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THE SECOND WORLD WAR  
1939-1945  
ROYAL AIR FORCE

# FLYING TRAINING

VOLUME I  
POLICY AND PLANNING

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## INTRODUCTION

The growth and decline of flying training covers the period from early 1933, when the Ten Year Rule<sup>1</sup> was abolished, until the end of the second World War in August 1945. For the sake of clarity and conciseness, the history has been divided into two volumes. This volume describes the overall policy and planning which governed the development of training; volume II is a detailed account of the training organization. The part played by training in the fighting of a war in the air is of supreme importance. Without the efficient flying training of adequate numbers no air war of the magnitude of World War II could have been sustained.

Before attempting to form any opinion on the policy governing flying training before and during the second World War it is important to appreciate the background to the subject. Training policy is in a sense an abstract study and cannot easily be criticised in the light of present knowledge. More than any other aspect of air warfare flying training was dependent upon extraneous factors beyond its control. Its policy was essentially governed by them and, apart from the basic ideal of maintaining a high standard of training, could not remain constant owing to their influence and also to the fluctuations of the war situation.

A certain phase of the war—the attainment of an objective or the implementing of a military plan—can be discussed objectively. In the light of what took place and the degree of success achieved, definite conclusions and criticisms may be formed, and from them lessons learned for future undertakings of a similar nature. This, however, is not possible with training because its policy was of necessity based on imponderables and assumptions. The training planners had perforce to estimate the requirements of the future, often twelve to eighteen months ahead and were, therefore, strictly subject to the changing circumstances of war which frequently could not accurately be foreseen. Almost all the major planning decisions were of a long term nature. The objectives and aims of the planners were constantly being changed and they were often compelled to revise plans and abandon or alter programmes before completion, owing to the influence of some outside factor.

The principal factors governing training policy were:—

- (a) Aircraft Production.
- (b) Manpower.
- (c) Wastage.

In the first two factors there was an almost perpetual shortage and, throughout the whole history of the subject, the controversy as to the best use to be made of the available resources is always apparent. The third factor, wastage, was often the most troublesome because of its indeterminate nature. It was never possible to accurately assess the losses which could be expected at any particular time. The scope of this narrative does not permit of digression into aircraft and manpower problems, the difficulties caused by them to the training authorities must be accepted as such.

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<sup>1</sup> An assumption, made in 1919, that there would be no major war for ten years.

At the conclusion of the first World War Britain was the leading air power with 200 squadrons, some 20,000 aircraft, and a considerable training organization. Within a few years its force had been reduced to less than one tenth, due to financial depression and disarmament. There remained, however, in the Royal Air Force a determination to maintain a high standard of training so that the wastage caused by inadequate training would never be repeated. The importance of training was stressed by Lord Trenchard, in November 1919, when he said, 'The present need is not, under existing conditions, the creation of the full number of squadrons . . . but it is first and foremost the making of a sound framework on which to build a Service, which while giving us now the few essential service squadrons, adequately trained and equipped, will be capable of producing whatever time may show to be necessary in future'.<sup>1</sup>

Although the standard of training was improved and maintained at a high level during the inter-war years, the principle of Lord Trenchard's memorandum was not fully implemented. Despite the fact that the Air Staff, prior to 1939, were of the opinion that, when it came, air warfare of maximum intensity could be expected, the Government made no provision for sufficient adequately trained reserves to man the War Training Organization. Thus, at the outbreak of war, much of the training was being carried out by squadrons and the Royal Air Force was immediately faced with the double problem of expanding the operational and training units from strictly limited resources. This was made possible by the interval following the Munich crisis which fortunately lasted until May 1940. In fact, but for this period of grace it is doubtful whether the Royal Air Force would have been in a position to provide the vital defence for the Battle of Britain.

The most critical phase of the flying training story was the transition from peace to war. This involved the change over from the specialised, individual and more leisurely training of peace time to the mass production methods necessary to produce basically trained pilots as economically and quickly as possible to fulfil the demands of war. In order to accomplish this the Empire Training Scheme was evolved and its launching was undoubtedly the most significant event of the whole war as regards flying training. During this early period the emphasis lay on the production of pilots for immediate operational needs and the planners were faced with one of the most crucial decisions they were ever called upon to make. In order to ensure an adequate supply of pilots for the future it was essential to make provision for their training without delay and yet, at the same time, cater for the urgent demands of the current situation. The fact that the planners had the courage and foresight to continue with long term plans in the face of almost desperate short term exigencies was one of the major factors contributing to the ultimate overwhelming success of the air offensive.

Following the crisis of 1939-40 came the period of consolidation and development with different problems to be overcome. Beset by shortages of aircraft and personnel the planners were forced to decide as to the most advantageous allocation of the material available. It had not yet been

<sup>1</sup> *Outline of Permanent Organization of the R.A.F.* Published by H.M.S.O. 1919. Cmd. 467.

fully realised how great a proportion of the total aircraft and personnel had to be devoted to training. As the war progressed, the size of aircraft increased and great advances were made in technical development, involving a delicate decision as to the priority of operational or training units for the first use of the latest types of equipment. Experience eventually showed that if personnel were not converted or accustomed to the equipment, with which they were to operate, until after reaching their squadrons the wastage and crash rate would be heavier. It was then that the problem of operational and conversional training assumed paramount importance, causing a considerable outlay in aircraft and personnel. More and varied training became necessary as crews increased in size and the situation was extremely complicated until the decision to adopt a one pilot policy and dispense with second pilots in bombers had to be taken. The final stage of the history was the reduction of training as the war situation improved. The great difficulty lay in estimating the respective durations of the European and Far Eastern conflicts and their possible requirements.

The outstanding conclusion to be reached regarding flying training policy is merely an extension of the principle expressed by Captain Mahan, 'If time be, as is everywhere admitted, a supreme factor in war, it behoves countries whose genius is essentially not military, whose people, like all free people, object to pay for large military establishments, to see to it that they are at least strong enough to gain the time necessary to turn the spirit and capacity of their subjects into the new activities which war calls for'.<sup>1</sup> A sound training organization, capable of immediate expansion, must above all be maintained so that the machinery is ready to meet the most sudden demands of war and to provide replacements in the event of heavy losses to operational squadrons.

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<sup>1</sup> *Influence of Sea Power Upon History.* Captain A. T. Mahan, Pages 48-49.



**PART I**

**THE INTER-WAR PERIOD 1919-1939**



## CHAPTER 1

### THE PRE-EXPANSION ERA, 1919-1933

The experience gained in the first World War governed the policy of the post war period despite the drastic reduction of British air power and the long period of financial and political restrictions. The strength of the training system lay in the well learned lesson that before the pilot could fly he had to be thoroughly instructed in the principles of aeronautics. After experience of the vicious circle of inferior training, giving rise to heavy casualties which in turn demanded urgent replacement by yet more hastily trained men, the Gosport system under Colonel Smith-Barry set the pattern for the future which the second World War was amply to justify. Air training as disseminated throughout the Royal Air Force by the Central Flying School, the successor of the Gosport School, achieved and maintained an international reputation of the highest class for a standard of instruction in basic flying skill and general level of pure flying ability. For this reason the system of versatility in the pilots manning the operational squadrons during the inter-war years was enabled to function most reliably and permitted the attenuated air forces to fulfil their task with efficiency. The equipment which came into use under this system was likewise based upon this same idea of general purpose and represented improved versions of the war time aircraft and equipment.

The air forces of the inter-war years were designed to meet Imperial commitments in any part of the world, either in policing vast and backward areas, in internal security, pioneering air routes, or in representing the air component of the armed forces of Britain, whose function it was to meet any threat from other powers. In addition to meeting these demands, the first line units had the task of receiving newly trained pilots and training them in particular unit functions: the part time air gunner or observer element was found and trained from within the unit resources of technical tradesmen, who had thus in peace a dual role. A further measure of economy and useful employment was the training, by first line units, of a constant flow of short service officers who, after completing their term, passed into the reserve. Sergeant pilots were also trained, returning afterwards to their parent trades. Finally there existed the Auxiliary Air Force which undertook both the flying and operational training of 'weekend pilots' and whose existence represented a valuable potential, particularly for Home Defence.

The Royal Air Force of those years was as much a training organization as a garrison or police force and one whose activities were the more valuable because they created a cadre of seasoned pilots who had, by reason of overseas service under varied and difficult conditions, attained a high degree of flying skill, practical airmanship and operational knowledge so far as the equipment and work allowed.

### **The Training Organization in 1933**

By the end of 1933 the Royal Air Force consisted of 74 squadrons world wide, including the auxiliary and reserve squadrons, and backed by a training organization which produced approximately 300 pilots a year. The training organization consisted of four schools : the Royal Air Force College, Cranwell, which trained permanent officers ; and No. 3 F.T.S., Grantham, No. 4 F.T.S., Abu Sueir and No. 5 F.T.S., Sealand, which trained short service officers and airmen pilots. There were, in addition, a few small units such as Calshot, Leuchars and Old Sarum which were used for specialist training in flying boat and army co-operation work. There was no training outside a heavy bomber and transport squadron for the multi-engined types. The control of training in the Royal Air Force was spread, on a lower level, throughout the general service structure. From the Air Ministry level it was divided between the departments of the Air Member for Personnel, as an aspect of personnel efficiency, and the Air Staff, who took over the responsibility for unit efficiency.

Prior to the expansion, with the exception of Cranwell Cadets, who underwent a two years course, pilots in their one year of training did a two weeks disciplinary and ground training course at the Royal Air Force Depot, Uxbridge. This was followed by a ten month course at a Flying Training School during which time they did up to 150 hours flying in two stages, *ab initio* and advanced. In the first stage they flew in the training type (Avro Tutor), and in the latter they were instructed on the same kind of aircraft as those in general use in the Service, although these were mostly older or obsolescent. After selection by interview with a board the pilots went to their squadrons for applied training and learnt night flying, navigation and armament. In the case of the more specialised roles there was an intermediate course at a training establishment such as the Schools of Army Co-operation, the Flying Boat Training Squadron or the Air Pilotage School. In general, however, the difference between bomber, fighter or co-operation roles was comparatively small and there was thus a fairly smooth transition from flying training to squadron training, except for the multi-engined types. The roles of the squadrons and the wastage incurred by time expiring, sickness and reversion to trades were fixed so that the small flying training organization was quite adequate to support the first line squadrons.

In addition there were the tradesmen who were trained in their own squadrons as part time air gunners. These represented a much smaller proportion, since they were required only to man those squadron aircraft in active use at any one time, and the initial equipment strength of aircraft in squadrons world wide was less than a thousand. When these facts are compared with the figures of training production covering the period September 1939 to September 1945, it will be seen that a total of over 117,000 pilots (and 209,000 other aircrew) trained during the war period of six years represented a considerable increase of which for pilots alone jumped from an average of 300 to over 19,000 a year. These are facts beyond dispute, but even they hardly tell the full story because there was first of all the technical revolution to consider which took place simultaneously, during which time the old air force equipment was swept away even from the training units and which necessitated increasing the aircrew

categories from two (the pilot who was responsible for most functions, and the straight air gunner) to five main categories with all their specialised sub-divisions.

Not only was there the necessity for a great change in organization and equipment, but there was the fact that the process of re-equipment and re-organization was continuous and that it took place while fighting on a major scale in several theatres was in progress and while training activities were under direct and indirect enemy interference.

### **Reserve Training**

So far as Reserve training went, the main aim of the post 1914-18 war service was an efficient nucleus with a large reserve but, although provision had been made for this reserve in 1919, it was not until 1922 when the short service idea was maturing, that a comprehensive scheme for Reserve training was drawn up. In January 1923 it was approved and four civilian operated schools, each with an allotment of 70 pupils, were opened. The syllabus varied with the experience of the individual, but it consisted chiefly in dual flights in an elementary type such as the Avro with five hours solo on the service types such as the D.H.9 or the Bristol Fighter. The training period was roughly six weeks and the minimum total flying was 12 hours. The subsequent annual course was 12 hours on service types with such dual instruction as was necessary. This system lasted until 1933 and the size of the Reserve, as permitted by the Treasury, was 700 pilots.

As the supply of war time pilots dwindled, in order to retain the numbers direct entry reservists were accepted and their training began at the end of 1925. After an initial period of 30 hours flying instruction in the first year, reservists passed to the normal annual training. The intake was 50 per year until 1927 and was then increased to 60 per year up to 1933 when the reserve of pilots was increased under Treasury sanction to 1,500. In that year, owing to considerations of economy, the four civil schools went over to purely light training types of aircraft (Tiger Moths and Blackburn 2's). This economy enabled the annual training course to be extended from 12 to 20 hours solo flying and the initial course to be increased from 30 to 50 hours. This re-organization came just before the revision of training in 1934 which is described later.

### **The Dominion Air Forces**

During the first World War a considerable Overseas Training Scheme was launched. This was the background to the Empire Air Training Scheme. In Canada it began late in 1915 and by July 1917 there were 15 training squadrons. When the United States entered the war in April 1917 arrangements were made for Canadian training to be carried out in Texas during the winter by 10 squadrons, and in the same way 10 American squadrons did their work in Canada during the summer. By 1919 the Canadian organization had grown to four wings of five squadrons each, plus specialist schools, and by that time 200 trained pilots per month were being sent to Britain. Australia had established a Central Flying School at Point Cook before 1914 and had produced four squadrons by 1916-17. In addition there was also a training wing in Britain by 1918, entirely manned by Australians. New Zealand had two schools for training pilots during the 1914-18 war, but South Africans were trained either in Britain or in Egypt.

Thus a large proportion of Dominions personnel served in the British Air Forces in the first World War, although only the Australians had separate units of their own. The precedent therefore existed for overseas training and this undoubtedly was a factor when serious negotiations were begun after the start of the second World War. As will be seen, the financial considerations involved and the growing political consciousness of the Dominions provided obstacles during the initial stages. However, after 1919 the same drastic reduction of air power took place in all the Dominions, as in Britain. Each country formed its own air force in accordance with its domestic requirements; nevertheless each was reduced to a cadre with a small training backing and relied upon the creation of a Reserve to meet an emergency. The only overseas training unit which remained to the Royal Air Force was No. 4 Flying Training School at Abu Sueir which was formed in April 1921.

### **Training Policy**

Despite the limitations of the inter-war period the Air Ministry policy was that what little remained of the Service should be well trained and that the training organization should be in the form of a framework ready for possible future expansion. Any resources remaining after day to day Service commitments had been met were devoted to research and experiment. The advances made during this era, as evident in the winning of the Schneider Trophy by Britain, by the evolution of the super-charger and the gaining of the height record did much to prepare the Service mind for the technical revolution which was to follow.

More important, however, than even those considerations was the development of those doctrines of the Service which were the main spring of policy and action when the time came to recreate the air power of Britain, her Commonwealth and Empire. The flying training organization was vitally essential to the production of air power to an extent previously unparalleled—air power, as applied to the war at sea, on land and in the air, using in divers ways a complexity of equipment, each with its own special difficulties. The output of training policy and organization kept pace with the growth and diversity of air power, both in quality and in numbers. It provisioned against the delays attendant upon wide dispersal and perilous communications; it replaced the toll of heavy casualties as they occurred and it provided that margin over expenditure and immediate planning which enabled long term projects to be undertaken without consideration so far as skilled men were concerned. The expansion of air power was limited by the national resources and by the competing demands of other Services and industries, but not by the lack of adequately trained men, gathered together at the correct time and in the correct place. This would not have been so had not the Service been based on such doctrines and directed with a policy so consistent that the parallel growth of first line and training could proceed along predestined lines to a predicted end.

The inter-war policy of flexibility and the general duties idea meant that the nucleus of officers, whether engaged in training, operations, staff or active flying, had a common doctrine and view point and therefore a reserve of knowledge and understanding of the harmonious development of air power. This harmony extended not only throughout the Royal Air

Force but, by means of exchange postings, liaison visits, advisers and individual contacts, to the Dominions as well. There was thus a state of wide mental preparation which did much to replace material limitations and which allowed the air forces to expand as planned with remarkable speed, in spite of the many and perplexing handicaps in the detailed measures which had to be taken.

After 1919 the Air Ministry refought and won the battle for independence which alone would permit a standard doctrine, unified technical development and co-ordinated control. There was none of the subordination to other arms, with all its dire consequences such as befell the Luftwaffe, none of the complications of the early R.F.C. days, but a clear idea of the aim and purpose of a flexible, balanced and economical weapon. Royal Air Force air training, therefore, was based on a far wider concept and directed with a far steadier purpose than that of its rivals and owed much of its success to this fact.

There was, however, an adverse side to the subject during the days of political neglect and financial restriction. The clear sequence of training from the selection of the individual to the time when he could play his full part on active service was obscured by the manner in which operational units had become entangled with training. There was no centralised direction and co-ordination, no authority to represent training as a single problem and no clear idea of its long term needs with regard to equipment or personnel. Gradually Service thought adapted itself to the embryonic proportions of post war administration, and experience of the tasks involved in the handling of large masses of men and material, the wastefulness of modern war and the ponderous nature and complexity of great organizations, became obscured. The practice of reducing every idea and its requirements to a money problem had given a false basis and over-rigid mould to the staff mind when plans for total war in competition with a methodical and practical enemy became imperative. Finally, when first line expansion received its initial impetus, insufficient weight could be given to training needs, and it is possible that the dual function of the squadrons had been half forgotten so that measures to replace their training potential were not undertaken soon enough when demands upon them necessitated their release from training tasks. When the problems of applied training became more obvious, both time and material resources to remedy this condition imposed handicaps which nearly proved disastrous.



## CHAPTER 2

### THE PRE-WAR EXPANSION ERA, 1934-1939

There now succeeded, after 1933, a period of expansion in answer to the obvious failure of collective security measures and the weakness of the war-time Allied Powers of Europe. In the Far East, Japan had begun her chauvinistic career and in the West political events shaped towards an even greater peril. Thus it was that on 23 March 1932, the Cabinet decided to abolish the 'Ten Year Rule' which, since it was first laid down in 1919 had postulated the assumption, renewed periodically, that there would be no major war for ten years. This event marks the start of the history of flying training in the Second World War, for it set in motion those measures which culminated in the training during the war of over 300,000 men of the British Empire as aircrew, over two thirds of whom received their basic flying instruction under the various overseas training schemes.

#### **The First Expansion Plan, February 1934**

In February 1934 expansion began with the Defence Requirements Committee plan for the provision of 40 additional squadrons to the existing Royal Air Force as a whole and in particular to raise the strength of the Home Defence forces to 52 squadrons by 1940. In actual fact 'a modest upward trend' in the shape of four squadrons, of which two were for Home Defence, were sanctioned in the Estimates of March 1934. At the outset expansion was of the 'shop window' variety. The number of squadrons was increased without consideration for the creation of sufficient backing to make them efficient in war or to sustain their strength in trained fighting personnel in the face of operational casualties. The expansion was therefore unreal, and this was chiefly due to the fact that the cost of creating a true measure of air power whose depth was in proportion to its breadth was such that it was avoided. It was not certain how far expansion would have to be taken before its purpose as a deterrent to German aggressive tendencies was achieved. Each of the earlier schemes was produced under the same policy: it set a limit in numbers and in time which it was hoped would achieve the purpose on a short term basis of intensive preparation to be followed by a more leisurely period of consolidation. It was not until expansion had been in progress for some two or three years that it became reasonably clear that no such period of consolidation was to be expected but that the succession of ever-larger expansion schemes was in fact preparation for war. This realisation materialised in the increasing amount of national resources which went into the organisation supporting the first line.

