Part 3: Airfield Design and Construction

3.1 Introduction and Notes on Sources

This part first considers a site that was never actually built – at RAF Lawford which was planned and designed but rejected in favour of Coltishall. RAF Coltishall was constructed using money already allocated to Lawford. It is based on TNA files relating to works services at Coltishall, the Air Estimates, Secret Document 310, Sommerfeld track installation drawings, airfield site plans, The Civil Engineer in War, Volume 1: Airfields, Road and Bridges, the site plan for RAF Lawford as well as fieldwork.

3.2 Lawford or Coltishall

RAF Lawford (TM 09121 29688 – centre), named after Lawford House Farm, just north of Little Bromley near Colchester, Essex was planned originally to be built to drawing 5425/38 and then superseded by 67531/38 as a Scheme 'L' bomber station with six type 'C' hangars. The Treasury had agreed a sum, firstly of £500,000 and later of £736,000 for its construction, but at the last minute the Air Ministry decided that the additional cost of electric cable diversions would be prohibitive and the case was deferred in favour of Coltishall. The money that had been sanctioned by the treasury was therefore transferred and used for the purchase and construction of Coltishall instead. By 31 March 1939 the sum of £40,000 had already been spent at Coltishall; it was expected that a further £230,000 would be needed in the following financial year and £466,000 would be required to finish the project. RAF Lawford was never actually built, not even during the war as a temporary airfield which is very unusual. A further possible factor denying its development was that it would have resulted in the loss of five farms (Hollylodge, Rose, Grange, Lawford House and Riddlesdale Farms).

3.3 RAF Coltishall

In early July 1938, the proposed site for an airfield embraced the whole of Manor Farm (260 acres), Rookery Farm (72 acres), 100 acres of Colk's Farm and 105 acres of Malthouse Farm, but the actually acreage that was purchased in 1939 was reduced down to 529 acres. It did mean the total loss of the hamlet of Batley Green and the three tenant families there had to be moved out. The main contractor was Walter Lawrence Ltd of Swaffham along with many sub-contractors.

During October 1938, just three months after the treasury had sanctioned the purchase of Lawford, the site at Coltishall was in the process of being bought. Together with clearance rights, over another 102 acres to the north, north-east and south-west were needed, and including compensation for severance, tenant right and interference with sporting rights, this figure was estimated to be £40,000. Preparation of the aerodrome including removal of trees and hedges, the filling of depressions and grading etc was estimated to cost £12,000 – coincidently the figure of £52,000 was the same as that agreed for Lawford which had been passed in the Supplementary Estimate of 11 July 1938. Furthermore, the figure of £40,000 that had been spent up to 31 March is the same as the estimate for land purchase.

3.4 Bomber to Fighter Station

Coltishall was selected as a site of an aerodrome for two bomber squadrons (sic) in the autumn of 1938 and the work of construction commenced in November of that year. The station becoming ready for occupation in July 1940 (but it was actually occupied in May whilst construction was still in progress).

It had been on 14 May 1937 that a major reorganisation of Fighter Command came into operation when Duxford, together with Church Fenton became part of a new 12 Group which had been formed to give air cover to the Midlands and northern part of England. Air Commodore Trafford Leigh-Mallory assumed command in December of that year. The group was then strengthened by the transfer of Wittering and Digby to become Sectors 'J' and 'K'.

In the aftermath of the Munich Crises, Leigh-Mallory wrote to HQ Fighter Command proposing two new forward sectors in Norfolk, based possibly at two new aerodromes being constructed at West Raynham and Horsham St Faith. Meanwhile Debden was transferred to 12 Group and on 25 October 1939, the unfinished station at Horsham St Faith was used as a forward base by 66 Squadron, who had been chosen for the trials of the new VHF radio sets. The East Anglian sector organisation was finally settled on 27 March 1940, when Sir Hugh Dowding agreed to a new Sector 'J', based on Coltishall. The old Sector 'J' based on Wittering became 'K' with a consequent adjustment of the other sectors to the west and north.

The bomber squadrons due to arrive at Coltishall were then transferred to a new aerodrome some 18 miles to the west at Swanton Morley which was due to be occupied at the end of the year.

It is interesting to note that Swanton Morley (a Scheme 'M' station) was designed from the beginning as a fighter station with three type 'J' hangars, but only one was actually built. This sole hangar in peace time would have been completely inadequate for two bomber squadrons while Coltishall was planned as a late Scheme 'L' bomber station, firstly with six, then five and later reduced to four type 'C' hangars which meant that as a two squadron single seater-fighter station, two hangars were surplus to requirements (in peace time). In wartime however, aircraft were dispersed around the airfield and not kept in hangars. Furthermore, the fifth hangar would have been a bomber reserve shed to store aircraft held in stock prior to being allocated to a squadron. As the station was redesignated as a fighter station the fifth hangar was no longer required (WA7/Nor/1/40).

Bomb stores which were also completed prior to January 1940 were also surplus to the requirements of the fighter squadrons, but these were retained.

3.5 Access Road

In 1939, a grant of £2,087 was made to Norfolk County Council, representing one third of the estimated cost and the transfer of two acres of Air Ministry land (at a recoverable cost of £60) for the improvement (widening and strengthening) of the main B1150 approach road to RAF Coltishall.

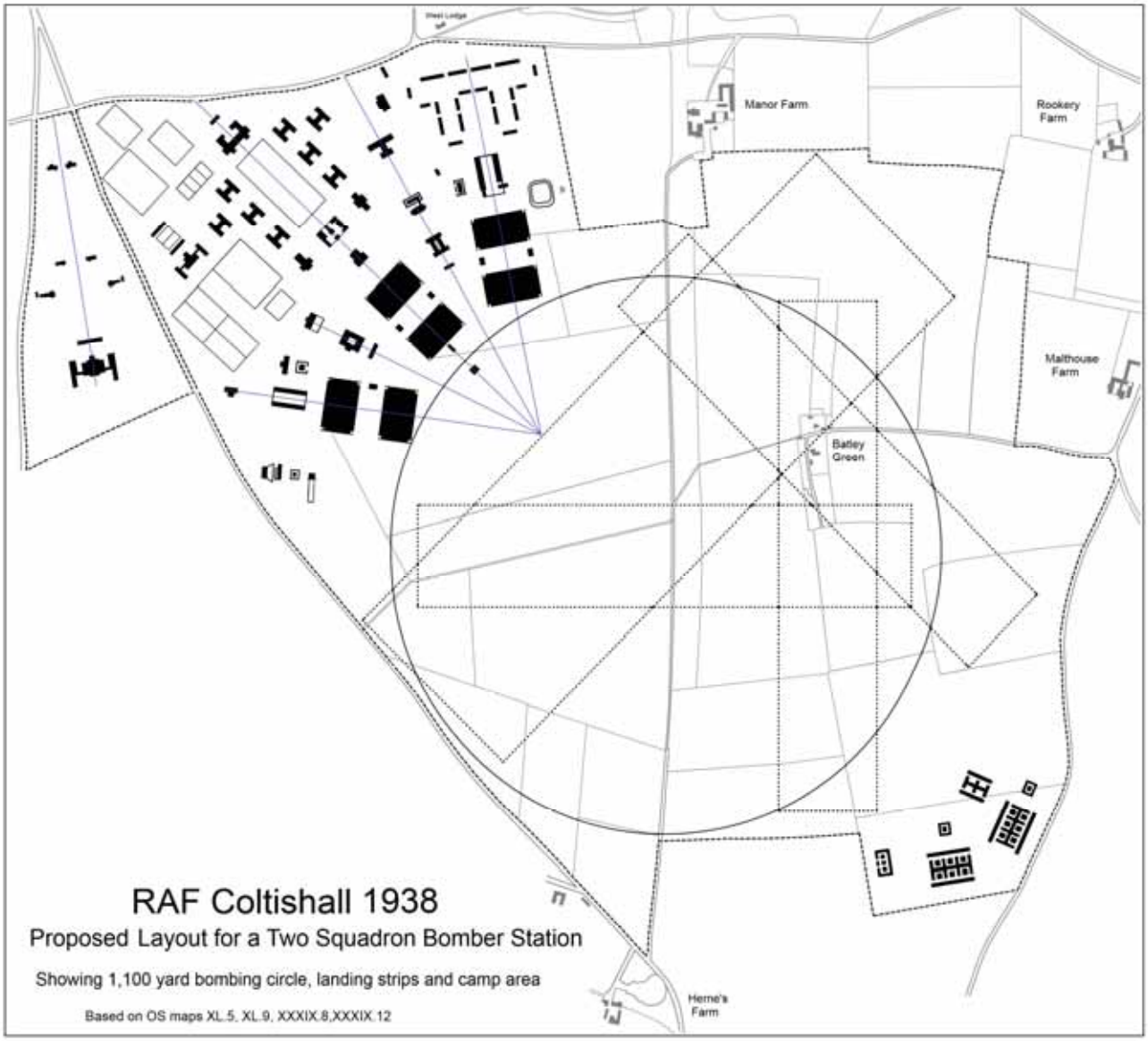

Fig 1: 1938 plan showing six type 'C' hangars

There is nothing unusual about this arrangement as, by 1938, heavy bomber stations were being designed with six hangars for three squadrons (the title of the original, as depicted in Fig.1, says 'two squadrons' but this is incorrect). In practice they only ever had a maximum of five; Horsham St Faith was exactly the same and ended up with five hangars – while in the next scheme, heavy bomber stations were built with just two (type 'J') out of six.

