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# Former RAF Upper Heyford, Cherwell Oxfordshire: A reassessment of the flying field Conservation Area

Wayne D Cocroft

Discovery, Innovation and Science in the Historic Environment





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Cherwell  
Oxfordshire**

**A reassessment of the flying field Conservation Area**

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NGR: SP 51374 27007

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ISSN 2059-4453 (Online)

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## **SUMMARY**

This report has been produced following a request from Historic England's Listing and Planning Groups to reassess the flying field of former RAF Upper Heyford; the area designated as a Conservation Area. RAF Upper Heyford was founded during the First World War and was subsequently abandoned for a short period at the end of the war. In the 1920s it was re-established under Trenchard's scheme to provide permanent bases for the new service and was the exemplary airfield and the only one completed to the original design standards. During the Second World War the most significant change to the appearance of the airfield was the laying of concrete runways in a characteristic 'A' plan configuration. In the late 1940s the airfield was identified as one of a number that might accommodate United States bombers with the capability of attacking Eastern Europe with atomic weapons. To fulfil this role the airfield was extensively reconstructed, including the lengthening of its runway, more extensive aircraft parking areas, the construction of new bombs stores, specialist maintenance hangars, and an increase in domestic accommodation. After a short period in the 1960s when aerial reconnaissance units were assigned to the base in 1970 it regained its nuclear deterrent role. From this date it was exclusively associated with the F-111-E 'Aardvark' one of the few NATO aircraft thought to be capable of penetrating into the heavily defended airspace of Eastern Europe. During the 1970s the airfield's landscape was again transformed through NATO's airfield survival measures leading to the construction of numerous hardened structures. With the end of the Cold War the last F-111-Es departed in 1993. Today, the flying field of former RAF Upper Heyford is an increasingly rare example of an unaltered Cold War fast jet airbase.

## **CONTRIBUTORS**

The report was prepared by Wayne Cocroft.

## **ACKNOWLEDGEMENTS**

The author is grateful to Beki Burns for assistance in the preparation of this report.

## **ARCHIVE LOCATION**

The Historic England Archive holds the air and ground photographs that were consulted during the preparation of this report.

## **DATE OF RESEARCH**

Research was undertaken during March and April 2016 and the desktop published report was completed in November 2017.

## **CONTACT DETAILS**

Historic England, Brooklands, 24 Brooklands Avenue, Cambridge, CB2 8BU  
Wayne D Cocroft; 01223 582770; [wayne.cocroft@HistoricEngland.org.uk](mailto:wayne.cocroft@HistoricEngland.org.uk)

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## INTRODUCTION

This report has been produced following a request from Historic England's Listing and Planning Groups in response to possible renewed development pressures around the airfield. Most of the former flying field and associated structures lie within a registered Conservation Area. Within this area are a number of nationally designated structures, three Nose Dock Hangars (325) (1392505), (327) (1392506), and (328) (1392507) are all listed at Grade II, also listed at Grade II are the hardened squadron operations cell (234) (13292509) and the Control Tower (340) (1392508). Other features are protected as a single Scheduled Monument (1021399), these include the northern bomb stores, Victor Alert hardened aircraft shelter complex, the Avionics Building (299), hardened Wing headquarters (126), and hardened telephone Exchange (129). In addition 59 buildings to the south of the flying field are locally listed. This report was a desk based assessment and no field visit was undertaken.

### Previous Research

United States Air Force (USAF) operations ceased at the base in 1993 and shortly afterwards the airfield was declared to be surplus to defence needs. In 1996, to assess the extent and quality of the buildings at Upper Heyford Cherwell District Council commissioned Paul Francis of the Airfield Research Group to carry out a survey of the airfield which was undertaken over 4 days in February 1996 (Francis 1996). A comprehensive gazetteer was made of all the pre-1945 and the most of the significant Cold War structures; the latter then a topic that had received little attention. Also around this time English Heritage was undertaking a thematic listing survey of airfields up to 1945 (Lake 2001). The Royal Commission on the Historical Monuments of England (RCHME) was simultaneously working on a national recording project to document key Cold War sites. In 1998, RCHME recording at Upper Heyford was generally limited to ground photography, air photographs were also taken around this time. Following the disbanding of the government's Property Services Agency (PSA) the National Monuments Record, now the Historic England Archive, acquired an extensive collection of PSA photography some of which document the most significant building programmes at Upper Heyford since the late 1960s and some is available online (<http://archive.historicengland.org.uk>). It also holds the national collection of aerial photography, although unfortunately no images of the airfield are for the period covering the 1970s to mid 1990s.

In 2003, English Heritage published *Cold War building for nuclear confrontation 1946-1989* (Cocroft & Thomas), which sets out the broad context for Cold War era USAF infrastructure in England. The research for this study also contributed to the Monuments Protection Programme assessment of Cold War monuments (Cocroft 2001). In this report a number of structures were identified for possible protection reflecting Upper Heyford's role as one of the principal USAF's Cold War bomber nuclear deterrent airfields. The scheduled areas were confirmed in 2006 and the listed buildings in 2008.

Concurrently, in 2005 North Oxford Consortium, Cherwell District Council and English Heritage commissioned The Tourism Company, Oxford Archaeology and



ACTA to produce a Conservation Management Plan for the site (2005). As a result of this study in April 2006 Cherwell District Council designated most of the airfield as a Conservation Area and also locally listed 59 buildings.

Further ground photography was undertaken by English Heritage in 2005 to record examples of wall art, mainly in the accommodation blocks to south (Cocroft et al 2006). Subsequently, additional recording work has been undertaken by Oxford Archaeology (Martinez-Jausoro 2009), not all of which is in the public domain (Phimester 2014, 16).

This re-assessment has drawn on previously unavailable files on the 1970s NATO airfield survival measures, or hardening, programme that have become available in The National Archives and official United States Air Force histories that are now readily accessible online.

## CONTEXTUAL RESEARCH

### Early History



*Figure 1: RAF Upper Heyford, during the war the most significant alterations to the flying field included the laying of concrete runways and taxiways. (c) Historic England CPE/UK2013/16Apr47*

RAF Upper Heyford was established during the First World War and after a short period of abandonment was re-established as a bomber station as part of the

Home Defence Expansion Scheme, begun in 1923 under the RAF's founder Lord Trenchard. Upper Heyford was selected as an offensive bomber station and was to be the template for other stations. However, concerns expressed by the Treasury and the Cabinet - in the face of increasing economic stringency and the prospects of a more peaceful world order - resulted in the deceleration of the programme and of the planned four Oxford group bomber stations only Upper Heyford was completed as intended and opened in October 1927 (Lake 2003, 5.1.2). At this time it had a typical omni-directional grass flying field to the north and buildings distinctly zoned into technical and domestic areas, the latter accommodation further subdivided by rank (Lake 2003, 2.4.2).

Forty-one technical buildings survive from this phase and up to the end of the war, including six 'A' type hangars, which absorbed 30% of the original construction budget (Lake 2002, 2.4.2); other notable survivals include the Station Offices and Officers' Mess. During the Second World War the airfield mainly fulfilled a training role. In the winter of 1943/44 work began on the construction of concrete runways laid to a typical 'A' plan. The main runway had a standard length of 2000 yards (1829m), while the two ancillary runways at 1,700 yards (1554m) and 1,550 yards (1417m) were slightly longer than ones elsewhere (Figure 1). In addition to typical circular pavements, or 'frying pans', for parking aircraft, two so-called spectacle hardstandings were also built alongside the southern perimeter track (Abraham & Towler 2002, 13). It was probably also at this time that a new control tower was constructed to the north of the 1920s hangar group. It was built to Air Ministry design 518/40, a temporary wartime design typical of Operational Training Unit airfields (Francis 1993, 35).

## **The 1950s – Strategic Air Command building for Mutually Assured Destruction**

Towards the end of the Second World War United States Army Air Force strategists began to consider their post war basing requirements and by early 1946 potential locations for atomic weapons stores. Initially, five bases in eastern England were identified, Marham, Waddington, Mildenhall, Lakenheath and Sculthorpe; at the latter two sites atomic bomb loading pits were substantially complete by 1948 (Young, 1977, 523-556). During the Berlin Blockade crisis of 1948, six squadrons of United States B-29 Superfortress bombers were moved to three bases in East Anglia (Moody 1995, 15), although unknown at the time none were adapted to carry nuclear weapons. These East Anglian bases were potentially more vulnerable to air attack and subsequent negotiations identified four airfields in the south midlands for the rotational deployments of Strategic Air Command's bombers. In April 1950, it was agreed to construct four bases initially to house United States Air Force B29 Superfortress strategic bombers and supporting refuelling tankers (Moody 1995, 276). Work began in June 1950 to extensively remodel Upper Heyford in readiness for the arrival of USAF's Strategic Air Command (SAC) bombers and refuelling aircraft (Figure 2). At this date a SAC bombardment wing typically comprised three squadrons of 10 aircraft (Murray 1995, 16). It might also be deployed with a squadron of refuelling tankers. It appears that Upper Heyford was developed to accept a wing of three squadrons with possibly some additional space for refuelling



*Figure 2: RAF Upper Heyford, this view shows the flying field shortly after its modification to accept SAC bombers. New features include an extended runway and additional aircraft parking areas. (c) Historic England 540/673/12Feb1952/frame 4272.*

tankers.

