

Part 5: Fighter Command Airfield Development, 1946–60

5.1 Introduction and Notes on Sources

This part is an overview of Fighter Command's post-war strategy for airfield development and how it affected fighter stations, particularly in East Anglia – Coltishall and West Raynham were both very significant in this respect. It is based on research carried out at The National Archives by ARG member Peter Howarth and it is an extract of a part-work which was published as in *Airfield Review* a few years ago.

5.2 Background

By VJ-Day on 14 August 1945, the RAF had just three operational units of Gloster Meteor F.3 jet fighters: 616 Sqn at Lübeck in Germany, and 74 and 245 Sqns at Colerne. In addition, 1335 Conversion Unit had recently been formed at Molesworth to adapt pilots to the new type. At this time, little thought had been given to the requirements relating to airfields in order to accommodate the new jets. This was to change over the next few years as an increasing number of squadrons converted to both the Meteor and the de Havilland Vampire, whilst a plethora of new Air Ministry specifications harnessing both the new technology and German research into high speed flight encouraged the development of faster and heavier fighters.

Co-incident with this, the armed forces were shrinking from their wartime strength to one more appropriate to their new role of defending the hard-won peace. Taking the RAF as an example, from its peak of 504 squadrons on 1 January 1945, it had reduced to 479 by VE-Day (8 May 1945); it then was further reduced to 397 by VJ-Day and stood at just 249 squadrons by the end of the year.

Commensurate with this was a requirement to reduce the number of airfields, both in the UK and abroad. Even before the end of the war, the Post-War Airfield Requirements Committee met on a regular basis in order to discuss the disposal or retention of all UK airfields. By September 1946 their requirements for the post-war RAF had settled at 180 airfields and 6 flying boat bases. These were to be selected by meeting at least one of the following criteria:

- Very Heavy Bomber bases (e.g. Lakenheath, Marham etc)
- Airfields equipped with FIDO (Fog, Intensive Dispersal of)
- Pre-war permanent airfields (i.e. Expansion period)
- Those suited to modern aircraft by either having existing long runways that could be strengthened or the space for runways to be extended.

By 1 January 1946, many of the temporary wartime airfields had closed, Fighter Command's structure had been rationalised and many surplus squadrons, particularly those assigned to foreign and Dominion air forces (i.e. 300 and 400 series), had been disbanded or transferred to the home country.

The airfield selection process outlined above carried on, and in October 1946 the requirements for Fighter Command under what was known as Plan 'D' settled on 15 squadrons in 11 Group, 10 squadrons in 12 Group, an Armament Practice School (APS), the Central Fighter Establishment (CFE) and two Operational Conversion Units. No.13 Group had been merged into No.12 Group on 20 May.

The Royal Auxiliary Air Force (RAuxAF) was reformed on 10 May 1946 and the squadrons were allocated to Fighter Command, boosting the numbers involved. By 1st July 1948, Fighter Command had 13 squadrons plus 7 RAuxAF in 11 Group and 10 squadrons plus 12 RAuxAF, 2 OCU's and the CFE in 13 Group.

At this point there had been little effort to cater for jet aircraft within the existing operational airfields and certainly no attempt had been made to standardise on requirements. From 5 to 10 July 1948, the first meeting of the Airfield Standardisation Co-ordinating Committee took place. This body contained representatives from the RAF, USAF and RCAF and attempted to agree common airfield standards. Sub-committees met to discuss radio and radar, explosives storage, airfield lighting, fuel storage, domestic accommodation and hangars, ground communications and anti-aircraft defence.

Two more meetings were held in April 1949 and January 1950 but little consensus resulted.

The RAF then gave their first thoughts on fighter airfield requirements. These were as follows:

- Runway length 6,000 ft for fighters with a maximum weight of 65,000 lbs
- Taxiways 50 ft wide
- Cleared zone 600 ft each side of the runway centreline, 1,000 ft clear at each end
- Glide path 1:50.

At the same time, correspondence was taking place between Fighter Command and the Air Ministry Directorate of Air Policy (D.Pol(AS)) on the subject of runways for RAuxAF airfields. D.Pol(AS) stated that the main runway for Vampires should be at least 1,800 yards whilst a secondary runway of 1,400 yards was not acceptable. For Meteors, the main runway should be between 1,800 and 2,000 yards in length. Fighter Command accepted the recommendation for the main runway but stated that a second runway was needed to ensure maximum effectiveness.

Issues were being reported with the deterioration of runways, particularly at the ends where the aircraft were held at full power on the brakes prior to commencing take-off. The Vampire was deemed to be the worst culprit due to the angle and distance from the ground of the jet pipe. They asked for concrete slabbing at the end of each runway to counteract this and the first airfield so equipped was West Malling which had the work completed in September 1948, coinciding with the conversion of 500 Sqn to Meteors.

5.3 The Rebuilding Programme Begins

Five fighter airfields were initially identified as requiring urgent upgrades, including Coltishall, Duxford, and Wattisham in East Anglia. They all had Pierced Steel Planking (PSP) or steel matting main runways which were completely inadequate for the new aircraft and clearance was given in April 1949 to start the rebuilding programme.

