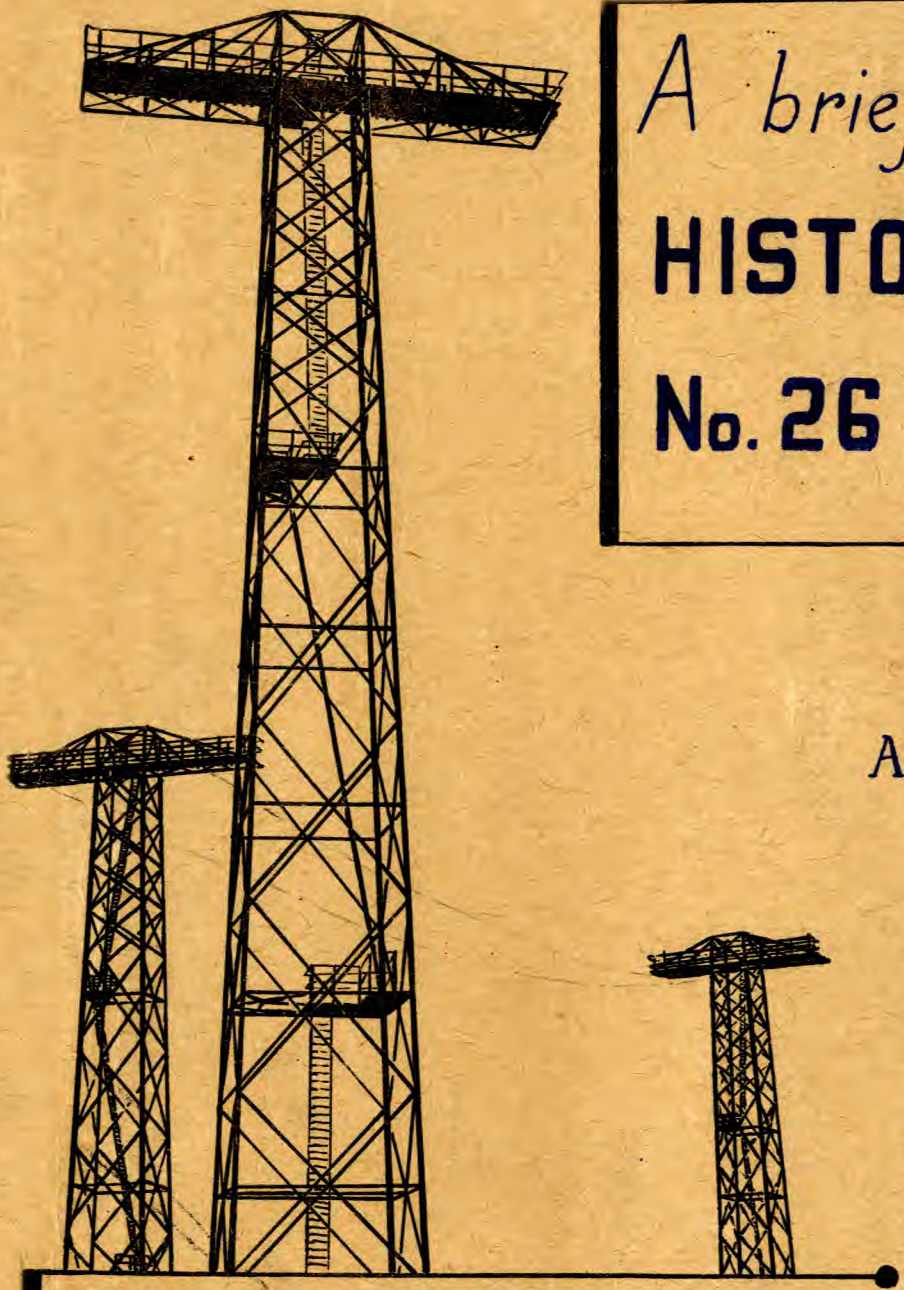
THE SIGNALS WAR



A brief

HISTORY OF No. 26 GROUP

ROYAL AIR FORCE.

Issued by No. 26 Group
December 1945.

BRIEF HISTORY OF NO. 26 GROUP.

CONTENTS

ILLUSTRATIONS.

BRIEF HISTORY OF NO. 26 GROUP.

Conditions prior to Formation.

In writing a history of No. 26 Group with particular reference to the part played in the organisation, development and maintenance of the communications system of the Royal Air Force, it is necessary to summarize briefly the existing position on and before September 3rd, 1939, in order to get the right perspective.

During the years 1934 to 1936 Air Vice Marshal O.G.W.G. Lywood introduced the first attempts at reperforating and printing at high speed between the United Kingdom and Egypt. Although good results were obtained at times, the high noise level in London made regular working impracticable and a reversion was made to undulator slip-reading. At that period also Air Vice Marshal Lywood succeeded in persuading the authorities concerned to place orders with radio manufacturers for commercial type main transmitters and receivers for the R.A.F. Intercommand service.

The Abyssinian crisis, accompanied as it was by threats to Malta and the Mediterranean cables, necessitated

an immediate overhaul of the R.A.F. Intercommand W/T system. Much more powerful transmitting and receiving stations than those then in use were planned at Dagnall, Symington and Cardington- all remote from the vulnerable London area. At this time, too, the then very small "Inter-Service" Network demonstrated its value to such an extent that it was immediately expanded by some 400 per cent.

By 1937 it was clear that the old inter-station W/T point to point system at home was quite inadequate for war purposes, and that land lines would be needed in considerable quantity. At a meeting held by the then head of the Signals Branch on the subject of Coastal Command communications, the idea was expounded of using teleprinter on voice frequency channels, thus saving in physical lines; and, for the first time in the history of British telegraphy, the principle of manual switching of Teleprinter channels was incorporated in the suggestion. The idea was adopted, and it was subsequently planned for the other commands as well. Thus the idea of the Defence Teleprinter Network first took shape as a purely R.A.F. requirement.

With the support of the Admiralty the idea was put into operation and as an interim measure the network was based on a central exchange in the Air Ministry in London. It was subsequently planned to incorporate the

main receiving terminal at Leighton Buzzard with Cardington also as a remote receiving station, and Dagnall as its main transmitting station.

At the time of the Munich crisis in 1938 the plans were still on the drawing board; but an immediate acceleration of the scheme resulted in the new Air Ministry Central at Leighton Buzzard being completed and in operation only nine months after the cutting of the first sod on the site. Meanwhile the Government's plan of evacuation to the West was being unostentatiously implemented, and to meet this Birdlip and Winstone were planned and built.

At the outbreak of war the need for direct printing on the radio links was clear, and a contract was placed with Standard Telephones Ltd., to install direct radio teleprinting between the United Kingdom and Ismailia, Egypt, with the intention of extending it to Singapore. The experiment, however, with the system then envisaged and the power available, proved a failure. The same lack of high powered equipment proved an obstacle to successful reperforating and printing, with the result that undulator slip-reading was generally adopted.

During the period of the "phoney war" the land line scheme and Defence Teleprinter Network were expanding at a prodigious rate. The three Coastal Command combined

Area Headquarters at Pitreavy, Chatham and Plymouth were fitted out as main switching centres, while new main signal centres near Liverpool (North West Central) and in Northern Ireland were provided by the R.A.F., who also set up a terminal centre at Gloucester without D.T.N. switching. In addition the Admiralty built a large centre at Glasgow and the Army a small one at Cheltenham.

Formation of No. 26 Group.

This briefly was the position when, on 15th March, 1940, No. 26 Group was formed and housed in the old Bomber Command Headquarters building at Langley Hall,Langley, Bucks. Nothing has been said about the important work of installation fitting and maintenance of equipment, which was to rank high among the commitments of the new signals group. It would be improper not to pay a tribute in this connection to the Civilian Wireless Reserve, a body of enthusiastic specialists formed in 1938 largely at the instigation of the present Air Officer Commanding the Group. These were mobilized immediately on the outbreak of war and formed into Emergency Fitting Parties. The work was subsequently "zoned", and the Central Emergency Fitting Parties were formed. Their work was difficult, entailed much travelling and living under hard conditions; much of the success

of the reorganized communications system was due to their efforts.

On its formation No.26 Group was placed under Technical Training Command, and its main responsibilities were for the training of Signals personnel; for this purpose it controlled the Signals Training Schools at Cranwell, Compton Bassett and Yatesbury. It was also responsible for the Air Ministry Central Signals Centre at Leighton Buzzard and the Air Ministry Telephone Exchange at Harrogate. At this time the other signals centres and overseas transmitting stations were not yet completed. On completion they were all destined to come under the operational control of No. 26 Group, which thus became responsible for all inter-command W/T links and for the Defence Teleprinter Network within the United Kingdom.

Charter of Responsibilities.

In March, 1942, the Group was transferred from Technical Training Command to Bomber Command. Although, with the change of Command, the Signals Schools passed out of its control, the Group retained the responsibility for certain aspects of signals training, notably that of the Mobile Signals Units. Under its new Charter of Responsibilities it became responsible - inter alia - for the following services:-

(a) the preparation of Signals Orders and Instructions for all inter-command point to point reinforcements and overseas flights;

(b) detailed planning in connection with Wireless Observer Units;

(c) formation and equipping of mobile signals units, and the training of personnel for these units;

(d) the provision and maintenance of signals personnel and equipment in connection with the "Beetle" organisation;

(e) co-ordination of standby W/T point to point services;

(f) siting of wireless stations, including D/F but excluding beam approach (the latter was added as a further responsibility later);

(g) installations of ground, air, and marine signals equipment;

(h) ground and air calibration of all new D/F and beam approach stations;

(i) liaison with G.P.O. and Works Department in connection with the telephone and D.T.N. extensions and installations;

(j) the operation and maintenance of all inter-command communications services;

(k) the periodical checking of equipment at all D/F stations;

(l) administration of the pools of mobile signals and transportable signals equipment;

(m) the operation of the Traffic Control Service of the R.A.F. point to point communications at home and of the inter-command telecommunications services;

(n) technical control of all W/T point to point services forming part of the main point to point organisation at home and with Commands overseas;

(o) technical and operational control of the Despatch Rider Letter Service, including organisation, personnel and vehicle questions.

Initial Problems.