Administratively, to manage the USAF forces in the United Kingdom the 3<sup>rd</sup> Air Division United States Air Force Europe (USAFE) (Provisional) was established on 16 July 1948 at Marham, Norfolk; a month later the (Provisional) was dropped. Due to the increasing construction work and build-up of aircraft the 3<sup>rd</sup> Air Division was split creating the 7<sup>th</sup> Air Division that took charge of all SAC B-29 bomber missions and the newly activated 3<sup>rd</sup> Air Force which reported to USAFE and was charged with tactical operations, logistics and supply, and negotiations with the United Kingdom (Murray 1995, 16-17).

The reconstruction of the base was given increased urgency by the detonation of an atomic bomb by the Soviet Union in August 1949 and the outbreak of the Korean War in the following June. The work included the extension of the main runway to 2767 yards (2530m), the addition of more aircraft parking pavements, the construction of new bomb stores, a control tower, underground fuel tanks, and



*Figure 3: RAF Upper Heyford, early 1950s Nose Docking Sheds, 324, 325 and 327, all are listed Grade II. (c) W D Cocroft*

a fire station (Figure 2). Distinctive American hangar types were also introduced at this date, the cantilevered, aluminium ‘Nose Docking Sheds’, 324, 325, 327, and 335 (Figure 3). Additions were also made to the airfield’s domestic area. A total of 170 buildings were either built or refurbished. In 1953, the runway was further extended to 3218 yards (2938m) (Abraham & Towler 2002, 16).

During this early phase of the deployment of nuclear weapons bases, such as, Upper Heyford, were pivotal to United States deterrent policy. Initially, their proximity to Europe provided frontline aircraft with enough range to strike targets in Eastern Europe and later to supplement long range B-36 Peacemakers based in the United States. Upper Heyford was configured so that suitably adapted aircraft could be operated to fly either with conventional or atomic bombs. In June 1950 President Truman authorised the storage of the non-nuclear components of atomic weapons in England. The exact locations of the weapons stores, the number of weapons deployed, and deployment dates remain unknown (OASD(AE) 1978, 15). Additional weapons were held under the control of the Atomic Energy Commission control in the United States and would only be flown to the operating bases during times of tension (Moody 1995, 199). It is believed that the capsules containing the nuclear cores and initiators were normally stored in the United States. Inert training weapons were routinely held in the stores. United States’ strategy from the late 1940s envisaged the Strategic Air Command might also use conventional weapons to suppress air defences, to act as decoys for the atomic attacks, and to aid ground forces (Moody 1995, 60-61, 329). To support conventional bombing operations a new southern bomb stores was built at the south eastern corner of the airfield to a plan form typical of Strategic Air Command bases of this date.

The first American squadrons of KB-29P refuelling aircraft on 90-day rotational deployments began to arrive at Upper Heyford from January 1952 (Moody 1995, 434) (Figure 4). This pattern lasted until June 1953 when jet powered bombers, B-47 Stratojets and B-36 Peacemakers, started their regular rotations through the base. Post-war United States forces in the United Kingdom reached a peak in 1955 when they occupied 80 installations, including 23 airfields. After this date with the



*Figure 4: RAF Upper Heyford, February 1952 this view shows some of the first tankers to be deployed (c) Historic England 540/673/12Feb52/F20 frame 4273*

need to reduce defence spending and the advent of inter-continental missiles their presence was reduced and rotational deployments ceased in March 1965 (Moody 1995, 22). The airfield then passed from SAC to USAFE's 3<sup>rd</sup> Air Force and for the remainder of the 1960s it was mainly used by reconnaissance aircraft, including U2s, RF-101 Voodoos and later F4 Phantoms.

### **The 1970s – Flexible Response and the F111 era**

In late 1969 the 20<sup>th</sup> Tactical Fighter Wing was assigned to Upper Heyford and after the arrival of advance personnel in the following March its F-100 Super Sabre fighters began to arrive. From September the unit rapidly re-equipped with a new generation of advanced low level strike aircraft, the F-111E Aardvark, the first operational aircraft to use a variable geometry wing, which were also equipped with a sophisticated terrain following radar and radar-guided bombing system. With a combat range of 4,700km (2,925 miles) the aircraft had the capability of striking deep into Eastern Europe. The 20<sup>th</sup> Tactical Fighter Wing comprised the 55<sup>th</sup>, 77<sup>th</sup> and 79<sup>th</sup> Tactical Fighter Squadrons, each with a nominal strength of 24 aircraft (Gunston 1978, 77). The actual strength sometimes reached up to 79 aircraft to provide spares for ones lost in accidents or otherwise unavailable. To provide for these sophisticated aircraft a new maintenance shop was built and for the pilots a dedicated simulator building (293). On the flying field fuel storage tanks, extended aircraft pavements, and a quick reaction area, comprising nine weather shelters were

built. £1.75m was spent on the refurbishment (AIR2/16603, E62).

## **Airfield Survivability Measures**

Following the near destruction of the Egyptian Air Force on its home bases by the Israeli Air Force in the 1967 Arab-Israeli war air forces around the world began to examine the protection of their mission critical facilities. In 1968, following a re-assessment of its defences the North Atlantic Treaty Organisation's (NATO's) Supreme Allied Command Europe (SACEUR) initiated policies to enhance Airfield Survivability Measures through the Physical Protection Programme (TNA: DEFE 24/1292, E46). This policy proposed constructing protected shelters for 70% of NATO's frontline tactical aircraft; the percentage that might be expected to be combat ready at any one moment. This was also the proportion of shelters NATO was prepared to fund, beyond this further shelters would be a national responsibility (TNA: DEFE 24/1292, E5/1). During this period NATO policy had also moved from one of Mutually Assured Destruction, or massive retaliation, to Flexible Response. Under this doctrine aggression by the Warsaw Pact would be met by a variety of reactions. To maintain the credibility of this policy vital offensive assets needed to be protected against a pre-emptive first strike by forces of the Eastern Bloc.

By the early 1970s this programme was given an increasing urgency with mounting concerns about the capability of the Soviet air force to carry out conventional attack on airfields in the United Kingdom. A threat that would potentially leave the F111s vulnerable to attack and in so doing greatly diminish their deterrent value (AIR 19/1161, 48/1). Due to the specialist technical requirements of these aircraft dispersal was not an option. Airfield Survivability Measures through hardening became a vital component of NATO's deterrent strategy.

## **The hardened landscape**

In the late 1970s the appearance of the airfield was transformed by NATO's policy of hardening and 'dulling down' its main operating bases to make them more resilient against conventional, biological and chemical attack (Figure 5). This transformation at Upper Heyford began in early 1975 with the construction of fifty-six Hardened Aircraft Shelters (HASs), including a new Quick Reaction Alert area for nine armed aircraft ready to take-off at a moment's notice (Breslin 1990, 47). Each squadron area was provided with hardened Squadron Operations Cells for the personnel. New aprons and taxiways were also laid to connect the HASs and parallel to the main runway a new taxiway was added that might double as an emergency runway. To support the F-111s specialised maintenance facilities were required to look after their complex electronic systems, and these were placed in a massive hardened avionics centre (299). To reduce noise during static engine testing two 'Hush Houses' (1368 and 1372) were built during the early 1980s. To ensure that the airfield could continue to operate under hostile conditions a hardened Wing headquarters bunker (126) and telephone exchange (129) were also built. Other features essential to the operation of the airfield included protected bulk fuel facilities and the protection of conventional weapons in earth-covered concrete igloos.