The specification for the rebuild was still not formulated but the following layout was suggested:

- Runways: Main – 2,000 yards × 50 yards constructed of concrete. An 04/22 orientation was determined to be the optimum for UK conditions but the only RAF-operated fighter station that actually met this criteria in East Anglia was Coltishall. Others were:

Duxford: 06/24	Horsham St Faith: 09/27	Marham: 06/24 and 29/11
Stradishall: 07/25	Wattisham: 06/24	West Raynham: 03/21

- Secondary: Single cross-runway of 1,600 yards recommended. Alternatively build a parallel runway or use a satellite airfield
- Dispersals: To be built at ends of runways to cater for four squadrons of 12 aircraft each, although concerns were raised about presenting a concentrated target to the enemy. Normal dispersals were also needed for spare aircraft and second line maintenance
- Control tower: A combined airfield and approach control building was to be located away from the main technical site
- Refuelling: Tankers were to be used rather than piped supplies to dispersals.

All new construction would cater for aircraft weights of up to 30,000 lbs and the runways were needed to be in service by 31 March 1950 at the latest. A concrete running-up platform adjacent to the hangars would be needed and bulk fuel storage was to be investigated as it was felt to be inadequate at all three stations, with three times the current storage volume being proposed. Decisions were made regarding the new runways at the airfields:

- Coltishall: The southernmost of the two proposed parallel runways was to be built
- Duxford: The new runway was to be to the north of the existing PSP runway although road closures may be needed
- Wattisham: Extending the existing E/W runway was investigated but this had many disadvantages Therefore it was agreed to go with a main runway in the NE/SW orientation, to drawing 1502/49. Wattisham's 32 existing hardstandings were deemed to be sufficient, but those at the other airfields were still under review.

5.4 Enter the Central Flying School

Senior officers within the CFE at West Raynham had been monitoring developments and at this stage became involved, at the request of Fighter Command, in putting forward their ideas for the upgraded airfields. They had already voiced their approval to the standard 2,000 yard × 50 yard main runway, with 1,000 yard overshoots at each end and 50 yards clear to each side. On 10 May 1949 they held a site conference to discuss aircraft hardstandings. It was agreed that, where present, the existing PSP hardstandings, fitted as stopgaps in front of hangars to prevent grass being scorched and the aircraft sinking in, were not suitable and should be replaced by concrete. Some science was applied to the size of these, resulting in the following formulae:

- Width = (75 per cent of station establishment) × (wingspan + 6 ft)
- Depth = (2 × wingspan) + (1 × length) + (1 × bowser width) + 15 per cent

Assuming a station contained 74 Meteors, this would give a hardstanding of 2,700 ft wide by 150 ft deep, a huge area. Ideally it should be located outside the sterile area, i.e. outside the perimeter track. The size and location were not practical and so the first one built, at West Raynham itself, measured 420 ft by 150 ft and was located on the runway side of the perimeter track. These were to be called Aircraft Servicing Platforms (ASP). The basic definition of the ASP was contained in drawing FCW/31/49, later to be taken on by the Air Ministry as 2278/49.

A further meeting took place on 21 June between the CFE and the Air Ministry. Details on some of the key design features were discussed and it was agreed that the ASPs should be tailored to suit the available space, as per West Raynham, although it was desirable to be able to cater for 24 aircraft (two 16 aircraft squadrons at 75 per cent strength).

Furthermore, the first thoughts on what was initially known as a War Readiness Platform (WRP) at the ends of the runways were laid down. These were proposed to be an angled hardstanding capable of holding a single squadron. Separate shelters for each aircraft were to be provided, these being in the form of a 70 ft span blister hangar made from 3 inch thick concrete. This initial scheme was followed by one showing a dome-roofed circular shelter with internal blast walls, capable of holding six aircraft. By August, drawing FCW/65/49 was showing a large 700 ft long cone-shaped piece of concrete to be located at the each end of the main runway. Drawing FCW/66/49 showed a similar arrangement, tailored to a possible upgrade to Horsham St Faith. In all cases fuel was to be piped underground to the WRP, and thence to each shelter by flexible hose. Each WRP would also have crew rooms and offices.

There were some disagreements at the meeting. CFE wanted dispersed maintenance around the airfield, whilst the Air Ministry wanted it centralised at the traditional technical site. The CFE wanted Calvert crossbar runway approach lighting, whilst the Air Ministry preferred sodium straight line. The CFE also wanted flying control dispersed, with runway caravans and an offsite underground control room.

By the end of July, Fighter Command had decided that the ASPs for Duxford and Coltishall were to be sited near the existing hangars, one each side of the watch office. Further consideration was needed on Wattisham but its existing facilities were inadequate and two 12-aircraft ASPs would be required. It was also decided that the existing bulk fuel storage capacity was adequate and the specification for taxiways was agreed. The final runway design for Wattisham was approved, to drawing 2082/49, and its ASP was defined by drawing 1502/49. All runways were to have the final 250 yds at each end in concrete to increase the resistance to jet blast.

Airfield Lighting - To resolve issues related to lighting, the Air Ministry held a meeting on 8 July. The following specification was proposed:

- Runway: Edge of runway – C.11 GEC fully adjustable, high-intensity, flush, bidirectional lights, at 80 ft spacing
- Parallel strip: 25 yds from runway edge – C.12 or C.3b low intensity flush lights, at 400 ft spacing
- Threshold: C.11 green lights across the 50 yd runway at 12.5 ft spacing
- Distance Marker Lights: Bars of C.11 yellow lights at 12.5 ft spacing, 800 yds from runway end

- Taxiway: T.2 lights at 160 ft spacing on straight sections, and spaced at an eighth of the corner radius on the bends
- Approach Lighting: To be determined.

Later in the month, AOC Fighter Command decided that approach lighting was to be high intensity, of either the new Calvert line and cross bar or the American slope-line type. It was desirable to use the latest Airfield Lighting Mk.6 runway lighting system. By the end of the year the Calvert approach lighting system was chosen (see section 5.10) and it was recommended that this be fitted at the following airfields in East Anglia:

Coltishall Horsham St Faith Stradishall Wattisham.