The Defence Requirements Committee plan was succeeded by Scheme 'A' in answer to the German plan for the creation of an Air Division of 400 first line aircraft. The programme, to be completed within two years, involved the addition of 33 squadrons for home defence and 7½ squadrons for the Fleet Air Arm and for overseas requirements. To back this increase, a thousand more pilots were required in addition to the annual output of 300 a year, and this implied the opening of two more flying training schools. These events brought about the first re-organisation of training.

### **Incorporation of Civil Elementary Schools**

The Director of Training made some far reaching proposals for increasing the training potential by transferring the first elementary stage on light aircraft to the civilian operated schools which had been carrying out the training of the reservists. By this means the Service operated flying training schools could then carry their pupils forward on to more advanced work and thus free the squadrons of much of their individual training tasks.

In this development there were two objects ; the first was to make use of civilian resources outside the Service, an expedient which not only harnessed valuable potential, but which also enabled some of the restrictions of finance to be avoided. The second and most important object was to enable the training organization to approach more nearly to the ideal of producing a pilot who was capable immediately of taking his place, without further training, in the full activities of his squadron. Actually this ideal was not realised in full until the 'New Deal' re-organization of early 1942 but the first step to close the gap between training and the first line standards had been made. There was also, within this concept the idea that this plan would lay the foundations of the war training organization, thereby removing the radical difference between the peace and war systems of training and thus facilitating smooth transition in the event of war.

As the original plan stood, the net result would have been an increase in the duration of the training period by the amount which was done in the civil schools. As this raised the cost considerably and decreased the period of effective service of the short-service personnel, both the civilian and the service course length were reduced in order to keep the total duration of the training to the original period of a year. At the same time the pupil populations were increased from 80 to 96 at the flying training schools. The organization was to consist of 13 civil schools and six service schools.

The re-organization plan as amended was approved in June 1935, but in the meantime Germany had claimed that she had achieved air parity with Britain (approx. 1,000 aircraft) and that her next object was to equal the French first line of some 1,500 to 2,000 aircraft.

### **Expansion Scheme 'C', May 1935**

The answer to this situation was Scheme 'C' which planned to raise the Metropolitan Air Force from 85 squadrons under Scheme 'A' to 123 squadrons (or 1,512 aircraft) and the overseas squadrons to a total of 27 (292 aircraft). This programme was to be completed by the end of March 1937, an acceleration of two years over Scheme 'A'.

As was pointed out by the Chief of Air Staff, this programme was purely a show of force to act as a deterrent ; it was basically unsound in that although it had improved on the first line balance of Scheme 'A' by including a greater proportion of bombers, it suffered from the same grave defect in that it made but small provision for backing in depth. As it stood, the Royal Air Force could not sustain war attrition owing to the limited peace-time production capacity of the aircraft industry. It was in this direction therefore, that first expansion efforts for increasing the depth of the Royal Air Force organization were directed.'

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<sup>1</sup> C.A.S. Archives. DCM(32)145, 2 October 1935.

### **Trainer Aircraft Production**

The aircraft industry had suffered the same fate as the Service during the inter-war lull, and great difficulty had been felt in keeping in existence the vital nucleus of experienced personnel of the established aircraft firms. This had been accomplished largely by concentrating on a limited number (up to 20) of firms and by keeping them going by small orders for prototypes and for the limited numbers of aircraft required for the Service. Competition between the firms, which might have caused the ruin and disappearance of some, was avoided by the expedient of having competition only at the design stage. The firm whose prototype was successful was then rewarded by obtaining orders for quantity production. This was an expensive procedure for the Air Ministry but was the only way of keeping the firms in existence and at the same time of ensuring that research and development was kept in train, and it had the great advantage of retaining a nucleus for expansion. From the training point of view, however, it was unfortunate that the same degree of research and development in the complementary training types was not similarly in evidence. As expansion proceeded there was the utmost concentration upon the expansion and deployment of industrial resources for the manufacture of operational aircraft and of equipment for the air forces generally. Unfortunately, the sole advanced training aircraft designed to prepare pilots for first line aircraft, proved a failure.

The trend of British air re-armament at this stage was towards the high speed monoplane which won the Schneider Trophy powered by engines which showed a marked advance on their predecessors. In addition the development of the retractable undercarriage, flaps and improved blind flying aids all tended to complicate the training problem. The gap between the pilot trained on the Hart variants and the entirely new types under development suddenly increased to such an extent that the equipment of the training schools was rendered completely obsolete and unsuitable. In addition there arose the need for a training aircraft incorporating in simpler form all those new characteristics which were demanding a new technique in engine handling, particularly on multi-engined types, as well as the new methods of blind flying and approaches and landings. In 1935, of course, this revolution, so far as Britain was concerned, was still in the embryonic stage. Nevertheless the problem was realised as being of immediate concern. Of particular moment was the question of twin-engined experience and night flying. Already in August 1934, the A.O.C.-in-C., Air Defence of Great Britain in a letter to the Air Ministry had drawn attention to the problem of training pilots for the five night bomber squadrons, and he also envisaged this problem extending to all aspects of service flying, thus necessitating the subjects of twin-engine flying and night flying being taught in the Flying Training Schools.<sup>1</sup>

By August 1935, after the re-organization of training, this commitment was recognised when it was realised that pupils with as little as 20-25 hours' flying were capable of profiting from this instruction. Though these problems were fully appreciated at an early stage of expansion the difficulty was that the Flying Training Schools were only equipped, as already stated, with obsolete single-engined types. The Director of Training in June 1935 wrote a paper on this matter to the Chief of the Air Staff in which he dealt

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<sup>1</sup> A.M. File 325263/34.

with the prospective increase in the near future in the demand for twin-engined trained pilots. He tended, quite rightly in the light of subsequent events, to minimise the difficulties of conversion to twin engines. The question of an added stage in training was discussed, but was dismissed at that time because of the delay which would occur if pilots were to arrive at their squadrons in time for these units to form according to programme. It was also essential, in preparing for training expansion, to keep the number of new training units as low as possible in order to lessen the difficulties of providing equipment, accommodation and skilled ground personnel. It was, however, recognised that training for twin-engined squadrons was an essential link in the chain of war training and that eventually it would have to be seriously considered when time and resources permitted.

By September 1935, however, it was realised that the twin-engine training problem was of immediate urgency and a specification for a monoplane, high performance trainer was laid down. The upshot was the modification of the Anson and the Airspeed Envoy (later known as the Oxford) and the Flying Training School syllabus to include the training of one third of the pupils on twin-engines during the second half of their course. The first schools to be equipped with Ansons were No. 3 Flying Training School (Grantham) and No. 6 Flying Training School (Netheravon) in November 1936. Although the significance and implications of the technical revolution taking place were appreciated the need to establish a clear ratio between the multi-engined operational aircraft being produced and the training aircraft of appropriate type necessary to train an equivalent number of pilots to man those aircraft was not realised. Nor apparently was it appreciated that these special training aircraft had to be produced in advance of the complementary operational types.<sup>1</sup>

#### **Training Backing for Scheme 'C'**

In order to reach a first line of 1,512 aircraft by April 1937, it was necessary to provide a further 2,000 pilots within rather less than two years. To achieve this figure, it was necessary to increase the number of Flying Training Schools from the existing six to eleven, and this was done by March 1936. Thus began the process of creating machinery for supplying that constant flow of trained men without which the first line could neither expand at the rate dictated by the factors of supply and organization, nor sustain the drain of casualties in the event of war while this expansion was in train. But a new problem arose—the shortage of instructors. There were not enough seasoned pilots both to provide the essential stiffening, training and leadership element in the squadrons and at the same time to man the growing number of flying training establishments. Theoretically, in order to provide the necessary flying instructors, 40 per cent. of the first line pilots would have been needed, that is, if existing training standards were to be retained. In fact, the re-organization of training, by bringing in the civilian instructors, eased this situation, but even so the 'ideal' length of 13-14 months of the pilots' training course was cut to a year and later to 9 months. In this way, the essential needs of the first line were met while the minimum of service instructors was provided. The new system of training started in August 1935 at the original 4 civil schools and a further

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<sup>1</sup> Ibid.

nine opened in the following six months. This enabled the service schools to concentrate on military flying training for which they were equipped with the obsolescent service types of the Hart variety, a few elementary aircraft being retained solely for instrument flying.

Under the new dispensation, the course for the regular personnel at civil elementary schools lasted normally for eight weeks (10 in winter) during which a minimum of 25 hours dual and 25 hours solo flying was carried out. At this stage the pupils were civilians although paid by the Air Ministry. The serving airmen element, i.e., those comprising the sergeant pilot pupils under the old *ab initio* scheme, wore plain clothes, were given allowances and lived out under their own arrangements. On completion of the civil flying course, the pupil pilots were sent to the R.A.F. Depot at Uxbridge for two weeks' disciplinary training before proceeding to their Service F.T.S. The flying training school course was divided into two terms, i.e. the flying training (renamed Intermediate training in 1937) and the Advanced Training Squadrons. Pupils spent 13 weeks (15 in winter) and flew about 50 hours in each term. A new course was accepted every three months and the size of the course was 48 pupils (i.e. a total training population of 96). The civil schools were affiliated to individual F.T.S.s for the purpose of continuity in the instruction of pupils.

Under the new arrangements, much was done to relieve the service squadrons of the individual training tasks which had been theirs. Navigation training covered map reading and elementary dead reckoning work, in the intermediate stage, and during the advanced stages much preliminary armament training was done, culminating in a month's attachment to an Armament Training Camp. In addition the syllabus covered photography reconnaissance and formation flying. A new feature was the introduction of night flying and twin-engine training. These items however, represented more a gesture than an effective improvement chiefly owing to difficulties of supply, airfields and administration. This aspect will emerge more clearly as the narrative proceeds, but it will be realised that the lack of sufficient night flying experience during training and the failure of the supply of twin-engined advanced trainers were chiefly responsible for the complaints of Bomber Command in late 1941 that, although 95 per cent. of the flying of that Command was done at night, 95 per cent. of the hours spent in flying training was carried out in daylight.

#### **Summary of Early Expansion 1934-1935**

The end of the year 1935 may be said to see the close of this period of the preliminary expansion. Shortly the tempo of preparation was to quicken, Scheme 'F' was maturing and was soon to be launched. This scheme was the first which came nearest to satisfying the true aspirations of the Air Staff within the limits imposed from an authority still higher than the Air Ministry. Although the first line lacked the depth which only the adequate harnessing of national war potential could give it, at the same time it can be seen that proper steps within the political limits imposed were being taken. Of these, the re-organization of training in late 1934 and early 1935 was the most significant. In the stimulation of Reserve training, there was also a great improvement in the potential of trained pilots. Under Treasury authority given in 1929, the reserve of pilots was

fixed at 1,500, but in April 1935 there were 1,448 pilots of the R.A.F. Reserve of whom only 137 were fit to go to squadrons on mobilisation. By the end of that year, however, the Reserve consisted of 2,307 active pilots, 574 not in training, 268 Auxiliary Air Force and an estimated 1,300 civil pilots.<sup>1</sup>

#### **Expansion Scheme 'F', February 1936**

During 1935, from information received, it had appeared that although Germany was not likely to be ready for war before 1939, her preparations constituted a growing threat which could not be ignored. At the same time, new developments in aircraft design made it possible for a considerable increase to be made in the effective striking power of the first line. Certain changes in the composition of the force under Scheme 'C' were therefore proposed. These changes also envisaged an increase in numbers and an earlier completion of the existing programme in order that by the end of 1938 the Service should have advanced its state of readiness to the largest possible extent. Within these proposals there were naturally many significant practical measures contained and, with the usual concession to the Treasury in the shape of a cut of two overseas squadrons, the measures known as Expansion Scheme 'F' were approved by the Treasury on 25 February 1936. The target was now 124 squadrons comprising 1,736 aircraft by April 1937, (a slight increase on the former 123 squadrons) but the warning that Germany would scarcely be content with less than 2,000 first line aircraft could not be ignored.

Scheme 'F' had the distinction that it ran its full course and was the only pre-war expansion programme to be completed. In addition, under the measures proposed, the light bombers were eliminated and the bomber striking force was strengthened since now it was to be composed entirely of heavier types of longer range and higher performance. There was a great increase in the sanctioned reserves of war material, and above all, for training, the most significant feature was the recognition of the need to have an adequate Reserve training organization. This resulted in the formation of the R.A.F. Volunteer Reserve which planned to recruit and train a total of 8,100 pilots, observers and wireless operators (air gunner) by the end of 1938. So far as Regular requirements were concerned, Scheme 'F' as it developed during 1936 and 1937 demanded over 4,000 more pilots and 1,264 observers in the four years 1936 to 1939. Translated into terms of flying instructors, these figures meant that if the sequence and length of pilot training were left unchanged, about 10 per cent. of the experienced pilots in the cadre of the Royal Air Force would have had to be withdrawn to meet Scheme 'A', whilst, as already explained over 40 per cent. would have had to be withdrawn from units to meet Scheme 'C' and its modified version (Scheme 'F'). This formidable call with its unacceptable effects on the rest of the Royal Air Force was modified by using service instructors for the minimum of instruction and by keeping the numbers to be trained down to the least figure which would man the expanding first line. By these means and the progressive shortening of the training course and the increase in pupil population, the withdrawal of seasoned pilots was kept down to 20 per cent, but the limitation thus imposed on training expansion was felt later.

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<sup>1</sup> A.M. File S.36677.

The provision of training aircraft was a similar and parallel limiting factor. Had the amount of instruction and the number of pupils not been kept down Scheme 'C' would have required more training aircraft in schools than the Royal Air Force possessed for all purposes. The aircraft industry was hard pressed to turn out the operational aircraft required for first line expansion and re-equipment and had little margin for building trainers. Training expansion had therefore still to be done with as few aircraft as possible and even those few had to be mainly of such obsolescent types as the Hart and its variants. However, by means of the various expedients which have been described, in the middle of 1936 the annual rate of output had reached over 1,500 pilots a year compared with the 300 a year during the pre-expansion period. It must at this stage be explained that Scheme 'C' envisaged stabilisation by 1937, when three of the eleven Flying Training Schools (excluding Cranwell) would close down and the length of course which, in late 1935 had been reduced to six months, would be extended to nine months in the remainder of the schools. However, Scheme 'F' did not contemplate stabilisation until 1939 and the three schools remained open to train the additional pilots needed under the latter scheme.

#### **New Crewing Policy, April 1936**

Preparations quickened at the beginning of 1936. The rate of output, and the re-organization of pilot training has already been mentioned and it is now necessary to indicate the growth of training activities in the direction of the observer which had also been brought about by the rapid improvement in the performance of the new aircraft about to be introduced into the service. Under the old system which was a legacy of the first world war, the pilot was responsible for navigating his aircraft and for dropping the bombs. The new heavy aircraft envisaged tended to make the actual flying function a full time occupation and the navigation and bomb aiming had perforce to be delegated to another man. At the outset there was resistance to change in this respect, but the practical problems involved eventually forced the issue. The speed and range of the new aircraft had made the navigation and bombing function much more concentrated, fast working and complicated, and this resulted in the introduction of the aircrew category of observer and the opening of the first Air Observers School on 1 January 1936. This was the first training establishment which included the training of non-pilot aircrew. At first only armament subjects were taught to the observers and navigation training was carried out in the squadrons, and it was not until the end of 1937 that a navigation course for observers was given in the civil schools before the Air Observers School Course. Navigation training at the Air Observers School was still reserved for pilots destined for coastal work, and it was not until later that the general flow of pilots, apart from those on the maritime squadrons was freed from the navigation function.

Early in 1936 the crewing of aircraft was laid down by the C.A.S. as one pilot and one observer (with a wireless operator and/or air gunner where necessary) for bomber and two-seater fighter aircraft. For Coastal aircraft (G.R.) the crew was to be one pilot and a navigator who was also a pilot. This was a beginning of the aircrew as it later developed. Whenever possible, bomber aircraft were given two pilots and special provision was made for

the navigation of those bombers which could not carry two pilots by a special course of navigation training for observers.<sup>1</sup> It can be seen from the foregoing that navigation was still struggling to emerge as a full time special function for aircrew and that the tradition that the pilot should be responsible for it, was hard to overcome. It was not, in fact, until May 1939, that the policy of making the observer fully responsible for navigation was finally decided.

#### **Early Proposals for Overseas Training**

Little resulted from the first efforts to extend training facilities overseas at this particular time (March 1936) but discussion with certain Canadian business men on the subject of the construction of aircraft in Canada led to consideration of obtaining pilots from the Dominions.<sup>2</sup> Certain proposals had previously been put to the Canadian Government for 15 cadets a year to be trained in Canada and then to serve for five years in the Royal Air Force after which they would join the Canadian Reserve. In addition there was a proposal for 25 officers to be selected in Canada to be trained by and for the Royal Air Force. Neither of these proposals had by that time been answered but it was understood that 15 cadets had been entered for training in Canada in January 1936, and were to be sent to Britain at the end of the year. The Australian Government also proposed to send 50 officers in 1937 and 25 a year thereafter. New Zealand had also some similar idea in train but South Africa were not in a position at that time to do anything.

Small beginnings were therefore being made, although they bore no relation to the final great wartime scheme. However the building up of aircraft industrial potential in Canada, Australia and New Zealand at that time constituted an important step because the success of a training scheme was later to be shown to have depended largely on the industrial resources immediately available in the vicinity of the training area.

#### **Changes in the Royal Air Force Organization, May 1936**

In May 1936, there occurred a general re-organization of the Royal Air Force which had a deep significance for training because as a result of the measures involved, it began to assume a more homogeneous shape in the body of the Service.<sup>3</sup> Briefly, because of the need to get the higher peace organization into a form more suitable for that of the war organization, it was resolved to decentralise from the Air Ministry many of the functions and responsibilities which it had perforce to assume in the early formative years. Thus it was laid down that the Air Ministry should be the policy making body and that the chain of command should go through Commands, Groups and Stations. The existing 'Areas' were to disappear and to be replaced by Commands and Groups on a functional as opposed to a geographical basis. On 14 July 1936, Bomber, Fighter, Coastal and Training Commands came into existence.<sup>3</sup>

Although the operational Commands started without much trouble, Training Command had initial difficulties because so much decision and policy not necessarily on the highest level was retained in the Department of Training in the Air Ministry.<sup>4</sup> This was chiefly due to the pressure of events, need

<sup>1</sup> A.M. File S.40289.

<sup>2</sup> 31st Expansion Progress Meeting.

<sup>3</sup> A.M. Files S.35818 and S.35981.

<sup>4</sup> A.M. File S.38529.

for continuity in staff functions, and to the fact that Headquarters Training Command was not established with sufficient staff officers to handle the work of the Command. While under the old system of Areas, training units had been scattered throughout the organization they were now chiefly assembled in the new Training Command in place of the old Inland Area which had contained a large proportion of training units. Unfortunately under the new system, many units outside flying training were also inherited, from the Inland Area. There were in fact contained in the new Command the elements of what were later to become three other separate Commands, viz., Technical Training, Reserve and Maintenance Commands. This added greatly to the complexity and burden of its task. Incidentally an important bloc of maritime flying training units remained with Coastal Command. It was originally intended that these also should be transferred, but, owing to the pressure on Training Command at that time, this was not done.

In short, then, Training Command had difficulties under the new organization which were not resolved until February 1938 so far as adequate staff organization was concerned, and later still with regard to relief from the responsibility for the maintenance depots, ground training units and above all, for the difficult problems entailed in the great expansion of Reserve training activities which preceded the outbreak of war.