Note that the settings out lines shown are drawn at different angles from what was actually planned although the point of origin is in the correct place consequently the alignment of the buildings shown is different from that actually built. Furthermore, a few buildings like the sergeant's mess, the airmen's married quarters and the MT vehicle sheds are all shown in a completely different place from that which was actually built. The drawing number of this plan is unknown, but it was replaced with a new sequence of drawings 12387–91/38 which show the five hangars in the correct positions as drawn by J Binge. It is unknown why the setting out line angles were changed.

In 2013, the hamlet of Batley Green and Batley Green Lane exists on the ground as a crop mark and the best way to view it is on Google Earth. At ground level, there are depressions, large clusters of thistles and different species of grass in this area to the rest of the grass airfield. It is possible too (although not confirmed), that part of the metalled surface of the lane may be extant under the grass surface.

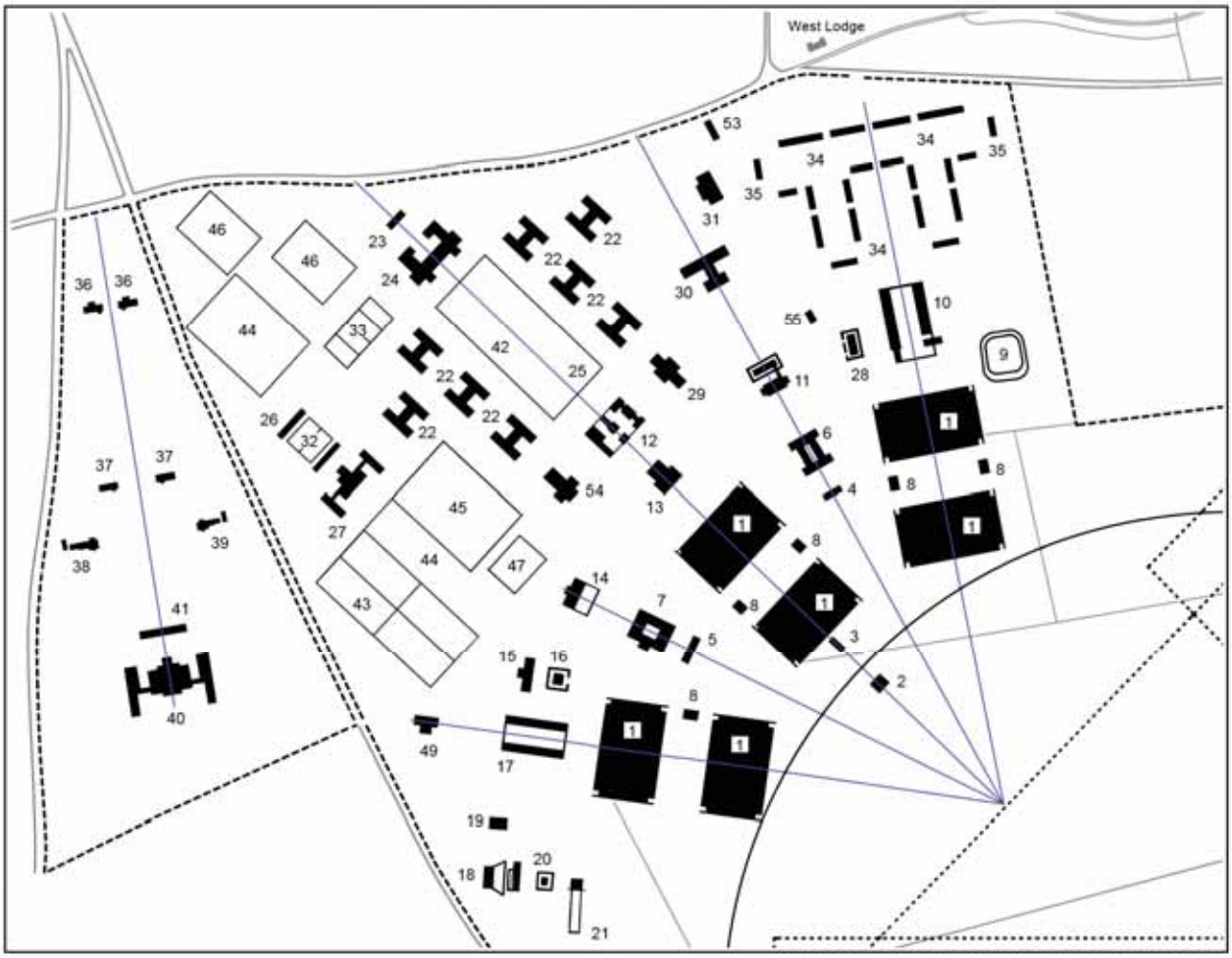

Fig 2: 1938 plan of Technical Site

1	Type 'C' Hangars		2	Watch Office		3	Fire Tender Garage
4	Lubricant & Inflammable Store		5	Parachute Store		6	Workshops
7	Main Stores		8	Petrol Tanker Sheds		9	Bulk Petrol Installation
10	MT Sheds		11	Sick Quarters		12	Works Services Building
13	Armoury		14	Central Heating Station		15	Engine Test Bed
16	Standby Set House		17	Fuel Store		18	MG Range
19	Practice Bomb Store & Gas Chamber		20	Group XII Store		21	MG Test Butts
22	Barrack Blocks		23	Ration Store		24	Dining Room & Institute
25	Flag Staff		26	Garages		27	Sergeants' Mess
28	Decontamination Centre		29	Gymnasium		30	Station HQ Offices
31	Guard House		32	Sergeants' Tennis Courts		33	Airmen's Tennis Courts
34	Married Airmen's Quarters		35	Married WOs' Quarters		36	Married Officers' Quarters Group V
37	Married Officers' Quarters Group IV		38	Married Officers' Quarters Group III		39	Married Officers' Quarters Group II
40	Officers' Mess & Single Officers' Quarters		41	Officers' Garages		42	Parade Ground
43	Rugby Pitch		44	Cricket Table		45	Soccer Pitch
46	Hockey Pitch		47	Cricket Practice Nets		48	Sports Pavilion
49	Incendiary Bomb Stores		50	Bomb Stores		51	Components Store
52	Fuzes Road Area		53	Families' Shop		54	Church

Plate 2: The airfield in May 1941
Photo: English Heritage (03887 of 28-05-41)

Note the following:

- The bomb stores have yet to be camouflaged
- The new concrete dispersal track but not for the south-east extension
- Only two runways have lighting (or so it appears, the straight lines being the cable trenches)
- The grass surface is painted to look similar to the pre-station field patterns
- It is just possible to make out that the perimeter track has been widened
- Aircraft are not using the blast pens which appear to be under construction (the rear walls are without earthwork traverses and are just concrete bagged walls). Aircraft are scattered around the airfield and there are no aircraft hardstandings present.

Plate 3: A similar view to above, taken in September 1941
Photo: English Heritage (A8N18 of 17-09-41)

Now note the following:

- The bomb stores are camouflaged with netting
- The new concrete dispersal tracks have been toned down as has the compass swinging circle
- The two runways are less obvious
- The aircraft pens to the south appear to be nearly finished.