5.5 Work Commences

Despite large elements of the airfield upgrade design being at best ill-defined, rebuilding work on the three airfields started at Wattisham in July 1949, followed by Duxford in October and Coltishall in November.

Slowly, the design definitions were resolved. The western ASP at Duxford was relocated to allow an extra 100 ft between the hangars and the revised taxiway, whilst the eastern ASP was moved eastwards by 150 ft. The original ASP design (to drawing 2278/49) had grass islands between individual hardstandings, rather as per the later V-bomber dispersal design. One additional T2 hangar was to be erected at Duxford due to the limited space within the WWI-era general service sheds, whilst a 2.5 ft hump in the Wattisham runway was to be removed. By August, after one month, the Wattisham work was already behind schedule!

The cost estimates for the work at the end of August were:

Wattisham, £582,000 Duxford, £482,000 Coltishall, £585,000

By October these had been reduced to £436,000, £414,000 and £439,000 respectively, primarily by reducing the amount of technical and domestic site work, at which point the plans were officially approved, despite work having already started.

The CFE were recommending one hangar per squadron as a minimum requirement and by November the term Operational Readiness Platform (ORP) was being used within Fighter Command for the WRPs. A memo from Air Officer Commanding (AOC) Fighter Command suggested that these features be installed at Wattisham only so that their effectiveness could be assessed.

On 16 January 1950, AOC Fighter Command published his thoughts on the optimum layout for a fighter airfield:

- Runways: Two parallel strips, 2,000 × 50 yds, 100 yds apart. One subsidiary runway of 1,600 yds at right angles to these
- ORP: Facility for 12 aircraft with 52 ft span at the end of each runway. Blast walls to be added in wartime. Construct at Duxford, Coltishall and Wattisham first
- ATC: Dispersed and concealed, with a runway controller caravan on a hardstanding to the left of each runway
- Landing Aids: Ground Controlled Approach (GCA) radar on each main runway
- Fuel: Four bulk fuel installations, supplied via separate roads
- Hangars - Servicing hangars to cater for 25 per cent of the station's strength. Individual aircraft hangars for 1st line maintenance
- Dispersals: Sufficient for all the station's complement
- Operations Rooms: Wing Ops Room to be well protected. Squadron Ops Room to be mobile.

As will be seen, many of these ideas came to nothing, primarily due to cost. The idea of blast walls on ORPs was soon dismissed, whilst the size of the ORPs was reduced to cater for six aircraft only, starting with those on the first three airfields. However one month later this decision was reversed, with each ORP to cater for

12 Meteor F.4 aircraft. A final design was agreed with the Air Ministry at a meeting at Waterbeach in May and drawing 1825/50 was created to define these.

Further details on plans for ATC facilities were published on 14 March 1950, although these would be too late to affect the immediate plans for Duxford, Coltishall and Wattisham.

In June it was recommended that all fighter aircraft be dispersed and serviced at those dispersals. The assumption was made that each airfield would have two squadrons of 16 aircraft each. Electrical power was required at both the dispersals and the 'marshalling areas' (ORPs) at the ends of the runway. Normal requirements were 28V DC 300A, with a peak current of 850A needed for heating the Airborne Interception (AI) radar of night fighters. Although underground supplies were proposed, it was also recommended that trailer-borne secondary power equipment be provided at the two locations for maximum flexibility. It was also calculated that two squadrons of Meteors would require 144,000 gallons of fuel per week, with storage to match.

As well as trying to cater for the new jet fighters, Fighter Command was also thinking about the next generation of jets, particularly the F.4/48 (Javelin) and F.23/49 (Lightning). For the latter in particular, it could be seen that longer runways may be needed, up to 7,500 ft, as well as the use of parachutes, arrester gear or high friction surfaces. Even further ahead, the Air Standardisation Coordinating Committee could foresee runways up to 9,000 ft in length, 200 ft wide and with 75 ft wide perimeter tracks.

In the end though development levelled off after the Lightning and so the more extreme rebuilding plans were shelved.

5.6 Works Services Programme, 1950/51

On 23 August 1950, HQ Fighter Command published its proposed works programme for the East Anglian region forthcoming year.

Station	Task	Completion
Coltishall	Cross bar lighting (additional to current work)	October 1950
Duxford	New runway, taxiway and hardstanding improvements, ASP, ORP	May 1951
	Additional T2 hangar	October 1951
Great Massingham	Cross bar lighting.	
Horsham St Faith	2 ASPs, ORP (to drawing FCW/141/50)	April 1951
Waterbeach	2 ASPs, ORP (to drawing FCW/140/50)	April 1951
Wattisham	Cross bar lighting, rehabilitate two hangars (Nos. 2 and 3 type 'C' hangars had been bombed in 1940 and laid derelict ever since)	October 1950
West Raynham	3 ASPs (to drawing 2291/49)	April 1951

As can be seen, this was a large programme to be completed in a very short timescale. Changes in the programme were continual. By the end of September, two ORPs had been added to the requirements for West Raynham. Small runway extensions were to be added at Horsham St Faith and Waterbeach although Waterbeach had lost its extension by the end of November! However, the overall plan for ORP and ASP construction was approved on 29 November.

The first of the three initial airfields was returned to service when Coltishall accepted 23 Squadron and 141 Squadron in September 1950, ironically still equipped with Mosquitoes. However the work was still to be finished as the perimeter track and new dispersals were incomplete. Wattisham recommenced operations in October 1950 when two squadrons of Meteors arrived, whilst Duxford was not completed until August 1951.