#### **Institution of the Royal Air Force Volunteer Reserve**

This stimulation of reserve training activity, brought about by the ever-increasing demand for numbers, had made it apparent that the existing machinery for the training of the Reserve at the civil schools was not adequate, and for this reason a proposal was made in February 1936, for a Royal Air Force Volunteer Reserve which would have a wide appeal and which would be based upon the Citizen Volunteer principle with a common mode of entry and promotion and commissioning on merit. This scheme was designed to recruit 800 men a year in each of the three years 1936 to 1938 for training as reserve pilots together with a total of 2,500 observer and 3,200 wireless operator (air gunner) trainees over the same period. Provision was also made for the direct entry of civilians for training in other branches (such as Signals, Equipment and Engineering).<sup>1</sup>

So far as aircrew training was concerned, the system was based upon local town centres for spare time ground training and upon aerodrome centres associated with the town centres for flying training at the weekends, also for a fortnight's annual camp. The importance of the proposals and the decision to embark upon so wide an extension of air training stands as one of the chief landmarks of 1936. So far as Training Command was concerned, it represented a serious burden which was imposed on it at a difficult time. From the point of view of numbers, some indication of the size of the commitment will be seen when it is realized that by April 1935, the size of the R.A.F. Reserve was 1,448 pilots, of which two-thirds required at least three months training at an F.T.S. before they were fit to go forward to a squadron. In addition there were roughly 150 Auxiliary and 1,300 civil pilots likewise needing varying forms of training. Finally the commitment

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<sup>1</sup> A.M. Files S.37628 and S.35435.

to recruit and train 2,400 civilians as pilots represented a very heavy task at that particular juncture, necessitating a completely fresh organization with all that that implied.<sup>1</sup>

Although the R.A.F.V.R. Scheme had been sanctioned in August 1936 it did not start at the Civil Schools until April 1937. The delay had occurred because of the lengthy and complicated procedure in drawing up contracts with the civil flying firms and for the acquisition of the buildings for the Town Centres. When Royal Air Force training had been re-organized in 1934-35 the nine new civil flying schools involved had come into operation over a period of two and a half to six months, and it was thought that the R.A.F.V.R. Scheme would form under similar conditions. Owing, however, to a new procedure whereby eight of the new schools were to be run under a management contract with aircraft owned by the Service and run by the firms, many and unforeseen complications arose.<sup>2</sup> There was no departmental obstruction, but the new conditions involving detailed contracts with more individuals and involving more government departments wasted a great amount of time.

In short, although it had been planned to train 800 pilots a year in 1936, 1937 and 1938 at 13 existing and 20 new civil schools, plans were modified and the revised programme provided for an entry of 1,200 pilots in 1937 and a further 1,000 in 1938, and the recruiting of observer and wireless operator (air gunner) trainees temporarily shelved. The first batch of 50 pupils were attested in January 1937 and started training in April at 12 of the 13 existing civil schools. By June 276 pupils were carrying out this training. By 7 October new civil schools opened and by the end of 1937 the strength of the R.A.F.V.R. was 845, of whom 150 had qualified to fly solo on Hart aircraft. This was made possible by the fact that the aim of V.R. training was to bring the pupils up to the standard of the Intermediate Training Squadron at the F.T.S. For this reason, the civil schools, previously established only with elementary aircraft received service aircraft in the summer of 1937. So far as the Town Centres (for evening ground training) were concerned, although by July 1937 there were none, by the end of the year two had opened.

#### **Expansion Scheme 'H'**

By October 1936, the Air Staff were in possession of evidence which suggested that the German programme had been increased to one of 2,500 first line aircraft (including 1,700 bombers) by April 1938. To meet this programme a new Scheme ('H') had been devised and submitted to the Cabinet in January 1937. The aim was to have a bomber force equal to that of the Germans and a fighter force adequate to meet the probable scale of attack, and to accomplish this, it was proposed to raise the first line strength of the Royal Air Force from 1,700 aircraft under Scheme 'F' to over 2,400 (145 squadrons) by April 1939 and ultimately to about 2,500 aircraft.<sup>3</sup>

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<sup>1</sup> A.M. File S.36677.

<sup>2</sup> E.P.M. 22 (37).

<sup>3</sup> C.P. 18(37).

This scheme, while giving further impetus to expansion as it was running, and continued to run under Scheme 'F', was a further unreal 'shop window' display involving manipulation of reserves. The only real accession of strength lay in the measures to increase the establishment of squadrons from 12 to 18 aircraft and for the addition of 11 new bomber squadrons. In putting the programme forward the Air Staff drew attention to the dangers of increasing the first line without a complementary increase in backing in the event of its having to suffer war wastage. In the end, owing to German propaganda and to the practical limitations set on the rate of expansion, the scheme was withdrawn, but not before sanction had been given for increased supplies of personnel for ground and air training, and for the construction of 13 more airfields. At that stage, it was aircraft supply which dominated planning, and the withdrawal of Scheme 'H' made a virtue of necessity.<sup>1</sup>

In the direction of training, the impetus given by Scheme 'H' continued to be felt. During discussions on that programme the fact was revealed that had war broken out in January 1937, there would have been an accumulated deficiency of 1,300 pilots by May 1939, on the basis of estimated wastage. This emphasised the need for long range planning on a large scale for the provision of pilots, especially as the Chief of the Air Staff ruled that as soon as squadrons could be equipped with the new types of heavier bomber aircraft, entailing a reduction in squadron aircraft establishment from 18 to 14, two pilots should be carried in each aircraft.<sup>2</sup>

#### **Further Consideration of Dominion Potentialities**

Under the abortive Scheme 'H', it was the question of the supply of personnel which most received attention. Doubts were expressed as to whether the additional personnel required under the scheme would be easily obtainable, particularly pilots and apprentices, seeing that under this programme 10 per cent. of the total annual output of the public and secondary schools of Britain would be required. For this reason the Air Council turned their attentions once more to overseas sources of supply. So far as Canada was concerned, there appeared to be a distinct difference between the official and public attitudes. The Canadian Government had, by January 1937, still not replied to the limited proposals for the local recruitment of 25 cadets and the training in Canada of 15 pilots a year, made in March 1936. So far as the other Dominions were concerned, Australia had agreed to train 50 pilots a year and South Africa had offered to run a local Selection and Medical Board, but could go no further because she needed all the pilots she could obtain. By April 1937, New Zealand had agreed to enter 15 cadets for training and also to select and send to Britain 25 cadets a year. This latter Dominion was most enthusiastic, an advertisement for 12 vacancies in the Royal Air Force having produced 350 applications. By April 1937, Canada had also agreed to the Air Ministry proposals, so a start was being made, but how short the official schemes fell behind public desire is demonstrated by the fact that over 150 candidates from Canada alone had come to Britain at their own expense in order to join the Royal Air Force.<sup>3</sup>

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<sup>1</sup> Ibid.

<sup>2</sup> 64th Expansion Progress Meeting.

<sup>3</sup> 78th Expansion Progress Meeting.

### Revision of Navigation Policy

Up to early 1937, therefore, it can be appreciated that the civil elementary flying training schools were providing a most important element in the training system. But the great part of their efforts were directed towards the training of Regular and Reserve pilots. Another commitment was emerging in the need for the navigation training of another member of the crew, a trend already indicated earlier in this narrative. Up to April 1937, the 'pilot complex' pervading Service thought had resulted in a compromise which, by adding a second pilot and by increasing the standard of navigation training given to pilots, attempted to meet both the practical need for a separate navigator and at the same time to preserve the ubiquity of the pilot. The observers up to that time were trained at the rate of 200 a year at the Air Observers School at North Coates where they received instruction in Bombing and Gunnery but not in Navigation. In April 1937, however, this policy was revised in respect of those aircraft (Blenheims, Battles, Wellesleys) which could not carry two pilots, to include one pilot and one observer in the crew. To this end the North Coates Course was increased from eight to twelve weeks by the addition of four weeks navigation training. This was similar to the navigation taught to pilots at flying training schools.<sup>1</sup>

At the same time, the two pilot policy for the other type of heavy aircraft created a further demand for navigation trained pilots and squadron navigation officers. To meet the added requirement for pilots, the F.T.S. course length was kept at six months, and the navigation course at Manston was reduced from 13 weeks to 10 and the number of pupils per course was increased from 12 to 22. This latter expedient was not enough, and it was eventually decided to use civilian training resources for pilot navigation training, and by July 1937, 67 pilots were under training on a three months course at two civil schools. In addition to the above measures arguments for an increase in pilot training by 10 weeks navigation on Ansons were strongly pressed and discussions continued throughout 1937. This was because the inadequacy of the training on obsolete aircraft together with the consciousness of the greatly enhanced navigational problem occasioned by the introduction into the Service of modern aircraft were pointing to the direction of a further step in training between the F.T.S. and the squadron. At that time, the issues were not clarified by the urgency of war, and the waste of teaching pilots pure navigation, or navigators to be pilots where neither could in practice do both jobs at once had not yet become manifest. At the same time, the numbers of aircraft required were helping to check this movement to increase the quality in training. Indeed the mathematical problem of keeping pilot production in step with aircraft manufacture was already engaging the serious attention of the Minister for Co-ordination of Defence, as were the problems of reserve of personnel and material necessary to tide over the period before wartime production became effective.<sup>2</sup> In these matters the question of ability to replace wastage, and provide for expansion were all-important. By the end of the year one final and important policy decision was taken. The practical difficulties of navigating modern aircraft resulted in the C.A.S. ruling that observers were to be capable of navigating an aircraft. In consequence it was decided that all

<sup>1</sup> A.M. Files S.40289 and 638478/37.

<sup>2</sup> A.M. Files S.37680 and S.36043.

observers should be trained up to the 10 weeks Manston syllabus and that direct entry observers should be recruited.<sup>1</sup> This direct entry was to be trained in navigation at the four civil schools, originally destined for pilot navigation training, and a course in bombing and gunnery was to be given at the Service Air Observers School. Observers recruited from within the service continued to be trained at the Air Observers School. Thus, under the pressure of circumstances, the function of navigation was passing to the observer. More important still, this departure meant that the unsatisfactory position whereby ground tradesmen carried out the functions of part-time aircrew was coming to an end.

### Calculation of War Requirements

In mid-1937 there were, in an answer to the Minister, to be seen the first serious attempts to co-ordinate the various expansion measures and to treat first line development and training as a single problem.<sup>2</sup> This was a significant step. All calculations sprang from the size of the force sanctioned by the Cabinet and by the disposition and effort of the force laid down by the Air Staff in accordance with the estimated wastage which would be incurred. The pilot and crew requirements were calculated by the difference between peace and war establishments and by war wastage which was laid down as being one pilot and two other aircrew per aircraft lost. Since the war training organization was designed to keep the Scheme 'F' force of 1,700 aircraft up to strength in war, and since it was estimated that it would take seven months for the first war entrant to reach his squadron, the war training organization was designed to effect replacements for casualties sustained on the eighth and succeeding months of the war. There was the need for a seven months reserve of trained crews. This amounted to a figure of some 13,700 pilots. On the outbreak of war an entry into training of 1,000 a month to meet a wastage of 720 pilots a month was laid down. So far as the aircraft were concerned it was estimated that over 6,300 training aircraft would be needed over the period of the first year of war to meet the training commitment entailed in a total production of nearly 2,400 aircraft. It was calculated in June 1936 that it would take the aircraft industry four months and the war training organization seven months before war production would be flowing into the first line. Therefore a four and seven months reserve respectively were required.

At that time (June 1937) the war training sequence was 4 weeks ground training followed by 8 weeks at an elementary flying training school and 16 weeks at an F.T.S.—a total of 28 weeks. It was considered that the war training organization would require 21 Service F.T.S.s of which 12 would be available (counting Cranwell) and 21 civil F.T.S.s of which 13 were already in existence. It was hoped that if the R.A.F.V.R. scheme with its additional 20 civil schools went through there would be enough to make up for this deficiency. In the same way 16 Observers Schools were required, of which only one existed (North Coates), although it was hoped to have

<sup>1</sup> A.M. File S.41243.

<sup>2</sup> A.M.S.O./A.M.P. paper for Co-ordination of Defence, June 1937.

12 Armament Training Camps converted to Air Observers Schools by the outbreak of war. In addition, another Navigation School and another Central Flying School were also thought to be necessary.

It must be emphasised here that all these calculations were made on the basis of the limited Scheme 'F' (1,700 aircraft) because an investigation into the prospects of pilot production to meet Scheme 'H' (1,700 to 2,400 aircraft by early 1938) showed that the training organization would fail, by over 2,000, to produce the numbers required.

It was stated in the paper prepared by the Air Member for Supply and Organization and Air Member for Personnel in June 1937 that the exact size of the reserve needed to tide over the period of the first seven months of war could not be exactly determined. It was considered sufficient to take into account the regular and reserve personnel available to meet the total requirements of war together with the war wastage replacements necessary during this period of the first seven months. It was for this reason that so much importance was placed on the plans to recruit and train 1,200 V.R. pilots in 1937 and a similar entry in succeeding years. On this basis it was calculated that if the war broke out on 1 April 1940, there would be a deficiency of 334 pilots, but if this did not occur until a year later there would be a surplus of over 1,000. All this was, as stated, on the limited basis of Scheme 'F' and already it was clear that expansion could not stop there. The above outline of the actual planning which took place in June 1937 does at least show the dimensions and nature of the problem as it had developed up to that time.

#### **Expansion Scheme 'J'**

The fact that the scope of expansion plans, based on Scheme 'F', was insufficient became apparent by July 1937, for it was then that convincing evidence of German intentions came to hand.<sup>1</sup> It transpired that Germany's new aim was to form a first line of over 3,000 aircraft (including about 1,500 bombers) by the end of 1939. On the basis of this evidence the Air Staff set themselves to make recommendations for a new expansion programme (Scheme 'J'). The intention was to increase the first line strength from the Scheme 'F' figure of 1,700 first line aircraft (the Scheme 'H' target of 2,500 having been withdrawn) to nearly 2,400 first line aircraft. The scheme was, on the basis of peace time economy, to be completed by the summer of 1941.

Like Scheme 'H' before it, Scheme 'J' was withdrawn, but it was of value to expansion effort in that it demonstrated that the limit of the rate and capacity of re-armament on a peace-time basis had been reached. In the meantime Scheme 'F' was still running its course and behind it were gathering the elements of the Service and civilian training organizations whose growth alone would enable the first line to become an effective instrument of national policy. Scheme 'J', as did Scheme 'H', gave further impetus to aircraft production, and made existing planning hypotheses, increasingly unreal. In one other important respect, plans were imperilled by the failure to produce up-to-date equipment for training, particularly in respect of a modern training aircraft which alone would enable expansion plans to be implemented.

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<sup>1</sup> C.A.S. Archives, DP(P) July 1937.

### **Difficulties in Trainer Aircraft Production**

The figures of total aircraft production had climbed from over 1,700 in 1936 to over 2,000 by the end of 1937, but at the same time, although this production consisted of many obsolescent types of aircraft, modern types were appearing. On the other hand, apart from the Anson, only six Oxford type of advanced trainers were produced, while for single-engined types of advanced trainer, the service still had mainly to rely on the outmoded Hart variants owing to difficulties with the production of the D.H. Don, which was intended to replace them. The dangers inherent in this situation lay in the fact that the Don was needed in the F.T.S.s to replace the Hart type because these had to go out of production to make room for the Hurricanes. The Ansons were all required for Navigation training and were being withdrawn from the F.T.S.s and at the same time the expansion of the Civil Schools rested on their obtaining the Hart types thrown up when they were replaced in the service by the Don. As it was, the F.T.S.s had to retain the Hart types, and to struggle with their increasing unserviceability owing to lack of spares. At the same time the V.R. pupils in the civil schools were completing their elementary training far more quickly than anticipated and needed to go on to more advanced instruction for which it was obvious that equipment was going to be increasingly difficult to provide.<sup>1</sup>

The Department of the Air Member for Supply and Organization was not satisfied with this state of affairs but it was apparent that planning for trainer production was 'rather a matter of guesswork' owing to the fluidity of expansion plans and to the fact that so much depended upon the mass production of the Don, whose designers were still struggling with the prototype. The full gravity of the situation was marked by the fact that training could make use of obsolete aircraft thrown up on the re-equipment of the first line with improved types.<sup>2</sup> By October 1937 the A.M.S.O. was reporting that all requirements in training aircraft could be met although there were only three spare aircraft available, after commitments had been met.<sup>3</sup> By December 1937, the continued failure of the Don stimulated demands for more twin-engined Oxfords, especially in view of the growing demand for twin-engined trained pilots, but even so, these demands were not related to any fixed ratio to operational aircraft production. At the same time it was laid down that the aircraft needed to expand the peace training organization to wartime size over the first four months of the war would be over 4,000 aircraft.

### **The Link Trainer**

An important development in the field of training equipment was the introduction into the service of 51 Link Trainers by December 1937 and in view of its immediate success, the order of another 150. This lessened the gravity of the lack of suitable modern aircraft. This device for teaching and practising instrument flying and blind landing procedure was so designed that it could reproduce all natural manoeuvres under relatively realistic conditions. It was fitted with full blind flying equipment and worked in

<sup>1</sup> 90th Expansion Progress Meeting.

<sup>2</sup> 92nd Expansion Progress Meeting.

<sup>3</sup> 95th Expansion Progress Meeting.

conjunction with an instrument which recorded graphically the manoeuvres carried out. Its importance in making possible the transition from flying by the senses to precise instrument flying cannot be exaggerated.

#### **Summary of Expansion by the end of 1937**

So far then, expansion under Scheme 'F' had progressed steadily. By the end of 1937 the strength of the Royal Air Force was 70,000 men. The size of the first line had reached over 1,800 aircraft (149 squadrons) but Schemes 'H' and 'J', evolved as an answer to the German plans for over 3,000 modern aircraft in their first line by 1939, had been withdrawn. This was because there was a limit to the rate at which the small cadre of the Royal Air Force could train and expand its numbers of men and similarly the nature of mass production made the production of aircraft a slow affair at first. Even so, figures of aircraft production were rapidly increasing, expansion was most successful but there can be no doubt that training expansion was not keeping pace. At the same time substantial progress was made. The R.A.F.V.R. Scheme was at last launched and doing well, within its limitations, though there were only 845 pupils against the planned 1,200. Nineteen civil schools were carrying out flying training. The only serious deficiency was in the provision of Town Centres which were badly behind schedule. The number of F.T.S.s remained constant at 11 and regular pilot output was still in the region of 1,500 a year. The difficulties encountered in carrying out training with obsolete types have been described as were the future dangers to the attainment of plans in the failure to produce a correct proportion of modern advanced trainers.

In the region of policy, however, some good advances were made, chiefly in grappling with the problem of navigation instrument flying and in the need for twin-engine instruction. The impression remains, however, that training was the chief sufferer from dilution of experienced personnel, and lack of proper equipment and it was baulked in its attempts to create overseas facilities.

#### **Acceleration of Expansion (Schemes 'K' and 'L')**

In early 1938 the Air Staff resumed its attempts to obtain sanction for a larger and more realistic programme, attempts which had been foiled when Schemes 'H' and 'J' had been put forward. The trinity of failure in this direction was completed by the submission, to the Minister for Co-ordination of Defence, of Scheme 'K' which was a reduced Scheme 'J' owing to financial objections.<sup>1</sup> It represented 'not even the minimum insurance' which the Air Staff considered necessary in the Metropolitan force.