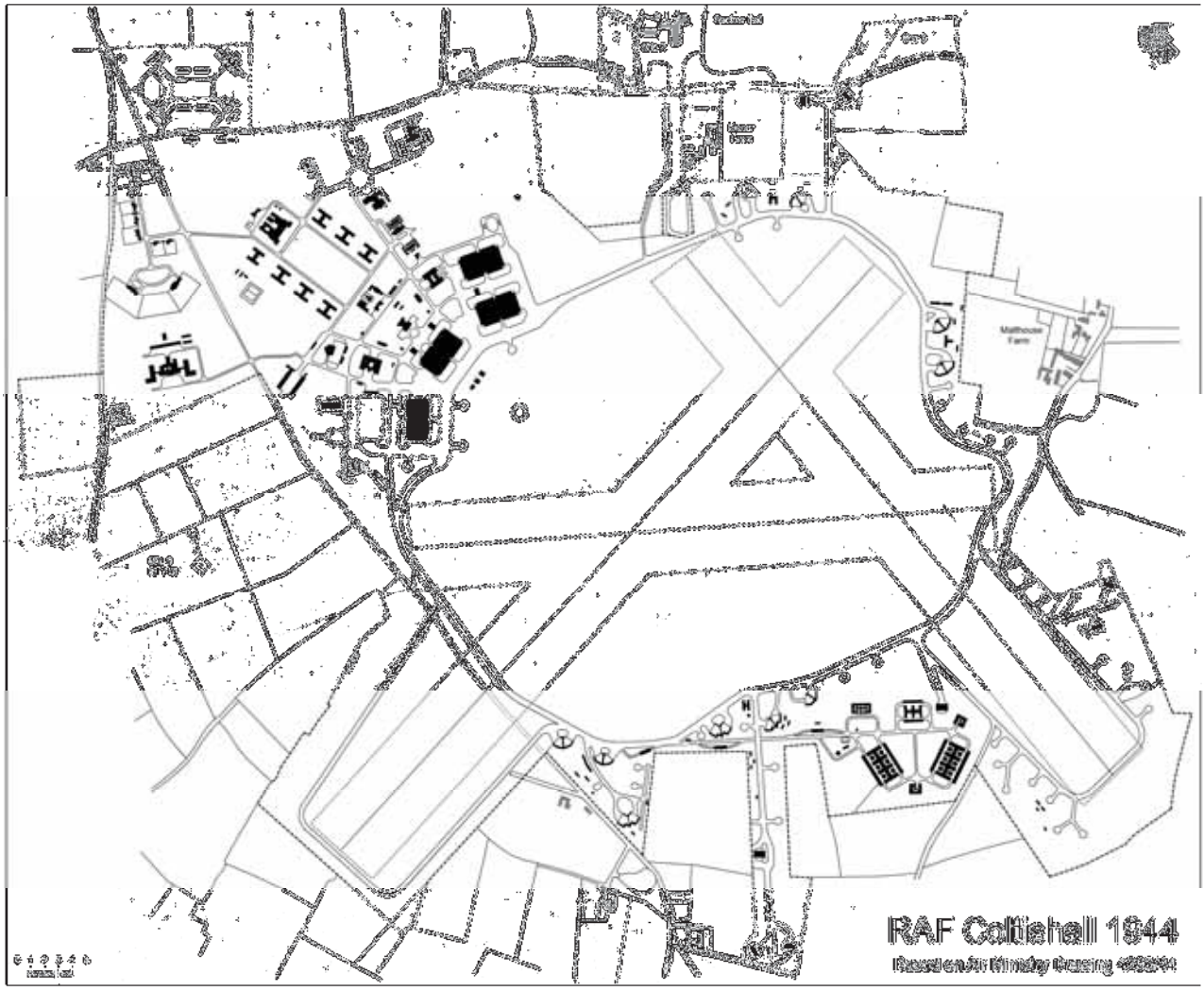

Fig 3: Site plan dated 1944

Note that the two fighter pens to the north-east of the site are missing – this is because they were built or partly built then removed as they were within the runway clearance zone. The plan is redrawn digitally, from an inaccurate original, and shows the stripping, not the actual runways which is surprising as the flare path lighting was in place as early as May 1941 on the main runway. It does however show the ultimate WWII layout with extensions, hardstandings and blister hangars.

3.6 Strips and Runways

3.6.1 Strips

As original planned, a 1,100 yard circular area was developed at the airfield, known as the bombing circle. Specified rectangular landing strips were planned across the circle in appropriate directions for taking off and landing with clearance zones at the ends for flightway approach, fanned at 15 degrees and a 1:15 glide angle from the airfield boundary.

Despite being a front-line Fighter Command airfield from its opening in 1940, Coltishall was never upgraded with hard runways during wartime, instead ending the war with two steel mesh runways and a third grass strip.

3.6.2 Perimeter Track

It was usual practice at a bomber station, to provide a 50 ft wide perimeter track but as Coltishall had been redesignated as a fighter station, it was only necessary to have one 40 ft wide (a surviving portion of original

track was measured at just 33 ft between taxi track lights). It was probably originally only wide enough for vehicles – a contemporary aerial photo shows this – but by May 1941, it had been doubled in width to 40 ft.

Construction of the track is of concrete and a tone-down topping of asphalt; it is of roughly circular form around the airfield boundary, but had slight bulges to enable the four grass landing strips to be set up at appropriate length. Pre-war, each of the strips apart from the NE/SW one were 200 yards wide while the main one was 400 yards wide. The following lengths were available in 1940:

N/S: 3,900 ft NE/SW: 4,800 ft E/W: 3,900 ft SE/NW: 2,790 ft

Using evidence from old site plans and a photo dated 1942, the following is apparent:

- Around 1942, the north/south strip was abandoned and the NE/SW and SE/NW strips were extended lengthways c.1943
- Two fighter pens located at the northernmost point of the perimeter track infringed the clearance zone of two runways and these were demolished
- If there were any problems with the runways they would be repaired by day; aircraft took off to the right of the runway in use and by night the Drem Mk II runways were used in the normal way. These were marked out as specified runways delineated by the light fittings and consisted initially in 1941 of grass, later as Sommerfeld tracking, and later still as a combination of PSP and bar-and-rod and possibly Sommerfeld tracking, while one is thought to have stayed as grass
- Each runway is 150 ft wide and aligned on certain headings – one or more runways were equipped with permanent electric lighting by May 1941.

Drem lighting runway headings:

- 05/23 (NE/SW) 6,000 ft may have been part Sommerfeld track and part grass, later part bar and rod / PSP and grass or Sommerfeld track, removed Nov 1949 – Sep 1950
- 10/28 (E/W) 4,200 ft grass, disused from Sep 1950
- 15/33 (SE/NW) 4,800 ft part-Sommerfeld track and part-PSP, mainly removed Nov 1949 – Sep 1950

It is known from the ORB that during July 1943, Sommerfeld tracking was laid for 700 yards on the main flare path (05/23); work also started on laying tracking on the extension at the 05 end as well as the extension to 15/33 flare path at the 33 end.

Airfield engineers inspected the airfield surface in November 1944 and decided that bar-and-rod tracking in all touchdown areas and PSP in the centre covering bad patches. Two works flights were on hand to carry out this work.

3.6.3 Sommerfeld Track

Sommerfeld track was a light-weight metal track, designed by Kurt Joachim Sommerfeld of 'The Cedars', Cowley, Uxbridge, Middlesex in July 1940, and manufactured in the company works in Iver Lane, Cowley.

This light-weight track arrived at the airfield as 10 ft 7 in wide rolls, each containing a 25 yard length of 3 in hexagonal-mesh wire netting of 12 or 13 gauge. When laid out, mild-steel rods of ⅜ inch diameter were threaded transversely at 8 in centres through the wire netting. The ends of the rods were formed into loops so that 15 ft long flat metal bars could be threaded through to join two lengths together. Slack was taken up by picketing one longitudinal edge with 3 ft long angle-iron pickets and by attaching a large-tracked tractor to the opposite side by means of a yoke, to strain the track transversely with the tractor. The final instruction was to retain the track in its stretched position by picketing along this edge with angle-iron pickets. Today there are many of the pickets lying around the southern group of revetments and there are a number of rods half-buried in the region of the ready-use bomb stores.

3.6.4 Bar-and-Rod

Towards the end of WWII the main runway was relaid or partially laid in bar-and-rod and this was used up until the airfield closed for the construction of the new hard surface runway. It was then removed as there is no trace of it today. The system was not used on a large scale and there were two types, a light and a

heavy duty version. Both were of mild steel and were supplied in panels 12 feet by 3 feet wide, both types were similar in arrangement, except the lighter track used thinner cross-section material.

