1a Spitfire) which would not have been possible otherwise. The ideal set of circumstances is to ensure the team is composed of a mixture of skill-sets; people with knowledge of the Spitfire, of archaeological techniques (including survey and finds recording), with military knowledge, and logistics skills. Furthermore, the importance of carrying out a robust desktop survey and non-intrusive investigation was highlighted. Out team will carry out all these elements in any future recoveries and would recommend their inclusion by other groups as they are simple pieces of research. These recommendations will be made to ALGAO, JCCC and to EH
- Is there any other (non air-crash) archaeology in the immediate vicinity and how was this affected by the events of 1940?

Although lying in a phenomenally rich archaeological landscape, with Scheduled prehistoric field systems, and the Iron Age Lidbury Camp, no archaeological deposits other than remnants of Spitfire were encountered. The Spitfire crashed closed to a field boundary but there was no evidence that pre-1940 deposits were truncated by the crash.

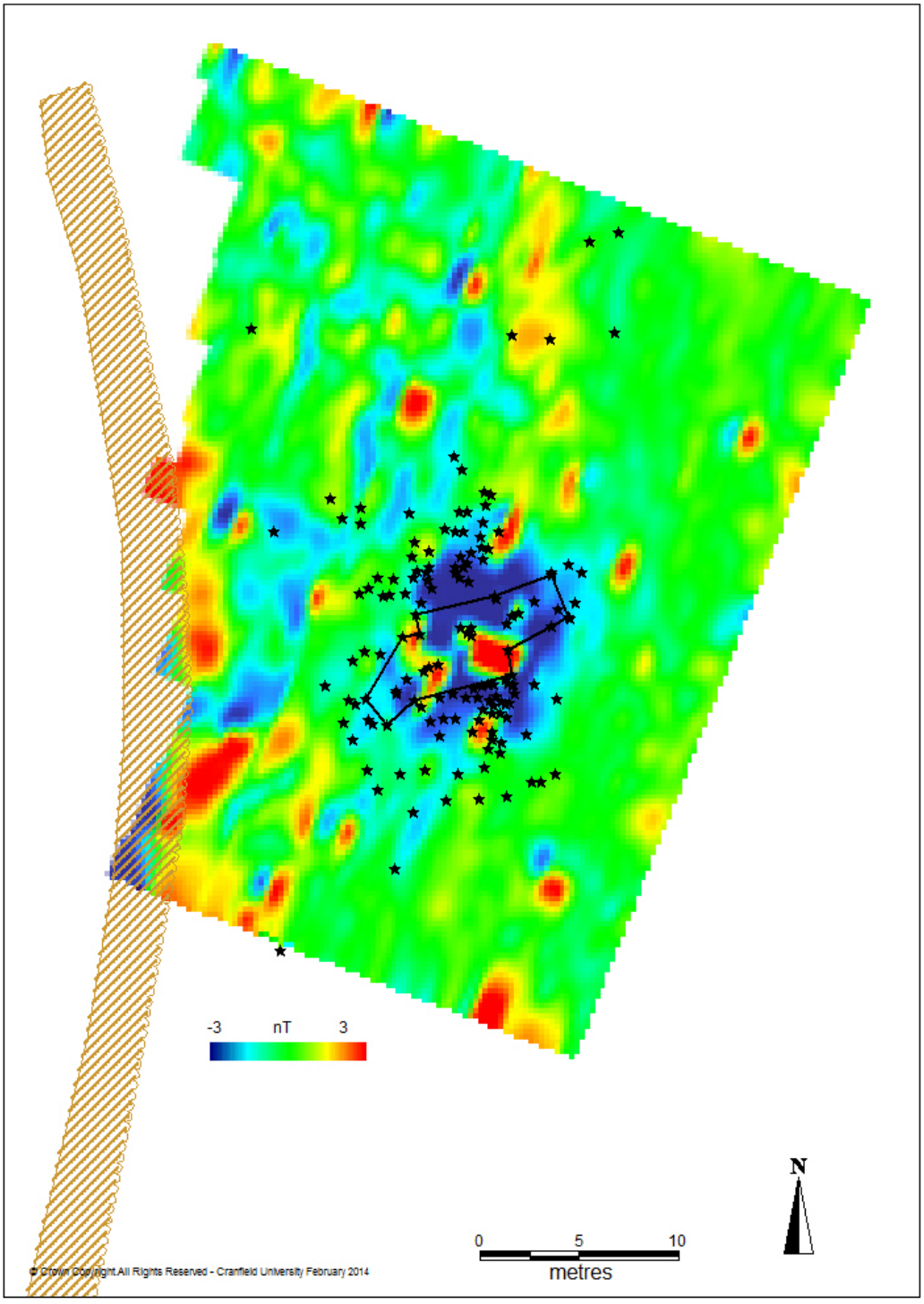


Figure 17: Magnetometer survey results of P9503UP with the excavation trench superimposed, and outlying stray finds marked as stars. Note the darker area of the crater with high central reading of engine components. © Peter Masters

Conclusions on crash:

Paul Baillon's account of the contact on October 27th mentions that he was hit by return fire from the bomber. Not surprisingly we were unable to discover any elements of battle damage (bar one older possible piece of battle damage repair to SF1) which would indicate what had been hit by the German rounds. The excavation revealed that the Spitfire had crashed almost vertically – with little debris spreading from the crash site and the form of the impact craters illustrating this. There had been a slight fire with some rounds burning and 'cooking' off and some airframe also being more melted in form. The upper most fills of the central impact crater (trench 1) showed that clearance had taken place – probably in two phases in 1940 and in 1985. The fieldwork programme showed the efficacy or archaeology in approaching one of these.