*Figure 5: RAF Upper Heyford, February 1999 this view shows the airfield soon after closure with the new NATO emergency runway to the right (c) Historic England 18517/25*

By the late 1970s the nuclear balance in Europe was being challenged by the deployment by the Soviet Union of the mobile SS-20 missile system. NATO countered with the deployment of tactical Pershing II and Ground Launched Cruise Missiles. Increasingly sophisticated air defences across Eastern Europe posed a growing threat to the F-111s and on 1 July 1983, the three resident F111 squadrons were joined by 12 aircraft of the 42<sup>nd</sup> Electronic Combat Squadron (Campbell 1986, 266). This unit flew modified EF-111A 'Ravens', an electronic warfare variant of the F-111 designed to suppress hostile radar systems. Initially they were under the charge of the 20<sup>th</sup> TFW, although in 1985 this passed to the 66<sup>th</sup> Electronic Combat Wing based Sembach, Germany (Office of History 2014, 21). In the early 1980s these new developments at Upper Heyford drew increasing protests from the peace movement (Campbell 1986, 266). During the 1980s a number of peace camps were established around the base, and on the site of one two oak trees have been planted to remember John Bugg, an MoD police officer who joined the protests.

With part of the F-111's wartime mission now allocated to the tactical missile units additional tasks were assigned to Upper Heyford's squadrons. The changing role of the 20<sup>th</sup> TFW was illustrated by Exercise Red Flag, January to February 1988, when the unit first tested the Durandal (BLU-107) runway buster bomb, a conventional bomb enhanced with a rocket booster (Office of History 2014, 22).

In 1986, F-111s from Upper Heyford achieved world-wide attention when on 14 April, they were involved (along with F-111s from Lakenheath) in operation



'Eldorado Canyon', an air attack on Libya, in retaliation for the country's involvement in acts of terrorism. The use of aircraft on British soil further emphasised the close political links between the two countries during the 1980s. In 1990, following Iraq's invasion of Kuwait, F-111s from Upper Heyford participated in operation 'Desert Shield', and subsequently in 'Desert Storm' to liberate Kuwait. During this conflict they demonstrated their capability to deliver a wide range of conventional munitions, including the BLU-107 runway buster (Office of History 2014, 21-24; <http://fas.org/man/dod-101/sys/dumb/blu-107.htm> ). In 1993, as a consequence of the massive defence 'draw-down' after the end of the Cold War, but also due to the growing obsolescence of the F-111s, the type was withdrawn from Upper Heyford on 7 December 1993 (Figure 6). Shortly afterwards the airfield was handed back to the RAF, who declared it surplus to military needs (Cocroft 2001).



*Figure 6: Pima Air Museum, Tuscon, Arizona, F-111, 68-033 formerly based at RAF Upper Heyford. (c) W D Cocroft*

## THE AIRFIELD AND ITS BUILDINGS

The physical fabric of flying field at Upper Heyford represents the technological and strategic evolution of the theory of bomber deterrence from the 1920s until the end of the Cold War. The early open flying field was overlain by a typical wartime 'A' pattern of runways. In the early 1950s to accommodate increasingly larger, heavier and more sophisticated long range bomber aircraft the airfield was substantially rebuilt and further adapted around 1970 to prepare for the deployment of F-111 low level strike aircraft.

### The 1950s - Strategic Air Command and Mutually Assured Destruction

Discussions about the allocation of United States Strategic Air Command bombers to Upper Heyford began in the late 1940s. Before the larger bombers could be accommodated considerable modifications were required. The main runway was extended and adjacent to the taxiways trapezoidal and spectacle type aircraft parking pavements were added. The increasing complexity of the aircraft and also the airfield was reflected in the requirement for an enlarged control tower (340), a two-storey, brick structure with a visual control room mounted on its roofs, built to Air Ministry drawing 5223A/51 (Francis 1993, 96-7). Internally, the tower housed rooms for GPO equipment, radio equipment, batteries, radar approach equipment, airfield lighting, meteorological services, as well as personnel facilities. The increased fuel requirements of the bombers was met by new fuel storage facilities with at least three underground tanks linked to buried pipes that delivered fuel to hydrants close to parking platforms. Immediately to the north of the 1920s hangars a large aircraft servicing platform was laid and two further large platforms were built to the west.

It was envisaged that aircraft would be based at Upper Heyford for perhaps up to three months, or moved here during times of tension. Deep servicing and maintenance was undertaken in the United States with limited servicing facilities provided at Upper Heyford. To accommodate larger aircraft four nose docking hangars (324, 325, 327 and 335) were constructed. These allowed the front of aircraft and their engines to be worked on under cover, while the tail sections projected from the hangars. The aircraft parking pavements were arranged in roughly three squadron groups, to the north west, north east and south east, and each was provided with a cluster of squadron operation cells, or headquarters, buildings.

### Northern bomb stores

To support Strategic Air Command's nuclear role a new bomb store was constructed at the northeast corner of the airfield (Figure 7). This area has the distinct form of a 'Q' site, one designed to accommodate nuclear weapons, which is reflected in strengthened security of double fences, raised guard posts, protected igloo stores, and other specialist buildings. The initial design comprised a Y-shaped road plan with loops at the end of each of the arms. It was entered from the perimeter track and to the east are four earth covered igloos (1001-1004) their doors protected by a blast



*Figure 7: RAF Upper Heyford, the northern bomb stores in 1961, first phase, showing four storage igloos to the right and various maintenance and assembly buildings to the left. (c) Historic England Fairey 21-006-6125 June 1961*

wall revetted in earth to the rear. On entering the stores area there are a number of single storey buildings including the guardroom and other personnel buildings. To the west is a double-storey building (1007), this is a standard USAF design for an atomic bomb trigger store (Figure 8). Examples of this building type are known in the United States (Air Combat Command 1999, 100-104; 3084 ADG). Outwardly, it appears to be a double storey building with metal framed windows. It is, however, a solid concrete block with a small, secure interior vault where nuclear capsules, or triggers, might be stored. The capsules were held in pressurised tubes within a rectangular, open, tubular frame, known as a 'Birdcage', and kept in the vault in open lockers about 0.91cm square. The vault might house upto 30 such devices (3084 ADG). An unverified report suggests a similar structure may survive at RAF Brize Norton, Oxfordshire. To its north is the concrete and earth covered Plant building (1006), this was used for the maintenance of the weapons' non-nuclear components, including its mechanical and electrical systems, and perhaps for inspection of the nuclear initiators or pits. Internally, this has been modified reflecting the different servicing needs of newer types of weapons. To its north within the road loop is another igloo (1005), which may have been used to store assembled weapons, defective devices, and weapons awaiting maintenance.



*Figure 8: RAF Upper Heyford, rear view of the early 1950s Strategic Air Command 'A' Structure, the capsule or trigger store (1007) , similar designs are found in continental USA. It is claimed that these buildings exhibited a remarkable similarity with the first SAC headquarters building at Offutt, Nebraska, designed by Albert Kahn for the Martin Bomber Plant. (c) C. Welch*

The stores were designed to hold the earliest generation of United States atomic bombs; the B-29 and B-50 Superfortresses that rotated through Upper Heyford were cleared to carry the Mark III, IV and 6/18 weapons (see appendix 1). The dimensions of these devices was determined by the size of the internal 'physics package' of inter-locking explosives lenses, all three weapons were 10ft 8in (3.25m) in length and 5ft (1.52m) in diameter. A feature of all these early weapons was a separate capsule containing the weapon's plutonium core and initiator (Gibson 1996, 88-92). This was in part a safety feature, but also a reflection of the polonium 210 used in early initiators that had a relatively short half-life and required regular maintenance. The design of these early weapons in turn dictated the design of the stores, with a separate trigger store and a building for the assembly of the weapon. Later bomb designs used different technologies and beyond the end of the 1950s the use of separate capsules ceased.

In 1969, in preparation for the arrival of the 20<sup>th</sup> Tactical Fighter Wing and the F-111s the storage area was extended westwards (Figures 9 & 23). This comprised 21 individual storage units; eight vaults to the west and 13 to the east, all were covered by a single earth mound. Property Services Agency photographs confirm that these stores were complete by September 1970. They were probably designed



*Figure 9: RAF Upper Heyford, Northern Bombs Stores in 1999, showing the second phase with a new storage building and a reduced defended perimeter. (c) Historic England 18537/09*

to hold the B-43 free fall nuclear weapon (Gibson 1996, 100-101). It measured 12ft 6ins (3.81m) in length and weighed 2,100lbs (923kg); depending on nuclear safety regulations each store might hold a number of weapons. F-111s were also cleared to deliver the B-61 and B-83 nuclear weapons, both of which were of a similar size (Gibson 1996, 137). Additionally, a board in the Wing headquarters bunker (126) confirms B-57 weapons were allocated to the Wing. During the mid-1970s hardening of the airfield the security of this area was increased by the construction of a hardened entry control point (1060) (Figure 10), combat support building (1050), and a tall steel-framed guard tower (UH49) typical of special weapons areas was also built. By the end of the base's operational life the nuclear weapons area was consolidated to the west with access into this area controlled by the entry control point (1060). The area was also protected by a triple fence, outward facing lights, and tall poles to deter helicopter borne assaults; additionally about 5m from the outer fence was a five strand barbed wire fence supported on angle irons. Its function was probably to deter people approaching too close to the main fence. A separate entrance was created for the area to the east.