On the 10 March 1938, Germany annexed Austria and Scheme 'K' was swept aside in favour of Scheme 'L' which was urgently prepared and approved on 27 April. This was an accelerated version of Schemes 'J' and 'K' aiming at producing a front line strength of nearly 2,400 aircraft by early 1940—a programme which would require the provision of 12,000 aircraft

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<sup>1</sup> C.A.S. Archives, A.H.B. V/5/11.

within the next two years. Events on the continent caused the abandonment of the principle of 'no interference with civil industry', which at last gave the opportunity for measures to be taken more in keeping with the urgency of the situation. Only a slight first line increase over Scheme 'F' was planned up to April 1939, but there was to be a great increase in bomber strength during the following year. This was made possible by the decision to adopt the double shift throughout the aircraft industry. So far as the Air Ministry was concerned the chief effect was to be in the direction of consolidating expansion achieved under Scheme 'F', after which further expansion was to be undertaken. At the same time the C.A.S. called for a drastic departure from the existing tempo of defence preparations and urged that there should be a 'changed outlook in regard to financial limitations to put us on a war footing'.

It was obvious that the Royal Air Force had entered an intensified phase of preparation and the problems of waging air war and of giving resilience in the form of a far deeper organization behind the first line were examined with much greater realism. All plans were based on the assumption that Britain alone would have to face the full onslaught of German air power. This implied unrestricted expansion of the first line with an appropriate and simultaneous training expansion. The requirement was laid down by the Air Staff for 'a sufficient war reserve of aircraft, equipment and trained personnel, backed by a fully adequate war productive potential both of aircraft and trained personnel, to enable the first line force to continue operations at the required scale of intensity'. Finally, they made it plain that even Scheme 'L' was inadequate to catch up on Germany with her population of 70 millions which had been on a war footing for the preceding four years. Short of national mobilisation on German lines, little could be done to improve matters in the dangerous months to come.<sup>1</sup>

#### **Revised Aircrew Requirements**

The training implications of Scheme 'L' were that the existing plans under Scheme 'F' for an entry of 1,750 pilots and 15,000 airmen a year, should be stepped up to over 2,000 pilots and 20,000 airmen, whilst between four and eight Service F.T.S.s and between eight and eighteen civil schools were immediately required.<sup>2</sup> The key to the situation at that time was aircraft. The paradoxical situation had arisen that this shortage of aircraft was causing a surplus of new pilots who could not be kept employed or in practice. For this reason there was a strong motive for extending the F.T.S. course to nine months from the existing, and in many ways unsatisfactory six months. Owing to the need to complete preparations by the target date, the extension was not approved. By this time the Commands were feeling the effects of rapid dilution with newly trained personnel and the effect of the lower standard of training on their ability to wage war. The Air Ministry fully realised that considerations of numbers had seriously affected quality and it was for this reason that Scheme 'L' did not immediately set a higher first line target.

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<sup>1</sup> Note by the Air Staff, C.P. 86(38).

<sup>2</sup> E.P.M. 38(38), 3 March 1938.

Consolidation behind the first line presented many difficulties. Chief among them was a general lack of reserves and a serious shortage of observers and wireless operators, it being calculated that the prospective deficiency under Scheme 'L' would be 700 observers and over 2,000 wireless operators. The slowness in producing these members of aircrew had been due to lack of aircraft. At a conference called by the Secretary of State for Air to consider this position, requirements for crews under Scheme 'L' by 1939 were stated to be:—

	<i>Per year</i>
Pilots ... ..	2,500
Observers ... ..	2,069
W/T Operators ... ..	3,867
Air Gunners ... ..	554

In addition, Volunteer Reserve requirements amounted to 7,000 pilots and 9,250 other aircrew. It was therefore decided that in order to meet the needs of both regular and reserve training, eight F.T.S.s and 25 new civil schools were necessary, bringing the totals up to 19 F.T.S.s and 58 civil schools. Aircraft requirements to meet this expansion were 512 service aircraft for the additional F.T.S.s together with 376 elementary and 800 service aircraft for pilot training and 480 twin engined trainers for wireless operator and observer training at the new civil schools.

The training expansion thus envisaged put considerable additional strain on the Service as a whole, the instructor position alone being so difficult that in April 1938 it was proposed to revert to the expedient of the first world war and to take pilots who had just completed their training and put them back as instructors. The acute need for observers could not be met at once by the measures decided, and in the meantime a bomber station was temporarily converted to bridge the gap until the civil schools started their training in August, 1938.

#### **Start of the Civil Air Guard**

While decisions were being taken on the expansion of the Volunteer Reserve, the Air Members for Personnel and Supply and Organization were instructed to expedite the institution of the Civil Air Guard Scheme on a regional basis. This scheme aimed to create a reserve of civil pilots of both sexes by subsidising training in the light aeroplane clubs. When the scheme was launched in July 1938 some 35,000 persons applied for registration and a total of 4,000 were already in possession of 'A' licences or had commenced to qualify for them. The scheme provided a good start for the Air Transport Auxiliary of the wartime years which did so well on ferry and communication duties.

The middle of April 1938 thus saw the dawn of realistic expansion, but, the measures decided to expand regular and reserve training and particularly to remedy the shortage of non-pilot aircrew, did not stop there. On 13 April the Cabinet gave qualified approval for the entry into the service of the full numbers of recruits required to complete the programme.<sup>1</sup>

<sup>1</sup> Cab. 19(38).

### **Difficulties in Expanding Training**

At last the Royal Air Force had received all the authority they required for full expansion, but now, in the sphere of training, difficulty was encountered in carrying out the full programme for the provision of 2,500 regular pilots a year under Scheme 'L'. The C.A.S. had to explain to the Secretary of State that instead of the additional eight Service Flying Training Schools needed to produce this number, only four would be opened owing to the difficulty in finding the instructors.<sup>1</sup> The first line squadrons had already given up so many seasoned pilots that their operational efficiency had been seriously impaired. A temporary deficiency in pilot strength of 720 had, therefore, to be accepted. This deficiency was to be borne by those squadrons established with two pilots per aircraft. So far as Reserve training was concerned the C.A.S. proposed that four civil elementary flying training schools, which would have been required to match the cancelled service schools, should now be used to train reserve pilots.

Thus the dual competition for seasoned pilots between the squadrons and training units resulted in a compromise which satisfied neither. Training could not expand fast enough to supply the numbers of squadrons scheduled and the squadrons themselves were so depleted and the reserves were so small that the effective strength of Bomber Command was limited to 500 bombers, which, according to the rate of casualties encountered could only sustain operations for a period of between 7 and 19 weeks. The prospect for Fighter Command was similar but set a simpler problem because crew training was not involved. In the Reserve, the situation was even more unsatisfactory, because of the lack of facilities for advanced training. Most of the pilots were only trained up to elementary standard. Thus, at a time when the provision of Service flying training schools had become the vital link in the chain, the full number required had had to be cut by half. The preliminary survey of war needs revealed in broad terms that the problem was the number of reserve pilots and crews estimated to be required for the first year of war had been doubled since Scheme 'F' was superseded by Scheme 'L', but the vital F.T.S. facilities had only increased by half.

### **Review of the War Training Organization**

When the problem of the size of the Reserve War Training organization and its output was reviewed by a special Air Ministry Committee in June 1938,<sup>2</sup> it was stated that the Reserve should be about 20,000 (over 8,000 pilots) and that the training organization should be:—

- 33 Elementary F.T.S.s
- 33 Service F.T.S.s
- 25 Air Observers Schools
- 7 Navigation Schools

These schools would produce a monthly output of 1,100 pilots and 1,800 other aircrew and would need over 7,000 additional aircraft. These calculations were based on achieving Scheme 'L' by April 1940, and the numbers were required during the first four months of war. In the meantime the existing situation demanded attention.

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<sup>1</sup> A.M. File S.44537.

<sup>2</sup> A.M. File S.32963.

The general picture obtained from the discussions and calculations made in early 1938 revealed a situation which was extremely serious because regular and reserve training could not accomplish their task by April 1940.<sup>1</sup> The Air Staff demonstrated that because no reserves would exist, the effort of the bombers and fighters would waste down to nil very rapidly in the event of full scale fighting. At the same time they took consolation from the fact that there were still two years in which to do something to increase the flow of trained men to maintain the first line in action:—

‘There seems no reason why we should not be able to operate a very considerable proportion at least of our peace first line provided that we arrive at decisions at once, and proceed immediately with really drastic measures for the provision and training of regular and reserve crews and in those other trades in which serious deficiencies now exist.’

In brief, then, the situation at the start of intensified measures for expansion revealed that although there were good prospects for the manufacture of 20,000 aircraft in the two years before April 1940, the trained reserves to meet the interim war needs pending the transition to a war organization were not likely to be available in the numbers required. Nor was the aircrew war training potential likely to be able to meet the demand made upon it during the same period unless something drastic were done. It was obvious that aircrew and aircraft production had not been precisely co-ordinated, chiefly owing to the original ‘shop window’ basis of expansion. The mass production system, whether it be for the manufacture of trained men or material, does not lend itself to the distracting and disorganizing practice of the short term and violent boosting of its various constituent parts. This is especially so when the time lag is accentuated by the great distances and widespread organization which became so typical of training development.

By September 1938 there were only 818 aircraft (465 elementary trainers and 353 obsolete single-engined types), available for expanding the training organization to a war establishment. In all, about nine Elementary and nine Service Flying Training Schools could be put on a war footing with that number of aircraft. There were no additional aircraft available for the remaining F.T.S.s or for the Armament Training and Air Observers Schools. By putting together all the aircraft already at these schools, three wartime Air Observers Schools could be formed to work at a reduced capacity. Finally, by taking Hinds (obsolete single-engined aircraft) from non-mobilisable squadrons, two more Armament Training Schools could be used for training air gunners. That was the limit of the War Training Organization in September 1938, i.e. in place of 98 schools, 23 schools could be formed. The annual output from the organization would have been 3,100 pilots, 1,450 observers and 1,300 air gunners compared with the 1,100 pilots and 1,800 other aircrew required every month to meet estimated wastage in war. The difference between the 7,000 aircraft required and the 800 available for war training was not the only obstacle. There was also the severe

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<sup>1</sup> C.A.S. Archives Vol. 31, 11 April 1938.

shortage of instructors. In September 1938 there were only 132 reservists suitable as instructors over and above the 172 already employed. (By August 1939 this number had increased to 500.)<sup>1</sup>

#### **Increased Orders for Trainer Aircraft**

As has already been stated, the training facilities required to implement Scheme 'L' had to be increased to an enormous extent as a matter of urgency. This principally involved the provision of instructors and training aircraft. The civil flying facilities were to be greatly expanded but the service training phase was limited by half. Soon the problem of passing the reservists on to more advanced types of aircraft was to become acute. Yet no apparent effort to lay down an emergency programme of advanced trainers was made. The Oxford showed promise; Ansons were being produced in limited numbers but the Don, due to replace the outmoded Hart types in the Service schools, was still in difficulties. Thus it was that in the month of April 1938, when all the vital decisions for expanding training were being made, the Air Council looked for some other modern training aircraft. This was found in the North American 16, the 'Harvard', which it was proposed should be purchased in the U.S.A. At the same time 340 Oxfords, which were just beginning to appear in the F.T.S.s, 1,000 Tiger Moths and 200 Magisters were to be ordered. It was even suggested that Italian aircraft, some of which were thought to be suitable for crew training, might be obtained. The position was made more complicated by trouble with the Magister which caused more Tiger Moths to be ordered at the expense of twin-engined Oxford production, an unfortunate state of affairs.<sup>2</sup> By June 1938, however, contracts for the purchase of the Harvard were completed, although there was a delay in delivery owing to the inevitable need for modifications to meet British requirements. Originally, it was intended that the Harvard should be a stop-gap, but eventually most overseas F.T.S.s were equipped with this very useful single-engined trainer which was admirably suited to operate under conditions varying from those of the Canadian winter to those of the tropical and mountainous areas of South Africa or Southern Rhodesia.

#### **Overseas Training Facilities**

By now the pressure on Britain's war potential was making it necessary once more to cast about for overseas resources. For this reason another attempt to obtain training facilities in Canada was made with the despatch of a R.A.F. officer to that country in July 1938.<sup>3</sup> His mission was to attempt to obtain the equivalent of the output of three F.T.S.s. The Canadian Defence Ministry was helpful, but the political atmosphere was not generally propitious and the financial aspects at that time provided a great obstacle. On the other hand both Australia and New Zealand were keen to help and the latter Dominion in particular had made some very practical suggestions for setting up her own pilot training organization.<sup>4</sup> Thus the outline of a great overseas training potential began to appear.

<sup>1</sup> A.M. File S.46305.

<sup>2</sup> 124th Expansion Progress Meeting.

<sup>3</sup> 131st Expansion Progress Meeting.

<sup>4</sup> A.M. File S.43124.

### **Progress of R.A.F.V.R. Expansion**

While further efforts were being made to find sources of regular training overseas, at home the Volunteer Reserve organization, which had assumed so great an importance in war plans, received further attention in July 1938.<sup>1</sup> It will be recalled that following decisions reached in April 1938 when accelerated expansion measures in connection with Scheme 'L' were discussed, the Volunteer Reserve aerodrome centre requirement should be stepped up to 58 in order to handle an additional 3,000 pilots and 4,550 other aircrew, making a total target of 7,000 pilots and 9,250 other aircrew. By July, however, the delays in carrying out this plan made it evident that the numbers required could not be trained by April 1940. Also the Air Staff had revised their calculations on the wastage which would be experienced in war. The new rates resulted in a further demand for another 1,000 pilots and 2,400 crews over and above the original Scheme 'L' estimate. To meet this added commitment it was hoped to double the output from the existing training schools, but even so, a further 10 pairs of aerodrome and town centres were needed, raising the total figure to 68 aerodromes and 65 town centres.

At this stage it was decided that the control of this scheme should be taken over by the Air Ministry, and to this end a Director of Volunteer Reserve Expansion (D.V.R.X.) was appointed.<sup>2</sup> He was attached to the Department of the Air Member for Supply and Organization (A.M.S.O.) but also had direct access to the Under Secretary of State for Air. This post was filled by the A.O.C. of No. 26 Group in Training Command, which was responsible for the Volunteer Reserve, and he took up his appointment in September 1938.

Notwithstanding all the above measures, it was clearly realised that the new reserve requirements were so great that they could not be met by April 1940.<sup>3</sup> The best that could be done was to form as many schools as possible. The lateness and inadequacy of the start of training measures to back first line expansion was then sharply emphasised.

### **Separation of Maintenance Units from Training Command**

It will be clear that the added pressure on Training Command of these developments was making it all the more imperative that the A.O.C.-in-C. and his staff should be relieved of the many pre-occupations which the administration of units unrelated to his chief task were imposing. There were no less than 20 Depots and units concerned with maintenance in the Command, and the number was growing. It was, therefore, decided to form a Maintenance Command for their control, and this step was taken in August 1938.<sup>4</sup> Training Command was then left with responsibility for Flying and Technical Training and for the Volunteer Reserve.

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<sup>1</sup> 130th Expansion Progress Meeting.

<sup>2</sup> 133rd Expansion Progress Meeting.

<sup>3</sup> 135th Expansion Progress Meeting.

<sup>4</sup> A.M. File S.37588.

### **Pre-entry Training**

The picture thus far outlined of preparations for the air war would not be complete without a mention of the University Air Squadrons, the Air Defence Cadet Corps, and the Air Contingents of the Officers Training Corps, which formed part of the pre-entry training and recruiting activities which, in common with all other civil organizations designed to back the R.A.F., received stimulus from the service expansion taking place. In order of chronology, the University Air Squadrons have quite a long history, those of Oxford and Cambridge having formed in 1925. London University followed ten years later. The amount of flying given was small (a minimum of 15 hours) but they provided a valuable source of recruitment of high calibre personnel.

The first steps which gave young men preliminary training in aviation were taken by the Air League of the British Empire in 1937, and this led to the formation of the first Air Defence Cadet Corps Squadron of uniformed and disciplined cadets in August 1938.<sup>1</sup> By the end of the year 50 squadrons, located all over the British Isles, had formed. Each squadron comprised between 100 and 150 cadets and training included discipline, games, elementary technical subjects, theory of flight, navigation and signals. The keenness of the cadets and the valuable service performed by the corps came to be widely recognised. It will be seen later in the narrative how it grew to 172 squadrons by the outbreak of war and how it took a permanent place in the system of war training. The same form of training extended to the Officers Training Corps in the big schools and colleges, when in 1938 the War Office accepted a scheme whereby certain O.T.C.s provided facilities for the Air Training of certain of their members. The Air Section of each contingent was affiliated to the nearest suitable R.A.F. unit. Arrangements were also made for a member of the school staff to be granted, if possible, a commission in the R.A.F.V.R. Courses of instruction, including flying, were run under R.A.F.V.R. training arrangements.

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<sup>1</sup> A.M. File S.95241.



## CHAPTER 3

### FINAL PRE-WAR EXPANSION, 1939

April 1938 had seen a new and increased tempo given to preparation for air re-armament, but hardly had this impulse steadied down when a final acceleration was given by the crisis with Germany over Czechoslovakia in September 1938. The Munich Agreement allowed a year's breathing space to Britain for the final preparations for war, and in these preparations training, if possible, assumed further importance owing to the weaknesses which were revealed by the crisis. That there was a very serious position was made known to the Cabinet by the Secretary of State for Air in answer to the recommendation of the Committee of Imperial Defence for an investigation into the condition of the country's defences.<sup>1</sup> In the first place, the Air Ministry through the Secretary of State, put forward a survey of expansion and future needs which showed that the air defence of this country occupied a position of very special importance. It was Germany's strength in the air and the relative weakness in this sphere of the other powers which was the main factor causing the unrest and anxiety which then existed in the world. Again, from the point of view of world appeasement, our weakness in the air was obviously a serious handicap to our diplomacy.<sup>2</sup>

He went on to describe the anxiety caused internally by this weakness and the complicated position of the Government with regard to the pledges given to the British people as to air parity. He stated that if Britain had had to go to war in September 1938 her position would have been very grave. The first line was weak, and so far as reserves were concerned, the position was highly precarious. An effective fight could only have continued for a very short period. This led to the conclusion that only by a considerable increase in reserve strength, accelerated re-equipment with modern aircraft, further development of productive capacity and concentration on building up fighter strength could the immediate weakness be averted. This entailed that priority should be given to the completion of the fighter part of Scheme 'L' so that its provision for 40 squadrons should be completed if necessary at the expense of Bomber and Coastal Commands.

#### **Aircraft Requirements**

To illustrate the position as presented by the Secretary of State, the British first line, still composed of obsolescent aircraft, numbered some 1,600 aircraft with 400 in reserve, or less than a week's reserves at a conservative estimate; whereas Germany's first line was 3,200 with 2,400 aircraft in reserve. It was estimated that by April 1940 Germany would have over 4,500 first-line and 3,400 reserve aircraft to Britain's 2,400 first line and 3,400 reserves. So far as reserve crews were concerned, it was likewise estimated that by the latter date Germany would have matched her reserve aircraft with reserve crews; but that only in Fighter Command would Britain have done the same, although 'the position would show a marked improvement by the summer of 1940.' So far as the Air Ministry were concerned their task was now to

<sup>1</sup> C.I.D. 333rd Meeting, 6 October 1938.

<sup>2</sup> C.P. 218(38), 25 October 1938.

break down the last financial resistance to unfettered expansion, and this boiled down to full aircraft production and to the urgent measures necessary to balance this production with trained crews.

Up to that time, the Cabinet had (in April 1938) sanctioned the production of 12,000 aircraft and an appropriate intake of personnel to match that production. In effect this meant that the strength of the Royal Air Force would be increased by 40,000 men in the period up to April 1940. This expansion appeared to be limited by the amount of aircraft which would be produced in the time and it was not related to possible German strength. However, by that time, the Secretary of State, had demonstrated that by such measures as factory extensions, sub-contracting and grouping of firms, and by concentration on a limited number of aircraft types, the rate of aircraft production need no longer be the limiting factor. This was now the rate at which trained crews could be produced, particularly the complex training required for bomber crews. To sum up, then, the Air Ministry wished to complete the fighter defences, both in aircraft and pilots, as soon as possible in order to fulfil the immediate objectives of the protection of the British Isles, and the trade routes. Thereafter, provision for trained personnel for general expansion had to be made as soon as possible.