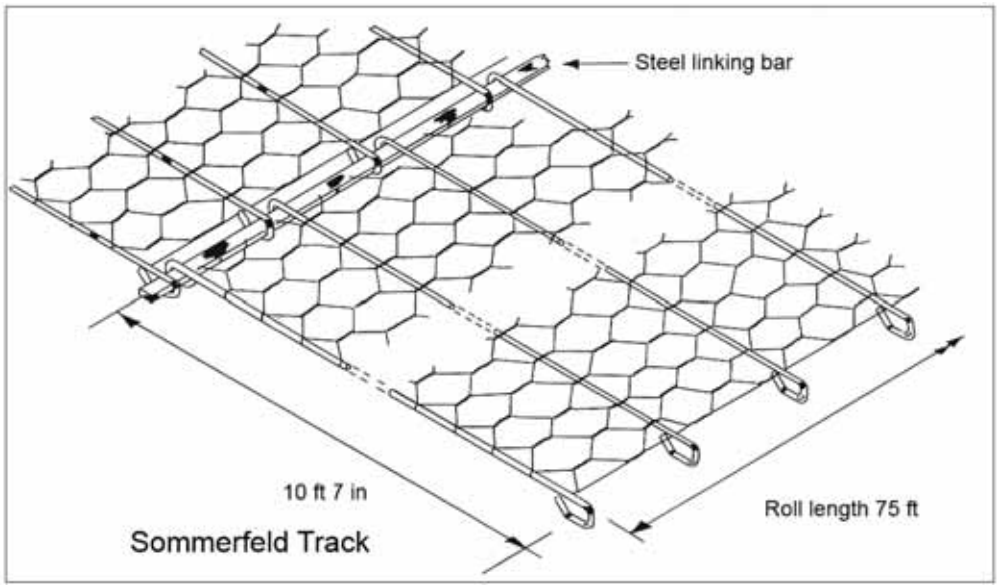

Fig 4: Sommerfeld tracking

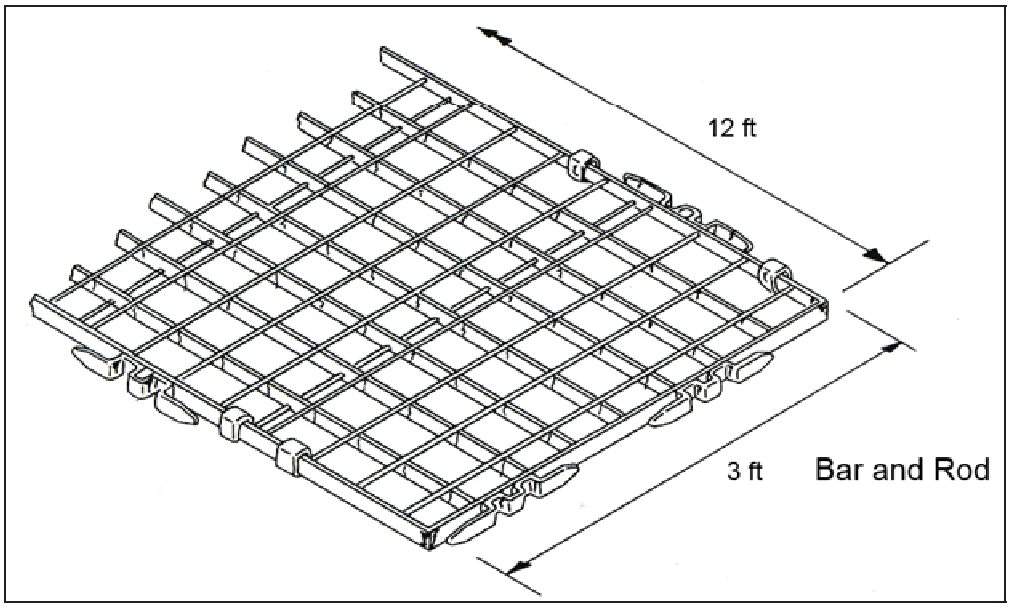

Fig 5: Bar-and-Rod track

3.6.5 Pierced Steel Plank

This track was developed in the United States prior to their entry into the war and was subsequently used far more widely than any other type British or American. It consists of panels or planks 1 ft 3 in wide by nearly 10 ft long, made from No.10 US sheet gauge mild steel plate. Longitudinal ribs are formed in the sheet to increase stiffness, and to reduce weight three parallel lines of 2⅝ inch diameter holes spaced at 4 in centres are punched out of the sheets on each side of the ribs. To obtain stiffness the holes are bent down. Side connections between planks are made by interlocking projecting lugs along the side of one plank with slots punched out of the side of the adjoining plank. Lugs and slots are provided along both edges of the planks. Spring steel clips are driven into the slots behind the lug projections to prevent the latter from slipping out. The planks are laid in rows parallel to the traverse centre-line of the runway and planks in successive rows are staggered by half a panel length. Each row of planks is laid with the lugs pointing in the opposite direction from those in an adjacent row.