*Figure 10: RAF Upper Heyford, 1980s heavily protected entrance to the Northern Bomb Stores. (c) W D Cocroft*

## Significance

The Northern Bomb Stores reflect one of the key characteristics of the Cold War the deployment of nuclear weapons to deter aggression. They also represent facilities for some of the earliest Cold War deployments of these weapons by the West. A time when the range of the bombers determined that they should be placed relatively close to Eastern Europe, an era before intercontinental missiles. These stores also predate the operational deployment by the RAF of nuclear weapons by about 6 years, a period where the West sheltered beneath the America nuclear umbrella. The presence of these stores does not in itself confirm that nuclear weapons were held at Upper Heyford, but that the capability was there to handle them in times of tension. The western extension was an integral part of the F-111's mission to strike at targets in Eastern Europe; the versatile B-43 weapon might be used against cities and large military complexes, troop concentrations and facilities.

The procedures surrounding the guarding and handling of nuclear weapons are some of the most closely guarded secrets. The double fence, anti-helicopter poles, guard posts and entry control point all convey the physical security of this area. The buildings of the bomb stores illustrate the secure and environmentally controlled storage conditions these deadliest of weapons require. They also reflect evolving nuclear weapons technology and their associated infrastructure. In the earliest weapons the initiators, or pits, required regular maintenance. They were stored in building (1007), known as an 'A' building and taken to the inspection and assembly,

or Plant building (1006) (Figure 22). In the second generation atomic weapons of the early 1950s some periodic disassembly of components was still required (Air Combat Command 1999, 100-104). While, the later facility to the west reflects both the reduction in size and improved design of subsequent weapons that could be left in storage for longer periods without the need for such regular disassembly, inspection and maintenance.

The northern stores are one of eleven igloo groups identified on bases assigned to the United States Air Force in England during the 1950s, with differences reflecting the differing roles of aircraft assigned to strategic and tactical roles (Appendix 2). As has been discussed they represent the infrastructure required to handle particular types of nuclear weapons and their presence alone does not confirm that such weapons were held on a particular airfield. Of the four south midlands airfields redeveloped in the early 1950s, only Upper Heyford and Fairford were provided with both special and conventional bomb stores. At Greenham Common only a special weapons store was built, while Brize Norton was only provided with a conventional bomb storage area, although an American designed Trigger House is reported. This building at Upper Heyford may indicate these stores were designed for a particular type of weapon, or by the time the stores were constructed at other locations these earlier generation weapons were no longer in use.

### Southern bomb stores



*Figure 11: RAF Upper Heyford, Southern Bombs Stores in 1954 shortly after completion, the open bomb storage areas are to the right (c) Historic England F22/542/RAF1/4Aug54*

Also constructed in the early 1950s were the Southern Bomb Stores, or South Conventional Arms Stores, these lie at the south eastern corner of the airfield and are defined by a single wire fence (Figure 11). The construction of the stores may be



*Figure 12: RAF Upper Heyford, southern conventional bomb stores showing the Igloo stores constructed during the 1970s and 1980s. (c) Historic England 18537/04*

seen to fall into three main phases. The earliest phase dates between 1950 and 1952 when the airfield was reconstructed to accept United States' Strategic Air Command (SAC) B-29 bombers. The layout at this date is very similar to other conventional bomb stores associated with other SAC airfields at Brize Norton, Oxfordshire, Fairford, Gloucestershire, Sculthorpe, Norfolk, and Lakenheath and Mildenhall, Suffolk. The latter example survived almost intact in February 2015. The early 1950s buildings are of a standard type and were found on all six sites. To the east were four parallel roads that gave access to 20 open storage bays, each protected by an earthwork traverse. To the south was a further parallel track serving a number of buildings. To the west were a series of single storey inspection and arming sheds and a guard room at its western end. This arrangement survived until into the mid-1970s. The total capacity of the open storage area was 60,000lbs (27, 216kg) of high explosives (TNA: AIR 2/16603, 15A).

Under the programme to improve the survivability of NATO airfields this open arrangement of conventional arms stores was seen as a potential weakness, where, for example, weapons on an open stage might be destroyed by blast damage (Figure 12). In the late 1970s, coinciding with the construction of the hardened aircraft shelters, 27 storage igloos arranged in two rows were constructed in the south of the area overlying one of the open storage rows and associated structures. The last eight were handed over to USAF on 1 September 1978 (Breslin 1990, 47). Also around this time a missile assembly building (1108) surrounded by an earthwork traverse was probably added to the west and an inert workshop (1111) to the north. Photographs in the Historic England Property Services Agency collection confirm that this construction work was complete by October 1976. At the end of the 1980s the area was further extended with the addition of 24 more igloos to the north covering the remaining open storage bays. The Igloos are of a similar



form with a trapezoidal concrete front elevation, with a double leaf steel door and external electrical junction boxes. Internally is a single rectangular storage space with enclosed safety lighting. Externally this concrete box is earth covered. Minor insignificant details exist between the different phases.

## Significance

The original explosives storage area is one of six bomb storage areas of this type built to serve airfields allocated to the United States Strategic Air Command forces in England during the early and mid-1950s (Appendix 4). The original form of the site indicates that it was designed to hold a range of conventional munitions. The concrete slabs protected by earthen bunds might be used for the open storage of large, conventional 'iron' bombs, minus their relatively flimsy tails and sensitive fuzes. The storage buildings were unheated, and might be used for the storage of conventional boxed ammunition and/or inert bomb components, such as tail units. Some of the smaller buildings were probably designed to hold bomb fuzes and perhaps aviation related pyrotechnic stores. Other buildings with doors to either end were inspection and arming sheds allowing bombs to be drawn through on trollies for the insertion of their fuzes.

The remodelling of the southern bomb stores in the mid-1970s is another reflection of the NATO policy of enhancing the survivability of its frontline bases. Open ammunition storage is potentially very vulnerable to aerial attack and for the base to remain operational it was critical that its conventional munitions stocks were protected. The protected igloos provided storage for conventional free fall bombs and ammunition for M61 A 1 machine gun that might be mounted in the F-111's weapon bays. By the end of 1977 most of the aircraft had been fitted with such guns (Gunston 1978, 81). During the mid-late 1980s the southern bomb stores were nearly doubled in size from 27 igloos to 51. This may be attributed to the changing role for the F-111s as ground based missile systems assumed the task of delivering tactical nuclear weapons. In particular, the 20<sup>th</sup> TFW trained to deliver BLU-107 runway buster bombs. The expansion may also be linked to a need store new types of conventional arms and perhaps a requirement to hold higher quantities of war stocks of ammunition on the base. A board on the Wing command bunker (126) lists the array of weaponry available to the F-111s in the early 1900s, see Appendix 3.

The Conventional Arms Stores illustrate that although Strategic Air Command and later units of the USAF's primary role was deterrence through the capability of attacking Eastern Europe with nuclear weapons, conventional weapons still retained an important role in Cold War strategy.

## The airfield in the F111 era

In preparation for the arrival of the F111s in 1970 the airfield underwent a major reconstruction to support what was then one of the world's most sophisticated aircraft. Weather shelters were built to cover nine aircraft held at a high state of readiness. To maintain their high performance jet engines a new engine

maintenance section was added. Frequent complaints by local residents about noise later prompted the construction of 'hush houses' for engine tests. To improve aircrew training a bespoke simulator building (293) was also constructed.



*Figure 13: RAF Upper Heyford, early 1970s weather shelters to the right is a Hush House and engine test cell, to the bottom is the 79th squadron headquarters complex (c) Historic England 18537/13*

## **Weather shelters – Victor Alert Area**

Probably in anticipation of the arrival of the F-111s as early as December 1968, the USAF proposed building 12 Quick Reaction Alert (QRA) hangars (AIR 2/16603, E50) (Figure 13). Work was, however, delayed until shortly after the arrival of the F-111s and construction began in early 1971 on nine weather shelters (2001-2009). They are located to the north of the southern perimeter track and were accessed from existing aircraft pavements. Property Service Agency photographs indicate that construction work was complete by about April of that year. The shelters are a simple steel-framed, open barn-like construction, with a baffle wall to the rear to dissipate engine noise. The whole complex was surrounded by a double fence, traces of which remain in places blocking former taxiways. A history of the base compiled by the history office of the 20 TFW noted that the Victor Alert Area was complete by 1979 that might suggest the security measures, including intruder alarms were a secondary development (Breslin 1990, 47). The alert area was served by a blast resistant Operations Building (357) and overseen by a guard tower (360). The purpose of these shelters was to provide cover for up to nine aircraft being held at a high state of readiness. Unusually for shelters holding fuelled and armed aircraft they were sited close to occupied buildings.