5.7 Control Tower Upgrades

At the time of the civil engineering work to Coltishall, Duxford and Wattisham, these airfields were making do with their WWII (or before) control towers and equipment. The first improvement was the introduction of a Unit Control System. This was a method of controlling runway lighting with more variation available than with the existing Drem controllers, whilst certain interlock safeguards could be incorporated via switchgear such that certain lights could only be illuminated if other lights were already switched on.

The control panel was located with the Flying Control Officer (FCO) in the first floor control room. A dedicated room in the tower, known as the 'A' Centre, was required to house the electrical translation and distribution equipment and was always located on the ground floor. An associated medium voltage switchgear room was also required. The first such system had been installed at Heathrow in 1946.

Wartime Drem lighting, operating under blackout conditions, was relatively low power which meant that cables could be run directly from the control tower's switchroom to the various elements of the system. Modern runway and approach lighting used substantially more power and hence had to be supplied 'locally' from transformer and control enclosures out on the airfield itself. These were known as 'B' centres.

At Duxford (tower type 12779/41) and Wattisham (modified 207/36), the 'A' centre and medium voltage switchgear room were to be converted from the met office and duty pilot's rest room on the ground floor, with the met office moving to the front room on that floor. These modifications were covered by drawing 281/51. At Coltishall (2328/39), the new equipment was to be installed in the old teleprinter and forecast room to drawing 278/51.

With the provision of aircraft on standby on the ORPs, the question of alerting them to scramble was raised. The solution was the tele-scramble system, whereby the command from the station operations room was fed via underground cable to a terminal box at the ORP. From here, umbilical leads fed to each aircraft. The FCO was also patched in to the system and gave the final permission for take-off. The first set of equipment was installed at Wattisham in 1951 followed by the other key fighter stations.

5.8 Operational Readiness Platforms

As already seen, the concept of an ORP was that it provided an area of hardstanding where a number of fighters could be lined up at the end of a runway, armed, fuelled and ready for take-off, had been developed through 1949, with major inputs from Fighter Command and the CFE. By the end of 1950 this had matured into a length of concrete, 600 ft long by 150 ft wide, with an angled lead-in to the runway. One was to be positioned at each end of the main runway, preferably on the same side. The platform was designed to cater for 12 Meteor aircraft and allowed for 6 ft between wing tips. From February 1954, having both ORPs on the same side of the runway was standardised. The logic for this was that it left the grass area on the other side of the runway free for wheels-up landings or left space for a clearance zone between two parallel runways.

In later RAF layout specifications, the official description became:

Specially prepared areas at each end and immediately adjacent to one side of a runway on which aircraft may be assembled, either for rapid 'scrambling' or for final flight preparation.

As already seen, electrical power was fed to the ORPs to allow aircraft systems to be ground checked and kept on standby. However, plans to pipe fuel to the hardstandings were dropped and aircraft normally sat fully fuelled, topped up from bowsers as required.

Although there were several detail variations, the main drawing number for ORPs was 2196/51. They also became standard at most Royal Auxiliary Air Force airfields and some Flying Training Command airfields.

5.9 Aircraft Servicing Platforms

The official description of the ASP was:

Paved areas provided for the centralised servicing and turnround of aircraft. They will be provided in accordance with scales agreed between the Air Ministry and the Command concerned.

As described above, there was initially much debate as to their size and number. The first was built at West Raynham for the CFE, but this was relatively small, being 420 ft by 150 ft and catering for 8 aircraft only. This did however set the pattern by being adjacent to the hangars, but on the opposite side of the taxiway. Whilst a basic rectangular planform was desirable, some were curved to match the taxiway profile, for example at Leeming. Numbers installed varied from one to three per airfield, usually driven by the hangar layouts. Some early examples had grass 'islands' at each end, in effect providing an access taxiway to the rear of each ASP. These islands had a 20 ft. wide concrete strip in the middle for storing ground equipment. These features were later abandoned (as happened later at Coltishall) though, AOC Fighter Command disparagingly describing them as circular flower beds, and all later ASPs were solid concrete, normally formed from 10 ft square slabs.

By 1952 the space requirement per aircraft had been standardised and two specifications were defined. The type 'A' ASP catered for all-weather aircraft and allowed a width of 60 ft and a depth of 200 ft per aircraft. Each ASP had a clear zone of 70 ft at each end. The type 'B' ASP catered for short-range day fighters and allowed a width of 45 ft and a depth of 190 ft per aircraft. The depths were determined on the basis of the length of the fighter type plus a 50 ft taxiway at the rear and safety zones front and rear. Both types were available in standard lengths, normally catering for 8, 12 or 16 aircraft. Nevertheless this was only rigidly implemented at certain airfields and for most airfields the constraints of available space and taxiway shape determined the final size and profile.



Plate 41: Venom on Coltishall's northern ASP starting c.1951



Plate 42: Meteor NF11 landing at Coltishall c.1951.

Photos AHB

5.10 Runway Approach Lighting

By the end of 1949, it had been decided to standardise on the Calvert lighting system, although it would take some time before this was implemented at all Fighter Command airfields. The system was developed by Ted S Calvert at RAE Farnborough and consisted of a line of 500 Watt lamps extending from the end of the runway on its centreline, every 100 ft, for a distance of 3,500 ft. The first 1,000 ft from the runway had a single lamp, the next 1,000 ft had a double row of lamps, and the final 1,500 ft had three lamps side by side.