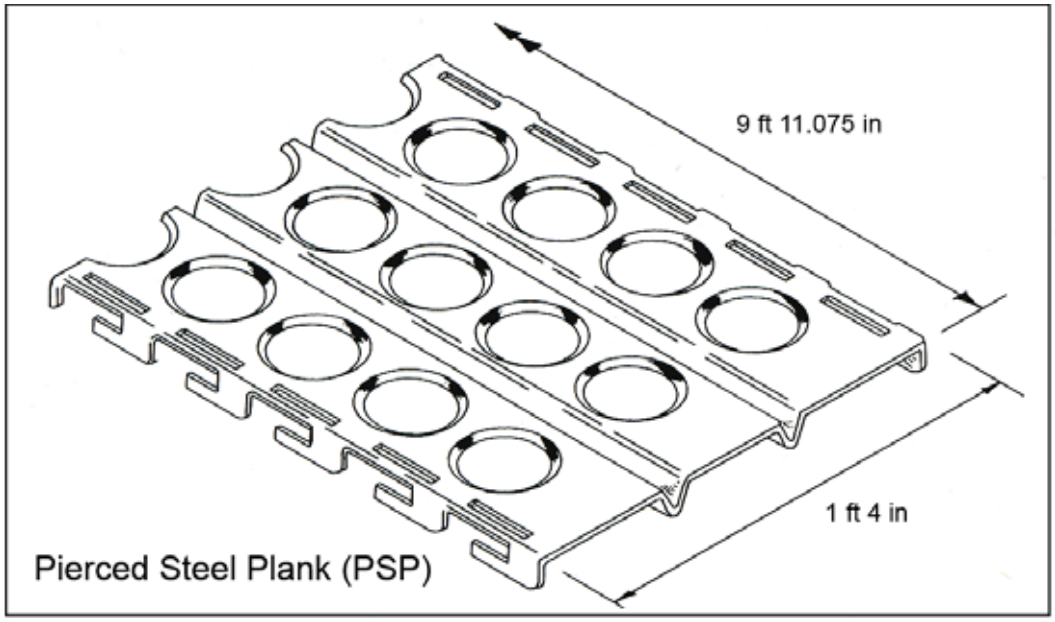

Fig 6: PSP track

Plate 4: PSP track underneath the grass surface adjacent to a Drem runway light

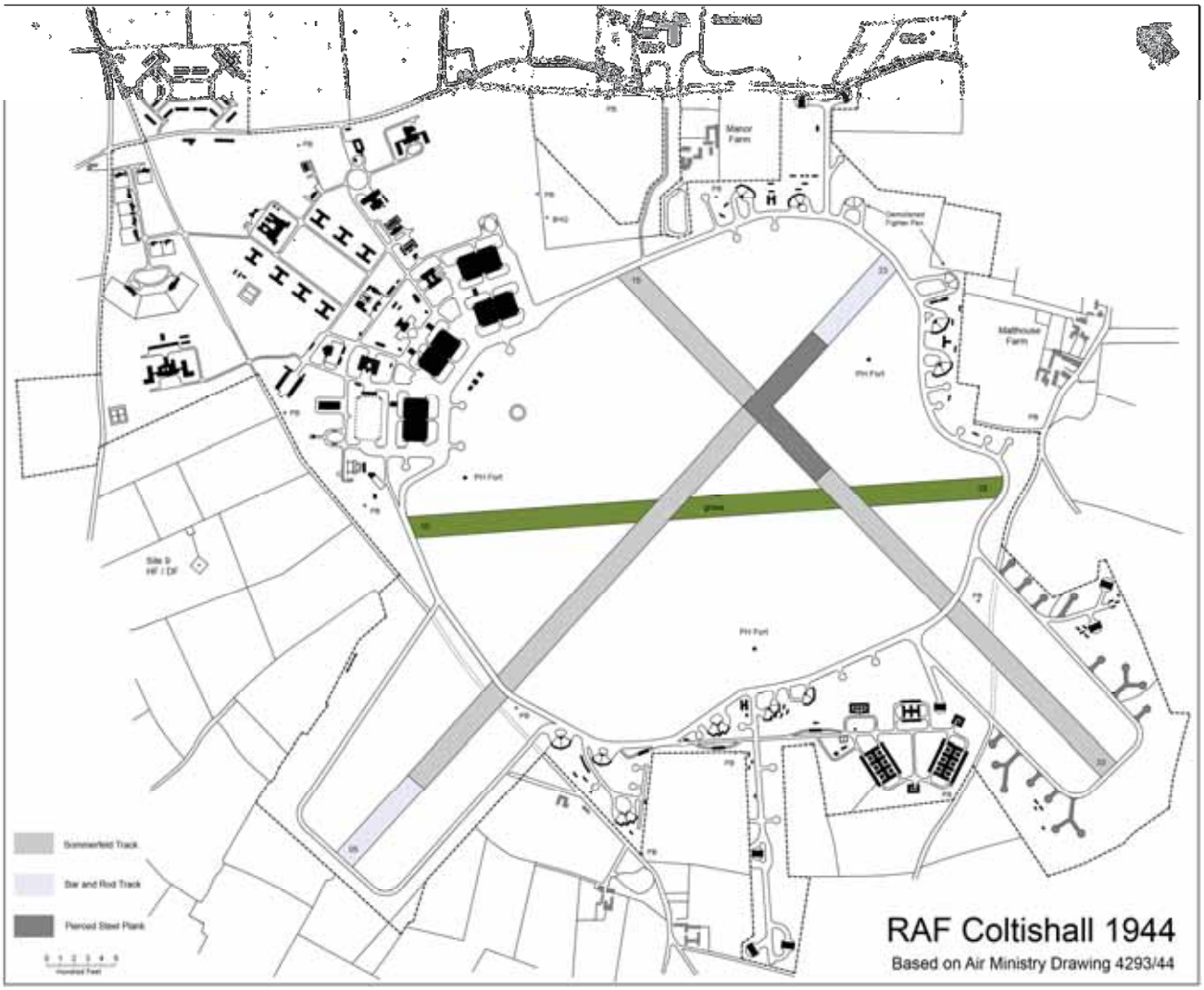

Fig 7: 1944 Layout

Going on the archaeology just below the surface and a small amount of primary source evidence, this plan is the probable 1944 runway arrangement though future discoveries either below the surface or in primary records, may dispute some of this. The PH fort close to the hangar line is the suggested position based on the English Heritage historical imagery.

3.7 Airfield Lighting

Permanent electric lighting began to be installed on UK military airfields in 1941, replacing paraffin flares which were in general use. The latter took a long time to set out when needed and importantly could not be extinguished in a hurry if the airfield came under attack. The first standardised electric system was based on a successful experimental design installed at Drem airfield in Scotland, which by the end of the year had been superseded by an improved version which became the standard throughout the conflict. Known officially as 'Airfield Lighting' (Mks.I and II) it was generally referred to as Drem.

As a night fighter station, Drem Mk II runway lighting had already been installed (although the number of runways having it pre-1942 is unknown). The lights post-1942 delineated the 150 ft wide grass runway along the centre line of at least three of the strips. It is known that there was a flarepath in use in May 1941,

though this may have been a temporary one. The type C.6 runway marker lights were bidirectional flush cast iron fittings (12 by 8 inches) which were (in this case) fixed to 4 ft square concrete blocks alongside the runway edge. The upper contour is dome-shaped and a typical unit projects no more than 1.5 inches above the concrete level and is capable of withstanding being run over by the heaviest aircraft. These were laid down both sides of each runway dead opposite each other and spaced nominally at 300 ft apart longitudinally. Each fitting contained two light apertures with two pygmy well-glass fittings with flanged semi-circular metal reflectors to throw the light from the lamps though the apertures in the dome – only one of these would be lit at any one time.

Across the width of each runway at 800 yards distance from each end, cross bars of lights were installed to warn pilots of the extent of the runway still available and to mark the last safe point for touchdown. These cross bar fittings were unidirectional in light distribution, blue screened with one pygmy well glass fitting housed inside a small 8 inch diameter cast iron dome (type C.5). They were spaced across the runway at 37.5 feet apart, altogether seven in number for each set and were connected to the corresponding runway marker lights electrical circuit.

The perimeter track was fitted with a taxi track lighting system. The fittings are similar to the crossbar light fittings except that instead of only one light aperture, there are six spaced around the periphery of the circular cast iron dome. This permitted an all-round visibility from the ground. The fittings, known as T.1s, were installed either on the taxi track itself or on separate precast concrete mounting blocks placed alongside the perimeter track. They were provided on both sides of the perimeter track and on straight portions, being spaced at 150 yards apart. On curved portions the spacing was reduced to one quarter of the radius of the curve. They were fitted with amber screens on the outside edge of the perimeter track and blue on the inside edge.

Plate 5: Type C.6 flare path fitting

Plate 6: Type C.6 flare path light and concrete mounting plinth
One of the two well-glass lamp-holders has been separated

Plate 7: Type C.5 800-yard runway cross-bar light

Plate 8: Type T.1 taxi track light (damaged)

Plate 9: Type T.1 taxi track light (intact)

3.8 Aircraft Dispersals

Aircraft dispersals included 35 single-engine (SE) hardstandings, though some of these may have been for twin-engine aircraft; they are not circular, but multi-sided, (a typical hardstanding is 60 feet across flats). These were mainly constructed adjacent to the perimeter track. Each of these has a pair of metal tie-down rings at 20 ft centres. The original 22 were constructed of concrete slab toned down with tarmac and another 15 built around the runway '33' end extension were constructed with PSP. The majority face away from the landing ground, so as to be outside the runway clearance zones.

Plate 10: Typical WWII aircraft hardstanding

3.8.1 Summary of WWII Aircraft Hardstandings

For Single Engine Aircraft:

26759 23287	26855 23328	27245 22996	26962 23323 crop mark
27228 22955	27347 22867	27000 22342	27077 22371 crop mark
26484 22106	26583 22149	26583 22149	26719 22220 crop mark

For Twin Engine Aircraft:

26820 22234

(all NGRs are 'TG')

Plate 11: Aircraft tie-down ring

Plate 12: Fighter hardstanding

3.9 Fighter Pens

3.9.1 Two Styles of the Same Fighter Pen

Fighter pens, as shown on a site plan dated 1944, were of two different shapes, one for the Hurricane and the other for a Blenheim, but aerial photographs showing their construction between May and August 1941 indicate that they were all originally Hurricane types. These were the earlier type 'B' pens to drawing 11070/40, each for two single-engine aircraft with a dividing wall. They were constructed of sand and cement bagged walls with earthwork traverses around the rear walls and an air-raid shelter located at the front of the central arm. They are associated with flight offices, ablutions, sleeping shelters and air-raid shelters or trenches. The northern group were constructed first and the southern group between May and September 1941. After 1942, three pens had their outer arms removed and rebuilt creating a 'W' shape in plan to accommodate twin-engine aircraft.

Plate 13: A fighter pen under construction in May 1941

The concrete bagged walls are present but the earthwork traverses are yet to be added, as is the air-raid shelter, although the floor slab is present.

Plate 14: Group (flight) of three pens which are finished and in use (Sept 1931)

Plate 15: The only surviving twin-engine aircraft pen
The image clearly shows the 'W'-shape planform

Plate 16: The scheduled single-engine fighter pen (one half)

Plate 17: WWII era temporary brick store at front of the scheduled fighter pen

3.9.2 The scheduled fighter pen

The scheduled fighter pen is the best example of the two partially extant pens, being roughly 90% complete whereas the other pen is around 45% intact (it is difficult to ascertain what exactly remains as it is almost completely overgrown and difficult to get to). The front part of the pen included the site of the air-raid shelter was obliterated with the construction of the drop-tank storage area (220).

The scheduled pen's maximum width dimension is 65 ft, the wing span of a Hurricane is 40 ft and that of a Blenheim is 56 ft 4 in so the pen is definitely for a single-engine fighter and the tie-down rings are at 20 ft centres. The sandbagged walls were probably originally 8 ft high, but they now vary in height by nearly 2 ft in places. The rear walls at the ends have triangular-shaped sandbagged returns which are earth bank retaining walls – the earth covering is missing.

- Scheduled fighter pen: TG 26780 23406

The function of temporary brick building 93 at the front of the pen is unknown; this arrangement is unique to Coltishall, as a few of the other pens had this structure as well, in this exact position. There is single access, which used to be a double-width door beneath the concrete lintel but it has been replaced with another of single width and infilled in 9 in brick. The roof is corrugated asbestos sheeting fixed to steel purlins carried on internal brick piers.

- NGR: (93) TG 26773 23390

The air-raid shelter at the front of the pen and behind the temporary brick building is constructed of reinforced concrete with 13 in brick access points. It measures 7 ft by 15 ft and is within a sandbagged protected enclosure that is triangular-shaped in plan.

On the airfield side of the pen is a detached air-raid shelter 'P'.