In the field of general policy, even at this late stage before the war, the Air Ministry had considerable difficulty in getting approval for their emergency measures. While expenditure on the fighter part of the programme was accepted, the Cabinet was alarmed at the expense of the bomber force.<sup>1</sup> In this particular aspect, it was in the increase in aircraft production rather than personnel that the trouble lay. The Air Ministry wished to go in for the heavy bombers, Stirlings, Manchesters and Halifaxes, because it had been proved that an aircraft of gross weight of some 35,000 lb., was capable of lifting over 2,400 lb. of bombs, or four times the weight of an aircraft half the size and cost. Efficiency and economy also increased with structure weight though to a lesser extent. The saving in crews was proportionate, i.e., a saving in crews and training establishments of 50 per cent. was possible. On the other hand each aircraft would cost nearly £30,000, and of course, there would be additional costs in runways and general facilities. The upshot was that instead of full production of this type being authorised, only sufficient orders were to be given to enable development to go ahead and to 'avoid substantial dismissals in the aircraft factories concerned'.<sup>2</sup>

On the general subject of the allocation of aircraft used, during the Cabinet discussions, an interesting indication was given of how the large output of aircraft was allocated to produce quite a modest first line development. Up to that time the Air Ministry had ordered or were asking permission to order some 29,000 aircraft. It was intended to dispose of these aircraft as follows:—

(a) First line	...	...	...	...	...	...	...	3,525
Reserves	...	...	...	...	...	...	...	7,475
								11,000

<sup>1</sup> D (38) 2nd Meeting, 28 October 1938.

<sup>2</sup> Cab. 53 (38), 7 November 1938.

(b) Training and Miscellaneous	...	...	...	...	2,750
Reserves	.....	...	...	...	7,250
					10,000
(c) Wastage for 4 years	...	...	...	...	8,000
					Total
					29,000

It will be noted how small a proportion actually went to enlarging the first line, and how the training commitment absorbed nearly as many aircraft as did the fighting element. This was, of course, due to the necessity of relating the size of the first line to the amount of wastage it could sustain without running down. The size of the training commitment was commensurate with the number of replacements necessary to keep the first line continually in action without its suffering depletion. The increasing complexity of modern equipment compelled the necessity for additional stages in training, as the war progressed, so that in the end the amount of aircraft of all types devoted to training exceeded the first line strength. Therefore, the trend to be discerned in these pre-war figures is clearly demonstrated.

#### Acceleration of Training

So far as training was concerned, it transpired that under Scheme 'L' there would be a deficiency of Regular pilots of 500 by the end of March 1940 and that this could not be made good until November 1940. To meet the situation it was decided not only to retain in the service all pilots due to pass to the Reserve or to basic trades, but also to accelerate the opening of three F.T.S.s and to increase the output of existing F.T.S.s. As a special measure to provide an additional 200 fighter pilots it was also decided to investigate whether it was possible to open two additional service and four elementary civil F.T.S.s. These personnel were not to be posted to squadrons but were to be held in Group Pools, the scheme for which was about to be submitted to the Air Council.

#### Formation of Group Pools

In May 1938, the C.A.S. had drawn attention to the fact that although the standard of F.T.S. training had gone up despite the shortened course length, the improvement was still insufficient to make up for the increased demands on the skill of the pilots by new types of aircraft.<sup>1</sup> He had, therefore, stated that there was a need to fill the gap between the time of leaving F.T.S. and that of entering the service unit. This ought, in his opinion, to be done by pupils flying on aircraft with modern characteristics. Until they could be provided, he was resigned to this being done on such aircraft as were available. At the time he was thinking purely of Bomber Command requirements. As time went on this need for operational conversion grew more imperative. The shortage of pilots in Bomber Command, coupled with the general lack of reserves had, by the necessity for withdrawing certain squadrons temporarily out of the line, made facilities for this new trend towards the introduction of another stage in training. At the same time under

<sup>1</sup> A.M. File S.46938.

Scheme 'L' bomber expansion was also to be completed as soon as practicable and it was recommended that use should be made of those squadrons of Bomber Command which were on a non-mobilisable basis.<sup>1</sup> (Estimated at 17 by end of July 1939.) It was likewise recommended, though never carried out, that aircrew personnel (observers and wireless operators) could only be provided from the R.A.F. Volunteer Reserve by the adoption of a scheme for entering them for an initial period of six months continuous service in Regular Units. Owing to lack of aircraft the non-mobilisable squadrons would also have to be used for this purpose.

During 1938, the Air Ministry realised more clearly the importance and difficulty of providing properly trained crews to take the place of war casualties.<sup>2</sup> The quantitative aspect had by the end of the year been dealt with, but it had become increasingly obvious that more should be done quickly to provide service training facilities if replacement crews were to be trained up to the desired standard to take their place in the fighting units when required. There were four sources from which replacements could be drawn, viz.:—

- (a) Spare crews on peace establishments.
- (b) Reserve Pilots (Class A).
- (c) The Royal Air Force Volunteer Reserve.
- (d) Output from Service training establishments.

Owing to the elementary nature of the equipment with which the civil schools and Volunteer Reserve Centres were equipped, the first three categories urgently needed the provision of up to date facilities for advanced training. The fourth category likewise was in need of an intermediate training stage. It was, therefore, strongly urged in November 1938 that Group Pools should be established in the proportions of six bomber, three fighter and one coastal to meet immediate requirements.<sup>3</sup>

Unfortunately, resources, and the pressure of expansion in the direction of basic flying training was such that only one fighter Group Pool could be formed before the outbreak of war. Nevertheless this commitment had now emerged as requiring urgent attention, and some advance had been made. At the time it must be admitted that the Air Ministry was chiefly concerned with the question of creating holding units and reserves to meet casualties behind the squadrons. Nevertheless the trend had considerable significance as foreshadowing the vital operational training unit stage without which the deficiencies in the quality of training could not have been remedied.

#### **Observer and Wireless Operator (Air Gunner) Training**

If the pilot training position was unsatisfactory, the crew position was worse. It is true that the observer by October 1938 had emerged as being solely responsible for navigation in war under an Air Ministry decision of 8 May 1938.<sup>4</sup> But the full 10 weeks' course had had to be given under varying conditions and at different standards at the elementary civil schools,

<sup>1</sup> A.M. File S.39898.

<sup>2</sup> A.M. File S.39293.

<sup>3</sup> 141st Expansion Progress Meeting.

<sup>4</sup> E.P.M. 153(38).

at the Air Observers School and at sundry Armament Training Camps. Under Scheme 'L' the requirement was for over 2,000, but direct entry recruiting was disappointing. This was especially unsatisfactory because entry from the service meant that qualified tradesmen would have to leave their trades just when war expansion was urgently requiring their services in that capacity. To make matters worse, the wireless operators (air gunner) and the 'straight' air gunners were only part time and were also drawn from the service trades.

In October 1938, therefore, changes in the method of recruitment and conditions of service of the non-pilot aircrew were indicated. There was a full blown scheme for drawing all observer personnel from the wireless trades and for a scheme for offering a permanent career to a proportion. This need not concern the main narrative because it was not possible to implement it. What was important was that it was decided to make the observer a full time duty. This category was to be drawn from wireless trades and by direct entry. It was also decided at the same time that all air gunners, whether wireless operator or 'straight', should be drawn from the boy entrant wireless operators. Thus the commitment under Scheme 'L' for 3,800 wireless operators and 600 air gunners would all be trained as wireless operators (air gunner), from volunteers among the wireless trade.<sup>1</sup>

The importance of the proposals and decisions lay in the fact that officially the observer had at length come to be regarded as being of equal importance to the pilot. Also both observers and wireless operators (air gunner) became full time aircrew, thus avoiding the dangerous and unsatisfactory position under the old part-time system, whereby in war the part-time aircrew would be required full time, while they would be just as urgently required in their ground trades.

#### **Proposed Formation of Reserve Command**

Thus, under the impact of the September 1938 crisis, further steps to ensure smooth transition to war organization were taken.<sup>2</sup> The crisis had revealed that No. 26 Group of Training Command had had to control and issue orders to 59 separate elementary and reserve training units. The staff was therefore overloaded. Furthermore, the Reserve training organization was still growing to an ultimate target of 20 elementary and reserve F.T.S.s (civilian) and 58 R.A.F. Volunteer Reserve Aerodrome Centres.<sup>3</sup> In addition, there were reserve training commitments in the sphere of non-pilot aircrew, and ground trades as well. Broad calculations had shown that a reserve of between 70,000 and 80,000 personnel were required under Scheme 'L'. The control of these activities was exercised by No. 26 Group, nominally under Training Command, but in practice controlled directly by the Air Ministry. This was, of course, contrary to the principle of decentralization to Commands. The load was too great for Training Command, whose

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<sup>1</sup> 140th Expansion Progress Meeting.

<sup>2</sup> A.M. File S.47389.

<sup>3</sup> E.P.M. 166(38).

responsibility for the war flying training organization under Scheme 'L' was now estimated to comprise:—

- 5 to 10 Acceptance Units,
- 35 to 40 Elementary Flying Training Schools,
- 35 to 40 Service Flying Training Schools,
- 25 to 30 Observer Training Schools,
- 5 to 10 Navigation and Reconnaissance Schools.

There would also be certain other commitments such as Flying Instructors Schools, Torpedo Training Schools and similar units. All these had to begin to function during the first three months of war if war entries were to be available in time to meet wastage when regular and reserve personnel became exhausted for casualty replacement. It was quite obvious, therefore, that the direct control of so large a number of units by the existing Training Command or by one administrative staff was out of the question. Two or more Commands would be necessary in war.

In peace and war alike, the major problem was on the administrative scale, particularly with regard to the question of mobilization arrangements. The result was that on 23 November 1938 the Air Council approved the formation of a Reserve Command divided into four Groups. At the same time, responsibility for mobilization of all reserve personnel, excluding officers, was passed to the officer in charge of Records. It was not, however, until February 1939, that the new Command was formed. By this step, however, Training Command was relieved of all but technical training for the service ground trades and consisted of six Groups: No. 17 for specialist flying training; Nos. 21 and 23 for F.T.S.s; Nos. 20 and 25 for armament and air observer training; and No. 24 for ground and technical training. Reserve Command then comprised four Groups (Nos. 26, 27, 28 and 29), responsible for the Elementary and Reserve Flying Training Schools and for Reserve Ground Training organized on a geographic basis.

By this time, the Volunteer Reserve organization had made fair progress. The programme which had started to function on 1 April 1938, had called for a total of 33 aerodrome centres and 25 town centres to accommodate a training population of 2,500 Volunteer Reserve pilots. By 1 January 1939 32 aerodrome centres and 14 town centres had been formed and the strength of the Volunteer Reserve was 2,493 pilots.

In the meantime, however, expansion under Scheme 'L' had called for a further 3,000 pilots and for 4,550 aircrew, to meet which demand 25 new aerodrome centres were called for. Unfortunately, the recruiting response had been poor, and the facilities for observer training had not even been half filled and that of the air gunners was down to 27 per cent. of capacity.<sup>1</sup> The great drawback to the whole scheme was that it took much longer to train volunteers on a part time basis than it would have done if they could have been given continuous full time training for a period of up to six months. There were also difficulties in providing more advanced equipment. Chief of all obstacles, however, was lack of instructional staff, there being less than half the 438 flying instructors required and but a fraction of ground

<sup>1</sup> E.P.M. 174(38), E.P.M. 168(38) and A.M. File S.50933.

instructors was available. It was for this reason that by the end of the year courses of instruction for armament, wireless and photographic instructors were arranged at the appropriate Service establishments. In addition to the foregoing, there were also difficulties in arranging for the actual centres themselves.<sup>1</sup>

### **Summary of Progress in 1938**

So far as regular pilot training was concerned, the number of F.T.S.s had gone up to 15 instead of the 19 required under the accelerated expansion measures, and the course length remained at six months. There was thus an increasing deficiency of pilots. Observers had been made full time aircrew, but their training organization was badly behind schedule as was that for training air gunners. The provision of training aircraft was still, with lack of instructors, the chief difficulty. Nevertheless aircraft production was going up steadily. In 1937 over 2,000 were produced, in 1938 over 2,500, moreover improved bomber and fighter types represented an increasing proportion, although too many obsolescent types still persisted. At the same time, ambitious training plans in the sphere of volunteer reserve training had been laid, but their implementation was hampered through lack of facilities and owing to the late start which had been made. Finally, on the training side, the need for operational training was becoming increasingly evident as was the inability of the Air Ministry to provide means to carry it out.

Although air rearmament had received valuable impetus from Scheme 'L' and particularly after the September 1938 crisis, there were still financial objections to long term planning, particularly with regard to bomber production. In this can be seen the fact that short term consideration still persisted, which modified the measures which the Air Ministry in their long term view considered desirable to take.

### **Expansion of Flying Training Schools**

The year 1939 opened with technical progress and re-equipment showing more clearly than ever the failure of training to keep pace with it. The chief reason was the lack of measures to create training potential in proportion to general aircraft production. What measures were initiated for the provision of suitable equipment came too late. The numbers of Oxford's and Anson's were increasing, but not the quantity required to meet the growing demand for twin-engine training ( $\frac{2}{3}$ rds of all pilots), night and instrument flying or crew training. Group pools could not be formed for lack of facilities while at the same time the number of Volunteer Reserve pilots requiring such training was steadily mounting.

The narrative up to this point has been concerned chiefly with efforts to expand the basic training facilities, particularly for pilots; yet, at this time the service flying training school was the chief restrictive factor. By April 1939 the prospective deficiency of pilots to be provided by April 1940 had grown to 1,200. It was obvious that intensified use would have to be made of existing facilities. Already the F.T.S. course had been reduced to six months and the intake had been increased to 48. It was, therefore,

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<sup>1</sup> E.P.M. 174(38), E.P.M. 168(38) and A.M. File S.50933.

decided to increase intake to 60 per course, to give each school an additional 11 aircraft, additional maintenance staff and more spare parts. (These measures could not, however, be implemented until September 1939.) By these means it was hoped to increase the annual pilot output by some 470 a year.<sup>1</sup>

In this intensified use of existing resources there lay much benefit to the service, because already in June 1936 it had been recommended by the Director of Training that maintenance, instead of being done on a flight basis, should be centralised on the 'garage' system which had long been in force in the civil schools. This suggestion was carried out with the introduction of squadron (Intermediate and Advanced) maintenance at F.T.S.s in May 1937. At the same time, lack of spares had put the brake on the full benefits to be derived from planned maintenance. By the beginning of 1939 this preliminary step can be said to have shown increasing efficiency in making up for the serious lack of training aircraft.

### **Problem of Applied Flying**

While, therefore, the expansion of F.T.S. facilities represented the major need of training, the problem of applied training was of almost equal moment. Power operated turrets were being provided in modern aircraft, yet there was no central gunnery establishment for the dissemination of doctrine or for essential research and development. All training for gunners had been on a part-time unit basis. Squadrons visiting the six and a half Armament Training Stations were cut down to a visit of three weeks only and had been forced to devote the whole of this time to gunnery training alone. Finally, in point of numbers in Bomber Command there were only 622 trained air gunners (plus 691 under training) against an establishment of 1,576.<sup>2</sup> In the meantime, the demand for improved gunnery training was clashing with Observer training. There were only ten and a half armament training camps of which four and a half were used for the observers. To meet minimum needs, 300 more attack and target towing aircraft were required. There was a crying need for co-ordination, and on 10 February 1939 a meeting was held in the Air Ministry to examine the position. The investigation and relevant planning measures extended into late 1940, but so far as the first steps went, they were confined to calculations for determining a survey of strength, wastage and rates of replacement required, based upon forecasts of peace and war production of aircraft over a period of the following two years.

### **Expansion of the War Training Organization**

The problem was chiefly concerned with the reserves of aircraft and trained personnel which would have to be built up until war production was capable of taking the strain. Above all, it was shown quite clearly that the size of the training organization was intimately bound up with the whole problem of war potential and the operational effort which could be exerted. Thus everything hinged on the forecast of casualties that could be expected. Here the estimate was that total casualties of all kinds would be nearly 35,000.<sup>3</sup>

<sup>1</sup> A.M. File S.51631.

<sup>2</sup> BC/S. 21581/TV, 23 January 1939, A.M. File S. 56180.

<sup>3</sup> C.S.B. gives the figure of actual casualties up to September 1941 as being nearly 16,000. A.M. File S.50352.

This led to reconsideration of the size of the war training organization. To meet war requirements it was decided that by April 1941 a reserve of 17,000 pilots would be necessary together with 13,000 other aircrews. To produce this number up to 120 flying schools were estimated to be required. To raise the establishment of schools from peace to war it was estimated that over 800 aircraft would be required while nearly 3,000 would be needed to meet war expansion, and over 400 would have to be supplied, in addition, to meet wastage.

In comparison with these figures an estimated 13,000 pilots were capable of being produced by April 1941 by the Reserve organization. However, there was not the time for this to take place, and on the outbreak of war the strength of the R.A.F.V.R. was 20,000 of which 5,000 were flying personnel, so far had plans failed to come up to requirements. In this the time factor was decisive. The above figures of likely war casualties and the organization necessary to replace them did at length introduce a realistic element into planning. They revealed the extent of unpreparedness.

Early in 1939 yet another shortage was also having a restrictive effect, that of higher grade ground tradesmen. This led to the Air Council being warned of the 'serious consequences which would follow unless further demands on such personnel were restricted to essentials.'<sup>1</sup> From the general point of view of expansion there was calculated by March 1939 to be a deficiency of 1,400 officers and 8,000 Group I tradesmen of which 4,700 were Fitters I. The situation was considered likely to be further affected by expansion of the Fleet Air Arm. In short, there was the prospect of a breakdown unless sacrifices were made in certain directions. It was decided that the chief sufferers under the postponement of expansion rendered necessary were to be the bomber squadrons who were reduced to a temporary one pilot establishment in order to save 366 pilots. The overseas squadrons were to remain temporarily on a reduced establishment and the formation of a new Armament Training Group was deferred. Most serious of all from the training point of view was that instead of five group pools scheduled to be formed during 1939-40 only two were to be formed, both of them fighters. So far as Bomber Command was concerned it was decided that the nine non-mobilisable squadrons should continue temporarily to serve the purpose of group pools. No provision was made for group pools for Coastal Command. It was hoped to form the full number of pools required after March 1940. By these means a saving of 150 Group I tradesmen was effected.

Notwithstanding handicaps such as have been mentioned, the creation of a centralised organization to embody all the various training activities was formulated and issued to all concerned in April 1939.<sup>2</sup> The aim was to train personnel up to the standard which would enable them to be able to carry out their full duties on reaching their first line units. So far as organization was concerned, responsibility for co-ordinating all action passed to the Director of Training. This was important because it represented a further step in centralising control of training, albeit under a Director and not under an Air Member of Council. The principle on which

<sup>1</sup> E.P.M. 57 (39).

<sup>2</sup> S.D. 138, April 1939.

the organization worked was known as the 'meccano', i.e., complete sections could be added or removed according to the particular requirement of war. The time allowed for training in war was reduced to the minimum possible without too drastic a lowering in standards. Training wherever possible was standardised and followed the peace organization as closely as possible in order to allow smooth transition on the outbreak of war.