All of the excavation elements and the ancillary components included in the project showed just how powerful such programmes can be in inspiring groups whom have had no traditional access to archaeology, also in providing a tangible link to the Battle of Britain and a period in the Nation's history which is featured heavily in the educational curriculum. The project has also provide a very useful opportunity for military and civilian personnel to practice their surveying skills and also to compare crash site investigative techniques from modern sites with those which are appropriate to use on the crash site of a 1940 airframe. The project team have visited the Air Crash Investigation Branch based in Portsmouth to this end.

Dissemination

The project approached the dissemination of their results with several angles:

The artefacts have their own embedded story which is very powerful. To this end they have been taken to primary schools for talks on their key Stage 2 study of Britain in WW2. One of these schools, St Bede's Primary school in Winchester highlighted that the subject was perfect for their National Curriculum study of WW2: it was a story that had much resonance with Hampshire with the aircraft having been manufactured in Southampton, flown from Middle Wallop, and eventually hit over Andover, and also perfect for highlighting the role of women in the war with their role in building these planes and then with Female pilots of the Air Transport Auxiliary flying them to front line squadrons. The objects are also going to be a key component of the Service personnel talking at the Chalke Valley Festival in June 2014 before their final inclusion in the Ratcliffe College Spitfire.

Figure 18 : Building Spitfires – the Battle of Britain Monument, London

There was much media coverage of the work, with the results being discussed on television, on radio, and in the printed media. Much is still present on the internet (see URLs below). The team has produced this 'grey literature' report for the HER and is writing a paper for inclusion in the MOD Sanctuary Magazine of 2014. The excavation also appears in the 2012-13 Government Historic Estate Unit Biennial report as a case study of good practice and has been submitted to English Heritage as a case study for their revised guidance notes. As the author is part of the scrutiny chain of all PMRA applications, this report will be made available to any recovery group who is required to write a project report and needs an illustrative example.
The excavation has been the subject of a paper to many local archaeological societies (including the Hampshire Field Club) and is included in the Wiltshire Archaeological Conference of 2014 in Devizes.

The team is also looking to produce a report for 'Britain at War' and in a journal such as the Wiltshire archaeological Magazine or the Cranfield University Journal of Cultural Heritage.

Archive:

All of the material finds were initially curated at Westdown Camp, Tilshead. As mentioned above, they were then used as part of an educational package to primary schools and local history groups before going to Wessex Archaeology for final packaging and conservation. They will then be utilised as a teaching aid for the service personnel presenting the results of Exercise Tally Ho to the school element of the Chalke Valley Festival in June 2014 before, in September 2014, their final deposition with Ratcliffe College in Northampton as part of their commemoration programme. All digital and paper records were retained by R Osgood at Westdown Camp.

Overall Conclusion

The excavation of a crash site using traditional archaeological techniques throughout was innovative. From desktop research to non-intrusive surveys, and from field excavation, recording and conservation through to the dissemination of results. All of these components

are those that would be familiar to the professional archaeologist. Further innovations include the use of XRF machines and a distinct strategy for the finds that not only ensured their future survival, but also enabled their use as both a commemorative and educational resource, both of which were critical to the project from the outset. It is hoped that by using this site as a case study, other groups will agree that much is to be gained through a more sensitive approach to recovery of these sites and that an air crash and deposits of the 20th Century are still an important part of the archaeological record.

Acknowledgements

The success of this project would not have been possible without the hard work of an exceptional team –from identifying elements of air frame, to supplying equipment and food, and from excavation to arranging the fly-over of a Harvard trainer to close the dig. This was certainly a team effort and a superb mix of students, aviation experts, serving and veteran military personnel (including those for whom Operation Nightingale has become something of a habit!) - my huge thanks to all. Paul Turner, George Pas, Martin Puxley, Graham Moore, Rowan Kendrick, Dave Hart, Paul Hemmingway, Steve Winterton, Mark Khan, Peter Masters, Kelly Domoney, John Clarke, James Eade, Gareth Lloyd, Richard Preece, Colin Baker, Paul Armstrong, Jeanette Dunn, Mark Dunn, Mike Prior, Duncan Hedges, Stuart Gray, Richard Bennett, Ellie Morris, Tom Theed, Elaine Corner, Georgia Kelly, Dougie Donnelly, Gary Lewry, Tim Burgess. Dominic Jones, James Holland, Timothy Kearsey, Dave Murdie, Phil Harding, Dominic Berry, Adrian Crossan, Andy Saunders, Gareth Jones, Tony Dyer, Nick Richardson, Chris Maple and The Royal Engineer Survey team – Sgt Leighton, L Cpl Feeney, LCpl Stonestreet, Cpl Olajide, Sgt Windle, Spr Cordory.

The assistance of Landmarc Support Services, Sean Davies of Wessex Tree Care, Help for Heroes (Tedworth House), Care for Casualties, Wessex Archaeology and World Wide volunteering was also very much appreciated, as was the donation of some Spitfire Ale from Shepherd Neame!