At 500 ft from the runway end was a cross-bar of 10, 140 Watt lamps, 105 ft long. This was repeated every 500 ft, but the cross-bars got progressively wider with subsequent bars having 14, 18, 28, 32, 36 and 40 lamps. The effect of this was to describe a triangle with an included angle of 4 degrees, focussed on a point 1,000 ft along the runway. As well as providing a tunnel to the end of the runway, the system also featured 'roll guidance' which allowed the pilot to assess his bank angle and make a judgement as to his glide slope.

This arrangement was confined to the main runway only and normally in the instrument landing direction only. All other active runways had simple centreline lighting. Some concerns were raised about the presence of elevated lights in the runway overshoot areas and it was agreed in October 1951 to install the lights at ground level for the first 1,000 ft. from the end of the runway.

5.11 Runway and Taxiway Lighting

Initial Air Ministry thoughts on runway lighting have been described earlier. Further consideration was given to the style and type of runway lighting required and trials were carried out at RAF Gütersloh from 12 to 15 December 1950, with further trials from 26 to 28 February 1951, particularly looking at the possible use of high-intensity lights. Two operational requirements were generated as a result of this: OR.830 for elevated high-intensity lights and OR.880 for a flush version, both of which would be required for the 1953/54 works programme.

In March 1951 the following specification was published for airfield lighting upgrades:

- Instrument runways: Where Mk.2 lighting fitted, apply high-intensity lights every 100 ft
- Where Contact or Contact and Mk.2 lighting fitted, apply high-intensity lights every 200 ft in one direction only, all other lights to be C.11
- At runway intersections, flush lights to be used
- At ORPs, elevated lights to illuminate them every 200 ft
- Subsidiary runways: Replace all lights with T.2 type
- Threshold Green bars consisting of flush lights at 12.5 ft intervals across the width
- Distance Marker at 800 yds from upwind end, at 12.5 ft spacing
- Taxi track. Replace all lights with T.2 type, at 160 ft intervals
- All lights to be capable of being dimmed at various preset levels.

Based on early experience at Coltishall and Wattisham, ASP lights were changed from blue to amber in November 1951, whilst green threshold lights were confirmed in October 1952. Meanwhile, the relative merits of elevated and flush lighting were being debated. Developments were led by Bomber Command as they were planning a series of wider runways for which there was some concern as to whether the existing runway edge lights were visible enough during take-off and landing.

Holophane Ltd developed their LR/21 semi-recessed light fitting to OR.880 and a trial installation was carried out at Honington in 1955 for a centre-line lighting system using green lights at 100 ft intervals. Following the completion of bomber trials, on 2 December the CFE was requested to carry out trials using Hunter aircraft to assess the effects on landing, taxiing and braking. The Air Fighting Development Squadron performed 18 landings in early 1956, 12 by day and 6 at night. The conclusion of the trials was that the effects on the aircraft were negligible and that therefore they were suitable for installation. The main advantage was that any aircraft leaving the runway would not be caused any damage by an elevated light fitting, however the main disadvantage was a restriction on the elevation angle possible with the semi-recessed light for which the RAE was to carry out further trials. Ultimately, high-intensity lights mounted at the runway edges were standardised upon.

5.12 Landing Aids

The initial thoughts were to standardise on the late-war Beam Approach Beacon System (BABS). This was to be for night fighter airfields only, partly because the prime use for the system was at night, and also because it required a second crew member to monitor a cathode ray display and to relay commands to the pilot. However as many day fighters flew at night and were single-seaters, a more practical solution was required.

The first version of the American Ground Controlled Approach (GCA) system (the Gilfillan AN/MPN-1) had been fitted to a number of airfields from 1944 and consisted of a trailer-mounted control room with radar and various antennae. Initially the aircraft was directed to the start of the final leg. The operators then tracked the incoming aircraft in both elevation and azimuth and relayed the aircraft's position relative to the glide slope through a controller talking to the pilot on the standard VHF radio. One advantage of this system was its mobility. However only a limited number of systems were purchased (24) and these were shared between airfields in all Commands.

In 1952, the first of a developed version designated the AN/CPN-4 was installed at the Central Signals Establishment at Watton. This had a greater range, with 40 miles for the general area radar surveillance and 10 miles for the final precision approach, and contained its generator units in a separate trailer. The performance of this system met all expectations and it was agreed that this should become the standard landing aid, not just for Fighter Command airfields. Twenty-five systems were ordered for delivery from July to September 1954, although due to the small numbers involved it was agreed that the new AN/CPN-4 systems would be concentrated at Fighter Command airfields, whilst the existing AN/MPN-1 systems would be concentrated at Bomber Command and Coastal Command airfields. AN/MPN-1 systems already installed

at Fighter Command airfields would be transferred as and when the new equipment arrived. In 1954, airfields equipped with the original system included Coltishall.

The initial batch of new systems was allocated to Linton-on-Ouse, Leeming, Leuchars, Tangmere, Horsham St Faith and Coltishall, in that order. The first two systems didn't arrive until February 1955 and were installed at Linton and Leeming. Deliveries were painfully slow and the airfields allocated to the equipment programme and their order of installation was constantly changed.

Following the delivery of the thirteenth system in March 1956 (allocated to Duxford), all remaining deliveries were to the later AN/MPN-11 standard, the primary difference being an improved method of construction for the trailers. Total orders for AN/CPN-4 and AN/MPN-11 systems were increased to 33. Deliveries were still protracted and, for example, West Malling wasn't re-equipped until April 1957. Some OCU stations were restricted to the original AN/MPN-1 systems whilst many RAuxAF stations had no GCA system installed at the time of their disbandment in March 1957.