## **Significance**

The weather shelters reflect the F-111s' primary mission to provide a speedy reaction

to Warsaw Pact aggression in Western Europe. During the 1970s these aircraft, and later with their partner F111 squadrons at Lakenheath, provided the only all-weather, 24 hours-a-day attack capability within the European NATO states (Gunston 1978, 78). Both stations were at the heart of NATO's initial response to an attack on a member state. These shelters associated with F111s are unique to Upper Heyford. The presence of the double fence and guard tower indicates an area where nuclear weapons might be held.

## 293 Simulator

To support the introduction of the F-111Es a dedicated Simulator Building (293) (now demolished) was constructed in the technical area on the north side of Camp Road. The main building was a windowless, two and half storey concrete framed structure with brick infill panels. It played a crucial role in training the F-111 pilots and weapon systems officer in the operation of this complex aircraft, while reducing flying costs and the fatigue life of aircraft. Typically at this date a simulator comprised a fully instrumented cockpit section for the trainees and large landscape model, often covering the floor of a building. Above this a camera on a moving gantry mimicked an aircraft in flight which was projected onto the windshield of the cockpit section. To illuminate the model were powerful sets of lights. These and the other electronics in the building generated a tremendous amount of heat, which in turn required an elaborate air conditioning plant, represented by the large vents on the building's walls and roof. Contrary to the dull down paint schemes of much of the base the upper pressed metal panels were finished in buff yellow to reduce heat gain.

## The hardened landscape



*Figure 14: RAF Upper Heyford, the airfield landscape with Hardened Aircraft Shelters. (c) W D Cocroft*

The present character of the flying field exemplifies that of a typical NATO airfield in the era of Flexible Response and the application of airfield survival measures to ensure it could resist attack with conventional weapons, biological and chemical agents, and some effects of nuclear weapons (Figure 14). To be eligible for NATO funding airfield protection measures needed to meet certain criteria -

Hardened aircraft shelters for at least 70% of combat aircraft

Protected bulk fuel installations

Protected airfield and squadron operation cells

Protected conventional and special weapons stores

Alternative runways

Runway repair strategies

Local air defence by missiles and/or anti-aircraft guns

In addition to the hardened structures the aircraft pavements were extended to the new shelters. One of the most significant additions was a new taxiway north, and parallel with the main runway joined at the western end to the protected Victor Alert area. Small 1980s pillbox-like defence fighting positions were built to meet the perceived threat from terrorists and Warsaw Pact special forces. The visual appearance of airfields was also toned down by applying earth coloured concrete stains, which was completed by August 1980 (Breslin 1990, 47), and other buildings were painted in infra-red reflecting paint. Trees were also planted around other installations to act both as camouflage against low level attack and to meet the environmental concerns of local residents.

## Hardened Aircraft Shelters



*Figure 15: RAF Upper Heyford, a typical third generation hardened aircraft shelter. (c) W D Cocroft*



*Figure 16: RAF Upper Heyford, typical Hardened Aircraft Shelter, interior showing metal formers and pedestrian access door. (c) W D Cocroft*

The Hardened Aircraft Shelters at Upper Heyford are all of the third generation type with steel-framed, reinforced concrete sliding doors (Figure 15). Each is of standard design with a semi-circular cross-section measuring 120ft (36m) in length, 71ft (21m) wide and 28ft (8m) high. Internally, they are formed of curving, pressed steel panels to prevent concrete spalling in the event of an attack. To the rear were a set of sliding steel doors that could be opened to permit the aircraft engines to be started up under cover. During trials this design was shown to be most effective form to resist blast from conventional weapons and during tests of a simulated nuclear explosion. The pressed steel sheets are covered by 2ft (60cm) of reinforced concrete (Figure 16). Each shelter cost \$500,000, which was a fraction of the \$13 million price of a single F-111 (DEF 71/301, E53). A minor variation is found in the design of the rear efflux deflectors, ones constructed by John Laing and Son Ltd have a simple deflector, while those built by Richard Costain Ltd exhibit wing-like projections; the significance of the difference is unknown. One shelter in each squadron area was also provided with a decontamination unit, shelters 3014, 3026, 3041 and 3043. At the western end of the airfield nine HASs were enclosed by security fences and on 14 May 1981 opened as a Quick Reaction Alert facility. In addition to fences it was also protected by an intruder detection system, security

gatehouse and a blast resistant crew building (Breslin 1990, 47).

At Upper Heyford the original intention was to build 72 shelters, one for each of the aircraft allocated to its three squadrons. The 56 shelters built may roughly equate to NATO's requirement for 70% of front line aircraft to be protected, that is aircraft from the three original squadrons and the 1980s addition of electronic warfare EF-111s. In an emergency two aircraft could be operated from a single shelter, although they would need to be towed into place. The Hardened Aircraft Shelters are arranged in distinctive, but random patterns laid out to NATO guidelines, including that no more than three should be in a direct line over 500m and that there should be a minimum travel time to the runway (DEFE 71/210, E50, 66). To accommodate the number of shelters required 30.4 hectares of extra land was acquired at the northwest corner of the airfield (DEFE 71/301, E102). The final five shelters in this area (3052-3056) were built by the Amy Roadstone Company Ltd.

## Significance

The hardened landscape and individually protected buildings, constructed as result of NATO's Airfield Survivability Measures programme, survive as an intact ensemble little altered from the time of their abandonment. They both exemplify the range of structures built at this time and in addition include the specialised avionics building.

*Late 1980s airfields in the United Kingdom with hardened aircraft shelters listing the principal occupier, aircraft type, and current use.*

RAF Alconbury, Cambridgeshire - USAF, Phantoms and TR1s – Enterprise Zone

RAF Bentwaters, Suffolk - USAF, A10s – business park, museum

RAF Boscombe Down, Wiltshire - USAF reserve, active airfield

RAF Coningsby, Lincolnshire - RAF, Phantoms later Tornados, active airfield

RAF Honington, Suffolk - RAF, Tornados, active MoD non-flying

RAF Lakenheath, Suffolk - USAF, F111s, active airfield

RAF Leuchars, Fife - RAF, Tornados, active airfield

RAF Marham, Norfolk - RAF, Tornados, active airfield

RAF Wattisham, Suffolk - RAF, Phantoms, active airfield

RAF Woodbridge, Suffolk -, USAF, A10s, MoD Army

RAF Upper Heyford, Oxfordshire - USAF, F111s, business park

## Bulk fuel installations – POL Petroleum, Oil and Lubricating

Another critical part of the airfield's operation was the provision of aircraft fuel. From the early 1950s fuel appears to have been stored in at least three underground storage tanks with surface connections and roadways for the fuel bowzers. As part of the NATO airfield survivability measures programme the protection of the bulk fuel installations was one of the improvements required. In place of the old tanks new tanks covered in earthen mounds were constructed interconnected by buried pipelines. Two methods of refuelling appear to have been practiced directly from fuel bowzers and in designated areas from fuel hydrants. Fuel bowzers offered a very flexible form of refuelling and if necessary refuelling could take place within the Hardened Aircraft Shelters or on the airfield. In peace time the bowzers were parked on the southern side of a flying field on a distinctive herringbone pattern parking area. To protect the bowzers seven double bay garages were built, 228, 381, 3200, 3201, 3202, 3136 and 3138.

In Europe, the USAF preferred the 'hot' refuelling method where aircraft, potentially with their engines running, were refuelled directly from hydrants in dedicated areas (Hawkins 1974, 5). Generally, each squadron area was provided with one of these areas with four refuelling points, although the northern squadrons appear to have shared a single facility.

## Significance

The protected POL facilities illustrate another vital part of the airfield survival measures put in place by NATO during the 1970s. They also reflect the choices made by USAF for refuelling its aircraft and add to the educational value of understanding how a Cold War fast jet fighter base operated.

## Avionics building 299



*Figure 17: RAF Upper Heyford, 299 Avionics Building. (c) W D Cocroft*

The Avionics Building (299) (Figure 17) was completed by 8 December 1981 (Breslin 1990, 47). The function of this heavily protected structure was to maintain the complex electronics of the F-111, such as its terrain following radar and radar assisted bombing systems. Sections within the building were also dedicated to photographic processing. Soon after its construction the building was extended; a unique extension to meet the needs of Upper Heyford's electronic warfare EF-111 Ravens.