Bibliography

Ely, K.D. 2005 (unpublished). Warton Marsh, Lancashire - an archaeological evaluation by the TIME TEAM, July 2004. Videotext

English Heritage, 2002. *Military Aircraft Crash Sites: Archaeological guidance on their significance and future management*. English Heritage (London).

Franks, N. 2008. *Royal Air Force Fighter Command Losses of the Second World War.* Volume 1: Operational Losses: Aircraft and crews 1939-1941. Midland (Hersham).

Osgood, R. 2007 (September). Revealing the Pathfinder. *Britain at War*, **5**, 61-66

Osgood, R. & Gibson, A. 2007. Revealing the Pathfinder: Excavation of Avro Lancaster Mark1 PB911. Swayfield, Lincolnshire. *Sanctuary Magazine*, **36**, 32-33

Price, A. & Blackah, P. 2007. *Supermarine Spitfire 1936 onwards (all marks): Owners' Workshop Manual.* Haynes (Yeovil).

Saunders, A. 2012. *Spitfire Mark 1 P9374: the remarkable story of how a unique aircraft returned to flight*. Grub Street (London)

Taylor, T. 1999. 58-65. Reedham, Norfolk. Time Team 99: the Site reports. Channel 4 London

Ziegler, F.H. 1971. *The Story of 609 Squadron – Under the White Rose*. Macdonald (London)

URLs

(Correct as of 14 Feb 2014)

https://www.gov.uk/government/news/battle-of-britain-spitfire-unearthed-on-salisbury-plain

http://www.raf.mod.uk/news/archive/spitfire-unearthed-05092013

http://www.salisburyjournal.co.uk/letters/10685389.Spitfire_ace_was_shot_down_in_fierce_Channel_dogfight/

http://www.bbc.co.uk/news/uk-england-wiltshire-23942610

http://www.dailymail.co.uk/news/article-2411551/Spitfire-shot-Salisbury-Plain-Luftwaffe-70-years-ago-dug-Iraq-Afghanistan-veterans.html

http://ratcliffe-college.co.uk/wp-content/uploads/2013/10/ratcliffespitfirebullitenautumn20131.pdf

