

Extract from
R.A.F. MONOGRAPH
(First Draft)

DECOY

and

DECEPTION

Air Historical Branch(1)
Air Ministry

FORWARD

Before the war the study of Visual Deception was neglected except to a minor degree in relation to camouflage. During the war it was developed by branches of the three Services with inadequate direction from operational Staffs. Owing to the secrecy enforced, few staffs other than those in immediate contact with the deception branches knew anything of the measures and practice of Visual Deception. At the end of the war the branches are being disestablished and the technicians, who were temporary officers, are rapidly returning to civil life. The risk of this form of deception returning to its former state of oblivion is obvious.

This War Book has been written with two objects in view. Primarily it provides a detailed history of R.A.F. Visual Deception during the war. Information is also included on similar work by the other services, together with suggestions for the formulation of doctrine and for a co-ordinated policy for the future.

The War has shown the necessity for all staff officers to have sufficient knowledge of the principles of Visual Deception to make use of it in war, and for policy and development to be directed by specially trained operational officers. This War Book has been written to meet the needs of both; the first six chapters provide the basic information necessary for the ordinary staff officer; the remaining chapters record the details required by the specialist and technician. Some repetition in these other chapters has been unavoidable but, it is hoped, not unreasonable.

As certain terms and initials constantly recur in the text, it has been considered advisable to group them with their explanations immediately after the index of chapters.

CHAPTER I

INTRODUCTION AND BASIC FACTORS

1. Introduction

Deception is as old as war itself, and has been employed effectively by many great commanders. It is, perhaps, not always recognised that modern invention and appliances and the general complexity of modern war have considerably enhanced the means by which deception in its various forms can be practised. Time-honoured methods of imparting false information on a strategic scale have been amplified by the broadcasting of studied indiscretions and by many forms of propaganda, and new devices and equipment have enabled tactical deception to be developed in many new directions. In practice, it is impossible to lay down a hard and fast dividing line between strategic and tactical deception, but for general purposes present day tactical deception, as used in cover plans, includes schemes or for the protection of vital points, includes deceptive measures classified under the following three heads.

- (a) Visual Deception.
- (b) Aural (or Sonic) Deception.
- (c) Radio Deception.

2. Concealment and Display

Visual deception consists of concealment and Display. Concealment includes all methods of hiding a target or equipment, both natural, i.e. under trees or other cover, or artificial in the form of camouflage or smoke cover.

Display includes all forms of artificial work, dummy structures and equipment, dummy lights and fires purposely exposed before the enemy's view.

3. Basic Factors

In every visual deception scheme four basic factors are involved in varying degrees.

These are -

- (a) the object of the scheme, protective or misleading.
- (b) The importance of the scheme.
- (c) The the difference in conditions by night and by day.
- (d) The extent of our air superiority or inferiority.

It is essential that these factors and their implications are be thoroughly understood both by operational staffs directing visual deception and by technical staffs responsible for its implementation and operation.

4. The object in view

Visual deception, whether in the form of camouflage or display, may be employed in two quite different ways, i.e. to protect or to mislead.

When used for protection, camouflage helps to conceal the true target, and display, in the form of dummies, tracks, lights, and fires, etc., is designed to draw attack off the target.

Protective display is therefore a decoy.

When used to mislead, the object is to induce the enemy to draw wrong inferences as to the disposition of our troops, aircraft etc., and to induce him to make his own dispositions in a way which will best suit our plans. Camouflage then conceals our true concentrations

and positions, and display, with dummies, etc., by day and lights by night, provides the false view to which the enemy should react as we require.

These two purposes must be kept quite distinct, as they are differently affected by other factors, and often require quite different treatment. One important difference may be recorded here. If a protective display or decoy is recognised as such, the individual target may lose its protection and be attacked. Other targets and their decoys are not necessarily compromised. If, on the other hand, part only of a misleading display is suspected not only is the whole scheme compromised, but the enemy may guess our real intentions. In such a case the misleading scheme may be worse than useless.

5. The importance of the Scheme.

The degree of importance attached to any scheme must be decided and specified by directing staffs, as it dictates the amount of effort to be expended. In modern war a nation is involved as a whole, and to produce the maximum effect, labour, raw material and factory output must be allocated on a basis of balanced economy. Over-elaboration or extravagance in meeting one requirement will be detrimental to the adequate output of others. In visual deception the degree of importance may vary from a standard of vital necessity to one of mild desirability. For instance, in a protective scheme the importance of the target, (which may be a single source of supply), its location and the degree of air attack expected may demand the best possible camouflage and the construction of a dummy installation; whereas another possible target may be one of a number of similar factories or supply centres, and its location or importance may render it less likely to attack; in such a case simple camouflage may be all that is reasonably necessary. Similarly a misleading scheme may be of such importance as to justify in a Commander's opinion the use of considerable equipment and personnel to make certain of deceiving the enemy on a strategic scale; on the other hand difficulties in communications, transport or shortage of men, may reduce or even preclude the mounting of a desirable but not vital misleading scheme.

6. The Day or Night Factor

Conditions for visual deception by day differ considerably from those experienced at night.

By day visual deception must be good enough to contend with clear weather visibility, when the enemy pilot will not only be able to identify the exact position at any time but will also be able to observe any suspicious lack of "life" in displays. His observations will be backed by photographic reconnaissance, which is carried out constantly in modern war, both on special areas to which priority attention is for a period directed, and over wide areas to pick up new developments for general intelligence purposes. Successive photographs are examined by specially trained experts, and all indifferent or elaborate camouflage, (which takes a long time to produce and which is difficult to maintain in good order), and any mistakes in displays, particularly lack of movement and of personnel, will be detected. Visual deception by day therefore must expect to have its position exactly identified, and its measures closely scrutinised. The longer it remains in being, the greater the chances of detection.

By night, although modern aids, developed in the later stages of the war, almost guarantee crews reaching the targets they are detailed to attack, generally speaking, a pilot cannot be certain of his exact position at any time, unless he can recognise

landmarks either visually or by radio. Night photography may provide a check on his observations, but will not produce the detail for close scrutiny provided by the camera by day. Concealment by night relies mainly on disciplined black out, though certain camouflage measures may be undertaken to make large targets inconspicuous; display is provided by lights or fires. The position of lights is usually unidentifiable by day photography but fire sites may be picked up. As these forms of displays are economical in men and material, considerable numbers can be provided in any particular area, and, if varying sites are operated, a pilot is unlikely to identify exactly either their position or his own, even if some of them have been detected by previous reconnaissance. By night therefore, concealment is easier than by day, and a display cannot normally be pinpointed or recognised.