## Significance

This building lies in the scheduled area (1021399) and is one of only two buildings of this type in England, the other being associated with the F-111 Wing at RAF Lakenheath, Suffolk. It reflects the complex maintenance needs of the F-111 and its extension the increasingly challenging air defence environment of 1980s Eastern Europe. The building remains in its original condition.

## Wing and squadron headquarters



*Figure 18: RAF Upper Heyford, 126 hardened Wing Headquarters built to a standard NATO design. (c) W D Cocroft*

From the late 1970s the operational flight operations were overseen by the Wing Headquarters (126) in addition to this role this headquarters was also responsible for weather reporting, co-ordinating engineering services, airfield defence, including controlling British surface to air Rapier missiles, and communications (Figure 18). The reinforced concrete bunker follows a standard design and 90% of its consoles were laid out to a standard configuration (Figure 19). The remainder of the design was determined by the unit's mission and local preferences. (<http://www.bcwm.org.uk/wp-content/uploads/VisitorsGuide.pdf>). Ground communications were routed through the associated hardened telephone exchange (129) (Figure 20). The





*Figure 19: RAF Upper Heyford, 126 hardened Wing Headquarters, the consoles and other equipment within this building are a rare survival of insitu 1980s era information technology. This building was used during the Eldorado Canyon operation to attack Libya in 1986. (c) W D Cocroft*

Wing Headquarters also contained a vault holding the Wing's war plans. This would include the Wing's Single Integrated Operational Plan (SIOP), the detailed plans for nuclear war. It is believed that all aircrew were required annually to study their role in the plan and would be examined on their understanding to maintain their SIOP certification (Graham 1996, 115-116). On the rear wall of the vault is an air map of Europe with much of the key data scratched away.

During the early 1950s reconstruction of the airfield squadron operation cells, or headquarters (209, 234 and 370), were built close to three groups of aircraft parking pavements. Their function was to provide welfare facilities for the aircrew when they were held at readiness on the airfield dispersals and for operational briefings. In the late 1970s hardened extensions were added providing protected accommodation for aircrew and ground personnel, and briefing facilities for mission allocations. In addition to the extensions to existing facilities a new operations cell (383) was added at the northern end of the airfield for the 42<sup>nd</sup> Electronic Combat Squadron. A new operation cell (2010) was also included in the Quick Reaction Alert area.

## Significance

Modern combat forces are ineffective without robust command, control and communications (C<sup>3</sup>) procedures and equipment. The Wing Headquarters (126), or Command Post, and squadron cells illustrate this hierarchy of command. Through the associated hardened telephone exchange (129) the airfield was in direct communication with one of USAF's main mission planning facilities at Daws Hill, High Wycombe, listed grade II\*. Communications would also be maintained with United States Air Force Europe (USAFE), Washington, NATO, and facilities around



*Figure 20: RAF Upper Heyford, 129 Telephone Exchange. (c) W D Cocroft*

the airfield. Together these hardened facilities illustrate the chain of command and operational procedures that were necessary to launch a combat mission, potentially culminating in a nuclear release.

The Wing Headquarters (126) is a rare example of a late Cold War command post that was abandoned in the early 1990s leaving most of its contemporary information technology in place. At former RAF Greenham Common, West Berkshire, the Wing Headquarters is listed Grade II\*, there most of its communications equipment has been removed. At former RAF Bentwaters, Suffolk, the Command Post has been restored using equipment recovered from former RAF Alconbury, Cambridgeshire. Periodically, it's brought to life by recreated command post exercises (<http://www.bcwm.org.uk/wp-content/uploads/VisitorsGuide.pdf>). Elsewhere, other command posts have been modernised, stripped, vandalised, and identified for demolition.

### **Engine test cells and hush houses**

To maintain the serviceability of high performance military jet aircraft their engines require constant maintenance. This was reflected in the early 1950s by the nose docking hangars which allowed the engines to be maintained while under cover. At this date aircraft were generally based at Upper Heyford for limited periods of 3 months and deep maintenance was undertaken at their home bases in the United States.



*Figure 21: RAF Upper Heyford, 1372 Hush House. (c) W D Cocroft*

For deeper maintenance engines were removed from the aircraft for full dismantling. After their reassembly they were first ground tested before being reattached. An engine test cell (1319) was constructed in 1959 at the northern end of the airfield. In the 1980s this was joined by another test cell (1443) at the eastern end of the Victor Alert area that was specially imported from the United States to service the F-111s' Pratt & Whitney TF30-P-3 engines. The noise created by the F-111s and static testing of their engines was a constant source of complaint from local residents. To lessen the noise impact of ground testing two Hush Houses (1368 and 1372) (Figure 21) were added in the mid-1980s, one at the northern end of the airfield and the other adjacent to the new engine test cell. In these buildings aircraft could be fully grounded tested with a rear detuner to reduce noise.

## **Significance**

The engine test cells and hush houses reflect the complex maintenance needs of Cold War fast jet aircraft. They also represent the experience of the majority of the personnel at Upper Heyford whose responsibility was to keep the F-111s airworthy and fully operational. In the long term, along with the fuel installations, these facilities designed to support manned, hydro-carbon based air warfare, a development just over a century old, may to future generations appear as archaic as knights on horseback.

## ANALYSIS

The earlier designations at Upper Heyford were applied in the context of a national assessment of Cold War monuments tasked with identifying key sites in England (Cocroft 2001). These designations focussed on structures associated with one of the key characteristics of the Cold War the deployment of nuclear weapons. These reflected both 1950s Strategic Air Command mission under the strategy of massive retaliation and the later NATO policy of Flexible Response.

This re-evaluation of Upper Heyford has benefitted from new sources that have become available since the 1990s and a closer examination of Upper Heyford's Cold War role. Over 20 years since the closure of the base it now stands as one of the best preserved late Cold War fast jet bases in England. Elsewhere, across the United Kingdom and Europe similar facilities have been subject to modernisation, neglect and demolition. It, nevertheless, only represents one aspect of this country's experience of the Cold War. In England, a number of other key sites have been protected, such as British V-force installations, Thor missile sites that were held at readiness during the Cuban Missile Crisis, and the 1980s Greenham Common cruise missile shelters, which were also at the centre of contemporary peace protests.

### Pre-1945

RAF Upper Heyford was first established during the First World War and after a short period of disuse was reacquired under Trenchard's 1920s Home Defence Scheme. No features from the First World War have survived and due to later alterations the airfield cannot be regarded as characteristic of 1920s bomber stations and no buildings were recommended for national statutory protection (Lake 2002). Upper Heyford was, nevertheless, the only airfield completed to the original design standard. Many good examples of individual structures and groups of buildings from this phase survive and these have been acknowledged by inclusion in the Conservation Area and local listing of individual buildings. In the domestic and technical area the character of this period is also reflected in the existing road pattern and some areas remain lined with ornamental trees. On the flying field the 'A' pattern of wartime runways and linking taxiways has defined its later forms.

### The Cold War

The present visual character of former RAF Upper Heyford has been defined by the remodelling of the air base to meet the Cold War needs of United States' forces that were based here for over forty years. The base's infrastructure may be seen to reflect some of the key characteristics of the Cold War, the forward deployment by the United States of nuclear weapons and the joint endeavour with the United Kingdom to deter Soviet aggression. Its landscape and buildings illustrate evolving military technologies, international alliances, strategies and tactics (DoD 1994, 11). They also demonstrate evolving military strategy as high level policy moved from one of Mutually Assured Destruction, or massive retaliation, to be delivered by Strategic Air Command units on short deployments, to one of Flexible Response, with permanent units held at high levels of alert. Each period may be seen to have created

a distinctive landscape of runways, taxiways, aircraft pavements, and buildings, and in part bequeathing its character to later phases.

It also exemplifies many of the attributes that the United States Department of Defense identified as characterising military operations during the Cold War (DoD 1994, 44).

Forward power projection

Capability to engage at all scales, limited, theatre and global

Rapid deployment

Rapid resupply

Large standing forces

24 hour vigilance

Short warning response time

High level of security

Emphasis on high technology

### **The early 1950s – Strategic Air Command and the era of Mutually Assured Destruction**

At Upper Heyford the surviving features of the 1950s airfield represent one of the four bases in the south of England reconstructed to accept potentially nuclear armed Strategic Air Command B-29 bombers (Figure 22). Elsewhere, at Greenham Common, Berkshire, most of the runways and other concrete surfaces have been removed. There, this phase is represented by the listed control tower and two unlisted hangars. A distinctive American designed Luria hangar has been lost. Other buildings from this phase survive in the domestic area, but face an uncertain future. Brize Norton, Oxfordshire, and Fairford, Gloucestershire, have remained in military hands and since the early 1990s both have undergone further modifications to meet their evolving roles.