Annexes

Annex 1

Aerial photographs held by the NMR, Swindon for SU 1653

Obliques

Photo reference (NGR and Index number)	Film and frame number		Original number	Date	Film type		Map Reference (6 figure grid ref)
SU 1653 / 1	ALK 7428	/ 187	SEE PRINTS	04 JUL 1924	Black& white	Unknown	SU 166534
SU 1653 / 2	CCC 11752	/ 4112	SEE PRINTS	Unknown	Black& white	Unknown	SU 160536
SU 1653 / 3	NMR 117	/ 397		05 APR 1969	Black& white	70mm,120,220	SU 167533
SU 1653 / 4	CAP 8112	/ 54	SEE PRINTS	02 MAY 1953	Black& white	Unknown	SU 167533
SU 1653 / 5	CAP 8112	/ 55	SEE PRINTS	02 MAY 1953	Black& white	Unknown	SU 167533
SU 1653 / 6	CCC 5208	/ 06729	APR654	07 DEC 1932	Black& white	SF or I Neg	SU 166535
SU 1653 / 7	NMR 4256	/ 6		10 OCT 1988	Black& white	70mm,120,220	SU 166533
SU 1653 / 8	NMR 4256	/ 7		10 OCT 1988	Black& white	70mm,120,220	SU 166533
SU 1653 / 9	NMR 4256	/ 8		10 OCT 1988	Black& white	70mm,120,220	SU 166533
SU 1653 / 10	NMR 4256	/ 9		10 OCT 1988	Black& white	70mm,120,220	SU 166533
SU 1653 / 11	NMR 4256	/ 10		10 OCT 1988	Black& white	70mm,120,220	SU 166533
SU 1653 / 12	NMR 4256	/ 17		10 OCT 1988	Black& white	70mm,120,220	SU 166533
SU 1653 / 13	NMR 4256	/ 18		10 OCT 1988	Black& white	70mm,120,220	SU 166533
SU 1653 / 14	NMR 4256	/ 19		10 OCT 1988	Black& white	70mm,120,220	SU 166533
SU 1653 / 15	NMR 4256	/ 20		10 OCT 1988	Black& white	70mm,120,220	SU 166533
SU 1653 / 16	NMR 4256	/ 21		10 OCT 1988	Black& white	70mm,120,220	SU 166533
SU 1653 / 17	NMR 4256	/ 22		10 OCT 1988	Black& white	70mm,120,220	SU 166533
SU 1653 / 18	NMR 4256	/ 23		10 OCT 1988	Black& white	70mm,120,220	SU 166533
SU 1653 / 19	NMR 4256	/ 24		10 OCT 1988	Black& white	70mm,120,220	SU 166533
SU 1653 / 20	NMR 4256	/ 25		10 OCT 1988	Black& white	70mm,120,220	SU 166533
SU 1653 / 21	NMR 4256	/ 26		10 OCT 1988	Black& white	70mm,120,220	SU 166533
SU 1653 / 22	NMR 4256	/ 27		10 OCT 1988	Black& white	70mm,120,220	SU 166533
SU 1653 / 23	NMR 4256	/ 28		10 OCT 1988	Black& white	70mm,120,220	SU 166533
SU 1653 / 24	NMR 4256	/ 29		10 OCT 1988	Black& white	70mm,120,220	SU 166533
SU 1653 / 25	NMR 4256	/ 30		10 OCT 1988	Black& white	70mm,120,220	SU 166533
SU 1653 / 26	NMR 4256	/ 31		10 OCT 1988	Black& white	70mm,120,220	SU 166533
SU 1653 / 27	NMR 4256	/ 32		10 OCT 1988	Black& white	70mm,120,220	SU 165534
SU 1653 / 28	NMR 4256	/ 33		10 OCT 1988	Black& white	70mm,120,220	SU 166533
SU 1653 / 29	NMR 4256	/ 34		10 OCT 1988	Black& white	70mm,120,220	SU 166533
SU 1653 / 30	NMR 4256	/ 35		10 OCT 1988	Black& white	70mm,120,220	SU 166533
SU 1653 / 31	NMR 4259	/ 20		10 OCT 1988	Colour slide	35 mm	SU 167532
SU 1653 / 32	NMR 4259	/ 21		10 OCT 1988	Colour slide	35 mm	SU 167532
SU 1653 / 33	NMR 4259	/ 22		10 OCT 1988	Colour slide	35 mm	SU 167532
SU 1653 / 34	NMR 4259	/ 23		10 OCT 1988	Colour slide	35 mm	SU 167532
SU 1653 / 35	NMR 4259	/ 24		10 OCT 1988	Colour slide	35 mm	SU 167532
SU 1653 / 36	NMR 4259	/ 27		10 OCT 1988	Colour slide	35 mm	SU 168532
SU 1653 / 37	NMR 4259	/ 28		10 OCT 1988	Colour slide	35 mm	SU 168532
SU 1653 / 38	NMR 15368	/ 20		09 AUG 1995	Colour slide	35 mm	SU 161531
SU 1653 / 39	NMR 18234	/ 01		20 DEC 1998	Black& white	70mm,120,220	SU 167533
SU 1653 / 40	NMR 18234	/ 02		20 DEC 1998	Black& white	70mm,120,220	SU 167533
SU 1653 / 41	NMR 18234	/ 03		20 DEC 1998	Black& white	70mm,120,220	SU 167533
SU 1653 / 42	NMR 18219	/ 19		20 DEC 1998	Colour slide	35 mm	SU 167533
SU 1653 / 43	NMR 18219	/ 20		20 DEC 1998	Colour slide	35 mm	SU 167533
SU 1653 / 44	NMR 18219	/ 21		20 DEC 1998	Colour slide	35 mm	SU 166533
SU 1653 / 45	NMR 18230	/ 06		20 DEC 1998	Colour neg	70mm,120,220	SU 168533
SU 1653 / 46	NMR 18230	/ 07		20 DEC 1998	Colour neg	70mm,120,220	SU 167533
SU 1653 / 48	NMR 24883	/ 01		12 DEC 2007	Digital colour	35 mm	SU 168533
SU 1653 / 49	NMR 24883	/ 02		12 DEC 2007	Digital colour	35 mm	SU 168533
SU 1653 / 50	NMR 24883	/ 03		12 DEC 2007	Digital colour	35 mm	SU 167533
SU 1653 / 51	NMR 24883	/ 04		12 DEC 2007	Digital colour	35 mm	SU 166532
SU 1653 / 52	NMR 24883	/ 05		12 DEC 2007	Digital colour	35 mm	SU 165531
SU 1653 / 53	NMR 24883	/ 06		12 DEC 2007	Digital colour	35 mm	SU 168532
SU 1653 / 54	NMR 24883	/ 07		12 DEC 2007	Digital colour	35 mm	SU 164530
SU 1653 / 55	NMR 24883	/ 08		12 DEC 2007	Digital colour	35 mm	SU 164530
SU 1653 / 56	NMR 24883	/ 09		12 DEC 2007	Digital colour	35 mm	SU 167531
SU 1653 / 57	NMR 24883	/ 10		12 DEC 2007	Digital colour	35 mm	SU 167532
SU 1653 / 58	NMR 24883	/ 11		12 DEC 2007	Digital colour	35 mm	SU 166532
SU 1653 / 59	NMR 24883	/ 12		12 DEC 2007	Digital colour	35 mm	SU 166533
SU 1653 / 60	NMR 24883	/ 13		12 DEC 2007	Digital colour	35 mm	SU 166533
SU 1653 / 61	NMR 24883	/ 14		12 DEC 2007	Digital colour	35 mm	SU 163536
SU 1653 / 62	NMR 24883	/ 15		12 DEC 2007	Digital colour	35 mm	SU 163536
SU 1653 / 63	NMR 24883	/ 16		12 DEC 2007	Digital colour	35 mm	SU 162536
SU 1653 / 64	NMR 24883	/ 17		12 DEC 2007	Digital colour	35 mm	SU 163536
SU 1653 / 65	NMR 24883	/ 18		12 DEC 2007	Digital colour	35 mm	SU 163536
SU 1653 / 66	NMR 24883	/ 19		12 DEC 2007	Digital colour	35 mm	SU 165535
SU 1653 / 67	NMR 24883	/ 20		12 DEC 2007	Digital colour	35 mm	SU 163537
SU 1653 / 68	NMR 24883	/ 21		12 DEC 2007	Digital colour	35 mm	SU 163537
SU 1653 / 69	NMR 24883	/ 22		12 DEC 2007	Digital colour	35 mm	SU 163536