These day and night conditions affect protective and misleading displays and their control differently.

By day, it is improbable that men, transport, and materials will ever be available in sufficiently large numbers to render realistic an isolated protective display which has generally to be operated for a considerable period of time. In terms of airfields, protective displays should only be mounted on partially occupied airfield, or for a very short time on one that has been temporarily abandoned by aircraft, but on which ground crew and transport are still located. In similar circumstances, the army may consider it desirable to display dummy tanks, guns and transport to draw air attack away from true equipment which has been partially concealed. Protective day displays therefore are domestic and limited. On the other hand, an army Commander, wishing to deceive the enemy, may decide to mount a misleading display by day on a large scale for a short time, and he may think it well worth while to allot a large number of true units and transport to back up dummy equipment to produce the required effect. Many brilliant misleading schemes were carried out on these lines by Army during the war. In some of them the R.A.F. co-operated by displaying dummy and true aircraft. Domestic misleading displays of aircraft were also mounted by the R.A.F. for special purposes during the war, but always on partially occupied airfields.

By night, protective displays of lights and fires form one of the defences against air attack, and were used in large numbers by the R.A.F. during the war. The Navy and Army also made use of this form of protection in the United Kingdom under Air Staff direction and co-ordination.

Misleading displays by night are only carried out to confirm day displays and are dependent on the same cover plan.

Summing up we find that

- (a) Day protective displays are domestic and limited.
- (b) Day misleading displays may be on a very large scale and may need the co-ordination of all three Services.
- (c) Night protective displays can be used in large numbers and form one of the defences against air attack.
- (d) Night misleading displays are only required to confirm day displays.

7. Air Superiority or Inferiority

Air superiority or inferiority may vary between belligerents in any theatre and at any time during the progress of a war. Our air superiority or inferiority will considerably affect the measures we take to provide visual deception, protective or misleading.

With marked air superiority by day, there is less need for protection. Camouflage may be reduced considerably, and nets, which tend to impede operations, may be discarded, especially in back areas. No degree of air superiority can guarantee complete immunity from air attack at night, and lighting displays may still be necessary to draw attack off vital points, particularly in forward areas. When we suffer from air inferiority or even from equality, good concealment and camouflage is necessary by day, and disciplined black out by night. In certain areas liable to sudden attack domestic displays will probably be required by day to draw attack, and an extensive system of decoy lights and fires will be needed at night. Air inferiority is especially likely to occur in the early days of a campaign in theatres of war abroad. It is, unfortunately precisely at this period when all efforts, shipping and transport are allocated to the concentration of troops, and supplies, that deception requirements are liable to be neglected.

In misleading schemes, if our air superiority is overwhelming, the enemy may not be able to carry out daylight reconnaissance and the deception must then fail. It is important in all misleading schemes to institute fake wireless messages to attract enemy attention, and if we have marked air superiority it may be necessary to instruct our fighter screen to permit some reconnaissance by day, as it is the reconnaissance by day which results in his being misled. His night reconnaissance may draw his attention to a possible concentration or confirm what he sees by day, but it is insufficient alone to induce him to react as we wish. If enemy superiority is considerable, we may get overmuch reconnaissance of our misleading schemes, and our chief concern will be to prevent their detection as fakes, especially by low flying aircraft

8. Direction

Three of these basic factors, the object of the scheme, its importance and the degree of our air inferiority or superiority are matters on which only operational staffs can give advice and information. Visual Deception must therefore always be directed by operational staffs.

CHAPTER II

HISTORICAL SUMMARY OF C.T.D. ACTIVITIES (1939-45) IN BRITAIN

1. In October 1939 the Air Ministry originated a special branch of the Air Staff to organise a system of decoys for the protection of R.A.F. airfields and Stations against air attack. Colonel Turner, formerly Director of Works at the Air Ministry was selected as head of this branch which, for secrecy, was designated "Colonel Turners Department", (C.T.D.), and was omitted from the official Air Ministry list. After discussion with Commands and Groups it was decided to commence work east of a line PERTH - BIRMINGHAM - SOUTHAMPTON and to provide, where conditions permitted, a day and/or night dummy airfield to protect each existing R.A.F. airfield; other R.A.F. stations were to be provided with night protection in the form of dummy fires.

2 Dummy day airfields, K sites

The pre-war R.A.F. station with its concentration of large buildings alongside the open airfield, and its constant movement of aircraft and transport could not be simulated by any practical form of decoy. Fortunately at the commencement of the war there were a considerable number of satellite airfields of no great size without buildings; normally the area cleared of hedges, the one entrance road and a concrete yard where the only indications that a satellite existed unless it was occupied by aircraft, which only occurred at intervals. The simulation of these satellites was a reasonable possibility. Suitable sites were selected 2 to 6 miles from the R.A.F. Station to be protected, wherever possible on the anticipated line of approach of hostile aircraft. The work consisted of levelling hedges to resemble the dummy hedges painted on true airfields, so leaving the wide open space which was the most marked feature of airfields in England. In addition, suitable types of dummy aircraft were provided, and also accessories in the form of dummy roads and dumps, dummy tracks on the airfield, real and dummy machine gun posts and a shelter and trenches for the operating crew.

The first K site was in operation at the end of January 1940, 34 were ready by the end of July and two more were added later. Attacks on K sites commenced in July 1940 when 6 attacks were recorded. By the end of 1940 thirty attacks had been delivered. Six more were made in 1941, the last in June of that year.

By May 1941, enemy air attacks had fallen to occasional tip and run raids on those airfields situated near the south and east coasts. To save man power 12 inland K sites were closed down in June and two more in July, leaving 22 in operation. Meanwhile the satellites which had been simulated, were being rapidly transformed into full-size operational airfields, with clusters of hutting on the perimeters, and often with concrete runways and taxi tracks. It was evident that deception of the enemy by K sites would not last much longer. This was confirmed first by the gradual reduction of attacks on K's, and secondly by the recovery of a map from an enemy reconnaissance aircraft which was shot down in October 1941 which showed 50% of the remaining K's marked clearly as decoys. The Air Staff agreed to the closing down of 19 sites, but retained 3 near the coast until May 1942 when these last K's were also abolished.