From the late 1940s until the 1960s about 32 airfields were used by or assigned to the United States Air Force (see Appendix 4). The first deployments in 1948 to Lakenheath, Marham, Scampton and Waddington, initially resulted in few alterations to the physical fabric of these airfields. From about 1950 the numbers of United States' aircraft in the United Kingdom greatly increased and was accompanied by a huge infrastructure programme directed at about 23 principal airfields (Murray 1995, 22). The types of works were dependent on the intended roles for the airfields, some, such as, Bruntingthorpe, Northamptonshire, and Elvington, North Yorkshire were little more than extended runways and taxiways



*Figure 22: RAF Upper Heyford, 1006 Northern Bomb Stores , early 1950s Plant building for maintaining nuclear weapons. (c) W D Cocroft*

to be used as forward operating bases. Others were assigned to fighter and reconnaissance squadrons. The works carried out varied at each airfield, some were original 1930s permanent airfields, while others were ones built to temporary wartime standards. In turn both the intended roles and existing infrastructure determined the new structures that were required. New types of buildings specifically associated with United States Air Forces appeared. Nose docking hangars, similar to those built at Upper Heyford, were also built at Alconbury, Cambridgeshire, where they are threatened by redevelopment within an Enterprise Zone. Weather shelters were rarely found on RAF bases, but were also provided for USAF fighters at Wethersfield, Essex, and Bentwaters, Suffolk.

### **The 1970s and 1980s – the era of Flexible Response**

The destruction of the Egyptian air force during the 1967 Arab-Israeli war brought home to air forces across the world the vulnerability of unprotected aircraft on open airfields. From the early 1970s NATO and Warsaw Pact began to protect their key airfields with hardened facilities. Today, many air forces continue to operate from this legacy infrastructure, which due to its dispersed nature is costly to operate, and as operations during the Gulf War demonstrated they are increasingly vulnerable to precision guided munitions.

Internationally, hardened airfield landscapes designed to counter conventional, biological and chemical attack are characteristic of the final phase of the Cold War. At Upper Heyford these later modifications to meet new strategic requirements have overwritten the earlier wartime and 1950s patterns and the superseded strategies that they represented. Nevertheless, the influence of the patterns of these previous phases may be discerned. The 'A' plan configuration of the wartime runways is clearly visible as are the early 1950s modifications made by Strategic Air Command including the extended main runway, taxiways, parking area and distinctive structures.

## F-111 deployment

Some of the facilities that reflect the complex infrastructure required to support the complex F-111 jets have already been nationally designated, such as the Avionics Building (299). The F-111's role as NATO's principal tactical nuclear strike force for much of the 1970s and early 1980s is reflected by remodelling of the northern special weapons stores to accept a new generation of nuclear weapons (Figure 23). The continuous nuclear readiness state of the Wing is represented by the nine weather shelters (2001-2009), where nuclear armed aircraft were protected within a fenced and guarded compound. In addition to possessing the capability of delivering nuclear weapons both Strategic Air Command and the F-111 squadrons were tasked with dropping conventional armaments. This role is best reflected in the southern conventional armaments stores. The expansion of this area in the late 1980s also represented the changing assignments of the F-111s as the primary NATO tactical nuclear mission was taken over by missile systems. Specifically, the 20<sup>th</sup> TFW was assigned the role of runway denial by using rocket assisted bombs, which required additional and dedicated infrastructure.



*Figure 23: RAF Upper Heyford, Northern Bomb Stores, new stores completed 1969-70. (c) W D Cocroft*

The hardened landscape and supporting buildings demonstrate the complex infrastructure required by fast jet aircraft to fulfil their mission. This is represented by the extensive concrete operating surfaces needed by these heavy aircraft. When the F-111 was introduced it represented a major technological step forward in the use of terrain following radar and sophisticated bombing systems. To maintain these complex aircraft required a dedicated infrastructure of engine maintenance facilities, engine test houses, and a large simulator building for training aircrews, the latter building is now lost. The nuclear and conventional roles of the F-111 are reflected by two dedicated munitions storage areas. The all-weather capability of the F-111s made them key components of NATO's nuclear deterrent strategy during the 1970s,

when they were the sole carriers of the United States' intermediate range nuclear deterrent in Europe during this period. Upper Heyford was the first airfield in the United Kingdom to be provided with hardened facilities, reflecting its central role in NATO strategy at this time. Politically, its F-111s represented the United States' commitment to the defence of Europe (Kirtland 1995, 50).

Prior to the allocation of F-111Fs to RAF Lakenheath, Suffolk in 1977 the F-111 Wing at RAF Upper Heyford was the only F-111 Wing in Europe. RAF Lakenheath was developed in the late 1970s to accept F-111s with a similar mission to those at Upper Heyford, which is reflected in similarities in its infrastructure. Since the early 1990s this base had continued to evolve and will continue to do so as the main USAF F-35A base in Europe. As losses and change occurs elsewhere the significance of Upper Heyford's fossilised late Cold War landscape becomes increasingly significant.

In its last phase the airfield was adapted to support a single weapons system, the F-111, and evolved for 24 years to support this aircraft. Upper Heyford is also distinguished as the only European station for the EF-111A 'Raven' electronic warfare variant reflecting the increasingly hostile air defence environment over Eastern Europe. By the mid-1980s the F-111s' first strike role was being taken over by Ground Launched Cruise Missiles, such as, those based at Greenham Common, Berkshire (scheduled), and Pershing II missiles in Europe. It is believed that the F-111s' task may have changed to hunt down mobile Warsaw Pact missile systems and to drop conventional runway busting bombs.

## Visual character

The visual character of this 1980s airfield is enhanced by the retention of the distinctive USAF decorative paint scheme of brown and cream, and brown signage, created a unity that embraced structures of all periods. In the operational areas concrete structures were treated with low lustre colour washes and other features were finished in anti-infrared paint. The use of ornamental tree planting to improve the environment was a common feature on many inter-war airfields. On RAF stations this continued into the 1950s and ornamental planting has been observed in nuclear weapons stores and on air defence missile sites. Photographs of Upper Heyford in the Historic England Property Services Agency collection indicate that tree planting continued in the domestic areas and also around the hardened aircraft shelters. This was in part to provide concealment, but also met to local objections to the visual appearance of new developments at the base. Many of these trees have now reached maturity providing a degree of concealment intended in the 1980s. The American character of the base is also reflected in other details, such as, United States-style fire hydrants.

Upper Heyford was one of six airfields in the United Kingdom assigned to the United States' forces that was hardened (see page 23). Given its role throughout most of the 1970s and into the 1980s of providing one of NATO's first responses to Warsaw Pact aggression, it may be argued that it was the most significant of the six. From the late 1970s although Lakenheath shared a similar mission to Upper Heyford, no Quick Reaction Alert is readily identifiable. Uniquely, Upper Heyford was also



equipped with the F-111 electronic warfare variant the EF-111A. The twin bases at Bentwaters and Woodbridge, Suffolk, were home to A-10 ground attack aircraft, whose wartime mission was to deploy to Europe to hunt down Warsaw Pact ground forces on the North German plain. Alconbury's primary role was reconnaissance, although as with all these hardened bases extensive protected munitions stores were built for use by reinforcements flown in from the United States. Boscombe Down, Wiltshire, was held in reserve with no permanent units based there.

## CONCLUSIONS

The significance of Upper Heyford lies in the survival of the airfield landscape comprising many individual structures, whose importance is amplified by their interconnectivity with one another. The airfield exemplifies the complexity of a late Cold War fast jet operation and how this evolved through time to support evolving strategies and missions. Within the airfield landscape different zones may be isolated, but these are all dependent on central services scattered across the airfield, including fuel services (POL). In operation this was a dynamic landscape with aircraft constantly moving between the hardened aircraft shelters and the runway. To service the aircraft fuel bowsers moved from their southern parking area to the fuel tanks and then to all parts of the airfield. Munitions were moved to and from the two storage areas and exercises were routinely carried out with practice weapons. Personnel were also continuously on the move between their duty stations.

Internationally, the airfield symbolises the United States' commitment to the defence of Western Europe, it's a place that lay at the heart of United States and NATO nuclear deterrent policy for nearly forty years. This presence also represented one of the hallmarks of the Cold War, whereby the superpowers projected their power through stationing forces in the countries of their allied nations. The scale of this landscape and the investment in the 1970s of its heavily defensive architecture speaks of the perceived threats posed by the Cold War and the political will to counter this challenge through nuclear deterrence. In its last decade of operation the airfield became a contested landscape with peace camps around its perimeter. Today, to some the disused airbase represents another kind of Cold War victory. The preservation of the flying field in its totality, and down to its many small surviving features, enhances the significance and value of Upper Heyford as an important educational resource. It's a place to explore the nature of the special relationship, the strategy of bomber deterrence, practicalities of maintaining and operating late 20<sup>th</sup> century high-tech weaponry at a high state of readiness, and an ex-patriate community and its interplay with its host population, including those whose opposed its presence.