One of the first major commitments of the Group after its formation in March, 1940, was the large part that it had to play in the vast extension of the land line system in the United Kingdom, linking airfields with Group and Command Headquarters and with observer posts and radar stations, and in the herculean task of moving operations rooms away from threatened airfields. On Italy's entry into the war, the cutting of the Mediterranean cables threw a heavy load upon the inter-command W/T service, which now had to carry the whole weight. Actually the delays on signals proved to be comparatively small, one of the chief reasons for this being the efficiency of the cypher organisation - largely due to the introduction of the Type X cypher machine and the energy of the Group in setting up cypher offices and staffs. Air Vice Marshal Lywood had early foreseen the need for speedy cyphering and de-cyphering by machine methods and had stressed the need for its adoption.

At this time the principal problem in connection with the inter-command W/T Service was that of insufficient power in the transmitters. The production capacity for medium and high-powered transmitters was limited, with the

result that each of the services had to choose between a number of 2½ kW transmitters or one-third the number of 10 kW transmitters or one-sixth the number of 25 kW transmitters, since the production effort on each type was in that proportion. With its heavy commitments for ground-to-air and meteor work in addition to its point to point services, the R.A.F. was compelled to aim at numbers rather than power in the earlier years of the war.

To meet the call for higher power large orders were placed in the U.S.A. very early in the war for 15 kW transmitters. Delivery was promised late in 1940, but few arrived before 1943, and automatic working was seriously affected in consequence. However, by dint of constant pressure; a number of higher powered sets was produced in the United Kingdom, and installed by No. 26 Group - thus making possible a return to direct printing. To this end the G.P.O., No. 26 Group and Air Ministry worked in collaboration and developed the Single Side Band suppressed carrier multi-channel system.

The Signals Depots.

The planning, erection and equipping of new transmitting and receiving stations was a heavy tax on the resources of the Group. This work was undertaken by the Signals Depot at West Drayton, formed in September, 1940,

Nº 1. SIGNALS DEPOT, WEST DRAYTON.

AIRCRAFT INSTALLATIONS

● EACH FULLY SHADED AIRCRAFT REPRESENTS 250 INSTALLATIONS

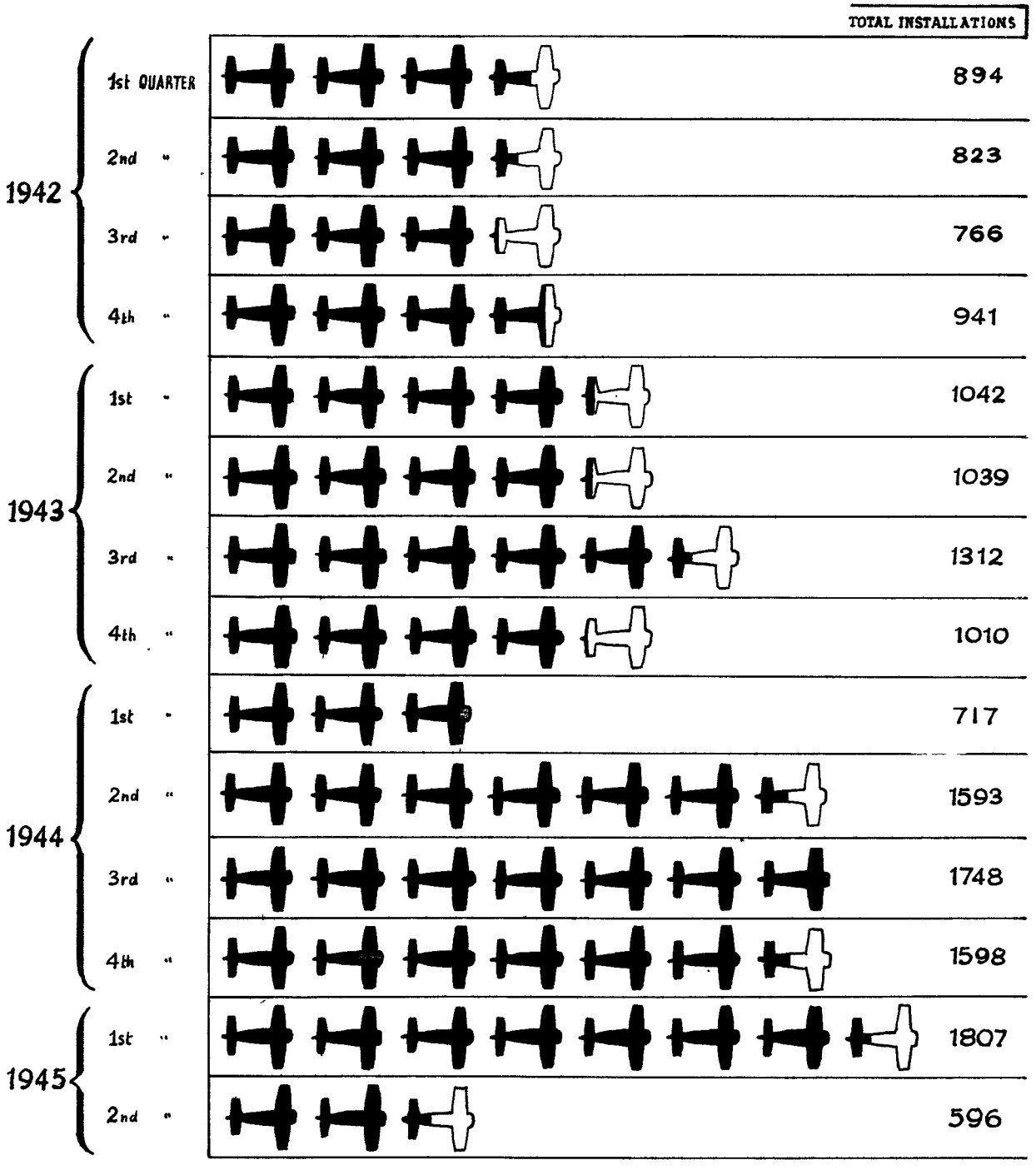


FIG. 1.

and by the Central Emergency Fitting Parties. In November 1941 it was found necessary to amalgamate the Central Emergency Fitting Parties operating in the Northern part of the United Kingdom and form a second Signals Depot at Cowglen, near Glasgow. This was moved, in 1943, to better accommodation at Fazakerly in the neighbourhood of Liverpool. The two signals depots have been responsible for the fitting up of W/T stations for all commands over an area extending from Jan Mayen in the Far North to Lagos and the Azores. The ground installations covered such a wide variety of activity that it is impossible to represent the work in diagramatic form. The setting up of the Inter-Command Point to point Network was perhaps one of the most important commitments involving transmitting stations at Dagnall, Greatworth and Weyhill and receiving stations at Stoke Hammond, Chicksands and Leighton Buzzard. Chicksands alone was fitted with 320 receivers plus monitoring gear fed by 30 aerials through wide band amplifiers. In the peak year of 1944 no less than 1472 transmitters and receivers were installed at widely separated ground stations, 1495 aerials were erected and 656 installations were overhauled, modified or repaired.

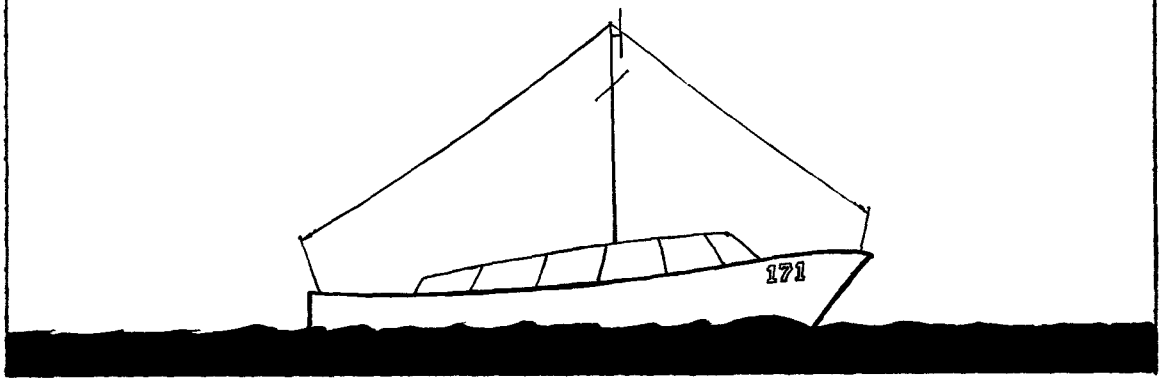
Among the many other tasks of this kind completed by the fitting parties from the No. 26 Group Signals Depots were the erection of a first class transmitting station in

Iceland, a Radio Range off the Scottish Coast designed to bring the U.S.A.A.F. across the Atlantic, a meteorological station on the almost inaccessible Island of Jan Mayen and, in the autumn of 1943, the vital radio link in the Azores. A few facts and figures about these typical commitments may give an indication of the difficulties involved.