Verticals

Sortie number	Library number	Camera position	Frame number	Held	Centre point	Run	Date	Sortie quality	Scale 1:	Focal length (in inches)	Film details (in inches)
RAF/106G/UK/839	85	RS	4196	P	SU 167 540	16	25 SEP 1945	A	10200	20	Black and White 8.25 x 7.5
RAF/106G/UK/839	85	RS	4197	P	SU 159 540	16	25 SEP 1945	A	10200	20	Black and White 8.25 x 7.5
RAF/106G/UK/915	100	RS	4264	P	SU 168 532	16	11 OCT 1945	A	10000	20	Black and White 8.25 x 7.5
RAF/106G/UK/915	100	RS	4265	P	SU 162 532	16	11 OCT 1945	A	10000	20	Black and White 8.25 x 7.5
RAF/106G/UK/942	113	RP	3119	P	SU 156 540	8	19 OCT 1945	AB	10800	20	Black and White 8.25 x 7.5
RAF/106G/UK/942	113	RP	3178	N	SU 175 529	10	19 OCT 1945	AB	10800	20	Black and White 8.25 x 7.5
RAF/CPE/UK/1821	501	FP	1145	P	SU 166 527	5	04 NOV 1946	A	10000	36	Black and White 8.25 x 7.5
RAF/CPE/UK/1821	501	FP	1146	P	SU 161 526	5	04 NOV 1946	A	10000	36	Black and White 8.25 x 7.5
RAF/58/1431	1526	F42	42	N	SU 168 531	6	10 MAY 1954	AB	9000	20	Black and White 8.25 x 7.5
RAF/58/1431	1526	F42	43	N	SU 162 531	6	10 MAY 1954	AB	9000	20	Black and White 8.25 x 7.5
RAF/58/3021	2300	F21	251	P	SU 160 538	5	14 JUL 1959	AC	10200	20	Black and White 8.25 x 7.5
RAF/58/3021	2300	F21	252	P	SU 166 538	5	14 JUL 1959	AC	10200	20	Black and White 8.25 x 7.5
RAF/543/3860	2340	F21	599	N	SU 165 526	4	13 JUN 1967	A	10600	36	Black and White 8.25 x 7.5
RAF/543/3860	2340	F22	599	N	SU 164 548	10	13 JUN 1967	A	10600	36	Black and White 8.25 x 7.5
RAF/540/1386	2869	F21	87	P	SU 163 531	5	16 AUG 1954	AC	8500	20	Black and White 8.25 x 7.5
RAF/540/1386	2869	F21	88	P	SU 168 531	5	16 AUG 1954	AC	8500	20	Black and White 8.25 x 7.5
RAF/106G/UK/1658	3314	V	5059	P	SU 168 535	2	11 JUL 1946	AC	4332	8	Black and White 5 x 5
RAF/106G/UK/1658	3314	V	5060	P	SU 164 535	2	11 JUL 1946	AC	4332	8	Black and White 5 x 5
RAF/106G/UK/1658	3314	V	5061	P	SU 160 534	2	11 JUL 1946	AC	4332	8	Black and White 5 x 5
RAF/106G/UK/529	3603	FS	2005	P	SU 168 534	49	22 JUL 1945	A	4500	8	Black and White 5 x 5
RAF/106G/UK/529	3603	FS	2024	P	SU 162 531	62	22 JUL 1945	A	4500	8	Black and White 5 x 5
RAF/106G/UK/529	3603	FS	2025	P	SU 168 535	63	22 JUL 1945	A	4500	8	Black and White 5 x 5
RAF/106G/UK/529	3603	FS	2056	P	SU 160 535	77	22 JUL 1945	A	4500	8	Black and White 5 x 5
RAF/106G/UK/529	3603	FS	2057	P	SU 165 538	78	22 JUL 1945	A	4500	8	Black and White 5 x 5
RAF/106G/UK/522	3608	RP	3294	P	SU 167 530	2	17 JUL 1945	AC	6000	20	Black and White 8.25 x 7.5
RAF/106G/UK/522	3608	RS	4293	N	SU 165 539	4	17 JUL 1945	AC	6000	20	Black and White 8.25 x 7.5
RAF/58/1877	3860	F21	85	N	SU 173 526	2	29 SEP 1955	AC	15000	20	Black and White 8.25 x 7.5
RAF/58/1877	3860	F21	86	N	SU 165 527	2	29 SEP 1955	AC	15000	20	Black and White 8.25 x 7.5
RAF/58/1877	3860	F21	87	N	SU 156 528	2	29 SEP 1955	AC	15000	20	Black and White 8.25 x 7.5
RAF/58/1882	3866	F21	71	N	SU 170 532	2	01 OCT 1955	A	15000	20	Black and White 8.25 x 7.5
RAF/58/1882	3866	F21	72	N	SU 159 532	2	01 OCT 1955	A	15000	20	Black and White 8.25 x 7.5
RAF/106G/UK/530	4972	FP	1075	P	SU 163 537	6	22 JUL 1945	A	4500	8	Black and White 5 x 5
RAF/106G/UK/530	4972	FP	1076	P	SU 167 539	6	22 JUL 1945	A	4500	8	Black and White 5 x 5
RAF/106G/UK/530	4972	FS	2075	P	SU 164 535	13	22 JUL 1945	A	4500	8	Black and White 5 x 5
RAF/106G/UK/530	4972	FS	2076	P	SU 168 537	13	22 JUL 1945	A	4500	8	Black and White 5 x 5
RAF/540/1402	6235	F22	43	P	SU 164 530	5	07 SEP 1954	AB	7998	20	Black and White 8.25 x 7.5
RAF/540/1402	6235	F22	44	P	SU 162 536	5	07 SEP 1954	AB	7998	20	Black and White 8.25 x 7.5
OS/71476	10203	V	222	N	SU 167 533	7	07 SEP 1971	A	7500	12	Black and White 9 x 9
OS/71476	10203	V	223	N	SU 160 533	7	07 SEP 1971	A	7500	12	Black and White 9 x 9
RAF/540/1302	15230	F42	131	P	SU 158 542	9	11 MAY 1954	AB	10000	20	Black and White 8.25 x 7.5
RAF/58/1276	15236	F22	68	P	SU 170 537	31	14 SEP 1953	A	5000	20	Black and White 8.25 x 7.5
RAF/58/1276	15236	F22	69	P	SU 171 534	31	14 SEP 1953	A	5000	20	Black and White 8.25 x 7.5
OS/98436	15302	V	6602	P	SU 169 529	6	08 AUG 1998	A	8800	6	Black and White 9 x 9
OS/98436	15302	V	6603	P	SU 162 529	6	08 AUG 1998	A	8800	6	Black and White 9 x 9
OS/01908	15416	V	8646	P	SU 173 530	3	05 MAY 2001	A	9000	6	Black and White 9 x 9
OS/01908	15416	V	8647	P	SU 166 530	3	05 MAY 2001	A	9000	6	Black and White 9 x 9
OS/01908	15416	V	8648	P	SU 159 530	3	05 MAY 2001	A	9000	6	Black and White 9 x 9