Initially a single hardstanding was built for AN/CPN-4/MPN-11 systems to cater for approaches from the primary direction, consistent with the approach lighting (two had been provided for AN/MPN-1 installations). However as the systems were mobile it was realised that they could easily be turned round to facilitate approaches from the reciprocal direction. Trials were undertaken at CFE West Raynham in September 1956 and from these it was recommended that two sites were required for runways of less than 6,863 ft, otherwise a single composite site was acceptable for which No.90 Group proposed a scheme in January 1958.

Equipment upgrades to the GCA caravans included the provision of mains supplies at the hardstandings from 1956, the installation of AN/GPX-8 IFF Mk.10 from 1957 and the installation of TD-58A map generators from 1959. By 1960 a specification was being developed for the replacement of the various GCA systems to ASR.2077.

Prior to starting their approach procedure, aircraft had to be guided to the airfield using direction finding equipment. Initially this was called VHF/DF and was often based in a van parked in the middle of the airfield. The signals crew rotated the aerial by hand to obtain the bearing of the aircraft and relayed this by land line to the Approach Controller in the tower. A new system called Cathode Ray Direction Finding (CRDF) was introduced which was an automatic system that relayed the bearing information directly to a cathode ray screen in the tower. This was initially introduced on bases having short-range day fighters from 1953.

5.13 The Parallel Runway Saga

An idea that occupied the minds of HQ Fighter Command and senior Air Staff was the possibility of using parallel runways, previously alluded to in the January 1950 airfield specification. The first idea investigated was to build a double-width (300 ft) runway that would allow two fighters to take off side-by-side, significantly reducing the time to get a defensive force into the air. Another idea was to build a back-up PSP runway parallel to the existing so that should the main runway become blocked or unserviceable, take-off and landings could still take place. In October 1950 it was proposed that a trial take place at Horsham St Faith, although this was soon moved to Linton-on-Ouse. Drawing FCW/145/50 was prepared for the trial installation although it was noted that this might clash with the new ASP being built. The plans were approved in December but the Air Ministry cancelled the trial on 19 February 1951.

A discussion paper was issued on 20 March 1951. The stated advantages of parallel runways were a quicker form-up time for the squadron once airborne, particularly at coastal airfields, and quicker turn-around times due to dual take-off and landings. Suitable airfields (27) were identified as being candidates and the estimated cost was £8,500,000, including the provision of ORPs at each. The airfields listed included the following:

Coltishall	Duxford	Horsham St Faith
North Weald	Wattisham	West Raynham.

Trials took place at Boscombe Down, Carnaby and Waterbeach in June 1951, looking at different take-off patterns on different sizes of runway. HQ Fighter Command recommended two parallel 150 ft. runways for a Wing of 32 aircraft. Based on this, an average saving of 37 seconds per aircraft would be gained and the cumulative advantage of this for the Wing would be 4 nautical miles at 40,000 ft. A total clear width of 1,200 ft would be required for this proposal comprising: 150 ft clear, 150 ft shoulder, 150 ft runway, 300 ft shoulder, 150 ft runway, 150 ft shoulder, 150 ft clear.

However, the Vice Chief of Air Staff was concerned about the cost of the proposal and the resources it would require to implement. (When Churchill heard of the dual-runway proposal he remarked that ‘...once again the Air Ministry was trying to cover the country in concrete’). As a result of this, HQ Fighter Command resubmitted their proposal on 20 September 1951, this time based on only six airfields. It was decided that the most benefit in terms of response times from having parallel runways would be gained at the flanks of the air defence network. Therefore in the north, Acklington, Drem and Leuchars were put forward, as were Exeter and Hurn in the south-west. Additionally Horsham St Faith was proposed it was seen to cover a direct attack route on London.

The Vice Chief of Air Staff replied on 9 October that the use of standby airfields should be considered to enable rapid turn-arounds to take place. It was conceded that a case could be made for Acklington, Drem, Exeter and Leuchars, but further study was required on Hurn and there was no need for a second runway at Horsham St Faith due to the presence of other nearby airfields such as Coltishall. However it was suggested that Driffield might be upgraded as there was a perceived gap in the air defences in that part of Yorkshire.

The Vice Chief of Air Staff agreed with this conclusion and requested that the storage facilities at the nominated standby airfields be upgraded where necessary. Following this, the Deputy Director of Operations wrote to HQ Fighter Command on 28 February 1952 stating that, due to the economics of the programme, there would be no funding made available for constructing parallel runways at Fighter Command airfields. The operational requirements could be met by using existing standby airfields remote from the home base. These would be used to re-arm and refuel closer to the enemy threat and could also be used for temporary redeployment. In effect this was the same solution as used in the Battle of Britain, twelve years earlier!