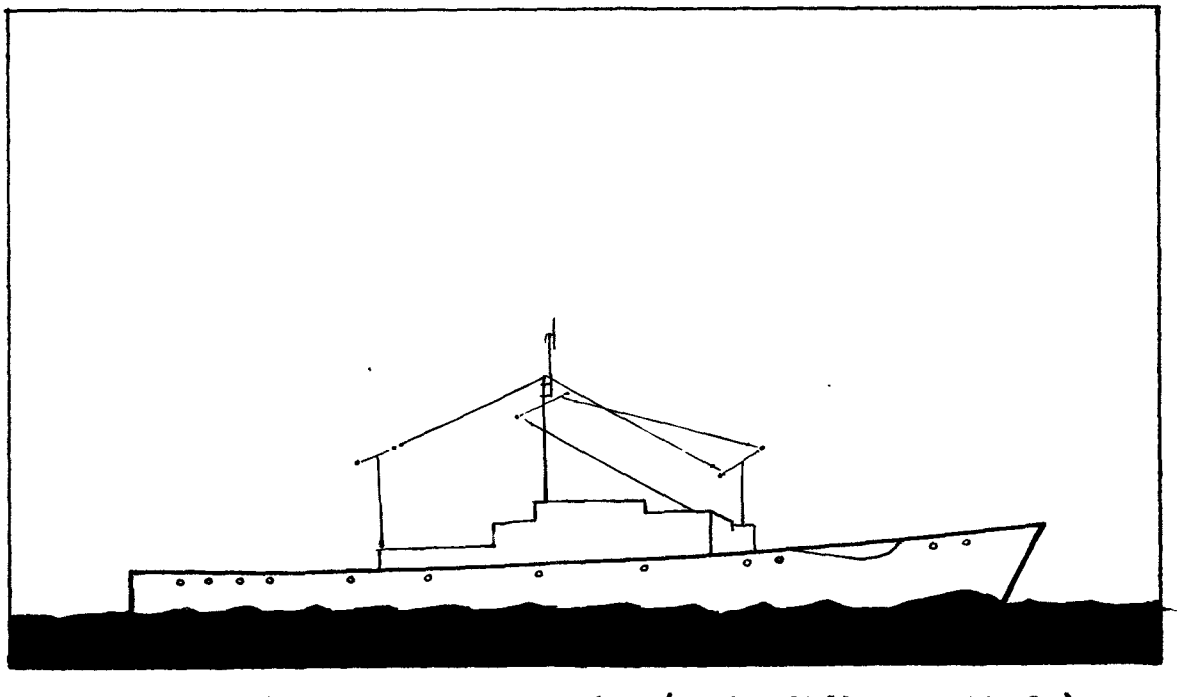
For the station in Iceland no less than 60,000 tons of concrete had to be mixed; the erection of twenty-six towers - four of them 200 feet high - was made more difficult by the prevalent gales, which often blew steadily at 90 m.p.h. and sometimes reached 120 m.p.h. in gusts. The whole task took nearly a year to complete. The technical equipment for the Azores was shipped in 840 cases weighing altogether 150 tons. The Officer who erected the meteorological station at Jan Mayen spent eighteen hours a day for nine days blasting eight holes in the Island's volcanic rock to accommodate the aerial masts; for several days he had to exist on seagulls and the flesh of an Iceland pony which had been landed with him to provide transport for the equipment. The fitting party detailed to erect a radio range at very short notice found nothing on the site but mud and water. Here they had to organize their own supply of poles, carry out their own splicing and build their own hut. In spite of this handicap, the

FIG.2.

Nº 1 S.D. WEST DRAYTON
MARINE CRAFT INSTALLATIONS



Standard High Speed Launches (63', 67', 68' & 78') for Air Sea Rescue Work. These boats were manned by R.A.F. personnel and operated with marked success throughout the war. Between September 1941 and June 1945 approximately 250 radio installations of various kinds were carried out in these craft by the C.I.S.



Fairmile Class B & D Launches (110' & 115' respectively). Naval manned, and designed for Long Range Rescue Work beyond the scope of the smaller craft mentioned above. Radio installations were undertaken in 71 of these craft between March 1942 and June 1945.

equipment - which was transported by air - was fitted up so quickly that the American engineer who was flying from the U.S.A. to install it arrived just in time to switch it on.

Side by side with the major tasks of erecting and equipping ground stations went the equally important ones of aircraft and marine-craft fitting. These also were a commitment of No. 26 Group through its depots, the first - and not least important - instalment being the fitting of VHF R/T equipment in fighter aircraft taking part in the Battle of Britain. Another exacting task was the fitting of the W/T Equipment in every aircraft operated by Bomber Command. In under six years nearly 20,000 aircraft were fitted with navigational aids by West Drayton alone. (See Fig.1.). Of the many types of marine craft fitted with communications equipment it is worth recalling the high speed Air/Sea Rescue launches and Fairmile Class 'B' and 'D' launches; these would have been unable to operate successfully without it. (See Fig.2.).

Other important installations by No.1 Signals Depot were carried out in Merchantmen, Destroyers, R.A.F. Pinnaces, Landing Craft Tanks and Infantry and Masbees (Motor Anti Submarine Boats).

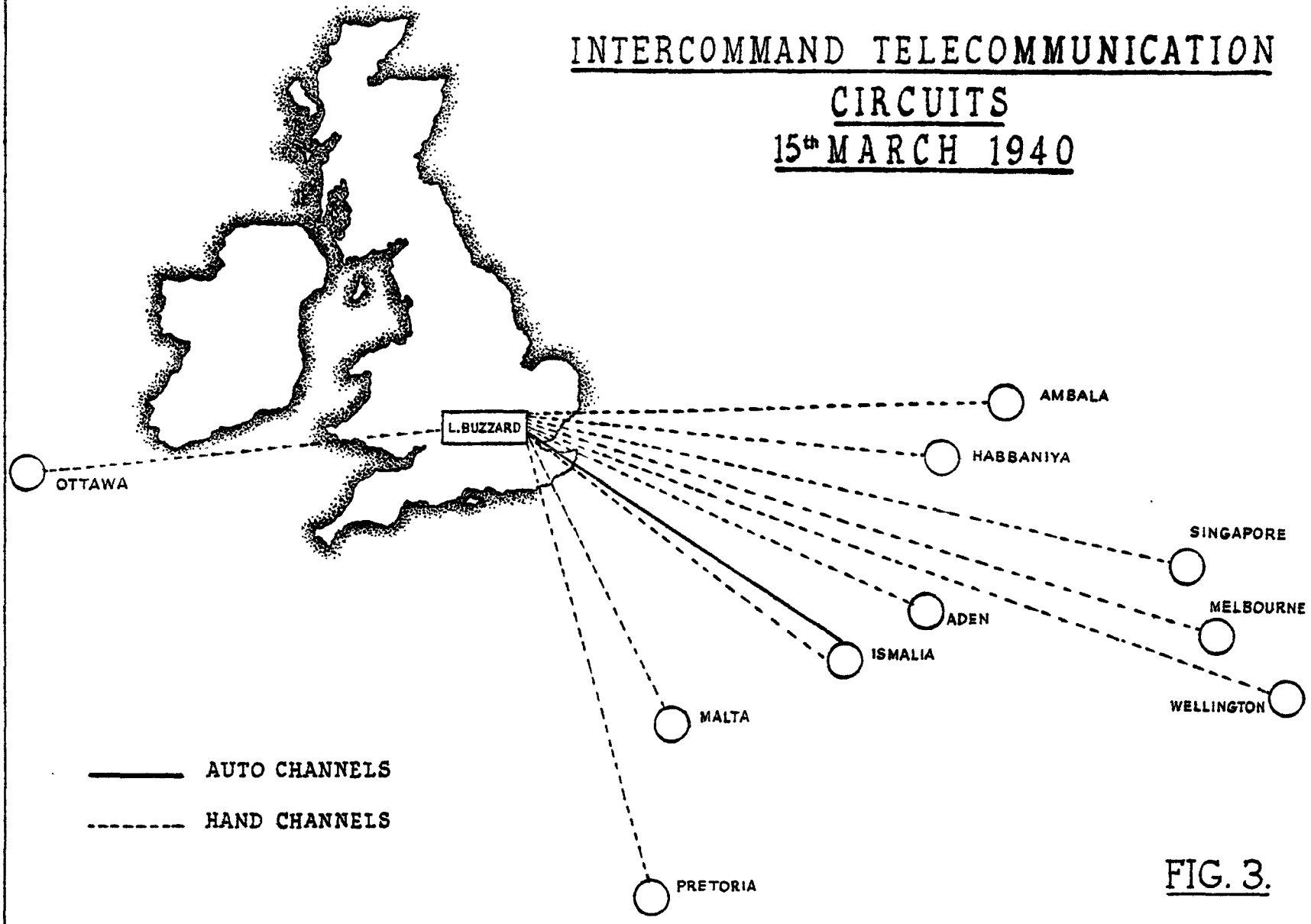
It is not possible in the available space to

give detailed figures of the work undertaken by No.2 Depot at Fazakerley. Aircraft installation did not figure largely in its work, but extensive ground and marine installations were carried out in the Northern half of the British Isles and the Islands up to and including Iceland. Altogether more than 1100 tasks had been completed by August, 1945.

W/T Network.

It has already been stated that when No. 26 Group was formed in March 1940 the only main Signals Centre was at Leighton Buzzard, with a W/T transmitting station at Dagnall and a remote receiving station at Cardington. In 1941 the plans for expansion and decentralization began to bear fruit, and further W/T stations were opened at Winstone and Birdlip, thus relieving the pressure on Leighton Buzzard. These were to be followed later by Prestwick (1942), Chicksands (1944) and Weyhill (1944).

Some idea of the expansion can be gained from the amount of traffic dealt with. In September, 1939, the approximate number of groups passed daily by the Air Ministry W/T Station on the top floor of Adastral House was 25,000. During the peak period of March, 1945, the average number of groups passed daily over the Air Ministry circuits was 400,000. The following is a brief summary of the daily averages at peak periods of the main overseas circuits,


INTERCOMMAND TELECOMMUNICATION
CIRCUITS
15th MARCH 1940
L.BUZZARD
OTTAWA
AMBALA
HABBANIYA
SINGAPORE
MELBOURNE
ADEN
ISMALIA
WELLINGTON
MALTA
PRETORIA
AUTO CHANNELS
HAND CHANNELS
FIG. 3.