Annex 2

Small Finds P9503UP

SF Number	Trench	Context	Object	Material	XRF	Comments
001	1	001	aluminium sheets and rivets	Aluminium		?Battle damage repair
002	1	001	Cockpit clock	Metal	Cu 45%; Zn 45%	
003	+	+	metal sheet	Aluminium		with green paint of cockpit interior
004	+	+	?Dial surround	Metal	Al 75% and Cu	With 'REF..' stamped on
005	1	002	Engine firing order data plate	Metal	Cu 73%, Zn 20% - brass	With annotation 'FIRING ORDER, AUNIT - 1635, BUNIT -6542
006	1	002	Metal connectors	Metal	Cu 60%; and Pb, Zn, Al, and Si	
007	2	101	Access port cover	Aluminium	Fe 73%, Cr 18%, Ni 8%	one of several from underwing area. Stamped 300008 4241 4a 88
008	2	101	Metal object from Service Tank	Aluminium		serial number stamped on 30054 253 3
009	1	002	Metal data plate	Aluminium	Al 85%; Si	wording includes

					1%, and Mg, Cr, Zn and Fe	'…AIRING,…L FLOWS, …YLENE,…INING
010	1	002	Canopy release lever	Metal	Fe 73%; Ni 8%, Cr 17%	
011	2	101	Quick release fitting	Metal		Some original green paint on outer face
012	1	002	Fuel Dial	Metal	Al and CuA	
013	1	002	Engine valve	Metal	Ni 85%; Cr10% and Pb, FE and Al	
014	1	002	Quick release cowling fastener	Metal	Fe and CuA	
015	1	002	Part of Wiring loom	Metal covering wire		?Ignition
016	2	101	.303 rounds	Metal		Two unfired .303 rounds and two bullets
017	2	101	.303 rounds	Metal		Two unfired .303 rounds (outer guns)
018	2	101	.303 rounds	Metal		Many rounds (inner guns)
019	2	101	pitot tube	Metal	Main Cu 75%; Zn 10%; and Ni, Pb and Fe. Head Cu 87%, Zn 6% and Pb, Ni and Fe	
020	2	101	Engine component	Aluminium		with data number DF 0605
021	2	101	thermostatic clip from water system)	Aluminium		300049 111
022	2	101	Gun shroud	Aluminium		with red paint covering - ?Gunport
023	1	002	Radio data plate	Aluminium	Cu 83%, Zn 9%	Script reads 'Transmitter receiver, Type T.R. 1133, Ref No. 10D/?3, AM, Serial 543
024	1	002	Gasket	Steel	Fe 97%	Manifold part
025	1	002	Electronic components	Bakelite		Some stamped 'AM'
026	1	002	Engine component	?Steel	Cu 78%; Sn 12%	Pinion (?magneto cross shaft drawing gear)
027	1	002	Cockpit label	Aluminium		scale and 5-4-3-2-1-0 probably from Fuel pressure instrumentation
028	1	002	wooden fragment	Wood		?Seat part
029	1	002	Flap selector	Metal	Cu 40%; Ni 26%; Zn 15%; Pb 5% and Cr	remnant of writing reads '..WN'