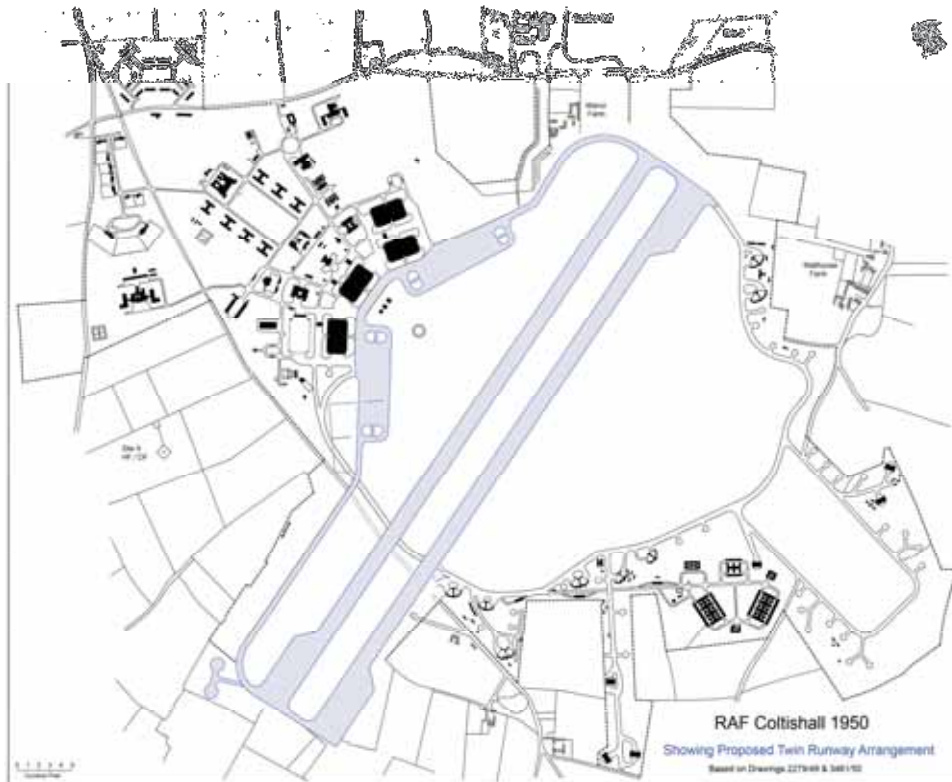


Fig 9: Proposed twin runway arrangement at Coltishall 1950

5.14 Emergency Arrestor Barriers

One outcome of the consideration of aircraft braking performance versus runway length was the decision in December 1953 to purchase two sets of emergency arrestor gear from the USA. These were to be installed at West Raynham for trials by the CFE. This early barrier system, known as the Mk.1 Aircraft Arrestor Gear, relied on a series of drag chains to provide the retardation. The trials took place in the autumn of 1954 and the conclusions were that the system only worked properly if the aircraft was doing a minimum of 40 knots and that it was only suitable for the Sabre and Swift due to their geometry and shape.

In October 1954 Operational Requirement OR.948 was published for a new arrestor system. This specified that it should be suitable for aircraft with all-up weights of up to 50,000 lbs, doing a speed of 70 knots, and be capable of stopping such an aircraft within 500 ft.

Meanwhile, trials took place of the improved Mk.2 system at West Raynham in August 1955. This provided a net barrier 12 ft high and took 1–2 minutes to erect. Following the conclusion of these trials, six sets of Mk.2 gear were ordered, initially for RAF Germany. However Fighter Command petitioned for them to be installed at its airfields, particularly those with Hunters, and so they were fitted during 1956 on the overruns at six of its airfields, including Duxford. The similar Barrier Mk.3 was also ordered of which four sets went to Fighter Command airfields. This had a different net system that was more suited to straight-winged aircraft such as the Meteor and Venom.

OR.948 resulted in the Mk.5 and Mk.6 systems being developed by Borgs Fabriks AB (BEFAB) in Sweden based on their Safeland system, the main difference being that the former had an 850 ft runout whilst the latter would stop the aircraft within 750 ft. The latter system was trialled at RAE Bedford at the end of 1957 and received its release to service in October 1958. It comprised two 14 ft high 'A'-frame masts, supporting a 200 ft wide net. The masts were electrically raised from horizontal to vertical in 3–4 seconds on command from the tower. Brake assemblies were attached at each end of the lower net cable which allowed the deceleration of the aircraft to be controlled.

The Mk.6 system was cleared for the Hunter, Javelin and Lightning and was to be the standard on Fighter Command stations. Duxford had the first installation in February 1959 and was soon followed by Waterbeach, West Malling, Coltishall, West Raynham and Wattisham.

Further Operational Requirements were issued in February 1960 for the next generation of equipment, OR.8009 for new arrestor gear, whilst OR.8011 covered a recessed airfield arrestor barrier. However they are beyond the scope of this document.

5.15 Dispersal Design

The use of aircraft servicing platforms would normally be used for aircraft in peace time, to enable servicing to be concentrated near the main technical area with its consequent savings in manpower, but the tactical risk of servicing aircraft in this way would not be acceptable in times of war.

The majority of airfields upgraded during the late 1940s retained their wartime dispersals, being of either the frying-pan or spectacle type. The former was preferred by Fighter Command, ensuring isolation for each aircraft. The recommended standard was an 85 ft diameter circle linked at right angles to the perimeter track via a 125 ft long leg, of 30 ft width. Dispersals should be separated by at least 250 ft. Of course this ideal was rarely followed due to the available space and geometry of a given airfield. These dispersals were to be used for reducing the risk of damage in the event of attack, the storage of spare aircraft and certain second line maintenance tasks.

Dispersals were then forgotten for the next couple of years until drawing FCW/1/52 was produced in January 1952. This showed a Y-shaped dispersal accommodating two aircraft and surrounded by blast walls. In April drawing FCW/54/52 showed a single 60 ft long dispersal with entry and exit tracks, protected by concrete and earth blast walls and with redundant blister hangars mounted on top of the walls. The latter was preferred as it allowed the aircraft to be taxied in under its own power. AOC Fighter Command requested a study in June 1952.