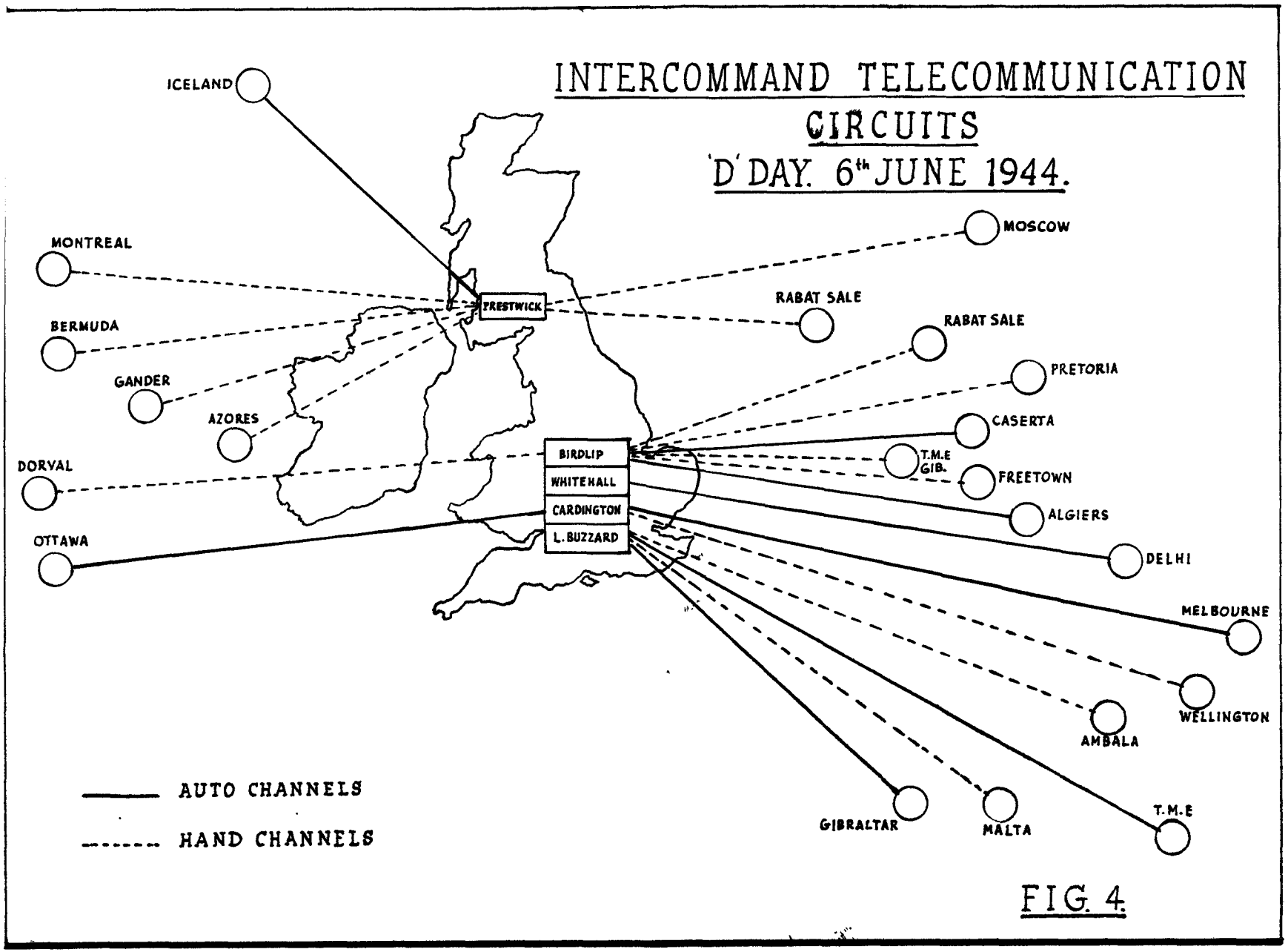

INTERCOMMAND TELECOMMUNICATION
CIRCUITS
'D' DAY. 6th JUNE 1944.
ICELAND
MONTREAL
BERMUDA
GANDER
AZORES
DORVAL
OTTAWA
PRESTWICK
BIRDLIP
WHITEHALL
CARDINGTON
L. BUZZARD
MOSCOW
RABAT SALE
RABAT SALE
PRETORIA
CASERTA
T.M.E GIB.
FREETOWN
ALGIERS
DELHI
MELBOURNE
WELLINGTON
AMBALA
T.M.E
MALTA
GIBRALTAR
AUTO CHANNELS
HAND CHANNELS

FIG. 4.

compared with the figure either in September, 1939, or at the dates when the circuits were opened:-

(1) AIR MINISTRY CIRCUITS	(Total Traffic)		
September, 1939,	25,000	groups	daily (approx.)
March, 1945, (peak)	400,000	"	"
May, 1945,	300,000	"	"
(2) MAIN CIRCUITS			
DELHI			
September,1939	4,000	"	"
April,1945 (peak)	40,000	"	"
CASERTA. (opened July 1943)			
July,1943	23,000	"	"
August,1944 (peak)	35,000	"	"
ALGIERS.(opened December,1942)			
December,1942	12,000	"	"
April,1943 (peak)	35,000	"	"
H.Q.M.E.			
September,1939	5,000	"	"
April,1943 (peak)	80,000	"	"
COLOMBO (opened October,1944)			
October,1944	12,000	"	"
April,1945 (peak)	25,000	"	" (rising)

(3) "INTER-SERVICE" CIRCUITS. (Total Traffic)

March, 1943 [1]	80,000	groups daily (approx.)
August, 1944 (peak)	400,000	" "
May, 1945	250,000	" "

[1] No earlier records available.

The transmitters in use in September, 1939, were chiefly T.1087's (which were succeeded by T.1190's late in the year 1940), with one SWB8 employed on auto-transmissions in Ismailia. Thus the average power was in the neighbourhood of 300 watts, with a maximum of 3.5.kW. By 1944 the introduction on the auto circuits of the SWB10 had raised the maximum power available to 25 kW, while the average power on the hand-speed circuits (apart from the short distance links to the Continent and N.Africa) approximated to the 3.5 kW which had previously represented the 'peak' power. Thus, side by side with increased facilities, increased quality was also achieved.

The growth in the number of Intercommand Telecommunications Circuits is illustrated in Figs. 3 and 4, the former showing those existing in March, 1940, and the latter those being worked in June 1944. Apart from the mere numerical increase, it is noteworthy that in place of the single auto-circuit (to Ismailia) being worked at the outbreak of war, there were eight in operation for D-Day.

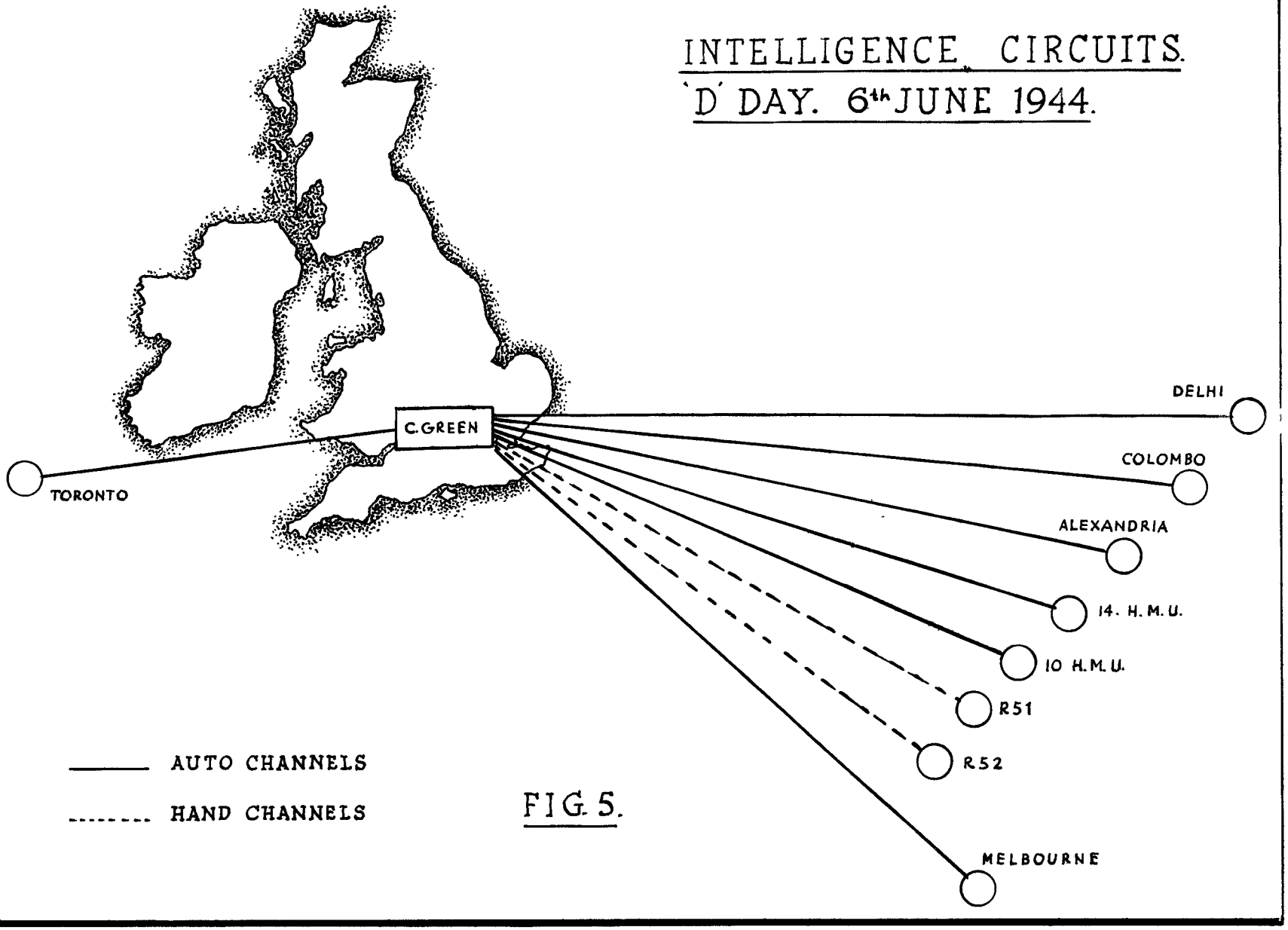

INTELLIGENCE CIRCUITS.
'D' DAY. 6th JUNE 1944.
C.GREEN
TORONTO
DELHI
COLOMBO
ALEXANDRIA
14. H.M.U.
10 H.M.U.
R51
R52
MELBOURNE
AUTO CHANNELS
HAND CHANNELS

FIG. 5.

The number of "Inter-Service" Telecommunications Circuits in use at the time of the invasion of Europe is shown in Fig.5. Great strides were planned to meet the demands of the Far Eastern and European Wars. Fig.6 illustrates the proposed radio teleprinter network which was in course of implementation at the time when war ended.

During this period of rapid expansion problems of design were continually arising and were being met by the No.26 Group engineers. Constant research was being made into the properties of different types of aerial systems; devices were perfected for switching transmitters to aerials for greater flexibility; feeders had to be matched to aerials; the problem of fading was considerably reduced by the development of triple diversity reception, that of feeding several receivers from the same aerial was overcome by the application of wide band amplifiers with distribution to multiple points of reception.