The sequence of training laid down in the War Training Organization started with an Initial Training School course of four weeks for all aircrew at which discipline and elementary ground subjects were taught. Thereafter, each aircrew category went its own way. The pilots were then to pass through the civil elementary F.T.S. stage in eight weeks; the service F.T.S. in two stages, Intermediate and Advanced, each of eight weeks. The flying hours remained at 100 for the service F.T.S. and 50 for the elementary stage. The air gunners and observers were to go to an air observer school, the air gunners flying 12 hours and the observers 45 hours. In addition to the main stream of trainees there were also laid down courses for specialists such as flying, navigation and armament instructors.

#### **Basis for Development of Empire Air Training Scheme**

It is important that this draft organization be borne in mind because it set the pattern for training on the outbreak of war and formed the basis for the development of the Empire Air Training Scheme when that started. In mid-1939, however, there were still no signs of that great expansion of basic training overseas which was to allow the development of the air power of Britain to proceed without hindrance so far as trained personnel were concerned. In fact, since November 1938 negotiations to train 300 pilots for the Royal Air Force in Canada had, after vicissitudes resulted in an offer by the Canadian Government to train 50 British pupils a year. For political reasons this offer was accepted and arrangements were made for the first course of 17 to begin training in September 1939<sup>1</sup>

Apart from Canada, discussions had long been going on with regard to the location of one service flying training school abroad. Various localities in the Middle East, Africa, India, in Northern Ireland and Scotland were repeatedly considered, but all came up against various and varied objections and nothing was done. In Australia and New Zealand, however, a different atmosphere prevailed. Australia had started on her own re-armament by the end of 1938, and by May 1939 had to cease sending trained pilots to Britain (of whom 176 had received short service commissions). They still, however, continued to send locally selected men for training in Britain. In New Zealand, arrangements had been made to manufacture Tiger Moths and Moth Minors, and at the same time their Government made proposals for the training of 1,000 pilots on R.A.F.V.R. lines. Already in 1937, New Zealand had laid plans to multiply by five their regular cadre of 28 officers and 160 other ranks, and had borrowed the services of a Royal Air Force officer as C.A.S. By April 1937 a scheme for training 15 cadets a year for Britain had started. The capacity of their F.T.S. was 40 a year, the remaining 25 cadets being posted to New Zealand Air Force units. By mid-1939 a second F.T.S. was opened and the output was stepped up to

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<sup>1</sup> A.M. File S.51649.

280 pilots a year. It is important to note that both Australia and New Zealand had started before the war to create aircraft manufacturing resources, thus giving their training organization that resilience and independence which was so essential for a widespread system such as the Empire Air Training Scheme. In May 1939 the establishment of a school in Kenya had been approved and by September a plan for locating schools in France had been agreed by the governments concerned. This represented the extent of the measures which were taken before the outbreak of war to create an overseas training organization.<sup>1</sup>

### **Military Training Act**

While plans for wartime training had been going through, it will be recalled that non-pilot aircrew recruiting in the Volunteer Reserve had resulted in the training facilities being only 45 per cent. and 27 per cent. full, in respect of the observers and air gunners respectively. By May 1939, however, with the proposed passing of the Military Training Act, there had been a sudden improvement, and recruiting offices found themselves overwhelmed with applications. In consequence all training facilities were filled and the recruiting programme promised to be completed ahead of schedule. As soon as this happened, the question arose as to whether there were facilities for training this greatly increased flow into the Service, and particularly whether training output could balance an aircraft production which had jumped from 2,000 a year in 1937, to 8,000 in 1939, and which was planned to achieve very shortly a rate of over 2,000 aircraft a month. Thus on one side of the training organization lay sufficient Volunteer Reserve recruits, on the other lay a huge acceleration of aircraft production. Part-time training was proving slow and wasteful, taking three to four times as long as continuous service training. The passing of the Conscription Act in May, meant that now the Air Ministry could give this continuous training. On 5 July 1939 training was made compulsory for the R.A.F. Volunteer Reserve and on 1 September the R.A.F. Reserve and the Volunteer Reserve were called out for active service by Royal Proclamation.<sup>2</sup>

At the same time, these measures did nothing to solve the problem of finding adequate facilities. The F.T.S. requirements had increased by 16 additional schools and there were few aircraft for them. The problem was not made easier by the fact that there was some difference of opinion regarding the types of trainer to be ordered and there was an acute need to settle a general policy with regard to future requirements of training aircraft. The instructor position also remained acute and, in fact, became more so owing to the needs of accelerated expansion. The flow of short service pilots into the Reserve had ceased thus drying up a valuable source of flying instructors for the civil firms. The ultimate requirement for instructors and staff pilots for Volunteer Reserve training had risen to nearly 800 while nearly 400 were required immediately. By August the problem was partially solved by the premature release of 150 service pilots and by recruitment from volunteer sources. This, however, was not an unmixed benefit, because the service squadrons lost the services of seasoned pilots,

<sup>1</sup> E.P.M. 80(39) and A.M. File S.50935.

<sup>2</sup> 168th Expansion Progress Meeting.

and were too heavily worked to train Reservists which it was suggested should be called up to take their place. Altogether, by mid-1939 it was obvious that the training organization was heavily overloaded and all attempts to increase its potential came up against many obstacles. Even with the additional training facilities contemplated, there was a threatened deficiency of 2,000 pilots by early 1941.<sup>1</sup>

All this pressure raised the total requirements of the Volunteer Reserve aerodrome centres from 58 to 80, but time did not permit the slow moving procedure of acquiring facilities for them to mature in time. Nevertheless, right up to the outbreak of war it was in this direction that the Service hoped to achieve most in providing for the large reserve of 30,000 aircrew needed to tide over the transition period at the start of the war.<sup>2</sup>

#### **Increase in accident rate**

There was also another handicap to training progress. Accidents were increasing in such numbers that they constituted a heavy drain on extremely slender resources. The chief cause of the great increase in the rate of accidents was, of course, due to the sudden re-equipment of the service with modern types as demonstrated by the fact that the accidents in the squadrons equipped with new types were about four times as many. In addition it demonstrated clearly that training was not preparing pilots sufficiently for the advanced types they had to fly. Bad navigation also accounted for a high proportion of those accidents involving crashes into high ground. This was because lack of radio and wireless facilities at F.T.S.s caused pilots to rely on visual contact with the ground. They only carried out cross country practices in good weather and thus were ill-prepared for blind flying and cloud flying demanding other methods of ascertaining position before breaking cloud.<sup>3</sup>

In particular, it was made clear, by the Accidents Committee of the Air Ministry, that advanced and applied flying training was inadequate; it being considered necessary that before a pilot had completed his training, he should be given instruction in flying the modern heavily loaded service types of aircraft. Once more the demand for group pools was made, or failing them, that modern operational types should be allotted to the advanced training squadrons of the Service F.T.S.s. In this connection it is interesting to note that great importance was attached to the giving of dual instruction on service types in squadrons, it being pointed out that those types of operational aircraft not equipped with dual had a high accident rate.

#### **Effects of Expansion on First Line Efficiency**

Thus in the matter of quality, there had been a deterioration in first line standards. This was demonstrated by the Commander-in-Chief, Bomber Command who pointed out that technical developments had revolutionised the bomber's task and vastly increased its complication and difficulty. Apart from the elaboration of the equipment which the crew had to operate, requiring for instance, the memorisation by the pilot of about ten times as many operations as was necessary in the old aircraft. The efficient operation of a modern bomber required, because of its increased speed and range,

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<sup>1</sup> E.P.M. 48(39).

<sup>2</sup> E.P.M. 121(38).

<sup>3</sup> E.P.M. 116(39) and S.D. 119/38.

a far higher standard of navigation, a completely new technique for flight in clouds and a gun defence against fighters which had at least four times the hitting power of the old fighter. These comments from an operational commander serve to show the condition of the first line. It had been decided to give the observers training up to the standard of the 10 weeks course at Manston, and in addition that the pilots, while taking second priority, should eventually be trained to the same standard.<sup>1</sup>

The standard of training of the air gunners was the subject of the most concern. In the intense competition for limited training resources, the gunners had been the chief sufferers. There still had not been established a central gunnery school to evolve techniques for the use of the new gun turrets then coming into use; there was no standard teaching and but few training resources. Training rested with the squadrons, and depended on the squadron visits to the Armament Training Stations for its chief source of organized gunnery training. The Air Ministry were, of course, aware of the situation, and the answer was the usual one of inadequate facilities, and the fact already stated that observers' training clashed with the needs of gunners' training in respect of the use of the ten and a half Armament Training Stations, six of which had to be devoted to the observers. It was hoped, however, that by early July 1939, 300 air gunners would have spent four weeks at the four and a half armament training schools available. It was also anticipated that an Air Gunners School, for ground training, whose opening had been delayed by equipment difficulties would start to function by August 1939. Over all the field of gunnery training activity there were shortages, of instructional equipment, target towing and attack aircraft, ranges or instructors. Owing to these difficulties and to the fact that this form of training took priority after pilot and observer training, gunnery training may be said to have been the Cinderella. The change in tactics to night operations which followed the heavy daytime losses of the early months of the war, served to cover to some extent what otherwise might have been a disastrous situation.

Apart from these considerations, the first line suffered increasingly from the drain of experienced personnel of all ranks to the rearward services, and from the influx of new and inadequately trained replacements. The process, under the dual expansion of first line and backing was inevitable, but it was the price of inadequate and slow initial preparation and its effect was a most unsatisfactory state of preparedness for war. There were also problems presented by training a crew of up to six individuals to work together instead of the two people needed to operate the old two-seater bomber. The comparative efficiency of the fighter units compared with the bomber units at that time underlined this point.

In another aspect, also, expansion had caused a deterioration, namely in discipline. The entry of some 1,600 observers after December 1938 had resulted in a large number of 'raw civilian' and junior airmen being given the time honoured and hitherto hard earned sergeant and flight sergeant ranks. The effect on the ground trades of this innovation was the cause of bitter comment by the Commander-in-Chief.

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<sup>1</sup> A.M. Files S.44223 and S.47667

The lessons to be derived from this view of the state of Bomber Command were that the mass production of an inferior article from the training point of view, was a return to the vicious circle of the first world war, and that in the long run the policy of concentration on numbers to the detriment of quality did not pay. There is no evidence to show that this state of affairs, forced by necessity, was accepted with equanimity. On the contrary, every effort was being made to provide more resources for training and to keep to a minimum the abnormal demand for experienced personnel. It was a question of waiting for the time when resources permitted the creation of training establishments to meet both the demand for numbers and for quality.<sup>1</sup>

#### **General Effect of Policy Changes**

Apart from the large increases in strength of the Royal Air Force at Home and Overseas, the change from Scheme 'F' to Scheme 'M' involved many changes in policy, the most important of which, in their effects on training were:—

- (a) Change from biplane to monoplane.
- (b) Eventual change from gun to cannon; disappearance of the synchronised gun and increase in numbers of guns carried by the fighters and in the amount of ammunition carried.
- (c) Increase in multi-engined types of aircraft, even fighters being in some cases equipped with two engines.
- (d) Disappearance of the then medium and light bombers and replacement by 'heavy' bombers.
- (e) Large increases in the crews of bombers, two pilots becoming standard, an observer being added and the number of wireless operators being doubled.
- (f) Development of war readiness in all units.
- (g) The introduction of the Royal Air Force Volunteer Reserve and the organization connected therewith.

It will be appreciated therefore that the overall increases in Scheme 'M' requirements over those of Scheme 'F' did not imply a similar growth in first-line strength. In many cases this represented a doubling, or more, in the backing required, even if the size of the operational force had not been enlarged. The difficulties suffered in co-ordinating all the new and increased demands, depending as they did on mass production methods, needed to be based in a clear and well-defined long-term forecast of at least two years ahead. This forecast depended upon matters of policy and finance outside Air Ministry control. For this reason, so much development had taken place empirically in the absence of firm decisions on a higher level. It was only towards the end of 1939 that some idea of the ultimate force capable of attainment was clearly perceived and that the training organization began to have any hope of building up to the scale required. But hope rested upon the provision of the means to do so, and speedily at that. For this reason the vital part played by the Dominions in providing resources for the training organization can be appreciated.

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<sup>1</sup> 176th Expansion Progress Meeting.

### **Summary of Pre-War Expansion**

The story of expansion covering the period 1934 to 1939 can be seen to have been a struggle to expand the Royal Air Force and at the same time prepare that force for war. It is important to bear this distinction in mind, because there can be discerned certain laws governing expansion. The chief of these laws, is that the fighting potential of a force will be equivalent to the value of the equipment and training devoted to it, and it will exert that potential so long as the organization and facilities exist to ensure that its casualties are promptly replaced by equally well-trained personnel and equally good equipment. The first line was thus the final product of all the effort, activity and outlay representing the highly complex structure and organization of a modern service. Any lack of co-ordination or balance in the rearward services was speedily reflected in the state of the operational units. In addition, the creation of the organization and facilities supplying trained personnel for the first line was a slow process and the whole organization was inflexible and very vulnerable throughout to any failure or restriction in its parts. Moreover, the whole depended upon plans laid far in advance, plans which were based upon intelligent guesses regarding what was going to be produced, what casualties would be suffered and upon the general trend of events. While margins of safety or insurance had to be created, care had to be exercised that they did not become so large that they restricted the total effort which could be exerted.

The expansion of the training organization must precede by months that of the first line of attack; and, in order to maintain high quality in the enlarged striking force, the training establishments require as instructors the best personnel and the most up to date equipment. Ideally the latter ought to reach training units prior to its use in operational units unless 'security' would be hazarded by such issue. Throughout the period of peace expansion, much of this long term planning and co-ordination was lacking with the result that plans did not mature as they were intended. Nevertheless, the rate of expansion was rapidly increasing. The beginning of 1939 saw the Royal Air Force at a strength of over 97,000 of which one-tenth were aircrew (7,400 pilots, 950 observers and 1,100 wireless operators and air gunners). The end of that year saw the number nearly doubled. Up to that time the previous two years had seen a great increase in volunteer civilian activities undertaken under the direction of the Service.

On the training side it was in this direction that most progress had been made: the utilisation of civilian operated schools and civilian instructors for the primary training of regular pilots and observers had proved eminently successful, and this in itself proved to be an important factor when the time came to transform these resources from a peace time setting to a war basis.

In addition to the aspect of the harnessing of civilian resources, were the measures that had been taken to foster outside interest in aeronautical matters in order to ensure sufficient numbers of volunteers ready to make the best use of the various training schemes established at all levels of the community. Thus was provided a nucleus of trained and partly trained personnel able, in case of war, to fill the gaps in a rapidly expanding Air Force. By the outbreak of war the combined strength of this reserve, excluding the twenty thousand odd members of the Air Defence Cadet Corps and

University Air Squadrons, was approximately 73,000. The following is a summary of the Reserve Organization on the outbreak of war:—

- 46 Elementary and Reserve (Civil) Flying training schools training between 100 and 200 pupils each.
- 34 Town Centres for disciplinary and ground training instruction, each for between 100 and 200 volunteers.
- 3 University Air Squadrons.
- 20 Auxiliary Air Force Squadrons.
- 61 Flying Clubs operating with the Civil Air Guard and training 7,500 pilots (of both sexes) up to 'A' licence standard.
- 172 Air Defence Cadet Corps Squadrons each with between 100 and 150 cadets.

This position represented a considerable achievement when so much was done on a voluntary part-time basis and carried out with inadequate equipment and elementary or outmoded aircraft. The drawback was that time did not permit the provision of resources to enable the large number of pilots, trained to elementary standards to be given further advanced training. The result was that on the outbreak of war, the War Training Organization had to pass through it a very large pool of aircrew requiring advanced and refresher training and conversion to operational aircraft and equipment. The ensuing phase was, therefore, largely devoted to the provision of service basic and advanced training facilities—to be followed by the increasingly important problem of operational training.

**PART II**  
**THE EARLY-WAR PERIOD 1939-1940**



## CHAPTER 4

### THE OUTBREAK OF WAR, SEPTEMBER 1939

The fundamental policy of the Air Ministry following the outbreak of war was to create an offensive and defensive force which would not be inferior, numerically or technically, to that of an enemy within range of Britain.<sup>1</sup> In September 1939 the German Air Force out-numbered that of Britain by about three to one and it was estimated that three years would be necessary to achieve parity with Germany. In order to create a training organization to attain this objective extensive long range planning was necessary. It was essential that the policy guiding this planning remained constant despite any short term emergencies which might arise. Also planning had to conform to the basic doctrine that air power be essentially controlled and directed to be independent of other branches of the Service.

The first threat to this policy was the Cabinet decision in March 1939 to increase the British Expeditionary Force from 5 to 32 Divisions. The outcome was a move to tie up over 600 first line aircraft in a purely tactical rôle. There were insufficient resources to permit such a diversion, but the Air Ministry policy had to be conditioned to meet the requirements both for a long term strategic force and for short term Army needs. Regarding the latter it was clear that they could only be met after those of Fighter and Coastal Commands, which had first priority in the defence of the Nation, and the overseas squadrons.<sup>2</sup>

#### Assessment of Aircraft Requirements

The first step to be taken towards implementing the policy was to assess the proportion of operational and training aircraft required and the manufacturing capacity necessary to provide them. This proportion had to be relatively high in the early stages of expansion in order to match the large numbers of operational aircraft which would later be produced. Similarly, it was necessary to make good the high rates of war wastage in aircraft while simultaneously expanding the first line strength of the force to the size required. Unfortunately Britain was not beginning the war with such a force, nor was there the necessary reserve of personnel and aircraft. Some idea of the proportion of the effort which had to be devoted to training was given in a considered estimate by the C.A.S. that, in order to maintain in war a force with a total first line strength of some 3,700 aircraft, over 13,000 aircraft of service and training types were required in the training units. This was a proportion of over 70 per cent. in training to under 30 per cent. in the first line.<sup>3</sup> By November 1939, the programme for the Royal Air Force, making allowance for increased co-operation with the Field Force on a 32 Division basis, had been accepted. To conform to this programme a statement of monthly aircraft requirements was produced, which in the view of the Air Ministry Department at that time concerned with aircraft production

<sup>1</sup> 184th Expansion Progress Meeting.

<sup>2</sup> Cabinet Conclusions 13(38) 14 March 1939, A.M. File S.2102.

<sup>3</sup> 195th Expansion Progress Meeting.

NOTE. By 1939, while the Germans were producing 750 first line and 250 training aircraft per month, Britain produced 2,500 in 1938 over 8,000 in 1939 and in 1940 more than 14,000. This increased production coincided with intensified technical advances in aircraft types.

(A.M.D.P.), was generally in harmony with existing plans. The build up of the first line was based on 2,550 aircraft a month which it was hoped would be reached by August 1942 and took account of Canadian but not American production.<sup>1</sup> To meet this expansion it was estimated that some 20,000 pilots and 30,000 aircrew per year would be needed,<sup>2</sup> requiring more than double the training school capacity then available in the U.K. It was obvious that additional capacity would have to be created overseas.

As soon as the Royal Air Force programme had been approved there followed the process of projecting training plans to conform to the plan for the development of the operational first line.<sup>3</sup> The basis of these calculations was the estimated aircraft production over the following three years; the ultimate force at which the Air Ministry was aiming (4,000 aircraft); and finally the sustained effort to be exerted including allowance for aircrew wastage, which was estimated at 12,000 in 1940, 21,000 in 1941, 60,000 in 1942. It is important to realise the fact that first line expansion could only be achieved by a small margin or surplus, if any, after all other commitments had been met. This then was the outline of the Air Staff policy and the scale of aircraft production to meet it. There was however a fallacy in the approach to training plans on the basis of the aircraft production target of 2,550 aircraft per month by August 1942. Whereas it was recognised that an enormous proportion of aircraft would have to be devoted to the training backing, a ratio of advanced trainers to operational type aircraft had not been laid down in the aircraft construction programme. The avoidance of a stage in training giving experience of a light aircraft with all the characteristics of the operational type was found in practice to be not impossible, but was too expensive in time and resources.<sup>4</sup> An advanced trainer, therefore, was found to be most necessary particularly in the case of pilots destined to fly multi-engined aircraft.