In the winter of 1940/41, the enemy delivered a number of strong attacks on our most exposed airfields in the East Kent, and this led to the withdrawal of the squadrons occupying these airfields to safer ones further inland. Dummy aircraft were installed on

some of these vacant airfields, which were then known as K.L.G.'s; there were 6 attacks on the dummies at Lympne, 2 attacks at Eastchurch and three at Manston. When, in May 1941, the scale of enemy attack fell off, these stations were again reoccupied and the dummies were packed up.

The eventual recognition by the enemy of our K sites as decoys was a certainty. It is surprising they managed to deceive him as long as they did. Protective displays of this kind lack reality in the form of movement of men, transport, and aircraft and they can only be expected to be successful in special circumstances such as were provided by the existence of satellite airfields, and in the early stages of a war before photographic cover has been sufficiently developed. On the other hand the location of dummy aircraft in suitable concentrations on partially occupied or temporarily unoccupied airfields is a method of protection that can be adopted with success at any time. There will usually be sufficient men and movement for realism even on airfields from which squadrons have been temporarily withdrawn, as ground personnel and transport will normally be present and at work, and the defences will be manned.

3. Dummy night airfields, Q sites

The night dummy airfield offered a simpler problem, as it was only necessary to simulate the forms of lighting normally used on a R.A.F. airfield. Sites were selected in the same way as for K decoys, but were more easily found, as flat ground was not necessary, and hedges and crops offered no difficulties as the lights could be carried on poles. To minimise interference with agriculture, the cables were laid along hedges or buried below turf or below ploughing depth. The forms of lighting on these sites varied during the course of the war to suit similar alterations of lighting on true airfields. It was, however, always necessary in the design of Q sites to ensure that there was no risk of our own pilots mistaking them for true airfields and landing on them in error. Certain lights were omitted and others deliberately introduced which identified a Q distinctly to our own pilots but which would not be likely to be noticed by an enemy: constant briefing of our own pilots in these differences was arranged. The first Q site was in operation at the end of January 1940. Twenty were working by May, forty-two by June, and seventy nine by the end of 1940. Owing to the collapse of France, airfields throughout the country had now to be protected by these decoys and during 1941 and 1942 the numbers of Q sites were increased as new airfields were completed and required protection. A limit was eventually reached at a maximum figure of 170 in March 1943, as the country by then was so crowded with airfields, factories, depots, and training grounds that further sites were unobtainable. By the end of 1943 enemy air attack became negligible in the North-West of the country and Q sites were progressively closed down first in Ireland, then in Scotland and North-West England, later in the Midland and South-West England, until only 93 remained in East and South-East England. These were made non-operational in September 1944 and cleared as conditions permitted.

Of all decoys the Q sites were the most fruitful in drawing enemy attack. The first attempt occurred on June 6th/7th 1940 and in that month 36 attacks in all were recorded. The following figures are of interest; they represent recorded attacks: others certainly occurred which were not recorded.

<u>Date</u>	<u>Night Attacks on R.A.F. Stations</u>	<u>Night Attacks on Q's</u>
In 1940	90	174
Up to end of June 1941 (end of main blitz)	304	322
Up to end of 1941	360	359
To end of May 1944 (end of night attacks)	434	443

It will be seen that the attacks on the 170 Q sites and those on something over 500 R.A.F. airfields were almost identically the same in number. It cannot be considered however, that the Q's drew off 50% of the attacks on R.A.F. airfields as it is fairly certain that many aircraft attacking Q sites had been originally detailed for attacks on towns and other civil targets. The bulk of the Q's were located in the East and South of England, and many aircraft crews that were temporarily lost or not anxious to attack a well defended objective, might well have considered an apparent airfield a reasonable target. In this way the Q's contributed to the defence of the whole country, and the large number of attacks on them compared with those on other decoys is due to the fact that many Q's, but comparatively few other decoys, were in operation during the main blitz in the winter of 1940/41 and the Spring of 1941.

4. R.A.F. Q.F.'s

To protect important and vulnerable R.A.F. stations other than airfields, dummy fires were provided some 3 to 4 miles away which could be lit under the orders of the Station Commander, if and when his station or its vicinity were bombed. Some 15 of these Q.F.'s were constructed. Only 5 were ever lit and of these two drew attack. The difference between dummy lighting and dummy fire operation should be understood. Dummy lights were operated frequently - on the average some 20 hours per week - to draw attack at any time. Dummy fires were not operated unless there was a definite attack on the particular target they protected, as it was considered undesirable to draw attention to the vicinity of any target. Whereas lights often drew attacks from single aircraft, fires when lit tended to draw considerable attack.

5. Dummy Buildings

Demands came in from two R.A.F. sources for dummy buildings to protect important installations. In June 1940, the Signals branch at the air ministry asked for maximum protection to be provided for their very vital communication centres at Leighton Buzzard and Dagenham. Camouflage, in the form of a complete cover by netting of all buildings and roads, was undertaken and very satisfactorily carried out by the R.A. Works Services. It was not possible to conceal the large group of wireless masts at each place and the decoy buildings had to be constructed by the Department alongside those masts with the object of drawing off any attack from the true target. The work was started early in July and completed by the end of September 1940. An abortive attack was made while the work was in progress, but none were subsequently delivered, though both camouflage and dummy were maintained until the end of the war.

Later, similar camouflage and decoy protection was undertaken by the Department for the civil wireless station at Leafield. The work was completed, in September 1941. Neither the station nor decoy were ever attacked.