"Inter-Service Stations"

Included in the comparative figures of traffic passed over the W/T Network already given above were those of the "Inter-Service" Stations. In 1941 it became apparent that the only way to co-ordinate satisfactorily the work of this inter-service intelligence system was to transmit home vast quantities of material. This

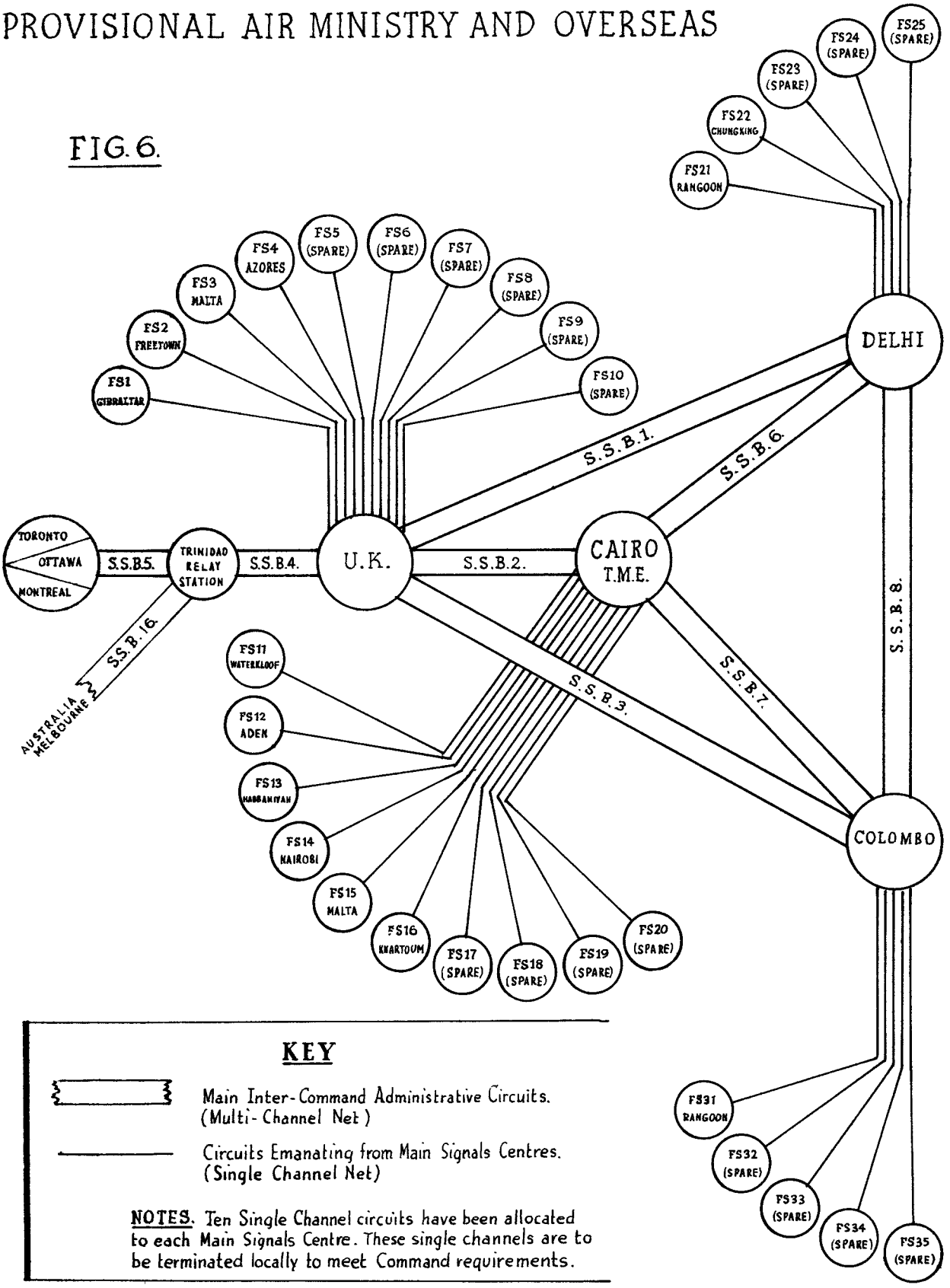
entailed the setting up of radio links to all the main theatres of war and to Canada, capable of handling up to 500,000 groups a day, complete with full cyphering, signal office and distribution systems. The Director General of Signals, asked by the Government Committee concerned if the R.A.F. could undertake this major engineering task, agreed. No. 26 Group was given the task of carrying out the work as far as the home terminals were concerned, and completed it in the record time of almost exactly a year. This brought the additional responsibility of the technical and administrative control of the three main "Inter-Service" Stations, Canterbury, Chicksands and Cheadle, with their associated network of D/F Stations. Some idea of the scale of the work involved may be obtained from the fact that Chicksands and Cheadle alone operated, on the average, 500 receiving sets, and the total number of personnel employed in this service in the United Kingdom grew from 60 in 1938 to approximately 5000 in 1944.

Defence Teleprinter Network.

At home the traffic passing over the Defence Teleprinter Network was increasing rapidly, and before the end of 1940 it was clear that the Central Signals Centre at Leighton Buzzard would not be able to cope with it alone. In September, 1939, the average number of

PROVISIONAL AIR MINISTRY AND OVERSEAS

FIG. 6.



KEY

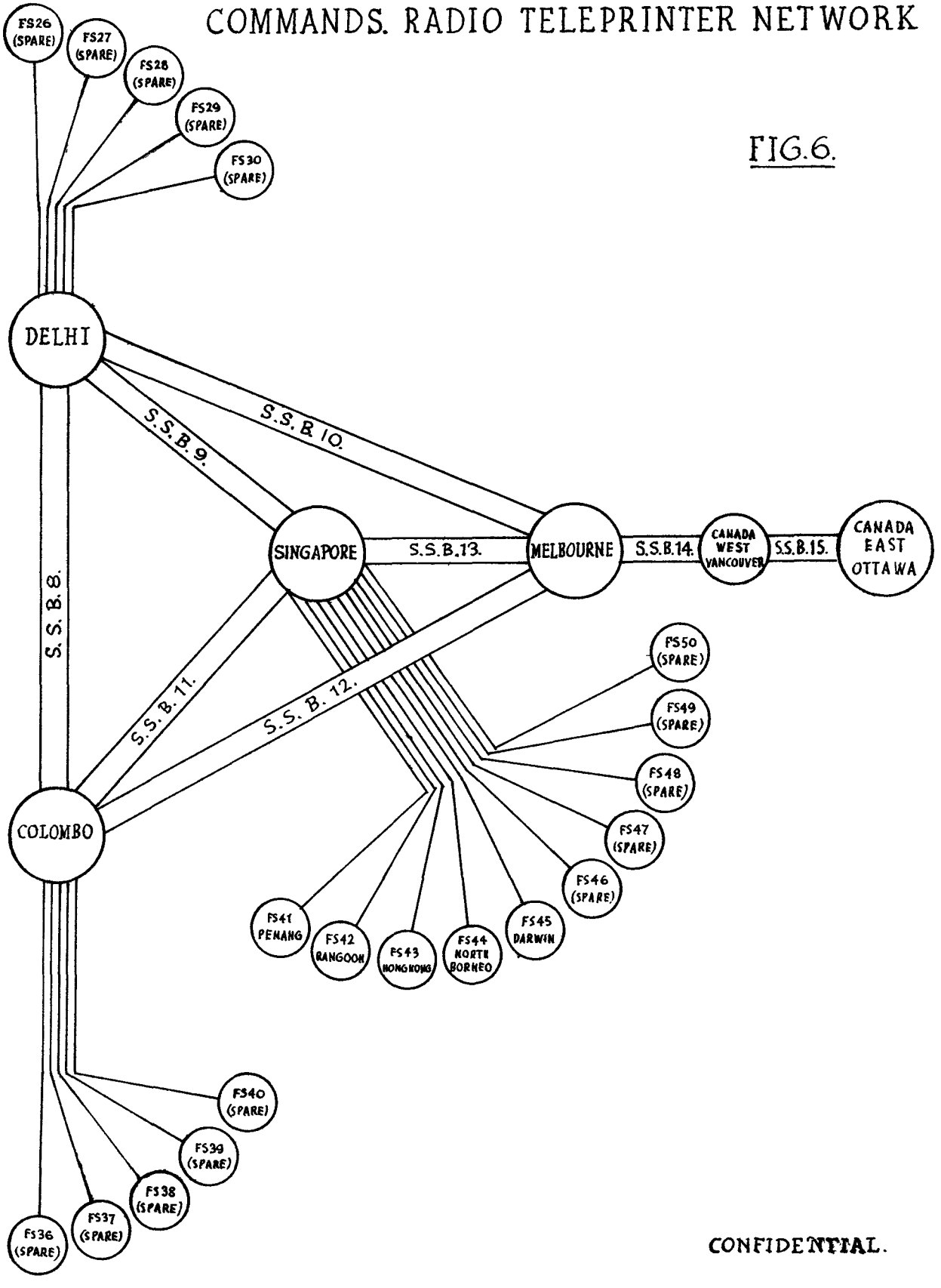
Main Inter-Command Administrative Circuits. (Multi-Channel Net)

Circuits Emanating from Main Signals Centres. (Single Channel Net)

NOTES. Ten Single Channel circuits have been allocated to each Main Signals Centre. These single channels are to be terminated locally to meet Command requirements.

COMMANDS. RADIO TELEPRINTER NETWORK

FIG.6.



CONFIDENTIAL.

messages of all lengths being passed daily was 2,000; 500 of which were passed through Leighton Buzzard. In October, 1941, Leighton Buzzard was dealing with no fewer than 6,000 messages daily, an increase of 1,200 per cent on its 1939 traffic figures. The pressure was relieved in December, 1941, by the opening of North West Central at Blackbrook, which in its first month of operation dealt with an average of 600 transmissions a day, rising to a peak average of 5,000 in May, 1944. In September, 1943, the postion was eased still further by the opening of South West Central at Hawthorn. This Centre averaged 1,200 messages during September, 1943, reaching its peak in June, 1944 with a daily average of 4,200 messages. It is interesting to note that, whereas in September, 1939, there were approximately six operating positions in use on the D.T.N. switchboards, by April, 1945, this number had risen to 126. The D.T.N. traffic returns of the three Signals Centres, in quarterly totals, are clearly illustrated by block graphs (See Fig.7). It will be seen that in the quarter including "D" Day, well over 1,000,000 messages, "In", "Out" and "Through", were dealt with.