After September 1939 and before the start of the crisis in May 1940, this deficiency had been, to some extent, masked by the numbers of obsolete aircraft transferred to training as the squadrons were re-equipped. For example, when Scheme 'L' was approved in May 1938 and efforts to expand the R.A.F. were re-doubled, the elementary and reserve flying training schools were equipped with all kinds of aircraft from Moths to Hart variants and Battles the latter a front line type. Time did not permit the full development of the advanced trainer problem before the outbreak of war when all but 19 of the Elementary and Reserve Flying Training Schools were closed down and advanced trainer aircraft were thus made available to help establish the Service Flying Training Schools on a war basis. Even though 540 such aircraft were available only nine S.F.T.S.s could be raised to war establishment. This was the first indication of a problem which developed as the proportion of pilots, required to be trained on twin-engined advanced trainers, rose steadily from two-thirds to over six times the number of single-engined trained pilots, by the end of 1942. Attempts to specialize schools,

<sup>1</sup> E.P.M. 14(40).

<sup>2</sup> As a matter of interest, over the period September 1939 to September 1945 (six years) a total of over 300,000 aircrew were produced. This was almost exactly what the above average requirements stated.

<sup>3</sup> C.W.E./2/T.

<sup>4</sup> A.M. File S.4828 (See Vol. II).

to train either one type or another, broke down initially because of the shortage of twin-engined trainers; overseas development was similarly affected.

The key to the situation was the production of twin-engined advanced trainers. Not only were the schools deficient of this type on the existing war establishment, but the proportion of the production of twin-engined to single-engined trainers had to be gradually increased to meet the estimated needs. Only by excepting inappropriate establishments, that is to say if advanced trainers were regarded as a whole without differentiation of type; and by converting, where necessary, pilots trained only on single-engined aircraft after their basic training, was it possible to proceed with the expansion of the S.F.T.S.s. It was made clear in February 1940 that it would be a year or more before the correct proportion of aircraft could be achieved. It was not until then that a general agreement was reached on a fixed ratio of pilots to aircraft (i.e., the number of aircraft needed to produce one pilot of a given type per month). This was laid down as 3.4 single-engined aircraft or 2.8 twin-engined aircraft per pilot. A conference was held at the Air Ministry on 6 April 1940 to discuss the training aircraft programme in general and steps were taken to increase production. It was realized, however, that some time would have to elapse before the balance between twin and single-engined types could be restored.<sup>1</sup>

#### **Re-organization of Training Schools**

It was found that training could not be increased up to the ideal level because by January 1940 there were only 15 Royal Air Force Service Flying Training Schools in operation against an estimated requirement of 17, rising to 31, by the end of 1940. The expansion of Service Flying Training Schools governed expansion of the Elementary Flying Training Schools because their intakes were based on S.F.T.S. intakes and the number of S.F.T.S.s was governed by the supply of advanced trainers. S.F.T.S. courses were shortened from six months to 16 weeks, although the flying syllabus remained at 100 hours. The pupil capacities were also gradually increased from 96 to 152 per school as facilities in the form of aircraft instruction and accommodation became available.

The navigation training carried out by some of the schools was entirely divorced from the training of pilots and new units known as Air Observer Navigation Schools were formed. So far as the training organization generally was concerned categories of aircrew other than pilot were comparatively not in such short supply. The Air Ministry continued to produce a greater proportion of other crew categories since they could be given longer courses and more thorough training. It was easier to slow down the training flow than to open new schools.

At all the civil elementary flying training schools the pupils were collectively grouped as Royal Air Force, and the staffs assumed the status of serving Royal Air Force personnel, their Chief Instructors becoming the Commanding Officers responsible to and approved by Training Command. It had also been planned to increase the capacities and shorten the courses

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<sup>1</sup> A.M. File S. 2102.

of elementary F.T.S.s but, due to the Volunteer Reserve activities, there was a glut of pilots trained to elementary standard waiting to pass through S.F.T.S.s. The fact that there were not adequate facilities to train them further, constituted one of the main restrictions to expansion. For this reason the E.F.T.S.s remained on a ten weeks course instead of the planned war-time eight weeks course. In fact there were so many elementary reserve pilots in the early stages of training that a number had to be returned to civil life after mobilisation, to wait until training capacity became available. For this reason also war entrants had to wait until the accumulation of volunteer reservists had passed into the schools.

So far then the basic Air Staff policy for the creation of a balanced force of both defensive and offensive elements had resulted in the laying down of a long term programme of aircraft construction, whose characteristic was a growing proportion of heavier multi-engined types of aircraft demanding a larger share of pilots and crews to man them. This in turn revealed the fact that an intermediate modern training aircraft was essential in large numbers, and until these numbers were produced the growth of the training organization would be hampered. Apart from Coastal and Bomber Commands, Fighter Command, whose attainment was of first priority, was not capable of being maintained unless urgent short term measures were taken. This necessity for short term defensive measures, which did not harmonize with long term strategic plans, was the greatest single obstacle to the training organization as a whole and in particular to the Empire Air Training Schemes.

#### **The need for Operational Training Facilities**

The necessity to create facilities for an advanced operational stage in training became apparent during the 'Phoney War' period when casualties were very light and the output from the S.F.T.S.s had risen sharply. It was calculated that, at the existing rate of pilot production, the deficiencies would be wiped out and a surplus of 1,100 would be created by April 1940. By increasing the course length at the S.F.T.S.s by 25 per cent. in December 1939 more quality in training was given and the surplus of pilots was adjusted. This did not meet the need for operational training. It will be remembered that one fighter group pool and 12 non-mobilisable bomber squadrons had to be devoted to this form of training which was designed to save the squadrons the work of converting pilots to operational standards and to create a pool of replacements immediately behind the first line. By the outbreak of war there were 55 squadrons in Bomber Command of which 40 were mobilisable and 15 were not. In addition the Commander-in-Chief had requested that five more squadrons should be converted to reserve squadrons. Therefore, in effect, there were 20 non-mobilisable squadrons (with 450 bomber and trainer aircraft) to 35 first line squadrons (with 500 aircraft).<sup>1</sup> Large therefore as was this provision for operational conversion, a prolonged investigation in the latter part of 1939 revealed that, on a basis of 45 hours flying per pilot in the group pool, the training facilities for the Whitley and Wellington squadrons would have to be trebled before any first line expansion could take place. The output from the twin-engined F.T.S.s was double the training capacity of the non-mobilisable squadrons.

<sup>1</sup> A.M. File S.46938.

(276 pilots per month compared with 115) and Bomber Command requirements which amounted to 290 pilots a month exceeded even the S.F.T.S. output. Training facilities for observers and air gunners were similarly affected. It was agreed that when stability had been reached one Initial Equipment aircraft would be required in the group pool for every three pilots wasted per month. On 5 September 1939, No. 6 Group became responsible for all operational training in Bomber Command and 12 squadrons were selected for this purpose, and renamed Operational Training Units on 28 November 1939.

Up to this stage, the operational training problem had bulked largest in Bomber Command because of the size of the crew and the nature of its tasks. The fighter aspect was, however, equally important, and in fact more urgent owing to the fact that Fighter Command would have to conform to the enemy's initiative and could not control its wastage by limiting its operations as Bomber Command was able to do.

The Commander-in-Chief, Fighter Command, correctly appreciating the vital struggle which was about to take place, was concentrating on increasing at all costs his first line strength and in 'working up' to full operational pitch. He was therefore most reluctant owing to the time factor and to shortage of aircraft, to devote any resources to operational training. For this reason he resisted proposals to create a second fighter group pool (or O.T.U.), and proposed instead that the aircraft were needed to make two half squadrons of Blenheim fighters.<sup>1</sup> It was pointed out, however, by the Air Ministry that lack of fighter group pools would mean lack of casualty replacements when fighting became intense and that, in emergency, operational training aircraft could be used. Fighter Command therefore reluctantly agreed to the formation of a second group pool (No. 12) on 25 September 1939. Both pools were handicapped by lack of camera guns, reflector sights, armoury and radio telephonic facilities. There was also a shortage of fully equipped aircraft. This made them only capable of producing half the planned output of 1,100 pilots a year. In fact they hardly met, in quantity or quality, the requirements of the fighter squadrons in France. At the end of April 1940, the Air Ministry overruled Fighter Command's objections to the diversion of resources into the operational training organization, and two more fighter O.T.U.s were formed and the entire establishment of the four O.T.U.s was increased.

Coastal Command had remained self contained with both operational and advanced training units and therefore its problems were the least prominent of all. The main burden of operational conversion remained with the squadrons. It was not until November 1939 that the first coastal pool was created. This pool became No. 1 O.T.U. in February 1940 after a winter devoted to wrestling with numerous handicaps and was devoted to land plane training. The other two Coastal Training Units, viz., the Seaplane Training Squadron and the Torpedo Training Unit being in effect O.T.U.s were devoted to the flying boat and strike squadrons respectively.<sup>2</sup>

<sup>1</sup> A.M. File S.1924 and A.H.B. IHH/1/18.

<sup>2</sup> A.M. File S.1887.

The specialised post-S.F.T.S. course given to pilots at the School of Army Co-operation was in effect operational training and was treated and planned on similar lines to other group pools. The first-line operational squadrons requiring training support were four single-engined and four twin-engined squadrons (96 aircraft) whose estimated wastage was 464 pilots a year. By adding another unit, Andover, the combined rate of training 58 pilots every six weeks balanced the estimated wastage.

It was therefore in the direction of bomber operational training that there was the greatest need, and indeed the situation was one which urgently required a remedy. In this problem, the main complication was the heavy bomber (later known as the medium bomber when the four-engined types came in). The requirements for the other types of bombers and the fighters were more reasonable. It was therefore decided to have one advanced training aircraft to every aircraft in a heavy squadron, and a somewhat lower ratio in the other types of squadron. It was obvious, though, that at that time there were not the resources available to keep to these ratios, there being in fact less than a third of the aircraft available to meet the 100 per cent. requirement.

At this stage the Commander-in-Chief, Bomber Command, was asking for 55 hours flying for each pilot at the operational training stage, whereas the Department of the Air Member for Supply and Organization calculated that no more than 40 hours in six weeks could be given and that even on this basis over 2,000 aircraft in the bomber O.T.U. organization would be required to produce 1,200 pilots a month to meet wastage and expansion.<sup>1</sup> It must be emphasised that, in this problem of the amount of flying hours devoted to O.T.U. training, Bomber Command expansion rested on a delicate adjustment between the minimum outlay on training which could be made to keep casualties and accidents down to reasonable proportions and the resources which remained to expand the first line. This remained the crux of the matter throughout the war.

When this problem was examined at the end of 1939, the size of the commitment caused serious concern. When the ultimate size of the Royal Air Force was laid down as being over 4,000 aircraft it was calculated that it would need to be supported by about 2,000 operational and 500 training aircraft, together with an immediate reserve of one-third that number. To man this organization it was found that 2,760 officers, nearly 40,000 men and 36 aerodromes each with one satellite would be needed. So far as wastage was concerned, for every seven heavy bombers required to replace wastage in the first line, one would be needed to replace wastage in the O.T.U.s. On the other hand for every four heavy bombers required to increase or to re-equip the first line, no less than three were wanted to increase or to re-equip the O.T.U.s proportionately. These figures, as can be imagined, caused great concern, although their soundness was not questioned. The whole problem was considered again at a C.A.S.'s conference on 19 April 1940, and the crux of the matter was agreed to be the 'heavy' bomber requirement, which amounted to half the total front line strength and three-quarters of the 2,000 operational aircraft needed to support it. By comparison the other operational training demands were light.

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<sup>1</sup> A.M. File S.46938.

It was agreed that no reduction in the standard of first-line training could be accepted and it was confirmed that further training would be necessary between the basic training stage and the squadrons. The O.T.U. requirement could therefore only be reduced by increasing the standard of training before the O.T.U. stage. The Commander-in-Chief, Bomber Command, agreed that if this could be done he was prepared to reduce the amount of O.T.U. training to 30 and 35 hours for twin-engine and single-engine trained pilots respectively. Failing this, he insisted on the full 55 hours flying requirement which had already been stated. In the meantime the ratio of one training aircraft to one squadron aircraft was confirmed. The whole matter rested on the standard of training that could be attained up to and including the S.F.T.S. stage. The trouble was, however, that the standard not only of pilots but also of the other members of the crew was restricted by lack of facilities, particularly aircraft. This state of affairs was recognised by the authorities, and was one of the reasons for extending the S.F.T.S. course length by 25 per cent. Nonetheless the fact remained that only a small proportion of the numbers of pilots required had been trained on twin-engined aircraft. They had done little night flying (on an average 2 hours solo), they had had no cloud flying or formation practice and none on service types. In the same way, the observers' standard was criticised. While it was admitted that they had a sound theoretical basic knowledge, they had a minimum of practical experience particularly in conjunction with radio aids to Navigation and in operational procedure. So far as the W/T air gunners were concerned, they had a very small amount of air experience in wireless operating, little general air experience and none at all in operating the type of turret that they might be called upon to use on operations. Of all these adverse factors, the standard of pilot training caused the most concern, and it was particularly owing to the policy of Bomber Command of having two pilots per aircraft that the O.T.U. problem was so complicated and large.

#### **Bottlenecks in Pilot Training**

The lengthening of the S.F.T.S. courses to 20 weeks and the E.F.T.S. courses to 10 weeks was accompanied by instructions that more time should be devoted to instrument and general flying practice at the E.F.T.S.s and to instrument, night and formation flying at S.F.T.S.s, and there can be no doubt that this policy was sound and would have met to some extent the criticisms of the standard of training that have been mentioned. Unfortunately the winter of 1939-40 was exceptionally severe and the S.F.T.S. flying hours fell from a normal monthly average of about 40,000 to 22,000 in December, 29,000 in January and to 14,000 in February 1940. The effects of the weather were aggravated by the serious unserviceability of the existing grass aerodromes. In consequence, the S.F.T.S. courses had to be extended by anything up to 10 weeks and the actual output of pilots in the first three months of 1940 was 550 less than the 20 week courses should have produced and the forecast surplus of 1,100 pilots by April 1940 had completely disappeared.

Similarly intakes into flying training were reduced by the same factors which had restricted the S.F.T.S. output. By February 1940, the initial training wings had some 2,500 cadets, or nearly a six months supply waiting for vacancies. Training Command was pressed to take 20 more pupils at

each S.F.T.S. but found it impossible because there was not enough accommodation. The rate of flow was therefore increased in April 1940 by shortening the S.F.T.S. courses once more to 16 weeks. Similarly the E.F.T.S. course was restored to its originally planned length of eight weeks. In addition, in order further to ease the congestion in the initial training wings the total E.F.T.S. capacity was increased by 144 in March and at the same time advanced elementary training was started at two of the E.F.T.S.s. This advanced training was in night and instrument flying and was intended to keep pupils profitably and progressively employed until the S.F.T.S.s could absorb them.

Concurrently with these measures, Training Command proposed and the proposal was approved, that the pilots practical armament training should be carried out at O.T.U.s. In this way training was done on operational aircraft and as a crew, in a place where less time would be wasted and where more concentrated use could be made of the limited facilities in armament training stations. While this arrangement was satisfactory for Bomber Command, it did not meet the requirements of Fighter Command which could not be persuaded to create an adequate operational training organization. This emphasised the difference between the training given to single-engine pilots (Group I) and twin-engine pilots (Group II). This was because Fighter Command demanded that pilots should be given practical armament training at S.F.T.S.s. By that time the ratio of twin-engine trained pilots had risen to three to one and was destined to increase to over six to one by the end of 1941 owing to the growing proportion of multi-engined types being introduced into the Service. For this reason, in spite of the advantage of flexibility inherent in the organization of S.F.T.S.s with combined single- and twin-engined training, it was decided in January 1940 to specialise S.F.T.S.s as single- (Group I) or twin-engine (Group II) Schools. Armament training in Group II Schools stopped forthwith, but attachments of Group I pupils to armament training stations continued temporarily until armament training facilities could be provided at the Group I S.F.T.S.s.

No fundamental change in the S.F.T.S. syllabus was involved. Group II pupils still learned armament subjects and carried out bombing practice at the advanced training squadron stage. The essential difference was that bomber pilots did not do high level bombing or live firing until they went to O.T.U., and the time thus saved was devoted to training in night and instrument flying. This new departure involved the use of more twin-engined advanced trainers than were available, and specialisation could only be started at three S.F.T.S.s by April 1940. Moreover, the move of training units away from the eastern side of the British Isles precluded air to air firing over the sea, so essential for Group I training. At that time, then, the practical effect of the decision to specialise the S.F.T.S.s appeared to be nullified by events.

In other directions also, S.F.T.S. training received a setback. There was an acute shortage of spares which kept a large proportion of training aircraft on the ground and this, coupled with the dilution of skilled maintenance personnel with newly-trained recruits, caused an increasing shortage of training aircraft. Efforts to improve night flying were also restricted by lack of relief landing grounds in spite of the fact that satisfactory lighting and night

flying drill to cope with enemy interference had been worked out. There was also a difficulty in finding bombing ranges, and cloud and bad weather flying could not be practised because the schools had no facilities for wireless aids.

### **Navigation Training**

At the same time as deficiencies in pilot training were being revealed, the standard of navigation was so heavily criticised that the decision of May 1938 that the observer should be responsible for navigation was thrown open to discussion, even to the point that for a short period it was decided to increase once more the navigation training of pilots. Fortunately the sounder view prevailed that the fault lay not in the policy of observer responsibility, but in the training of the observers. In April 1940, the syllabus of flying at the Air Observer Navigation Schools was increased to 67 hours, but night flying instruction was abolished because of the difficulty of carrying it out without wireless aids. As usual at that time there were great difficulties encountered in giving effect to this policy owing to lack of Ansons and instructional equipment.

Pilot navigation training was also seriously affected by lack of proper instructors, and thus the full burden of these deficiencies fell on the bomber O.T.U.s. Similarly in Fighter Command, pilots unable to use their wireless aids were often losing themselves and there was a demand for one trained navigation officer per fighter squadron. Coastal Command was perhaps best off owing to the fact that a proportion of their pilots went through the School of General Reconnaissance (after leaving Flying Training School) whose wartime output was 416 pilots a year on a 12 weeks course. This was of course insufficient to meet the requirements of Coastal Command expansion and a second School of General Reconnaissance was opened at Squires Gate in May 1940.

### **Armament Training : Formation of Central Gunnery School**

The position of armament training was the same as pilot and navigation training. The 10½ armament training stations were due, under the War Training Organization to become Air Observer Schools training observers in navigation, bombing and gunnery and air gunners in gunnery. The theoretical annual output was 3,600 observers and 5,400 air gunners. In fact, as navigation training was impossible, the stations were renamed Bombing and Gunnery Schools in November 1939. Owing to the closing of schools in the East coast area and to re-organization, only eight stations became available. The usual shortage of aircraft, equipment, accommodation, and so forth was experienced and the schools were established to only half their requirements. In December 1939 the general lengthening of courses embraced the bombing and gunnery schools as well and forecast surpluses of observers and gunners also became deficiencies during the severe winter of 1939-40. The number of these aircrew turned out by early 1940 was but half the planned output, and by March 1940 the fact was accepted that they could not complete the syllabus.