A proposal was put forward in March 1940 to provide dummy factories to protect the then very few aircraft factories. In April authority was given to construct dummies for six factories, but dummy airfields, an essential adjunct, could only be found in the neighbourhood of four of them, viz. for Bolton and Paul (Wolverhampton), Armstrong Whitworth (Baginton), De Havilland's (Hatfield), and for Short Brothers (Rochester). The work was considerable, each decoy costing about £30,000. In addition to the buildings and airfield, dummy aircraft, roads and shelters had to be provided. To give some sign of life, broken down cars, bicycle stands and other accessories were added, including smoke from chimneys during an alarm. Lights and small flies were also arranged to attract attention by night. The four decoys were completed by the end of September 1940. Considerable success was not anticipated as, like the K sites, it is impracticable to provide men, transport, and movement generally to achieve realism by day. Nevertheless, in those early years, when aircraft factories were so few and so important, the draw off of any attack would have made those dummies worth while. The results far exceeded expectations as the four factories drew 23 attacks, 9 by day and 14 by night. When the scale of attack was considerably reduced, the expense of maintenance in manpower and material did not justify the retention of those decoys, and three of them were closed down in June 1942, and the fourth near Rochester, which was in the most vulnerable area, in April 1943.

6. Oil Decoys

In May 1940 the then Petroleum Board approached the Department for advice in connection with decoy sites for oil installations. Some experiments were then in progress on dummy fires to protect R.A.F. stations, but it was obvious that a decoy representing an oil tank on fire necessitated a quite different design. After discussions with the head of the Oil Refinery at Llandarcy in South Wales, the company had dug out on the Welsh moors a test trench about 2 feet wide in a circle the diameter of which was about 3/4 of a full size oil tank.

This was tested on the 2nd. of August and considered satisfactory but capable of improvement. The Department undertook the responsibility of finding suitable decoy sites near the most important installations and the Petroleum Board guaranteed that the Oil Companies would carry out all work and arrange for the manning of the sites. Very little enthusiasm was shown by the Oil Companies. It is fairly certain that some managers erroneously thought that the decoys might attract enemy attention to the installations, and difficulties were raised in regard to personnel for the work, and for manning. Further difficulties arose when it was found that concrete lined trenches cracked under the heat of the fire and fire brick linings had to be constructed. Nine oil decoys were reported to be ready for operation between the 24th April and the 1st of June 1941. It is fairly certain however that few of these decoys were ever satisfactory. At a later period two of them were taken over by the Department, and tests showed that considerable improvements were necessary. At the end of the war the Oil Companies raised similar difficulties in regard to the dismantling of their decoys prior to derequisition of the sites. One decoy successfully drew attack when it was fired in 1944 when enemy aircraft were operating close to an oil installation near the mouth of the Thames.

The Petroleum Board and the Oil Companies were lucky: oil storage before the war had been concentrated into packed areas of large tanks which were particularly vulnerable. No attempt was made at dispersal even on a small scale. When it is remembered that our air attack on German oil supplies and synthetic oil factories was one of the main factors contributing to victory, it is astonishing that the Germans made no systematic attack on our vulnerable installations at a time when the U boat campaign was causing such serious losses in tankers. It is hoped that in a future war decoy protection will be ready at the outset for oil installations as well as for all other civil vital points; in addition reasonable dispersal and a modicum of underground storage in place should be ensured.

7. Civil Decoys, Q.L.'s, Q.F.'s and Starfish

In May 1940 the Civil Defence Committee investigated the various systems of lighting adopted throughout the country, and, after experiments, issued instructions which allowed certain permitted lighting for essential purposes. They also started experiments on decoy lighting, but these progressed very slowly and in July 1940, the Deputy Chief of Staffs Committee reviewed the matter and decided that all decoys at night should be co-ordinated to prevent clashes and mutual interference between schemes. They considered the Air Ministry was the best authority not only for co-ordination but also for the development and control of all decoys for civil as well as R.A.F. protection. Naval and Army night decoys were to be developed by the appropriate Service, subject to co-ordination by the Air Ministry.

As a result of this decision C.T.D. took over the experiments being made at Sheffield and most of the staff employed. Contact was immediately made with the Air Staff Branch responsible for checking industrial lighting and experiments were started on decoys to simulate several types of "permitted" lighting in use in different parts of the country. The Ministry of Home Security supplied a list of the most important towns and other vital points and a search for decoy sites was commenced in the neighbourhood of some of them. A considerable number of night reconnaissances were undertaken in varying visibilities to view the true "permitted" lighting and to check the decoy simulations, now designated QL to distinguish these typos from the Q types of airfield lighting. Generators, cable, and other material was collected, and work on a few Q.L. sites was in progress when the concentrated attack on Coventry occurred on the night of the 14th/15th October, 1940.

The Coventry blitz and Hitler's threat to "rub out" our cities in successive attacks, entirely altered the situation. It was clear that decoy lights, however well designed, would be of little value if enemy pilots could see their target town in flames. Only large decoy fires, lasting several hours, could expect to draw off this new form of attack. The R.A.F. Q.F. type of fire was too small and burned out too quickly. Political pressure was strong for instant action and the Air Staff ordered trenches to be dug on suitable sites, to be filled with oil and set alight by hand until something better could be evolved. A few sites were selected and prepared in this way, but they proved of little value and were a source of much trouble both at the time and later. Ordinary soil cracks under the heat of an oil fire, and the oil on these sites seeped through the cracks and gradually found its way into ponds and streams polluting them in varying degrees. A chorus of protest at once arose from farmers and others, which continued long after this hasty type had been abandoned. Meanwhile experiments on new types of fires were rushed through, in which the Sound City Film Company showed much ingenuity. Three different types were produced, one

burning diesel, another paraffin, and a third scrap wood and sawdust. A combination of these three types provided realistic variations in flame and smoke and enabled a new large decoy to be constructed which, known first as the Special Fire or S.F. became famous under the code word of "Starfish". On each Starfish site two quite separate groups of these three types were located to provide two large fires each of some 30 tons of inflammable materials, for lighting on two successive nights. Later reserves for a third night were stacked on the site. Each 30 ton fire burned for 4 hours and was electrically lit from a shelter some 800 yards away.

Construction was rapid; four Starfish were installed in November, 18 by December 1940, 108 by March, 1941, and 155 by the end of July 1941. Others were added. later to protect new targets, the maximum figure in operation at any one time being 209.