030	1	002	Cockpit switch	Metal	Cu, Zn and Pb	?one of the magneto switches
031	1	002	Harness strap end	Metal		
032	1	002	Constant Speed Unit	Composite metal		
033	1	002	Vacuum pump	Composite metal		
034	1	002	Vacuum pump Drive	Metal		
035	1	002	Engine bearings	Metal		
036	1	002	Engine Reduction gear	Metal		
037	1	002	Data plate	Aluminium	Al, 78%; Some Mag	Annotation reads 'FOLLAND AIRCRAFT, HAMBLE, SERIAL….68/56067, DATE 02/40, 00027/SB 2…, FL26, AID
038	1	002	Pilot's flying helmet mic. Plug	Metal		
039	1	002	Bennet connector from flying helmet chin strap	Metal		
040	1	002	Oxygen mask strap tightener	Metal		
041	1	002	Fastening receptors	Metal		mainly Al and Fe
042	1	002	Propeller balances (2) and remnants of Spinner	Metal		Spinner has milling marks imprinted from balance
043	1	002	Cockpit armour fixing	Metal		
044	1	002	ammunition tray door fixings	Aluminium		Including number 30008 3995 L86 ?Z, F275 - with yellow paint, and 3995 24
045	2	101	Wing edging	Aluminium		with red paint - ?Gun port - and numbers 30008 420, 30008 2184/2, 30008 2012 55, 30008 3763, 30008 3060 639, 30008 4625
046	2	101	Part of wing leading edge	Aluminium		Leading edge with remnants of gun fabric attached
047	2	101	Browning machine gun components	Metal		
048	2	101	Back of oxygen gauge	Metal		
049	2	101	Back of air speed indicator	Metal		

050	3	201	Gun air pressure hose cover bolts	Metal		wired together
051	1	002	Flying helmet buckle	Metal		
052	3	201	Gun access port parts	Metal		Inc gun fixing
053	2	101	Fuel tanks strap	Metal		Fe and Al
054	2	101	Gun feed mechanism	Metal		
055	2	101	Gun access port parts	Metal		
056	2	101	Stengthening Frame 11	Metal		
057	1	002	?Trouser button	Metal		Fe
058	1	002	Chain	Fe		For Rudder
059	1	002	Oxygen bottle valve	Metal		
060	1	002	Fusebox Screw	Metal		
061	1	002	Flame Tape	Misc Material		
062	1	002	Engine Mount	Metal		
063	1	002	Slipper Clutch	Bronze		
064	1	002	brake pad	Aluminium		
065	1	002	Air Intake piece	Metal		
066	1	002	Top Tank pieces	Metal		largely Al
067	2	101	Gun Leading Edge	Aluminium		remains of doping patch still present
068	1	002	Engine Valve	Metal		
069	1	002	Trim Tabs	Metal		
070	1	002	Wing Rib	Aluminium		
071	1	002	?rudder control	Metal		largely aluminium, some FE
072	1	002	Gun vent system	Composite inc rubber		Rubber and Fe
073	1	002	Radiator	Metal		
074	+	+	Label of Engine Compressor	Aluminium		Marked 'REPLENISH WITH OIL OD72 EVERY 10 HOURS'
075	3	201	Turning Indicator	Metal		Marked 'TURNING INDICATOR, MARK 1A, AM, NO 2933/39, REID & SIGNIT LTD'
076	1	002	Spark plug	Composite		
077	2	101	Leading Edge D Box	Aluminium		
078	2	101	Aluminium sheet	Aluminium		paint adhering still
079	1	002	Seat Mount	Metal		largely Fe

080	1	002	Joiner	Metal		Fe and Al
081	1	002	Spring catch	Aluminium		
082	1	002	component label	Aluminium		VACCUUM PUMP, MARK
083	3	201	Data Plate from bottom tail plane	Aluminium		Marked 'GENERAL AIRCRAFT LTF=D, SERIAL NO GAL/6S/4082 DATE 6/3/40, SER NO 300018 5HT/5 IS…Z, PASSED ALD 5DL
084	+	+	Engine Gear Wheel	Metal		
085	1	002	airframe component	Composite		aluminium and rubber
086	1	002	?Cowling vent	Composite		mixture of Fe, rubber and Al
087	1	002	Clamp	Metal		
088	1	002	Spring mounts (2) for blind flying panel	Metal		
089	1	002	Bracket	Iron		
090	1	002	Bulkhead fitting	Metal		
091	1	002	Actuator	Metal		
092	1	002	Bulb casing holder	Composite		
093	3	201	Static Vent	Metal		largely Al - outside as opposed to Pitot
094	1	002	Filter	Fabric		
095	1	001	Harness Strap end	Metal		
096	1	001	datum line marker - adjacent to top engine bearer-to-fuselage taper bolt, port side? See Haynes Manual p54	Aluminium		all annotation still painted
097	+	+	Curved fixing ?Radiator component	Metal		Composed of Al and Fe, Stamped NORAL 30041 347 LK and with yellow/green paint
098	3	201	Access Port Cover	Aluminium		Light duck egg under wing paint and stamped 30008 4241 4/88
099	3	201	Access Port Cover	Aluminium		Light duck egg under wing paint and stamped 30008 4241 2/88
100	+	+	Instrument glass lense	Glass		c8mm circular green lense withy flat base and convex top

101	1	002	Instrument switch	Metal		
102	+	+	Seat Fixture	Mixed		wooden component fixed to metal seat fitting
103	+	+	Feature edging	Aluminium		Curved edge of airframe with smoothed metal covering bolts. Perhaps seat or front canopy fitting?
104	+	+	Electrical component	Bakelite		Stamped 79083/
105	+	+	Perspex fitting	Perspex		Stamped 'PERSPEX T140X' and etched X56133 and RN754 ?Z