The Telephone System.

It is appropriate at this stage to refer to the

R.A.F. Telephone Network. Prior to the formation of the Telephone Section of the R.A.F. Traffice Control in 1942, Commands and Units were served by a collection of several super-imposed systems - one per command - each of which covered the United Kingdom.

Lack of co-ordination resulted in inefficient and extravagant use of line plant, and a common point of contact was sought. This was provided by the Central Switching Centre formed at Leighton Buzzard and by the later addition of Switching Centres at the North West and South West Centrals. To implement this scheme, heavy demands had to be made for the release of circuits from the public network, which was reduced to an absolute minimum.

It was not possible to attempt a major revision in the lay-out of the network owing to its colossal size, but full investigation of the existing facilities was undertaken and instructions issued for the speedy and efficient handling of calls over the network as it stood.

Ultimately the network grew to a size comparable with that of the G.P.O., and at the peak of the war effort the three Switching Centres were handling a total of approximately 30,000 calls a day.

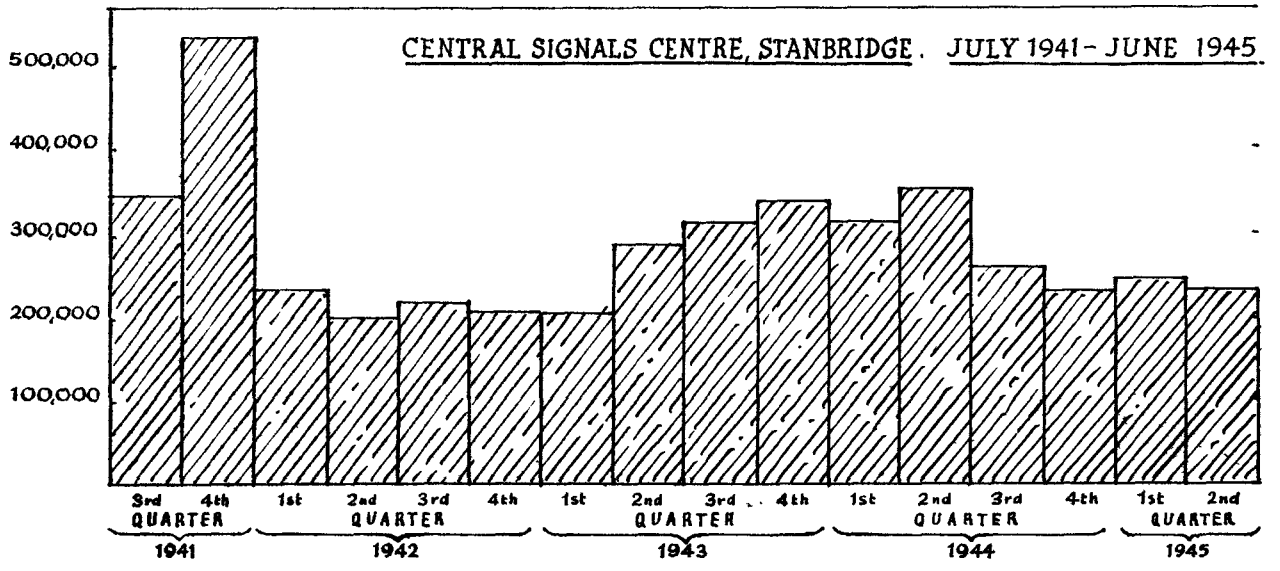
The Battle Training School.

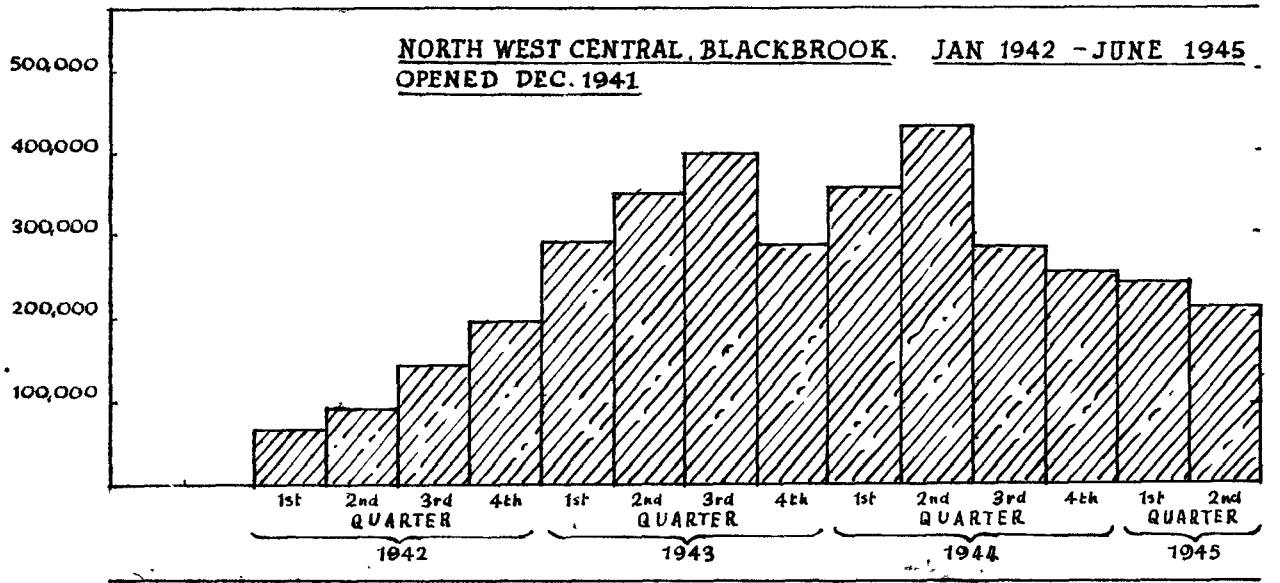
The experience of the First British Expeditionary

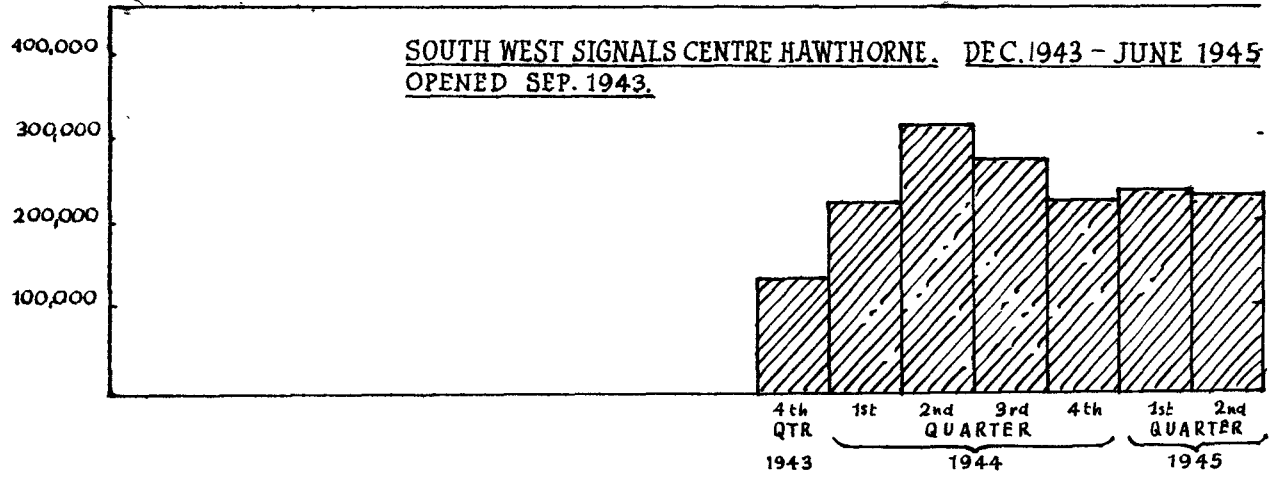
DEFENCE TELEPRINTER NETWORK

Fig 7.

QUARTERLY TOTALS OF MESSAGES DEALT WITH







Force demonstrated the need for mobile and self-contained Signals and Radar Units as an integral part of Expeditionary Forces.

Selection and training of personnel in the use of specialist vehicles, and instruction in the use of appropriate weapons of assault and defence, was originally undertaken at White Waltham. By April, 1943, commitments had grown to such an extent that the entire personnel moved to Chigwell, and White Waltham assumed the status of a satellite together with Putteridge Bury. A Personnel Disposal Centre was formed in May, 1943, within the framework of the Battle Training School, to supervise the preparation and formation of the various units under training.

From April, 1943, to "D" Day the main output from Chigwell was to A.E.A.F. formations and the schematic diagram (See Fig.8) illustrates the fluctuation in output and clearly shows the peak effort during the second quarter of 1944, immediately prior to the invasion of France.

In addition to this, Chigwell undertook the formation and training of hundreds of other Units for special operations all over the world. It is difficult to select an operation for particular mention as every unit fulfilled a vital part of each task. The South Coast Radio Scheme may perhaps be singled out. Mobile Units known as the

Radio Communications Units, were formed and trained to provide cross channel VHF R/T teleprinter links for "D" Day and subsequently, and to feed into the home based Headquarters. These Units were in operation on "D" Day with the Fighter Director Ships lying off the beachhead and on "D" Day plus 3, the Mobile Signals Units established themselves on the shores of France.