As soon as sufficient Starfish protection had been constructed to meet heavy concentrated attacks, attention was again turned to the development of Q.L.'s and Q.F.'s to draw attacks by single or small groups of aircraft. Various types of lighting were used on Q.L.'s e.g. marshalling yard, ship yard, factory, and coke oven to suit each locality so that ample variety was obtained. Many Q.L.'s were laid out on Starfish sites, the remainder were located in the vicinity of large towns or isolated vital points. Frequently Q.F.'s were also coupled with Q.L.'s but in some cases, where lights were undesirable, Q.F.'s were sited alone. Progress was good. By August 1941, 47 Q.L.'s and, 23 Q.F.'s were operating; by December 1941, 170 Q.L.'s and 73 Q.F.'s. Maximum figures amounted to 212 Q.L.'s and 82 Q.F.'s in November, 1942. In this month the total number of night decoys operated by the Air Ministry amounted to 171 Q's, 22 R.A.F. Q.F.'s, 82 civil Q.F.'s, 212 Q.L.'s and 208 Starfish, a total of 695 decoys on some 500 sites.

Starfish drew attacks at once. In December 1940 although only 18 starfish were completed by the end of the month, 10 had been hit, and 5 of these had been heavily attacked. Many other attacks were drawn during the rest of the 1940/41 blitz, the crowning achievement occurring at Sinah Common, the decoy protecting Portsmouth, on the 27th/28th April, 1941. Details of attacks on all types of decoy may be found in Chapters IX and X, where they are fully discussed.

It must be pointed out, at the risk of some repetition, that the main air attacks in this country occurred between August 1940 and July 1941. Subsequent attacks occurred in later periods but on much smaller scale. When the main attacks commenced, there were a considerable number of Q sites in operation, a few R.A.F. Q.F.'s but no decoys to protect towns or civil vital points. Starfish were hurriedly constructed during this period and from December onwards achieved increasing successes. The civil Q.L.'s and Q.F.'s were nearly all constructed, after July 1941, as were nearly all the naval and army decoys. Consequently the full development of decoys coincided with the reduced scale of air attacks.

As in the case of Q sites, when the risk of enemy air attack diminished, other decoys in the less vulnerable areas were successively closed down, first in Northern Ireland in early 1944 then in North West England and Scotland August 1944 and in South West England in September, 1944. Further reductions in the South of England were made in November 1944, leaving only certain decoys in the East and South East of the country. All sites except those protecting London were closed in March, 1945, and the few remaining London sites in May of that year.

8. Camouflage

The static camouflage of R.A.F. stations received no policy direction until September, 1941. Before the war the Works Services, on their own initiative, carried out certain experiments in netting hangers and printing hedges on airfields to break up "the open space". When the Munich crisis occurred, orders were issued to adopt these methods of camouflage, on certain airfields near London. German civil pilots flying the regular services to London took much interest in the work, and were seen to circle these airfields on several occasions. Similar measures were adopted after war broke out. It cannot be said that R.A.F. Commands and Units took much interest in camouflage in the early days of the war, and in fact opposition was encountered, if the methods adopted caused any inconvenience to the operation of aircraft on stations. Later when attacks developed, buildings were hastily painted and some station commanders did their best to get their stations rendered as inconspicuous as possible. In September 1941 some Commands approached the Air Staff with the request for a considerable increase in camouflage on their stations, and Colonel Turners Department was instructed, to direct and inspect all R.A.F. camouflage, the execution of which still remained the responsibility of the Works Services.

CHAPTER XXII.

THE DEVELOPMENT OF 'Q' DISPLAYS.

1. The original 'Q' sites built in 1939-40 were set out in the form of a T simulating the gooseneck flares used during the early part of the war for night landings. The 'Q' lighting was electric, power being supplied from a 1.5 h.p. J.A.P.- Higgs lighting set installed in the 'Q' site control shelter which was located about 500 yards from the lighting.
2. Each site was equipped with 4 alternative T's to provide for different wind directions. Each T consisted of 7 lights, 5 in the long arm of the T, which was 450yards in length. In addition to the lights forming the T, two Red obstruction lights on a separate circuit were located about 200 yards from each end of the flarepath as typical boundary lights. At the shelter a 500W lamp, known as the "headlamp", was fitted in such a way that it could be switched on intermittently and swung slowly round and rocked by the operator: when viewed from a distance this provided a good simulation of an aircraft switching on its headlamp while taxi-ing and turning on rough ground. The object of this lamp was to attract the enemy's attention from a distance and bring him near enough to see the T lighting. It was important that the headlamp should not be operated when the enemy was near enough to get a close up view, and it was therefore necessary to muffle the noise of the generator sufficiently to enable the headlamp operator to listen for aircraft and switch off his headlamp when any aircraft approached the site. Experience showed that the headlamps played a large part in attracting enemy aircraft near enough to the 'Q' sites to see the other lighting.
3. The first 'Q' site shelters were built below ground and in most cases these proved to be unsatisfactory on account of damp and flooding, and later all shelters were constructed above ground level. The normal shelter consisted of two compartments, one housing the engine and generator and the other forming the control room, with switches, telephone, crews quarters, etc. The normal crew for a T Type 'Q' site was 2 men, and Stations fitted with 'Q' sites had an additional establishment of 2 ACIH GD's.
4. The 'Q' site crews required a certain amount of instruction and, training in the care of the engine, generator and lighting equipment, and the operation of the lighting, headlamp etc., and this was carried out by instructors from the Department who visited new sites as they became ready. When the site was operating, one man was on duty at the telephone and switches, and one man was outside to listen for aircraft and to operate the headlamp.
5. The actual or operational control of the 'Q' site and the decision as to when it should be lit and doused was invariably the responsibility of the R.A.F. Station to which the 'Q' site was tied. The termination of the telephone tie line connecting the site with the Parent Station varied with the type of Station, but normally the Ops. staff had control of the 'Q' site and the telephone terminated in the Operations Room. Later, it became the more usual practice for the 'Q' site to come under Flying Control at the Parent airfield. There was no set procedure that 'Q' lighting should be operated when the Station lighting was