- NGR: TG 26785 23369
- Non-scheduled pen: TG 26567 22030

3.10 Airfield Defence

3.10.1 Background

During the late summer of 1940, as part of an Air Ministry enquiry into formulating an airfield defence policy, an inspection was carried out at 41 RAF stations by Major General GBO Taylor (Inspector General of Fortifications at the War Office). During September 1940, Taylor's conclusions were published in a paper known as the 'Taylor Report' and this became the main guide for the planning of airfield defences. He divided his proposals into three main categories according to the likely scale of attack from German forces.

The three classes were as follows:

- Class I – airfields located within 20 miles of a port that could potentially be used by enemy parachutists who would capture the landing ground for use by their troop-carrying aircraft. They could then operate a shuttle-service to deliver large numbers of infantry. These men might then advance upon the nearby port, so that once captured it could then be used to off-load more troops and fighting vehicles
- Class II – airfields defined as those 'liable to intensive attack, but mainly confined to air and parachute attack'
- Class III – all remaining RAF airfields.

Class II airfields were further divided into:

- Class IIa – fighter and bomber stations that could be used for refuelling and re-arming RAF aircraft engaged in operations against positions of enemy forces
- Class IIb – stations within five miles of a vulnerable point such as an aircraft factory
- Class IIc – all aircraft storage units.

Coltishall was a Class I airfield and would in theory have been generously provided with a combination of light anti-aircraft defences and pillboxes (20 to 30 structures), plus dummies and including three Pickett-Hamilton forts. Class I stations were the only airfields to receive these under Taylor's plan.

3.10.2 Coltishall Defences

Access to the English Heritage photos has confirmed that there were at least twelve pillboxes existed and today four are extant while two of the three Pickett-Hamilton forts have been found. It has also confirmed that by September 1941, the airfield perimeter had been completely encircled with a series of discrete defended interlocking localities, defined by lines and entanglements of Dannert wire, turning the entire airfield into a fortified area. The defended localities out on the airfield would be protected by the station's army garrison and the camp site by station personnel.

It is known that an FW3 type 22 pillbox used to be located at TG 25984 22680, but this was demolished c.1973 during the construction of the Jaguar flight simulator building. It is thought that the bulk of the defences were LAA gun positions of which 23 are thought to have existed. At least two pillboxes and two LAA positions were destroyed when the 15/33 and 05/23 runways were extended.

Extant pillboxes NGRs – note that these do not have building numbers:

- TG 27460 22924 (Malthouse Farm / The Fairstead)
- TG 26824 22191 (south blister hangar track)
- TG 26000 21959 (north-west of Colk's Farm)
- TG 27287 22153 (bomb stores)

3.10.3 Pickett-Hamilton Fort

The original drawing for the fort is signed by its designer, Donald Hamilton of 17–19 Stratford Place, London on 11 June 1940 and the title of this drawing is 'Obstruction Defence Post'. It was adopted by the Air Ministry as drawing 13313/40, possibly with a few amendments, such as omitting a central beam underneath the roof of the lifting head and substituting this with a steel plate where the jack meets the concrete – the revised version being flat.

The fort consists of two concentric hollow spun-concrete drums, one inside the other, resting on a concrete and brick base, with the inner drum (lifting head) designed to be raised under pneumatic pressure from a compressed air bottle, or alternatively a hand-operated oil pump. When in the down position, the lifting head is flush with the ground surface, but when it is brought into operation in an emergency it could be raised to surprise an enemy invasion force. The lifting head could be raised 2 ft or so above the surface, where Lewis or Bren gun loopholes were situated. Access to the fort was via a hatch in the lid of the lifting head and a series of iron steps allowing two men to reach these embrasures. Normally three forts were provided at each location. Airfield site plans do not normally identify where these structure are located. There were three known types, designed and manufactured by different companies:

- A manually operated cantilever type which used a large concrete weight to balance the rising head in its open position (Worthy Down) – probably not a Pickett-Hamilton design
- A manually operated lifting and turning head (Middle Wallop) – probably not a Pickett-Hamilton design
- The much more common pneumatically-controlled / hydraulically and rising head version (Coltishall).

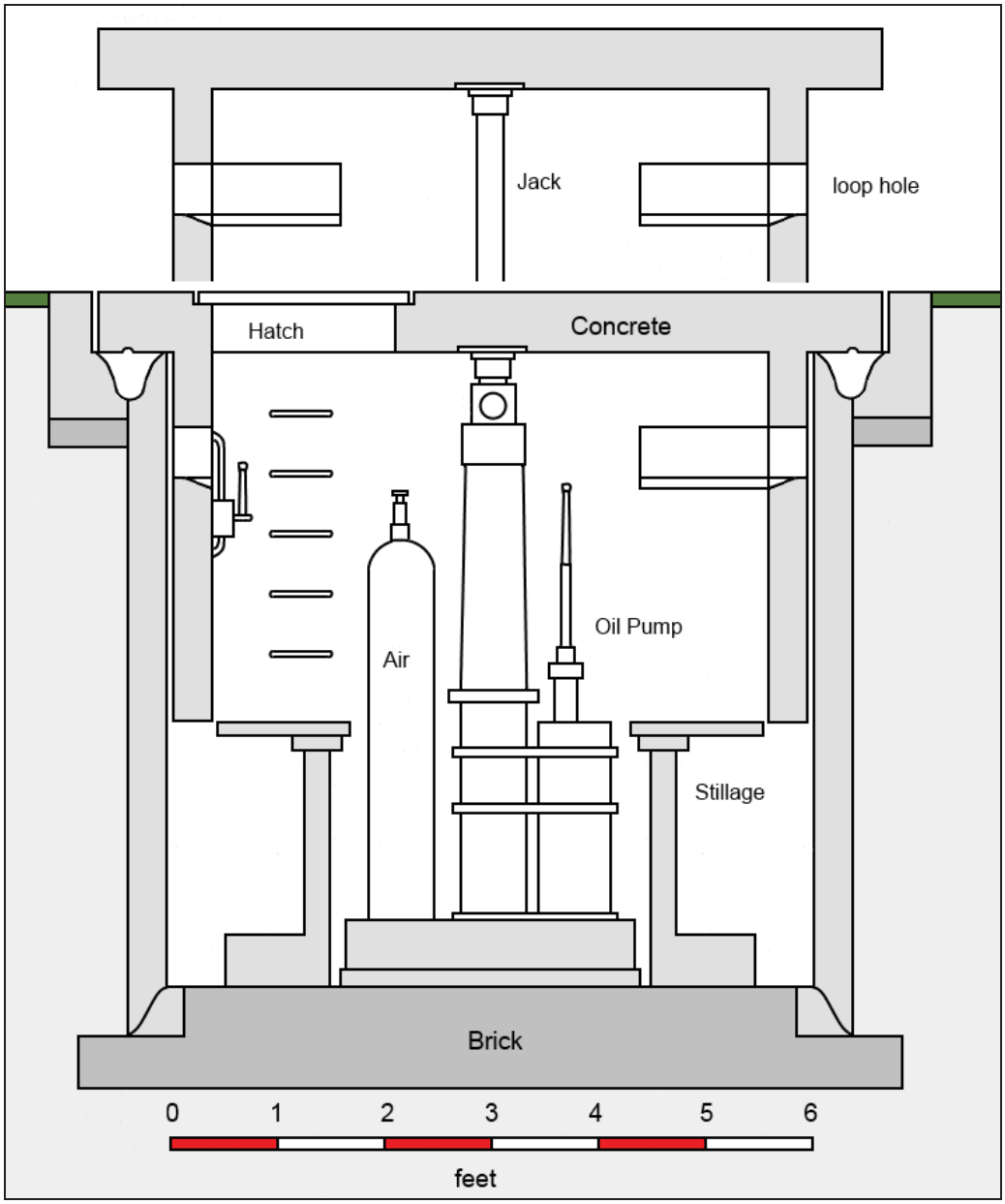

Fig 8: Diagram showing a section of the Pickett-Hamilton fort

Plate 18: Small six-sided pillbox inward facing with camouflaged anti-ricochet wall
Location is north of Colk's Farm

Plate 19: Interior of rectangular-shaped with angled end walls pillbox
It is outward facing and the wall on the left is part of the entrance blast wall (south blister hangar track).

Plate 20: Pickett-Hamilton fort discovered 15 June 2013

Plate 21: Pickett-Hamilton fort discovered 16 July 2013

Plate 22: The main technical and domestic areas in May 1941

Note that the camouflage scheme is in place over most of the buildings except for the officer's mess.

The circle of white on the airfield in front of the watch office/hangars is the compass swinging circle.