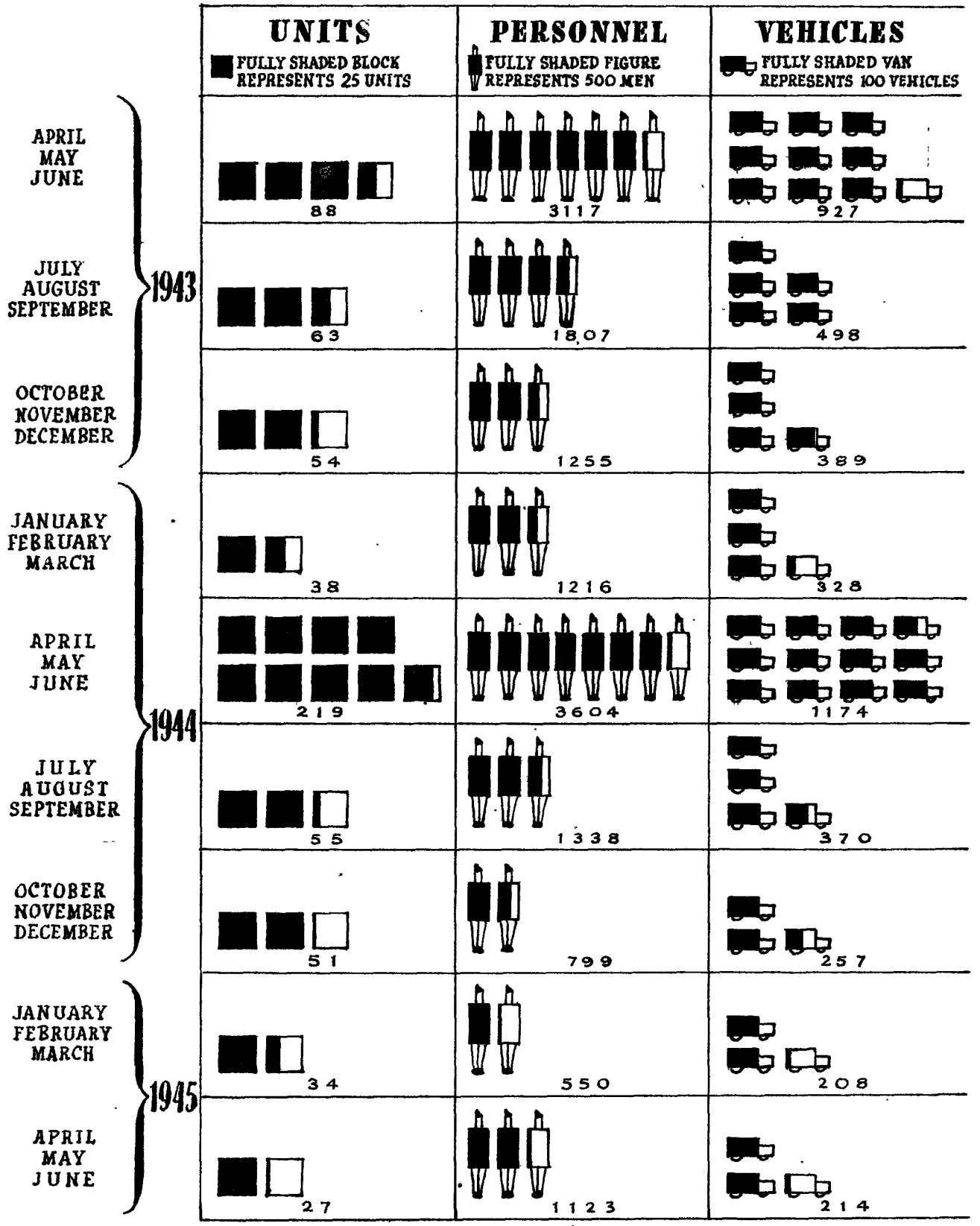
The system employed by the Radio Communications Units was that of transmission and reception of both speech and teleprinter signals on a single carrier ("Racehorse"), and was developed entirely by No. 26 Group. Much work has been done on this type of equipment by the Group Engineers and includes also the complete development of a three-channel two-tone teleprinter HF radio link and the development of one speech and four teleprinter equipment for a VHF radio link. It can be said that research and improvement of design have kept pace with expansion.

Over 70,000 personnel passed through White Waltham and Chigwell, and of these 52,000 were trained and kitted for such theatres of war as India, Iceland, Norway, North Africa, Sicily, Italy, Russia, Yalta, Azores, Middle East, Western Europe and many countries in the Far East.

Since the 1st April, 1943, over 900 Units have been fully equipped and over 3,200 specialist signals

R·A·F CHIGWELL

A·E·A·F SIGS UNITS FORMED AND TRAINED



vehicles, 1180 specialist radar vehicles and 2,600 load carriers issued. The volume of work can be imagined when it is realized that approximately 7,800 tons of domestic equipment alone was issued to Units.

Quite apart from the separate and vast undertaking of equipping and training the mobile signals units, a considerable amount of special planning and installation had to be done by the Group in the months immediately prior to "D" Day. In addition to the provision of land lines, which had to cover not only the R.A.F. but the whole of the American Air Forces involved as well, an immense W/T system involving some 200 transmitters had to be set up and worked.

Inspectorate of Inter-Command Telecommunications.

In order to co-ordinate the whole inter-command system, and expedite the provision and modernization of main stations overseas, an Inspectorate of Inter-Command Telecommunications was set up within No. 26 Group in August, 1944. Already a great deal has been done, and main stations in the East are rapidly taking shape. Others are in process of planning to give relay facilities, so that before long it will be possible to say that the R.A.F. system girdles the world by direct printing methods.

Monitoring.

Monitoring of transmissions for both technical and security purposes has been one of the Group's responsibilities, though until recently monitoring facilities have been somewhat dispersed, the monitoring section at Langley being on a small scale. In November, 1944, however, under the authority of Air Ministry SD.155 No.2706, the Air Monitoring Centre was formed at Tean - an outstation of Cheadle - on a basis of 26 receivers. Facilities are also available for the use of the Cheadle D/F network, and a mobile section is established with 10 VHF receivers. All home and inter-service hand-speed channels can thus be adequately watched for breaches of security and poor signalling. A similar organisation has been set up at Stanbridge, for the purpose of monitoring the inter-command auto channels.

Formation of the Signals Flying Unit.

Since the issue of the Charter of Responsibility in January, 1942, the responsibilities of the Group in connection with radio and radar aids to navigation have increased to a very large extent indeed. At that time they were confined to the siting of new D/F stations and the ground and air calibration of all new D/F and beam approach

stations. They were extended to cover the installation, maintenance and regular calibration of practically all types of radio navigational aids, and - in the case of Ground Controlled Approach - the formation and training of crews to operate the equipment. The Signals Development Unit was formed in April, 1943, at Hinton-in-the-Hedges to undertake this work, but owing to increases in its commitments the Signals Flying Unit, as it is now called, moved in the summer of 1944 to better accommodation at Honiley, taking in Baginton and (early in 1945) Stratford as satellite airfields.

Organisation of the Signals Flying Unit.

The Equipment Squadron of the Signals Flying Unit acts as the Maintenance Unit for practically all navigational signals equipments that are supplied to the R.A.F. at home on a common-user basis and - to a smaller extent - to the Commands overseas. The Signal Development Squadron carries out the installation of the equipment and maintains it once it is installed; all such equipments are regularly checked for accuracy by the Calibration Flight. The Development Squadron is also responsible for the service trials of new equipment, and for modifications and improvements to both airborne sets

and ground aids to navigation. One of the latest of these has been considered so important that a G.C.A. Training Squadron has been formed to develop it and to train ground crews in the method of its operation. To carry out its various duties the Unit is equipped with over fifty aircraft.

Navigational Aids.

At the outbreak of war the only radio navigational aids in use in the R.A.F. were medium frequency and high frequency (ground) D/F stations. Most of the M.F. stations had been installed for the use of civil aircraft; but the R.A.F. had a few stations for their exclusive use and all the civil stations were made available for R.A F. use on the outbreak of hostilities. The R.A.F. had also approximately 100 HF D/F Stations, about 75 of which were installed on a geographical basis to provide a fixing service for fighter operations, the remaining 25 being installed on Bomber airfields for homing purposes. The only bad weather landing aid available was Standard Beam Approach, which was installed at about ten widely dispersed stations.

By the time that No. 26 Group was formed in March, 1940, this position had already undergone a considerable change. Fighter Command had previously decided to abandon

the HF D/F system and set up an extensive VHF radio telephone fixing service. By June 1940 almost all the units in No. 11 Group had been equipped, and by the end of the year the change-over was practically complete throughout the Command. Bomber Command had decided to equip every airfield with one or - in some cases - two HF D/F Homers, and accordingly all the HF D/F Stations removed from Fighter units were installed at Bomber Command airfields. This was a 26 Group responsibility, and by the end of 1943 some 400 of these stations had been set up. Only short range homing (50 - 100 miles) was given by these means, and the MF D/F service was used for fixing up to 300-400 miles. Because both the HF and MF D/F service for Bombers had to be given by telegraphy (as distinct from telephony), and there were insufficient frequencies available for the number of bombers it was desired to operate, some other type of radio aid had to be found. A system of MF radio beacons covering the United Kingdom was therefore set up and brought into service between September, 1940 and July, 1941. D/F loops were installed in all bomber aircraft, which were then able to take their own bearings on these beacons. The combination of MF D/F and MF beacons for long range and HF D/F for short range continued in use until the beginning of 1942 when "Gee" was brought into use. This still remains

the main navigational aid.

Development in Coastal Command was similar to that in Bomber Command, except that since Coastal Command aircraft operated over sea at greater ranges a number of special long range HF D/F stations were set up to provide a fixing and homing service at greater distances. Although Coastal Command were provided with "Gee" late in 1943, they have relied more on HF D/F than any other operational command, both on account of their range of operation and because their close contact with naval forces compelled them to use HF in common with the Navy. In Transport Command the only aids used up to the end of 1943 were MF D/F, HF D/F, MF radio beacons and SBA Track Guides. During 1944 a small number of radio ranges (as used in the U.S.A.) were provided, and these - together with the radio ranges provided earlier by the United States Transport Command and MF beacons - have been, and still are, the main navigational aids used by the R.A.F. Transport Command. Since 1942, the use of MF D/F, except for training purposes, has been confined almost entirely to Air/Sea Rescue purposes.

The task of installing VHF D/F equipment at Fighter airfields, after initial troubles which were traced to 'tower effect' (due to the use of unseasoned wood in the construction of the 30 ft. octagonal type towers), was

considerably speeded up by the introduction of the Bullet and Blast-proof hut. This could be erected by a fitting party in little more than a day, and has on more than one occasion proved to be adequate protection to operators during air attack. A total of more than 300 of the two types of VHF D/F stations had been installed and were in operation in 1944.