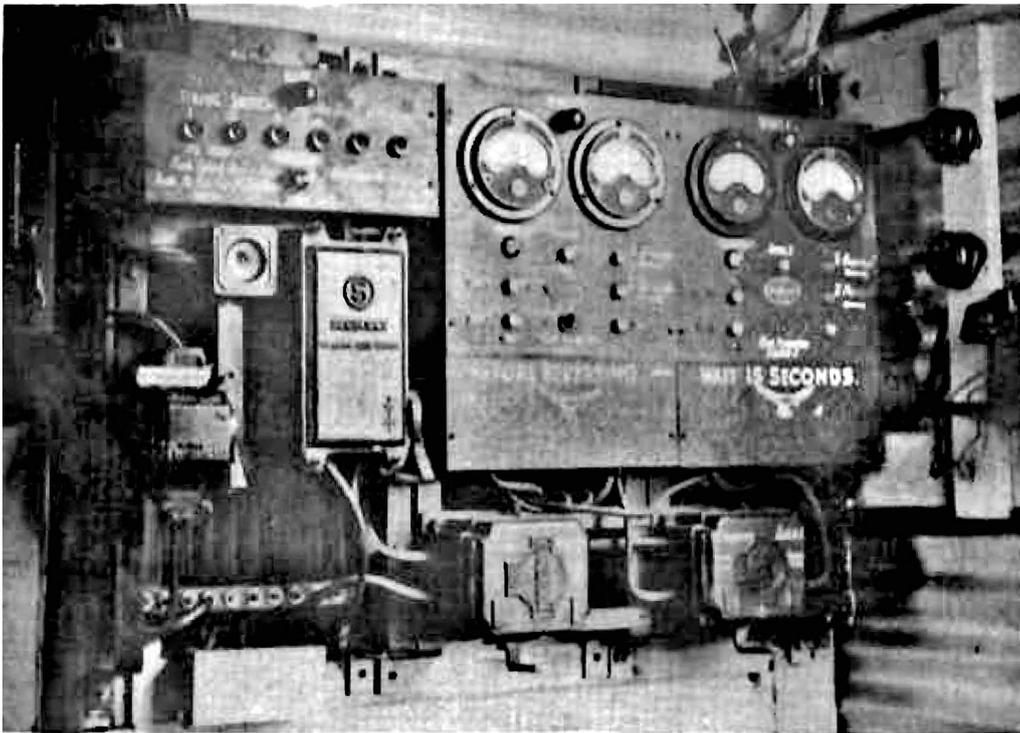
on or when the Station lighting was out, and all Stations were free to operate as they considered best under varying conditions, i.e. degree of enemy activity, visibility and geographical considerations, and different requirements as between Bomber, Fighter and Training Stations. A broad policy was however agreed between the Department and Commands that all 'Q' sites should operate for an average of 14-20 hours a week, as a general measure of protection, and also to ensure that the sites were kept serviceable and that the lighting was not turned on only when the enemy were actually approaching. There was a definite danger if the enemy saw the lighting go on that he would suspect a decoy. This was borne out by frequent reports by our own Pilots flying over enemy territory, where one of the weaknesses of the German decoys was that they were often seen to light up as our aircraft approached.

6. The normal procedure was for the operators, on the close approach of enemy aircraft, to turn out the Red obstruction lights so as to present to the enemy the appearance of Station blacking out on receipt of a warning. The flarepath lighting was left on but it was the duty of the man on lookout to watch for friendly aircraft and put out all lighting if any friendly aircraft appeared to be circling the site with the intention of making a landing.

7. During the period when enemy intruders were active and frequently followed our own aircraft back to base, it was the practice at some Stations for all returning aircraft first to circle the lit 'Q' site and to defer lighting the Parent Station and all landings until the enemy intruders had left. This resulted in several attacks on these 'Q' sites. The fact that 'Q' sites in different parts of the country were all operated rather differently was an important factor in the success of these decoys.

8. In the autumn of 1940 when some 70 T Type 'Q' sites had been constructed certain additional variations were introduced, such as wind T's, flashing HE - DF lights, bad blackout lighting, additional obstruction lights, aircraft navigation lights, etc., with the object of simulating realistic activity, and so that the sites should not all appear uniform, with a possible danger of detection by the enemy. A great deal depended on the skill and keenness of the men at the site, and these additions also gave the site crews more interest and scope in the operation of their lighting.

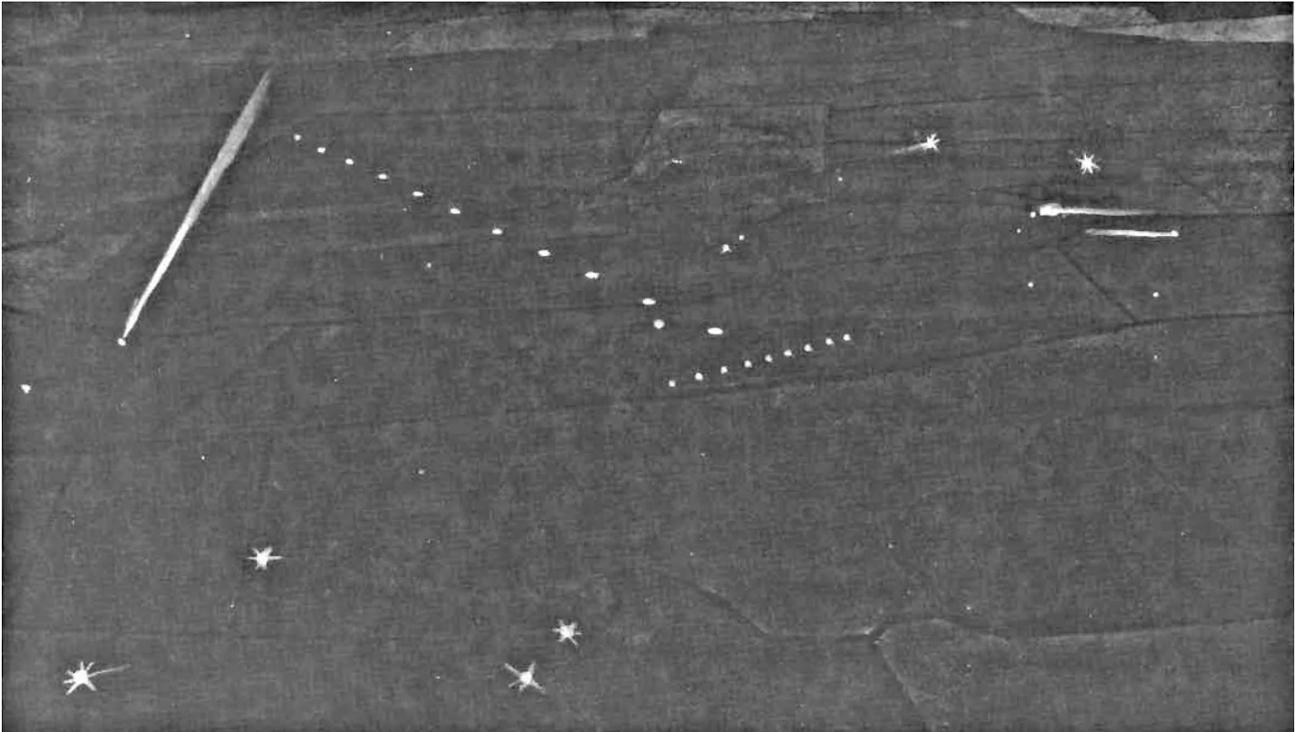
9. By 1941 most Stations were being equipped with Drem lighting and the number of airfields using naked flares was small. In June, 1941 the first Drem type 'Q' was constructed at HOUGHTON ('Q' Site for MIDDLE WALLOP). The lighting consisted of a single line flarepath of hooded lights 1,000 yards long, with the standard funnel of 6 lights on the North-East approach. In addition a floodlight was provided at the normal touch down point and this was fitted with a red obstruction light. An Angle of Approach Indicator was also fitted and the flarepath was reversible for use in either direction according to wind. Current was supplied from two generators as the floodlight required a 5 kW set, and the flarepath, floodlight and funnel were on separate circuits so that they could be independently operated in a realistic sequence as for aircraft landing or taking off. At the shelter a headlamp was fitted as on the T. type 'Q' sites.