The image shows a number of what appear to be defended localities consisting of pillboxes and light anti-aircraft gun positions which are protected with Dannert wire (shown as dark lines). One of these defended localities is just to the west of the officers' mess which has half a circle of Dannert wire around it, the wire then goes north forming the perimeter to the officers' married quarters and in an easterly direction to the south of the mess as it makes its way to another defended locality based on a pillbox to the west of building 14. There is a similar arrangement to the north of the sergeants' mess.

There is also a possible Bofors gun site to the north of the ration stores and all of these sites have been identified on this image in yellow.

It is exceedingly well defended.

(North is at the bottom.)

Plate 23: Interior of the pumped out Pickett-Hamilton fort
Note the bracket for supporting a machine-gun

Plate 24: Imperial War Museum photo showing a PH fort with Bren gun
Photo probably taken at the demonstration site at Langley airfield in 1940

Plate 25: Interior of rectangular-shaped pillbox inward facing with AA position in the roof
Location is at Malthouse Farm

Plate 26: Bomb crater
Many of the bomb craters show up on the ground as crop marks and depressions, but the best way to view them is on Google Earth.

3.10.4 121 Battery War Diary

The first mention of Coltishall in the 121 Battery War Diary is the entry for 1 June 1940 when four Bofors arrived. The next entry is 27 October: air-raid by Dornier 215 and Heinkel 111. Machine gun posts 1–4 and 40 mm posts in action, M/G posts were machine gunned from plane, three bombs dropped no casualties. He111 crashed in sea at Bacton. No.121 Battery (341 Troop) was officially credited with its destruction by Fighter Command.

On 3 November 341 Troop exchanged with 338 Troop at Horsham St Faith.

3.10.5 Station Operations Record Book, References to Station Defence

Note: Included here are references to other stations that were under the care of RAF Coltishall.

1940

18–22 Jun: On the nights of 18, 19, 21 and 22 June Air-Raid Warnings were sounded. On the night of 21/22 June, 11 bombs were dropped on Swanton Abbot, 4 at Felmingham, 12 at Suffield and 2 at Worstead. The bombs all exploded in fields, and apart from one horse killed little damage was done. However it is interesting to note that the areas bombed are 2 to 3 miles distant from the aerodrome and the nights were moonlit.

8 July: Lt WJU Lawrence, Norfolk Regiment was attached at Coltishall for station defence.

19 Aug: A bombing raid was carried out by an enemy raider, who suddenly came through the clouds, dropped six bombs doing little damage to an unfinished hangar, but killing and injuring several workmen.†

7 Sep: During the night six or seven bombs were dropped near the dummy aerodrome.

27 Oct: At about 18.10 hours an enemy aircraft dropped bombs in the vicinity of the aerodrome. Another enemy aircraft machine-gunned defence post No.3 who opened fire with their Lewis guns. Enemy aircraft disappeared in very low cloud, but came down in the sea off Lowestoft. It has been confirmed that an He111 was destroyed by the ground defences at Coltishall. (Note: compare this account with the one at the top of the page.)

29 Oct: Matlask aerodrome was bombed and machine-gunned with no casualties but otherwise little damage.

1 Nov: Air Raid warning – two sticks of bombs dropped three miles north of the aerodrome.

5 Nov: A single enemy aircraft made a surprise attack on the station, machine gunning defence posts and workmen.

8 Nov: An enemy aircraft dropped 11 bombs on the aerodrome; one badly damaged the watch office, the remainder making small craters on the aerodrome which were quickly filled in.

1941

4 Feb: At about 01.00 hours an attack alarm was sounded but bombs were dropped some distance from the aerodrome.

11 Feb: At 00.15 hours whilst night flying was in progress enemy aircraft dropped about 50 incendiary bombs on aerodrome and between hangars but these were quickly put out. No damage was done and no bombs dropped. The e/a was attacked but no visible damage observed.

12 Feb: At 20.20 hours about 30–40 incendiary bombs were dropped on and around the aerodrome which were quickly extinguished without causing any damage.

4 May: At 0145 hours in bright moonlight, a JU88 passed over the aerodrome chased by Spitfires, P/O BP Klee and Sgt JH Burgess of 22 (Natal) Squadron. E/A dropped a stick of four explosive incendiary bombs on the NW boundary of the aerodrome. These were immediately extinguished and no damage was done. P/O BP Klee was shot down in flames just off the aerodrome.

5 May: At 00.10 hours an Air Attack Alarm was given; five minutes later seven HE bombs dropped on the waste ground between the officers' mess and Block 5. There were six casualties, one dead, two seriously wounded and three minor. All clear at 00.50 hours. Another Air Attack Alarm was sounded at 01.30 hours but no bombs were dropped.

† The Commonwealth War Graves Register for civilians killed during WWII identifies the following that were killed at Scottow (sic) Aerodrome: Lawrence Wilfred Stone, age 31, husband of Laura AM Stone, of Church Cottages, Horstead. George Middleton, age 32, son of Harriet Middleton of White Horse St, Wymondham. Sidney Alexander, age 55, son of Robert and Martha Rix, of 19 Salford St, Heigham and husband of Maud Rix of Fairviews, Shorthorne Rd, Stratton Strawless.

8 May: (a): At 23.20 hours, seven HE bombs were dropped between south dispersal and watch office causing slight damage to the flare path which was quickly repaired.

8 May: (b): At 02.30 hours, four small bombs were dropped on the 'Q' Site. The only damage was to one electric cable and was immediately repaired.

12 May: Attack Alarm was sounded at 00.35, all clear at 01.16 hours, no bombs dropped. At 00.25 hours about 80 explosive / incendiary bombs were dropped on the airfield at Matlask and about 100 in adjoining fields. No damage or casualties.

20 Aug: Four 500 lb (at least) bombs in camp (sic) at 21.45 hours, no damage to personnel or property.

8 Sep: Five separate sticks of bombs within 10 miles, between 10.40 and 00.22 hours. Bombs in the vicinity at 22.22 and 01.10 hours.

11 Sep: Four bombs dropped at Colts (sic) Farm, access to camp shortly after midnight, no one hurt.

22 Nov: Army Exercise 'Samson' commenced and was completed the following day.

29 Nov: The Drem 'Q' Site was brought into operation.

18 Dec: Two armoured piercing bombs dropped at G8448 at 08.15 hours less than a mile SE of CHL (chain home low) – a direct hit on the 7th Norfolk mess. Two ORs killed and one officer and six ORs in hospital. The Ju88 approached below cliff level – crater 3 feet deep by 15 feet across.

1942

6 Feb: A Dornier 217 with grey underneath and black uppers passed the southern side of the aerodrome plainly visible, at about 180 mph at 1,800 feet. No action as no fighters in the vicinity and 41st Brigade advise that their guns at sites L2, L4 and L6 state that it was out of range.

29/30 Apr: About 30 enemy aircraft made a concentrated attack on Norwich between 23.19 and 23.55 hours, the bombing and dive-bombing was indiscriminate and from all heights. Most of the e/a approached from the north (several passing over Coltishall), and departed to the south. Many fires were started in the city and suburbs. Following are some of the landmarks reported bombed or burnt out: Hippodrome, Woolworths, St Benedict's Church, Caley's Chocolate Factory, Howlett & White's Shoes and Clark's Boot Factory. Fires were still burning in the centre of the city at 08.00 hours.

. Four Beaufighters of 63 Squadron were airborne during the attack, having taken off 22.20 and 22.28 hours. P/O Paton had three contacts on an enemy aircraft but nothing further. S/Ldr Howden had two contacts on one e/a, followed by a contact on a second, resulting on a visual and a combat, from which he claims one Heinkel III damaged. G/Capt Lees took off in a Spitfire at 23.26 and W/Cdr Hanks at 23.31 hours. W/Cdr Hanks claims a Do 217 probably destroyed, another damaged and another Do 217 destroyed shared with Coltishall ground defences.

19 Oct: Three enemy aircraft, taking advantage of very low cloud over East Anglia, crossed the coast at 07.00 hours. Attack alarm on camp was raised 15 minutes later and a Dornier was seen to pass over the south of the aerodrome. It returned or maybe another raid, also low over the officers' mess at 08.25 hours. Another passed over the watch office in cloud at 400 feet and emerged at 200 feet over the married quarters clearly distinguishable as a Do217.

23 Oct: A Stirling was homed by searchlights and landed after operations against Italy – this entry confirms that Coltishall had a Sandra capability. Three sites 'A' to 'C' but locations unknown.

2 Nov: Movement of RAF Regiment. No.2719 Squadron marched out to Collyweston (Wittering) and was replaced by 2781 Squadron from Collyweston.