The provision of Long Range Cathode Ray D/F stations, chiefly for Coastal Command, has been a No.26 Group responsibility. Six of these, at Ballywattick, Butser, Dyce, Old Boston, Sangerdi and St. Eval, have been operationally controlled by the Group and have given a fixing service covering the whole of the North Atlantic with an extreme range extending - in exceptional conditions - as far as the coast of Newfoundland.

In August, 1944, Air Ministry delegated to No.26 Group the responsibility of installing and maintaining Radio Range equipments for the use of Transport Command in the United Kingdom and in Europe, and of advising overseas commands in regard to those ranges to be installed in their areas of operation. The equipment - SCR.277, a Bellini-Tosi loop radio range transmitter to be supplied from the United States - was to be installed at five airfields in the United Kingdom and at thirteen airfields

overseas. By the end of April, 1945, four had been installed in this country and one at Brussels. In view of the probability that sufficient equipment may not eventually be forthcoming from the U.S.A., attention has been given to the development of an alternative navigational aid in the form of a VHF track guide. A prototype hutted installation has been developed by the Signals Flying Unit, and has given satisfactory results.

Radar aids to navigation - non-existant at the outbreak of war - originally arose from the practice of using standard I.F.F. sets as beacons. By October, 1941, a system of employing such beacons for general navigational purposes had obtained recognition at Air Ministry. Interim A.I and A.S.V. responder beacons were thereupon produced and installed throughout the country. The responsibility of installing, and subsequently of maintaining these beacons was given to No. 26 Group; by April of 1944 a chain of 47 beacons stretching from the Scilly Isles to Caithness was in service, constituting the principal means of navigation for night fighters based on the United Kingdom.

Radio and Radar Approach Aids.

Having very briefly covered the history of the main radio navigational aids, it is necessary to summarise that of the various radio approach aids, for bad-weather approach to

airfields. It has already been stated that at the outbreak of war the only bad weather approach aid available was Standard Beam Approach - in the form of a "beam" pointing along the landing lane - and this remained true until early in 1942. From this time onwards the general tendency was for Fighter and Coastal Commands to develop their own landing aids, along similar lines but in different parts of the radio frequency spectrum. In the other commands the policy was to adhere to SBA. At the end of 1943, Bomber Command decided to abandon SBA in favour of BABS II and G.C.A., and installation of both these systems on a limited scale is now going ahead. In August, 1944, Transport Command decided to abandon SBA in favour of the American SCS.51 system, leaving Flying Training Command the sole remaining supporter of SBA.

In May, 1941, it was decided to make SBA the standard bad-weather landing aid for Bomber Command and to install it at all Bomber stations. Since it was desired to make the system automatic in operation and to give its control to the watch office, all the beacons were arranged for continuous non-attended operation, and full remote control was provided in the watch office. This entailed a very large programme of main electric power supply to all beacon positions, and of remote control lines from the watch offices. The programme was started in August, 1941, and in March, 1942, the

first installation was put into service. By the end of that year about 70 airfields had the system in operation, and before the end of 1943 about 135 installations were in use.

It was at this time that Bomber Command's offensive reached a high pitch, and much experience had been gained in the use of the system. This showed that the system itself was not sufficiently flexible to meet the varying conditions encountered. Apart from undesirable features in the special airborne equipment required, the ground installation was not capable of being moved from one runway to another, and lack of sufficient radio frequencies in the limited band of the radio spectrum allocated precluded its installation at large numbers of Bomber airfields in areas where the concentration of airfields was heavy.

Accordingly, during the early months of 1943, attention was turned to finding some other system which would meet Bomber Command's requirements, and this resulted in the trials of Ground Controlled Approach during July of that year. At the end of 1943 the Air Staff decided to adopt this system for Bomber Command, supplemented as an interim measure by the provision of BABS II.

Meanwhile, Air Ministry had agreed, in August

1941, upon the introduction of VHF/BA to provide beam approach facilities for fighter aircraft, a total of 93 ground equipments being projected. Delivery of these commenced in January, 1942 and the airfield at Wittering was equipped a month later. By the end of 1943, a further 22 airfields had been similarly equipped, and in February, 1945 - both Bomber Command and Coastal Command having meanwhile become interested in the system - the total in all commands was 30. Difficulties experienced at first by reason of the excessive width of the beam were overcome by the introduction of a new aerial system.

Radar beam approach started in a very similar manner to that which obtained for Radar beacons (described in the last paragraph of the preceding section), initial experiments being based on the use of an I.F.F. set as a beacon. In Fighter Command an effective, if unorthodox, approach system was evolved on the SBA pattern, using keyed reflectors. Two of these were installed at Ballyhalbert and one at Coltishall. A further type of beam approach system was built by T.R.E. and, after initial difficulties, was made to work successfully at Church Fenton in 1942. At the same time, plans were made for the installation of A.I. B/A in brick buildings throughout Fighter Command, and of A.S.V. B/A throughout Coastal

Command. Difficulties were experienced, however, in the rapid provision of the buildings, and there was a strong objection to having a brick-built structure placed even at some distance from the end of the runway.

Accordingly, early in 1943, No. 26 Group designed a transportable installation for both systems, and arranged for the manufacture of these housings through the Ministry of Aircraft Production. In this way both difficulties were overcome, and by the end of 1944 over 30 Coastal Command stations had the system in regular use.

The two remaining radar approach aids, BABS MK. II and G.C.A., which have already been mentioned, are for the future rather than the past. The former has been adopted as the universal system to be used by Bomber, Fighter, Coastal and Transport Commands, while the latter is being provided on a much smaller scale for the general use of all R.A.F. aircraft, because it is the simplest system from the standpoint of the pilot, and because it is still effective when all radio equipment in the aircraft - except the R/T receiver (which is almost always duplicated) - has failed. In the case of BABS II No.26 Group started installation at the beginning of 1945, and this is still proceeding as a long-term safety measure. The system shows a considerable advance over the earlier

forms of B.A. equipment in that it is completely mobile, is compact and uses for the first time on these frequencies a cavity resonator aerial system, with keyed slot radiation. The beam, once set, cannot move from the centre line of the runway.

The first service trials of Ground Controlled Approach (Mark I) were held at Elsham Wolds in July, 1943, and subsequently at Davidstow Moor. In June, 1943 the first G.C.A. Mark II was delivered at the Signals Development Unit at Hinton-in-the-Hedges, and in April, 1944, the planning of a central G.C.A. school was put in hand by Air Ministry on the assumption that the delivery of G.C.A. main equipments for the training purposes and also for deployment to selected operational airfields would be speedily effected in quantity. In August, 1944, the Signals Flying Unit at Honiley, embracing the Signals Development Unit and the new G.C.A. Wing, commenced the training of the first three operational crews. Progress was much hampered by the non-arrival of expected equipment from U.S.A., but early in 1945 the G.C.A. Training Wing moved to Stratford, and a No. 26 Group operational G.C.A. detachment was deployed on an experimental basis at Epinoy with the 2nd Tactical Air Force. Here many G.C.A. landings were effected and much successful experience was

gained. In May, 1945, Air Ministry delegated to No. 26 Group quasi-global control of G.C.A. technicians and equipment, and new plans were drafted for the allocation of G.C.A. (Mark III) to United Kingdom airfields, Tactical Air Force and Transport Command (Overseas).

The Despatch Rider Letter Service and Air Despatch Letter Service.

The R.A.F. Despatch Rider Letter Service was introduced in 1940, to provide an assured channel of communications between R.A.F. Units and formations in the event of the failure of the normal land-line and rail systems through enemy action. The administrative, technical and operational control of the service was the responsibility of No. 26 Group.

Personnel and vehicles filling the establishments necessary to operate the service were under the operational control of No. 26 Group, but administered by their local unit.

A series of trunk routes was instituted, connected by a maze of feeder lines covering hundreds of units in England, Scotland and Wales. The service gradually grew to provide a means for the conveyance of Secret and Top Secret documents and the speedy distribution of operational maps and urgently required equipment.

A considerable number of Government Departments and Army and Royal Navy Headquarters were linked with the network and in 1941 facilities were provided for United States Army and Naval formations in the United Kingdom. In May, 1942, its reputation was such that authorisation was given for the carriage of highest priority "Cabinet" mail.

During the peak period of its activities, between 1941 and 1944, the operation of the Despatch Rider Letter Service system involved the employment of some 600 airmen and 275 vehicles, and covered 13,500 miles a day. Approximately 80,000 packages of all types were sorted and despatched, and the remarkable average of one accident per 95,000 miles bears adequate testimony to the skill of the drivers.

Although the Despatch Rider Letter Service was, in fact, never required to assume the function of acting as an ultimate channel of communication, it carried a considerable amount of signals traffic which would otherwise have increased the load on the already congested D.T.N. system, and also provided a regular and reliable communications service on which Air Ministry and R.A.F. Commands and Groups placed complete reliance. The service was terminated on 15th October, 1945.

The R.A.F. Air Despatch Letter Service was introduced in May, 1944, to supplement the cross channel communications between the United Kingdom and the Continent at the time of, and subsequent to, the invasion of Europe.

The planning of the Air Despatch Letter Service was delegated to Headquarters No. 26 Group and with the exception of minor amendments the prepared plan was incorporated in the Consolidated Signals Plan for the invasion operation.

Northolt was established as the main Traffic Office in the United Kingdom, with a secondary Traffic Office at Thorney Island. Both offices were linked to suitable exchanges on the D.T.N. system and connected by frequent services to the nearest main Despatch Rider Letter Service station.

The service operated with marked success throughout the invasion and the subsequent occupation of the Continent. In the early stages, Armed Hurricanes were used, but at a later stage Ansons and Dakotas were employed.

An average of 26,000 lbs. weekly passed through the traffic offices in the United Kingsom, a considerable proportion of which was of the highest priority. Accidents were relatively few and only on the rarest of occasions

was there any loss of traffic.

It should be stated that the foregoing is only a very brief account of the work of No. 26 Group and of the stations under its control. A more detailed history is in course of compilation and will be published later.

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