By now the USAF in Europe had settled on a Y-shaped design to drawing TAF 1149 and this would appear at UK airfields such as Manston and Woodbridge. The Air Ministry considered that 40 dispersals should be provided and suggested that existing types should be modified with blast walls, scheme FCW/111/52 being produced. It was agreed that two prototypes should be built at Odiham using Pierced Steel Planking to modify existing dispersals to drawings 4948/52 and 5200/52. The trials were soon moved to Tangmere as the existing dispersals at Odiham were deemed unsuitable, resulting in the production of revised drawings. The type 'A' dispersal to drawing 5601/52 was put forward by the Air Ministry and was similar to the American type, adding two 60 ft wide wings to the existing panhandle and increasing the circular pan to 100 ft diameter. The type 'B' dispersal to drawing 5602/52 forwarded by Fighter Command added two legs to the existing panhandle dispersal, each having its own pan at the end. The latter enabled an aircraft to taxi into position under its own power but would need more concrete.

The prototypes were rapidly built and the trials took place from 17 October using Hunter and Meteor NF.11 aircraft. A Javelin was also planned to be used but none were available. The trials also included the refuelling and re-arming of the aircraft in situ. From these trials the type 'B' was preferred and any new construction was to be prioritised for airfields without ASPs, particularly with all-weather fighters stationed there. A £1 million budget was allocated for dispersal construction from April 1953.

However it was felt that blast walls would be a useful addition to the design and so drawing FCW/3/53 was produced showing each leg widened with blast walls on each side, as well facilities for a local armoury and a hardstanding for a refuelling bowser. The blast walls were to be 16 ft high and 70 ft apart, thus allowing an extra-over blister hangar to be mounted on top to provide some form of protection. These blast walls were designed to offer some defence against shrapnel and strafing attack, whilst allowing the jet efflux to escape when ground-running the engines.

In February 1953 the Fighter Command Airfield Requirements Co-ordinating Committee met, the main topic of discussion being the provision of new dispersals. Both Horsham St Faith and Coltishall were reviewed to see how the new design could be integrated into the existing layout. At first 20 dispersals were considered, catering for 40 aircraft. Going against the original philosophy of re-using existing dispersals, entirely new structures would be built, the estimates being £300,000 and £350,000 respectively.

The next iteration of the design, to drawing FCW/11/53, included a track to guide the nosewheel along the leg of the dispersal to a turntable. FCW/16/53 moved the integral armoury from the inside to the outside of the blast wall. At this stage the cost quoted for building a new dispersal was £12,000, if an existing panhandle dispersal was to be modified it would cost £11,500, and if an existing spectacle dispersal were to be modified it would cost £9,700.

At this point a list of the first airfields to be modified was drawn up. The airfields listed were: Coltishall, Horsham St Faith, Leuchars, Linton-on-Ouse, Tangmere, Waterbeach, Wattisham and West Malling. The former two were selected to be converted first by the Air Ministry on 14 April 1953. Plans for the airfield layouts were drawn up to 3620/53 and 3593/53 respectively. It was suggested that trials ought to take place on the proposed turntable design. Meanwhile the blast wall height was increased to 17 ft and the pan diameter was increased to 53 ft to cater for the Javelin. The number of individual hardstandings required was reduced to 36 (i.e. 18 dispersals) and Duxford and Stradishall were added to the plan in July.

An official drawing for the new design was created in August as 4487/53, whilst another for a modified spectacle dispersal followed as 6116/53. Other airfields were added to the scheme but by the end of the year the need for blast walls at the other stations was removed and in the event, they were only constructed at the original ten selected airfields.

On 26 April 1954, taxiing trials took place at Tangmere using a Javelin on both pan and spectacle dispersals modified with PSP. These showed that the blast walls needed to be further apart, the lead-in taxiway needed to be wider and a bigger turntable would be required. This resulted in a rethink of the design. The access track was widened to 50 ft and the complex turntable and associated nosewheel groove was deleted. Work had already started at several airfields and this was now stopped. By the end of June, following further trials at Tangmere on the mechanical handling and positioning of the aircraft, the decision was made

to delete the turning pan at the end of each leg, where work had yet to start. The lead-in access track was further widened to 70 ft which was the same as the blast wall spacing. The armoury would be retained but it would only cater for belted ammunition, not guided weapons. The dispersal strength was also to be increased to cater for the loading from the Javelin.

5.16 V-Bomber Dispersals

As part of the plans for the V-bomber force, a number of airfields were designated as dispersed sites for either two or four bombers. Some of these airfields were under the control of Fighter Command and the following (amongst others) were allocated as two bomber dispersals:

Coltishall	Leconfield	Leeming
Leuchars	Middleton St George	Wattisham

5.17 The Lightning Aircraft

The introduction by Fighter Command of the new F.23/49 fighter, (later to become the Lightning) presented certain issues involving runway length, both for take-off and landing.

In May 1956, the Air Ministry were considering the construction of 7,500 ft runways at up to 12 Fighter Command airfields in order to be suitable for the Lightning. At that time it was proposed that trials be carried out at Boscombe Down to establish minimum requirements as it already had a 9,000 ft runway – indeed this was the favoured length for use in bad weather. Other points raised included the possibility of Vertical Take-off and Landing (VTOL) aircraft affecting airfield requirements, although it would be another 13 years before the Harrier entered service and even then conventional runways were still used.

An extension and resurfacing programme was begun in April 1957. Leuchars, Middleton St George, Wattisham, Leconfield and Coltishall were all extended to 7,500 ft, or in some cases 9,000 ft, between then and the end of 1958.