Q Site shelter control panel, showing flarepath switches and the controls for “Hares and Rabbits”.



Q Site showing shelter Headlamp with Operator’s handle for swinging the lamp.



Q. Lighting. A typical single line Q, showing position of "Red Bar" across the end of the flarepath, and the headlamp and miscellaneous bad blackout.

10. The lighting corresponded very closely to real airfield lighting, and with the large increase in the amount of night flying, both operational and training, it became essential to find some method of marking these new 'Q' sites so that our own aircraft would be able to recognise them and would not attempt to land on these sites. The problem was to provide some form of warning lights visible to aircraft making a normal landing approach, but invisible to the enemy. After a number of tests a series of 9 hooded red lights in the form of a bar across the entrance to the flarepath was adopted. This 'Red Bar' of lights was clearly visible to any aircraft coming in to land, i.e. up to 800 ft. over the funnel, but was not visible from above or from a side view. The Red Bar of 9 lights was fitted, at both ends of the flarepath and special care had to be taken to see that the lights were not obscured by trees or other obstructions. As a further precaution the Angle of Approach Indicator was removed and the Red Bar lights were placed on the same circuit as the flarepath and a tell-tale light which could be seen from the shelter was also provided.

11. During 1941 and 1942, 121 Drem 'Q' sites were constructed, of these 90 were new sites and 32 were T. type sites converted. One of the difficulties with conversion to Drem was the considerably larger area required for the 1,000 yard flarepath and funnel, the overall distance of 2,300 yards. The normal crew for manning and operating a Drem 'Q' site was four - one Corporal and three A.C.H.'s.

12. In November, 1941, it was decided to construct 6 'Q' sites in Northern Ireland for the protection of the new airfields then being built. It was realized that there was a serious risk of information regarding such decoys in Northern Ireland reaching the enemy and possibly compromising all the 'Q' sites in the U.K.. It was therefore decided that the

Northern Ireland sites should be entirely different in layout and that they should be on ground where aircraft could land, in fact landings with light aircraft were arranged so as to create a local impression that these sites were in fact E.L.G.'s. The lighting was in the form of a double "Avenue" flarepath, unhooded with Red Bar warning lights.

13. In the Spring of 1943, there were still some 50 T. type 'Q's in operation, mainly those sites where safety distances did not allow conversion to Drem type. Starting in May, 1943, 31 of these sites were converted to a new type of 'Q' known as the "Single line". The lighting consisted of a single line of flarepath lights 1,100 yards long and hooded from above. There was no funnel but the former cable runs of the alternative 3 T's were utilised to provide miscellaneous lighting such as red obstruction lights, bad black-out, aircraft navigation lights, etc., all of which were on separate circuits so that they could be switched out one after the other. Some of these sites were very successful, e.g. the sites at KNIGHTON (for R.A.F. WARMWELL), and LULLINGSTONE (for R.A.F. BIGGIN HILL) on which the enemy made several determined and sustained attacks.

'Q' Site Difficulties

14. In the U.K. the normal practice was not to requisition the land on which the lighting was installed but instead a "Works on Land" Notice was served on the local owners or tenants. 'Q' sites were frequently located on arable or grassland, and attention was paid to the minimum interference with agriculture. Lights had usually to be protected from cattle and the cable runs had to be buried, either below turf level or 18" deep below plough level. In the second and third year of the war a great deal of grassland was ploughed up and this necessitated re-burying the cables at sufficient depth. Also all lights among crops had to be raised 3 to 5 ft. above the ground. A careful survey when the site was first constructed saved much work and alteration later on.

15. In many cases 'Q' sites had to be located on undulating ground and to avoid detection on this account some of the flarepath lights were set up on poles to get a reasonably level run. The maintenance of these raised lights proved difficult. Considerable clearances of hedges and trees had to be carried out in some areas particularly for the Red Bar lighting.

16. Every effort was made when siting to avoid streams and dykes which would cross the flarepath. In some districts, however, the choice of sites was limited and this was unavoidable. In such cases instructions were issued that the sites should not be used in moonlight when they would be easily detected as dummy.

17. A problem which arose with some sites was the reluctance of the Station to use the 'Q' site at all, the theory being that they preferred a complete black-out in their district and that the 'Q' site might bring enemy aircraft into their area. Later, when 'Q' sites came to be regarded as a general measure of protection rather than for the particular airfields controlling them, this largely disappeared following instructions issued by the Commands regarding the lighting of 'Q' sites.

18. The problem of friendly aircraft attempting to land on 'Q' sites had to be kept constantly under review. One of the difficulties was that many pilots were being trained overseas and on arrival in this country they had no knowledge of 'Q' sites, or the means by which they could be recognised. The booklet issued by the Department in January, 1944 and illustrating the different types of 'Q' sites as seen from the air at night, proved to be the most effective way of dealing with this problem. The booklet "Beware of 'Q' Sites" was issued, through the Commands, to "Flying Control" and in this way was brought directly to the notice of all night pilots.