Annex 3

.303 rounds from the Browning Machine guns

Round Number	Trench	Stamp	Year	Place	Type	Comments
001	Tr2	K1939 WI	1939	K	AP	K – Kynoch
002	Tr2	RL 1939 B IV	1939	RL	INCEND	RL - Royal Laboratories Woolwich
003	Tr2	MF39 VII	1939	MF	BALL	Australian
004	Tr2	K1939 WI	1939	K	AP	K – Kynoch
005	Tr2	K1939 WI	1939	K	AP	K – Kynoch
006	Tr2	GB1940 VII	1940	GB	BALL	GB - Greenwood and Batley
007	Tr2	K1939 WI	1939	K	AP	K – Kynoch
008	Tr2	GB1940 VII	1940	GB	BALL	GB-Greenwood and Batley
009	Tr2	RL 1937 B IV	1937	RL	INCEND	RL - Royal Laboratories Woolwich
010	Tr2	K1939 WI	1939	K	AP	K - Kynoch - With belt
011 – Not used						
012	Tr2	K1939 WI	1939	K	AP	K - Kynoch - With belt
013	Tr2	K1939 WI	1939	K	AP	K - Kynoch - With belt
014	Tr2	K1939 WI	1939	K	AP	K - Kynoch - With belt
015	Tr2	RL 1937 B IV	1937	RL	INCEND	RL - Royal Laboratories Woolwich
016	Tr2	K1939 WI	1939	K	AP	K – Kynoch
017	Tr2	K1939 WI	1939	K	AP	K – Kynoch
018 – Not used						
019	Tr2	K1939 WI	1939	K	AP	K – Kynoch
020	Tr2	K1939 WI	1939	K	AP	K – Kynoch, with belt
021	Tr2	GB1940 VII	1940	GB	BALL	GB - Greenwood and Batley, with belt
022	Tr2	GB1940 VII	1940	GB	BALL	GB - Greenwood and Batley, with belt

023	Tr2	RL 1937 B IV	1937	RL	INCEND	RL - Royal Laboratories Woolwich
024	Tr2	GB1940 V11	1940	GB	BALL	GB - Greenwood and Batley
025	Tr2	R 1939 B IV	1939	R	INCEND	RL - Royal Laboratories Woolwich
026	Tr2	MF39 VII	1939	MF	BALL	Australian
027	Tr2	K1939 WI	1939	K	AP	K – Kynoch
028	Tr2	K1939 WI	1939	K	AP	K – Kynoch
029	Tr2	GB1940	1940	GB	BALL	3 x linked rounds
030	Tr2	RL 1937 B IV	1937	RL	INCEND	RL - Royal Laboratories Woolwich
031	Tr2	MF39 VII	1939	MF	BALL	Case only –cooked off. Australian
032	Tr2	Illeg				
033	Tr2	Illeg				
034	Tr2	Illeg				
035	Tr2	RL 1937 B IV	1937	RL	INCEND	RL - Royal Laboratories Woolwich, with belt
036	Tr2	RL 1937 B IV	1937	RL	INCEND	RL - Royal Laboratories Woolwich, with belt
037	Tr2	K1939 WI	1939	K	INCEND	K – Kynoch
038	Tr2	GB1940	1940	GB	BALL	GB - Greenwood and Batley, with belt
039	Tr2	GB1940	1940	GB	BALL	GB - Greenwood and Batley
040	+	RL 1939 B IV	1939	RL	INCEND	RL - Royal Laboratories Woolwich
041	+	GB 1940	1940	GB	BALL	2 x GB - Greenwood and Batley, with belt
042	+	RL 1937 B IV	1937	RL	INCEND	RL - Royal Laboratories Woolwich
043	Tr2	K1939 WI	1939	K	AP	K – Kynoch, with belt
044	Tr2	RL 1937 B IV	1937	RL	INCEND	RL - Royal Laboratories Woolwich
045	Tr2	K1939 WI	1939	K	AP	K – Kynoch
046	Tr2	Illeg			BALL	1 x MkVII ball round with belt
047	Tr2	MF39 VII	1939	MF	BALL	Australian
048	+	K1939 WI	1939	K	AP	K – Kynoch
049	+	K1939 WI	1939	K	AP	K – Kynoch with belt
050	+	GB1940VII	1940	GB	BALL	GB - Greenwood and Batley
051	+	K1939 WI	1939	K	AP	K – Kynoch
052	+	K1939 WI	1939	K	AP	K – Kynoch
053	+	K1939 WI	1939	K	AP	K – Kynoch
054	+	K1937 V II	1937	K	AP	K – Kynoch
055	+	GB1940VII	1940	GB	BALL	GB - Greenwood and Batley
056	+	GB1940VII	1940	GB	BALL	GB - Greenwood and Batley
057	+	GB1940VII	1940	GB	BALL	GB - Greenwood and Batley

058	+	GB1940VII	1940	GB	BALL	GB - Greenwood and Batley
059	+	GB1940VII	1940	GB	BALL	GB - Greenwood and Batley
060	+					Loose link parts
061	+					7 x .303 MK VII Ball rounds
062	+					8 x .303 WI AP Bullets
063	Tr2					4 x .303 Mk VII Ball rounds


SUPERMARINE
SPITFIRE
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