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## APPENDIX 1

### Correlation between USAF aircraft deployed at Upper Heyford and the types of nuclear weapons they were cleared to carry.

#### B-29 Superfortress

##### Weapons

MKI 10ft (3.01m) dia 2ft 4ins (0.71m) in service 1945

MK-III 10ft 8ins (3.25m) dia 5ft (1.52m) in service 1946-48

MK-IV 10ft 8ins (3.25m) dia 5ft (1.52m) in service from 1949

MK-6/18 10ft 8ins (3.25m) dia 5ft 1ins (1.55m) in service 1951

MK-5 10ft 8.5ins (3.26m) dia 3ft 7.75ins (1.11m) in service 1952

#### B-50 Superfortress

##### Weapons

MK-III 10ft 8ins (3.25m) dia 5ft (1.52m) in service 1946-48

MK-IV 10ft 8ins (3.25m) dia 5ft (1.52m) in service from 1949

MK-6/18 10ft 8ins (3.25m) dia 5ft 1ins (1.55m) in service 1951

#### B-47 Stratojet

##### Weapons

MK-5 10ft 8.5ins (3.26m) dia 3ft 7.75ins (1.11m) in service 1952

MK-6/18 10ft 8ins (3.25m) dia 5ft 1ins (1.55m) in service 1951

MK 15 11ft 7in (3.53m) dia 2ft 10.7ins (0.88m) in service 1955

MK28 8ft (2.44m) dia 1ft 8ins (0.51m) in service 1958

MK-36 12ft 5.8ins (3.81m) dia 4ft 10.5ins (1.49m) in service 1956

MK-42

MK-53 12ft 4.8ins (3.78m) dia 4ft 2ins (1.27m) in service 1962

B-43 12ft 6ins (3.81m) dia 1ft 6ins (0.46m) in service 1961

B-36 Peacekeeper

Weapons

MK-III 10ft 8ins (3.25m) dia 5ft (1.52m) in service 1946-48

MK-IV 10ft 8ins (3.25m) dia 5ft (1.52m) in service from 1949

MK-6/18 10ft 8ins (3.25m) dia 5ft 1ins (1.55m) in service 1951

MK-5 10ft 8.5ins (3.26m) dia 3ft 7.75ins (1.11m) in service 1952

MK-17/18 24ft 9.5ins (7.55m) dia 5ft 1.4ins (1.56m) – in service 1954

MK-21/MK-36 12ft 5.8ins (3.8m) dia 4ft 10.5ins (1.48m) in service 1956

MK-39 11ft 4ins (3.45m) 2ft 11ins (0.89m)

F-111 Aardvark

Weapons

B-43 12ft 6ins (3.81m) dia 1ft 6ins (0.46m) in service 1961-1991

B-57 9ft 9.5 ins (2.98m) dia 1ft 2.75 ins (0.37m) in service 1963-1992\*

B-61 11ft 9.5ins (3.38m) dia 1ft 1.3in (0.38m) in service 1968

B-83 c.12ft (3.7m) dia 18-20ins (0.46m-0.51m) in service 1983?

Source - Gibson, J N 1996 Nuclear weapons of the United States an illustrated history

\* Noted on board in building 126

## APPENDIX 2

### USAF Igloo bomb stores

- 1 Alconbury, Cambridgeshire, business park, Enterprise Zone
- 2 Bentwaters, Suffolk, business park
- 3 Fairford, Gloucestershire, active RAF
- 4 Greenham Common, Berkshire, part of cruise missile complex, scheduled
- 5 Lakenheath, Suffolk, active USAF
- 6 Molesworth, Cambridgeshire, part of cruise missile complex, active USAF, identified for closure by about 2020
- 7 Sculthorpe, Norfolk, active MoD training area
- 8 Shepherds Grove, Suffolk, business park, some damage
- 9 Wethersfield, Essex, active MoD, identified for closure
- 10 Upper Heyford, Oxfordshire, business park, scheduled
- 11 Woodbridge, Suffolk, active MoD
- 12 St Mawgan, Cornwall, built 1960s for nuclear depth charges, civil airport



## APPENDIX 3

Board in building 126 Wing Headquarters detailing munitions allocated to the F-111s in the early 1990s

B-61 Tactical thermonuclear weapon - *Silver Bullet*

B-57 Tactical nuclear weapon

BDU-38 Practice bomb (nuclear)

MK-20 Freefall cluster bomb - *Rockeye*

MK-82 General purpose bomb – 500lb

MK-82A General purpose bomb – 500lb (air)

MK-82C General purpose bomb - 500lb

MK82R General purpose bomb - 500lbs

MK-84 Freefall non-guided bomb – 2000lb

MK-84A Freefall non-guided airbag parachute retarded bomb – 2000lb

DURANDAL – BLU109 anti-runway bomb

CBU-52 Sub-munition cluster bomb – 220 bomblets

CBU-58 Sub-munition cluster bombs incendiary – 650 bomblets

CBU-71 Sub-munition cluster bomb random delay fuze – 650 bomblets

Chaff – radar counter measure

Flare – missile counter measure

## Appendix 4

### Principal United States Airfields 1950s-1960s in England

	Co	Main function	Occupancy	HAS	Igloos	Current use, notes	
1	Alconbury	CB	Recce	1953-95	Yes	Yes	Enterprise Zone, redevelopment underway, some listings
2	Bassingbourn	CB	SAC	1950-1			1930s RAF airfield, now MoD Barracks empty, runway removed
3	Bentwaters	SF	3rd AF Fighters	1951-92	Yes	Yes	Private estate, in part Cold War museum
4	Bovingdon	HT	Transport	1951-62			Part prison, runway survives in part
5	Brize Norton	OX	SAC	1951-65		Yes	Active RAF, much modified since 50s
6	Bruntingthorpe	LE	SAC	1953, 1957-62			Part Museum, layout suggests fighter field
7	Burtonwood	CH	Maintenance	1948-65			Final demolition imminent
8	Carnaby	NY		1950s			Not developed
9	Chelveston	NN	SAC	1952-62			Runway lifted, later RAF/USAF Communications Centre
10	East Kirkby	LI	Air Base Sqdn	1950-58			Few remains, museum, runway survives in part
11	Elvington	NY		1953-58			Never used, aviation museum, runway survives
12	Fairford	GC	SAC	1951-current		Yes	Active RAF, much modified since 50s
13	Full Sutton	NY	SAC Support	1955-57			Never used
14	Greenham Common	BK	SAC	1951-1992		Yes	Airfield pavement largely removed, some listings
15	Heathrow	GL	Support	early 1950s			Civil airport
16	Lakenheath	SF	3rd Air Force	1948-current	Yes	Yes	Active USAF, much modified post Cold War
17	Lasham	HA		1950s			Not developed
18	Lindholme	YK	Storage	1950s			ex-RAF, in part prison
19	Manston	KE	Fighter	1950-58			For sale uncertain future
20	Marham	NF	SAC	1948-49			Active RAF, much modified since 50s, little if any SAC infrastructure
21	Molesworth	CB	Supply	1951-57		Yes	Active RAF/US, closure announced, little 50s infrastructure
22	Mildenhall	SF	Various	1950-current		Yes	Active USAF, closure announced, potentially some 50s infrastructure
23	Scampton	LI	SAC	1948-52			1930s RAF airfield, no dedicated SAC infrastructure
24	Sculthorpe	NF	SAC, Recce	1949-91?		Yes	MoD Army, remains of late 1940s atomic bomb loading pit
25	Shepherds Grove	SF	3rd AF Fighters	1951-58		Yes	Some derelict structures, part buried Thor missile site
26	Stansted	EX	Recce aircraft	1954-58			Civil airport, heavily modified
27	Sturgate	LI	SAC reserve	1950s			Small civil airfield, runway part lifted
28	Upper Heyford	OX	SAC	1950-1991	Yes	Yes	Good survival of SAC and later structures, designations
29	Waddington	LI	SAC	?1948-50			Little if any SAC infrastructure
30	Wethersfield	EX	3rd AF Fighters	1950-1991?		Yes	MoD Police, good survival
31	Woodbridge	SF	3rd AF Fighters	1951-92	Yes	Yes	MoD Army, HAS, heavily altered to meet the Army's needs
32	Wyton	CB	SAC dispersal	1950s			Active RAF
							Occupancy = maximum extent including absences

Main source Jackson, R S 1986 *Strike Force - the USAF in Britain since 1948* London: Robson Books





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