Moving Lights

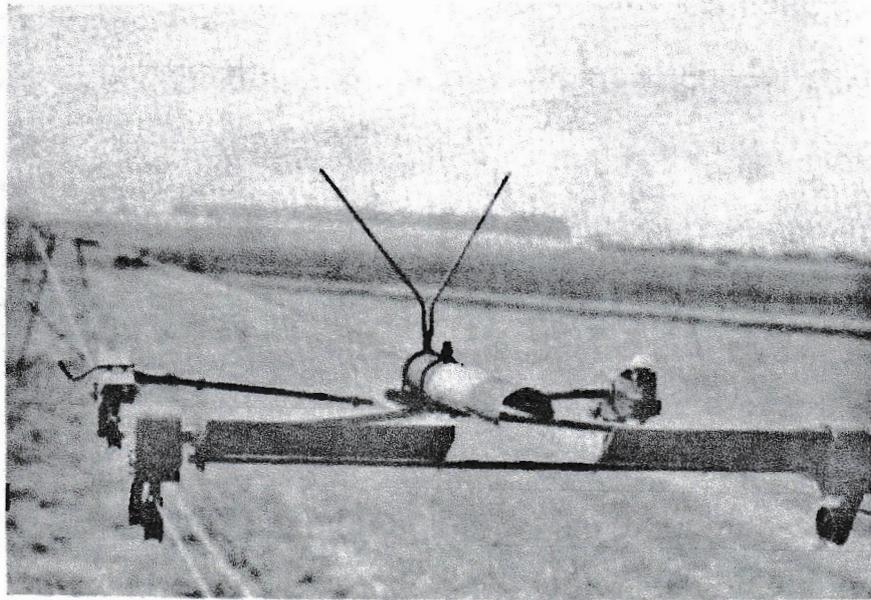
19. Early in 1942 enemy intruders were becoming increasingly active and the attacks on our returning bombers when coming in to land and on trainees doing circuits and bumps were reaching serious proportions. As a means of protection against this form of intruder activity it was suggested by several formations that their 'Q' sites should be provided with moving lights which would simulate aircraft landing on the dummy flarepath and taxi-ing to dispersal points. This equipment was developed and installed at the 'Q' site for MIDDLE WALLOP and came into regular use at this site in August, 1942. The moving lights went under the name of "Hares" (landing aircraft lights) and "Rabbits" (taxi-ing aircraft lights).

20. The "Hare" light was a set of navigation lights mounted on a trolley which travelled along a suspended cable track, about 12 feet high. The length of this cable was 1,000 yards and the trolleys were propelled by a specially designed rocket with cordite charge and special jet. It was found by observation that a minimum speed of 40-50 miles per hour was essential to simulate reality. This necessitated careful tensioning of the cable, special breaking arrangements at the end of the run and some means of adjustment for operating in varying wind strengths. It was also necessary to hood the flame of the rocket propulsion unit from the air view.

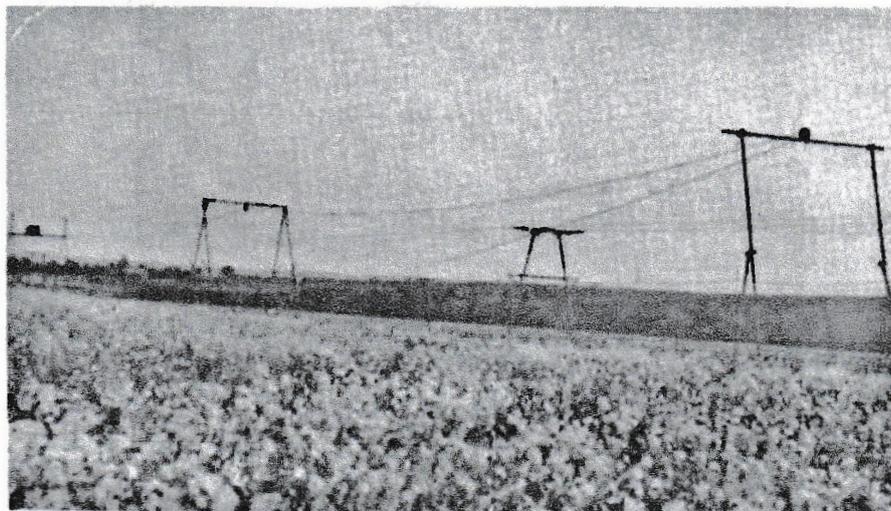
21. The "Rabbit" lights were lamps similar to aircraft headlamps and navigation lights, which were carried on suspended cables, one moving towards take-off point and one as for an aircraft that had landed and was taxi-ing away to dispersal. Motive power was supplied from electric motors, the course of the lights was curved and irregular, and to simulate reality the lights were automatically switched on and off while they moved along. Speed was approximately 8 m.p.h. and the distance travelled by each approximately 400 yards. The lights were operated in a definite sequence, e.g. "Rabbit", taxi-ing to take-off point, then pause for "Hare" to land, followed by the second "Rabbit" taxi-ing away to dispersal. All the controls for these special lights were located in the 'Q' shelter and were operated together with the Flarepath, Funnel and Floodlight, as for aircraft taking off and landing. After 5 Hares had been fired, the 5 trolleys carrying the landing lights had to be pulled back by hand to the starting point and reloaded, this required approximately 40 minutes.

22. When seen from the air these moving lights were very effective and provided the movement and life which were often considered lacking in the normal 'Q' site. It is

interesting to record that the "Hares and Rabbits" lighting was attacked by an intruder on the first night it was operated. This special equipment was not however proceeded with on other 'Q' sites owing to sudden decline in all intruder activity about the end of 1942.



Q site Travelling Landing Lights ("Hares"), holding 3-colour navigation light of aircraft (centre right), and reaction propulsion unit with flame-guard (centre). The Vee brake-fork for engaging trailing brake rope is seen above reaction unit, and the adjustable air-brake flaps are at rear of trolley.



Q site Travelling Lights equipment showing "Hare" Track and brake rope