1943

Jun: A new operations room was opened on 24 June involving largely increased communication facilities. At this time, an ops PBX was also brought into use in the old building at the rear of the SHQ and this was taken over by the Bofors defence crews (the main circuits duplicated those in the battle headquarters), thus rendering the system of operational communications more flexible. The changeover from emergency operations room (Catton) to the main operations room (Camp 'O' at Stratton Strawless Hall) was carried out successfully and without hindrance. The defence communications on Coltishall has been completely reorganised. The

perimeter cable was connected up and comms laid to all defence posts, Bofors gun sites, canopy gun sites and light anti-aircraft gun sites.

3–10 Jul: No.2812 Squadron RAF Regiment took over operations, manning and control of the Bofors guns; they replaced 2811, who moved away from the sector on 15 July. No.2812 had only just reorganised itself from a Field unit to an LAA unit, it was divided into flights specialising in certain weapons, carrying out training on Bofors, Hispano and Browning guns on the range at Stiffkey and ground instruction at Filey. On 12 April, they assumed control of eight twin Browning gun posts at Coltishall. After completing their training the Bofors Flight took over (on loan) the operational commitment from 'A' Troop, 457 Battery, 140 Regiment, Royal Artillery at Coltishall of the four gun sites

Aug: All ground defence weapons were removed from Ludham and Matlask, and Ludham was handed over to the AMWD while Matlask was put on a care and maintenance basis. No.2812 Squadron, RAF Regiment left the station for Holmsley South taking with them all four of Coltishall's Bofors guns. No.2885 Squadron arrived at Coltishall from Drem to take over the station's Browning machine gun posts (all Lewis and Vickers guns had been replaced by Brownings before December 1943) and 2803 Squadron arrived from Acklington equipped with four Bofors guns.

23 Aug: Attack Alarm sounded in the early hours – three bombs dropped on the aerodrome.

27 Sep: A Halifax crash landed at 00.35 hours, it had been on a bombing run on Hanover; during the return two of its engines packed up and it landed with its undercarriage up at the end of the runway. No sooner had it landed when three HE were dropped on the airfield rupturing the Sommerfeld track and three canisters of 2 kg anti-personnel bombs were dropped around the eastern perimeter. Two fighters then landed and the airfield was declared unserviceable. A bomb disposal squad blew up the bombs and the craters were filled.

16 Oct: No.2885 Squadron left the station for North Luffenham; they were replaced with 2735 Squadron from Snailwell.

1944

Oct: The 'Q' Sites at Beeston St Lawrence and Suffield were dismantled.

3.11 Dispersed Sites

There were nine numbered dispersed sites, plus two others, mostly located to the west. The army sites are for the army defence guard and the units that manned the LAA guns:

Site #	Function	Bldg numbers / notes
2	Airmen's Domestic Site	(201 to 216)
3	Army Domestic Site	(222 to 230)
4	Army Domestic Site	(230 to 233)
5	Army Domestic Site	(239 to 242)
6	?	(248 to 252) This site may not have been built
7	Gymnasium & Chancel	(253)
8	VHF D/F Site	(259 to 260)
9	HF D/F Site	(263)
10	Sewage Disposal Works	(266-271)
?	VHF Receiving Station	at Brookpark Plantation: building and two 90 ft masts
?	Receiving Station	south of St Michael's Church: rest hut and two 90 ft masts
Note that the building numbers listed are those that represent actual buildings (with the exception of Site 6). Most of these sites had a series of other building numbers allocated to them but these were not used. Site No.7 still retains its wartime gymnasium at TG 24809 23075		

Plate 27: Gymnasium building on Site 7

3.12 Air-Raid Shelters

Apart from basement refuges, beneath the officers' mess, sergeants' mess and the barrack blocks, there were two types of air-raid shelter – both were underground. One consisted of a trench shelter which was probably an earth trench with a timber frame and clad with corrugated iron, having a floor of duckboards, a roof of corrugated iron and covered with earth. These were 'W'-shaped and were placed mainly around the domestic buildings. None of these are extant in 2013.

The other type is a monolithic concrete shelter accessed from a flight of brick steps leading to a rectangular-shaped single shelter with an emergency exit at the opposite end with a vertical ladder. This shaft would have originally had a patent cast-iron cover but only one is extant, the others being replaced with covers fabricated from aluminium sheet. They were used post war and had telephone communication with the GDOC (32). The shelters have an internal measurement of 7 ft by 30 ft.

Plate 28: Air-raid shelter 'E' (513) showing an original escape cover

Plate 29: Interior view of shelter (517)

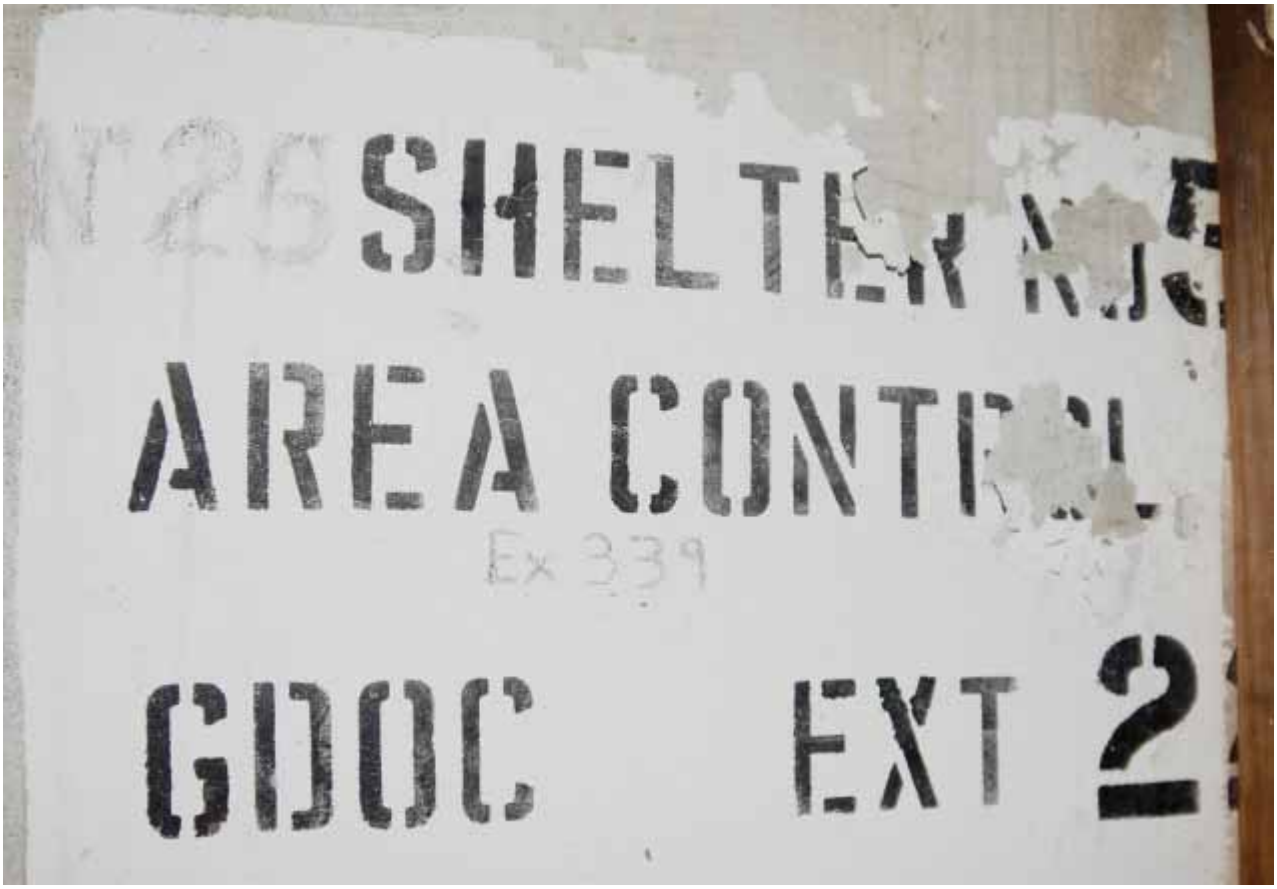

Plate 30: Signage (thought to be post-war) in shelter (517)

Plate 31: Close-up aerial view of the main domestic area

Photo: English Heritage (03879 of 28-05-41).

The buildings are displaying camouflage on their flat concrete roofs, but their poor colouring, shadows and new concrete paths give them away.

Note the 'W'-shaped trench shelters and what might be light anti-aircraft or ground defence positions in front of the SHQ (35)on the roundabout and another to the left of the central barrack block close to the left-hand edge of the image.

There is an extensive cluster of defence posts to the north of the ration store close to the top edge of the image.

Note that the image has been rotated and that north is at the top of the right-hand corner.