In addition a shortage of competent instructors was experienced owing to the failure to establish a Central Gunnery School before the war. It was not established until 5 November 1939 and then it concentrated upon the training of Gunnery leaders (20 every four weeks) to the detriment of research and development.<sup>1</sup> By January 1940 gunnery leaders were established in the operational commands.

So far as the development of bombing technique and equipment was concerned, the need for a Bomber Development Unit was discussed but nothing was done at that stage to meet the requirement.

#### **Recruiting Measures : The Deferred Service Scheme**

Before the war, the Royal Air Force drew its flying men from many different sources, all volunteer, and sufficient numbers of suitable men were always forthcoming. On the outbreak of war, however, the situation demanded vast numbers to meet the long term training programme which was laid down, both for the expansion of the Royal Air Force and also for the Air Forces of the Dominions and Allies. In this the time factor caused the drastic curtailment of course lengths, and the general speeding up and concentration of instruction made great demands upon the quality and character of those taking part. It was therefore the responsibility of the authorities in charge of recruiting and selection that the limited training places and, later, shipping space, should not be wasted on men who were in any way unsuitable.

It will be appreciated that the Air Forces had special needs where aircrew personnel were concerned and it was essential that some system should be devised whereby suitable young men of the highest physical, educational, and moral fibre should be secured, as they came forward, for service with the Royal Air Force in spite of the fact that facilities were not immediately available to train them. There was a danger that they might offer their services elsewhere and thus irreplaceable personnel might have been lost. For this reason the 'Deferred Service Scheme' was introduced on 27 September 1939.<sup>2</sup> Under this scheme, personnel enlisting in the Royal Air Force were selected; attested and then placed on a period of deferred service pending their call-up for regular service. This scheme became increasingly important as the war progressed and the manpower shortage became acute. The numbers held in this manner reached their peak in April 1941 when there were over 75,000 young men waiting call-up to the Royal Air Force. The length of deferment varied at different stages of the war owing to changes in training policy. In 1940 the period was rather less than six months, by 1942 it had risen to between six and nine months and by mid-1943 it was over a year. The overriding importance of having a reservoir of the most suitable young men always available to meet the huge demands for numbers, sometimes caused the Deferred List to come under severe criticism. This was the price which had to be paid for an uninterrupted flow through the training organization and it could not be avoided. In building up the Deferred Service list and in feeding in the flow to the service, under pressure to cut down unnecessary wastage, the methods of selection became increasingly scientific.

<sup>1</sup> A.M. File S.56180.

<sup>2</sup> A.M. File S.57959.

At the outset, the need was not so much for the raw recruits, they were required for the long term programme. What was wanted to meet the immediate situation was the ready-made pilot or those who had some air experience. For this reason the Auxiliary Air Force was so valuable. The Volunteer Reserve also was valuable so far as it went, but here the price had to be paid for insufficient facilities for advanced training, provided before the war.

### **Recruits from Overseas**

There was also a flow of volunteers from all over the world. Altogether some 4,000 from 89 different countries or parts of the Empire were enlisted. In addition large numbers of Poles, Czechs, French, Dutch, Norwegians and Belgians came to Britain after the fall of France in 1940. In May of that year for instance there were 350 Polish pilots in Britain. Steps were taken to concentrate these different nationalities and eventually to form Allied Air Forces. By the end of 1941, the strength of the Allied Air Forces was 14,476, in addition there were 170 Allied pilots serving in the Royal Air Force, and a year later this figure had grown to 18,672, of which the Polish contingent was more than half.<sup>1</sup> Personnel for the Allied Air Forces were also recruited from other parts of the world, viz., Poles, from Russia and the Middle East, Norwegians, Danes and French from Canada, Yugo-Slavs and Greeks from the Middle East. As numbers increased it was possible to form special squadrons manned entirely by Allied personnel and by the end of 1942 there were 27 Allied squadrons serving with the Royal Air Force. To meet the immediate short-term emergency, men of all countries, and races came forward. This was made possible by the abolition of the peace time rule which laid down that only candidates of unmixed European descent would be considered.

During the initial period of the war when the first line and training were being rapidly expanded, and when basic training was being set up overseas, this need for the ready-made pilot persisted; but after the successful outcome of the Battle of Britain, the main system of recruitment depended as always for its material mainly from the white population of the Empire, the main concentrations of which lay on either side of the Atlantic. In Canada, so great was the response to the call for recruits in the early months of the Air Training Plan that training facilities were completely inadequate to keep pace with the applications. Rather than lose good material, the Royal Canadian Air Force accepted suitable applicants for immediate enlistment and placed them temporarily on guard duty while awaiting aircrew training. The Canadians did not, however, introduce a deferred service scheme until February 1941. In Australia and New Zealand, the recruiting for aircrews was organised on similar lines to that of Canada. As in the latter country, the response exceeded all expectations and reserve pools were established. It was necessary also to organise an education scheme for aircrew while they were waiting to be called up.

Apart from the Empire Air Training Scheme, there was also recruitment in Africa. Personnel from Kenya, Northern and Southern Rhodesia, and South Africa were recruited and trained. However the bulk of air recruits

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<sup>1</sup> A.M. Files S.60600, S.1885 and S.81339.

came either from the British Isles or from Canada, Australia and New Zealand. Over the war period 243,000 candidates were accepted by Selection Boards in Britain alone.<sup>1</sup>

In the period immediately following the outbreak of war, only 3,600 candidates were accepted up to the end of 1939 and 33,100 up to the end of 1940. This was because of the initial delays in creating training capacity, in expanding air power and in extending its uses. It was, of course, also due in part to the large partially trained Volunteer Reserve (5,000), and to the Royal Air Force Reserve (23,000) which, with the Auxiliary Air Force, did much to meet immediate needs.

### **Selection Procedure**

Some indication has already been given of the fact that there was a great waste of resources and time when the number of recruits who failed to come up to standard during training was too large. In the beginning of every war, the standard of recruit has been very high but gradually that standard has perforce deteriorated. Thus in the late war this tendency resulted in the need to improve and lengthen training methods and at the same time to make a science of the process of determining as early as possible which recruits showed the most promise and in which direction their talents and aptitudes lay. Thus the methods of selection and classification underwent a considerable revolution as the war progressed. The result was a gradual change from the system obtaining at the start of the war, which may be termed 'survival selection' under which the candidates were both selected and classified solely as a result of the impression made at a personal interview with a board of officers, to a scientific system of 'quality selection.' This quality selection system as it emerged by the end of the war involved a series of practical and psychological tests, including flying, for which marks were given and from which it was possible with reasonable accuracy to forecast the employment and the standard of each candidate. This evolution took place in five main phases.

In the first phase which lasted until early 1942, the method of selection was entirely by interview and depended upon the experience and qualities of the selecting officers, who had to allocate personnel in accordance with the quotas laid down. In early 1942, there occurred a great advance in procedure with the introduction of the system of selection by actual flight test prior to entering flying training. Men were chosen who were considered suitable for the broad category of Pilot/Navigator/Air Bomber (P.N.B.). Those P.N.B. candidates who showed the greatest practical aptitude in the air were graded at the top of the list, those who showed less aptitude took their places on the list in order of merit. Subsequently selections were made from the list in accordance with the quotas required, the candidates at the top proceeding to pilot training, those halfway down to navigator training and those in the lower part to air bomber training. Those candidates outside the P.N.B. list, namely, the wireless operators, air gunners, and the flight engineers, were still classified in accordance with the recommendations of the Interview board. By early 1944, all categories of aircrew were tested scientifically

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<sup>1</sup> A.D.M. (Stats). Personnel Statistics.

for aptitude and 'shadow' selections were made. The flight test still continued to be used as the main instrument in classifying pilots. Finally in early 1945 an Aviation Candidates Selection Centre was formed as a centralised unit to select and to classify all candidates using the tests evolved during the war.

It is interesting to note that by the end of the war the circle of development was completed and once again selection and classification were carried out in one movement. The methods employed were very different, particularly in regard to pilot training, in that the emphasis moved gradually from the educational and intellectual standard of the candidate to a measurement of natural aptitude. The new methods as they evolved finally reversed the process, the first consideration being the aptitude shown for a particular aircrew category; later the educational aspect could be reinforced by a course of preliminary ground training, provided that the candidate showed general suitability for aircrew duties.

### **Reception and Initial Training**

Before September 1939 and since the reorganization of training in 1935, the only two categories of full-time aircrew personnel, i.e., pilots and observers, recruited respectively under the short service commission and the direct entry schemes, went straight to their training at the civilian elementary flying training schools or air observer navigation schools as appropriate. After completing this *ab initio* stage, both pilots and observers went to the Royal Air Force Depot at Uxbridge for a two weeks' disciplinary and ground training course. It was at this latter stage that the entrants assumed their service status as officers on probation or as airmen. This system worked quite well in peace but it obviously could not be suitable for the wartime expansion, particularly the first rush of volunteers. Some much larger organization was necessary, not only to handle the numbers involved, but, during the period of waiting for entry into flying training, to take advantage of the opportunity to raise the educational standard of otherwise suitable men. This latter consideration became increasingly important as the war progressed, and led to an elaborate series of courses lasting in some cases up to six months or even longer.

In September 1939 the selection of recruits was carried out by an Aviation Candidates Selection Board. Successful applicants then proceeded to an Initial Training Wing for reception and initial training. This type of unit was envisaged under the War Training organization as being the first stage of training; the course was to last a month and on its completion, the pupils were to be selected as pilots, observers or air gunners. It was intended to form two I.T.W.s on the outbreak of war each with a capacity of 350 pupils.

In the meantime in April 1939 Brigadier Critchley who had had experience of preliminary training in 1917 and 1918 proposed a scheme for training 10,000 cadets in preparation for entry into flying training. By August 1939 it was decided to establish Flying Personnel Reception Depots at holiday camps, universities and V.R. town centres to accommodate recruits prior to their entry into I.T.W.s. A special Group, No. 54, of Reserve Command was formed to deal with these Depots and Brigadier Critchley was put in charge. There was actually no difference between the new Depots

and the I.T.W.s planned under the War Training organization and by 15 September 1939 they became Initial Training Wings. Four I.T.W.s accommodating over 3,000 pupils had formed by the end of 1939. After the two stages described above the pupils proceeded to do their flying training.<sup>1</sup>

#### **Formation of Aircrew Reception Centres**

This sequence remained constant until early 1941 when the number of potential pilots awaiting training had risen to some 10,000. The period spent on Deferred Service increased considerably and in order to allay public criticism, an Aircrew Reception Centre (A.C.R.C.) stage was put in between the Selection Board and the I.T.W. This took some of the administrative load from the I.T.W.s and allowed the latter to specialise in the training of the different aircrew categories. It also made possible the re-selection of candidates who had failed their pilot or observer courses. In February 1943 the Preliminary Aircrew Training Scheme (P.A.C.T.) was introduced in order to concentrate on improving the standard of education of a growing proportion of candidates. This represented an intermediate stage between the Selection Board and the Receiving Centre for those requiring this training. Finally in April 1944 the whole system of selection, classification and initial training was revised in order that all candidates for aircrew should enter on a common footing and have a similar period of preliminary training. This placed more emphasis on the Reception Centre stage which needed greater capacity, a far wider syllabus and a more comprehensive system of tests. This was all part of the scientific trend of selection already mentioned. From the administrative viewpoint the system had become flexible and well defined. The whole purpose was to employ the cadets usefully while they awaited further progress. The system was an inevitable consequence of the mass production process and of the wide disposal of training overseas when communications were stretched and under constant threat by the enemy.

The importance of these preliminary training stages lay in the fact that, as the war progressed, cadets had to spend an increasing proportion of their time in the various pools which made up this non-flying but essential training machinery. The large numbers and varied categories and nationalities which passed through made the administration very complicated. The main difficulty however was to combat the lack of inspiration and aimless atmosphere which prevailed, due to the feeling of repression which young men, keen to fly, were bound to experience whilst waiting.

#### **Re-organization of the Training Administration**

As the expansion of the training organization increased in various parts of the world it became apparent (by April 1940) that the control of training needed re-organizing. Previously the training of pilots, air observers and air gunners was split laterally between Reserve and Training Commands; the elementary in the former and advanced in the latter. On the other hand, technical training was quite distinct and the numbers involved justified a separate command organization. It was therefore decided to abolish Reserve Command for training purposes and transfer its units to Training Command

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<sup>1</sup> A.M. File S.51385.

which would, in turn, hand over all technical ground training to a new Technical Training Command. Training Command was renamed Flying Training Command. This re-organization reduced the size of the latter to 54 stations, 3,200 officers and 26,000 men, while Technical Training Command had 23 stations, 1,650 officers and 69,000 men.<sup>1</sup>

Re-organization also took place in the Air Ministry in March 1940. The same distinction between the control of pure flying training and applied or operational training was maintained. The Air Staff remained responsible for operational training under a new Assistant Chief of Air Staff with a Directorate of War Training and Tactics, and with three departments dealing respectively with Bomber and Fighter, Coastal and Army Co-operation Commands. The Directorate of Training was also re-organized into four deputy directorates responsible for flying training: navigational, naval, armament and technical training. Matters concerning the Empire Air Forces were first handled by a Deputy Directorate of Dominion Air Co-operation which was formed in November 1939 to co-ordinate the Dominion air forces and their training schemes. After the signing of the Riverdale agreement this arrangement gave place to a standing committee of the Air Council—the Empire Training Scheme Committee—whose function it was to deal with all overseas training.

#### **Review of Factors Determining the Training Output**

In April 1940 a series of progress meetings were held by the Secretary of State in order to find out whether, if sustained operations began, it would be possible to replace casualties in flying personnel.<sup>2</sup> The factors which it was considered might limit the supply of such personnel were four:—

- (a) Shortage of training aircraft.
- (b) Shortage of instructional personnel.
- (c) Shortage of suitable recruits.
- (d) Shortage of aerodromes and of schools.

The shortage of training aircraft has already been described, and the Air Ministry departments concerned were trying to find the means to remedy the serious lack of twin-engined trainers that had developed. In this respect alone it has been shown that the position was far from satisfactory, although the single-engined trainer was in greater supply and therefore as regards the vital fighter element the short term position was not so serious. So far as instructors and suitable recruits were concerned, owing to dividends still accruing from the work of the Volunteer Reserve, the position was satisfactory. There remained the fourth factor, the provision of aerodromes and schools. In general there was no hold up for shortage of training schools. By April 1940 it had been possible to finalise the training commitment in relation to the total number of schools required to meet the wastage and expansion incurred when the production of 2,550 aircraft a month had been reached. These schools represented an ultimate commitment to be provided gradually over a three year period in step with the expansion and consequent wastage of the operational units.

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<sup>1</sup> E.P.M. 44(40) and A.M. File S.60147.

<sup>2</sup> E.P.M. 113(40).

In addition to these four factors there was the danger of enemy action against schools. It was obvious that it was not possible to provide specifically against the possibility of schools being put out of action and the question of transferring schools overseas was awaiting a decision on the provision of adequate resources. In the meantime efforts were being made to provide the aerodromes and the accommodation earlier than they would be required under the programme. By far the largest commitment was to find over 70 of the 100 additional aerodromes required at that time for operational training.

**The Position of the Training Organization on 25 March 1940**

Type of School	Ultimate Requirements	Existing R.A.F. Schools	Existing R.A.F. Schools Due to Close	R.A.F. Schools Planned or under Construction	Schools Planned under the E.A.T.S.	Total Schools Existing or Planned	Balance Outstanding
Elementary Flying Training Schools ... ..	60	19	4	10	25	50	10
Service Flying Training Schools ... ..	60	15	8	18	25	50	10
Air Observer Schools ...	40	15	8	7	14	28	12
Bombing and Gunnery Schools ... ..	27	7	1	3	14	23	4
General Reconnaissance Schools ... ..	2	1	1	2	—	2	—
Air Navigation Schools	6	1	1	1	3	4	2
Flying Instructor Schools	3	1	—	1	1	3	—
Army Co-operation Schools ... ..	3	2	—	—	—	2	1
Torpedo Training Units	2	1	—	1	—	2	—
<b>TOTAL ... ..</b>	<b>203</b>	<b>62</b>	<b>23</b>	<b>43</b>	<b>82</b>	<b>164</b>	<b>39</b>

### Expansion of Operational Training Organization

In general it was accepted that pilots should receive between 50 and 60 flying hours during the period of training (approximately six weeks) covered by the operational training unit. To have met this requirement in the case of bomber aircraft, however, would have meant that the size of the operational training organization would have been greater than the operational force. After considerable discussion and examination, a compromise was reached and it was decided that to meet requirements of personnel wastage, which might be expected under conditions of sustained operations, the total Initial Equipment aircraft establishments of the operational training units should be fixed as the following percentage of the Initial Equipment establishments of the actual operational squadrons which they were designed to maintain:—

	per cent.
Heavy Bombers	100
Medium Bombers	60
Fighters	20
General Reconnaissance	20
Army Co-operation (Twin-engined)	50
Army Co-operation (Single-engined)	25

On the basis that each Initial Equipment aircraft in the operational training units would give an average of 25 hours per month, the pilots could be given approximately 40 hours flying during their period in an operational training unit. If the units could increase the average monthly flying time per aircraft, then pilots would benefit accordingly by increased flying hours (towards the ideal mentioned above) during their period at the Unit. The training of observers and air gunners did not involve as much flying time as that of the pilot and consequently they could be fitted into the greater requirement. In view of the fact that one of the purposes of an operational training unit was to give a pilot as much flying time as possible before posting to his operational squadron, and in order to exercise a measure of economy, the aircraft establishment of these operational training units was part operational and part trainer types. The general proportion was 75 per cent. operational type and 25 per cent. trainer type, although there were some exceptions to this.

On the foregoing basis, and to meet the requirements of the ultimate Metropolitan force of 215 squadrons, and allowing for a maximum aircraft establishment at each operational training unit of 72 initial equipment and 24 immediate reserve aircraft, it was planned that the eventual O.T.U. requirement would be 31 for Bombers, 3 for Fighters, one for General Reconnaissance and 2 Operational Training Units for Army Co-operation.

Each of the above required a satellite aerodrome in addition to the parent station. This involved a total aircraft establishment of approximately 2,000 initial equipment and 700 immediate reserve operational types and approximately 600 initial equipment and 200 immediate reserve trainer types, whilst the personnel establishment, apart from those under training, amounted to approximately 2,750 officers and 40,000 airmen. In view of the fact that these O.T.U.s were required to fit pilots and aircrews for the operational squadrons of the Metropolitan Air Force, it was considered necessary that this training should be carried out under the weather conditions affecting the Western European theatre and, in consequence, the plan was to locate these

units in the United Kingdom or in France. Consideration was however given as to whether, when the Empire Training Scheme and other overseas training schemes became effective, it would be possible to reduce the amount of time in the operational training units by the establishment of conversion courses to operational types for pilots in the country in which they had been trained. The final training of the pilots, observers and air gunners would, however, have to be done in the United Kingdom or in France.

It was considered that if it were practicable to carry out conversion at overseas stations before the pilots were posted to Britain it would probably not result in any reduction in the number of operational training units required. By decreasing the establishment of aircraft at each operational training unit to what would probably be the practicable maximum, the necessity of increasing the number of aerodromes in the United Kingdom or France for operational training purposes would be avoided. Congestion would also be lessened. A probable future commitment also envisaged, for which no plan had yet been made, was the necessity for operational training units for overseas commands. At that time (April 1940) the squadrons of the overseas commands were not engaged in operations, and could therefore devote their time to the training of pilots received from Britain. In the event of their being called upon to carry out operations, it was considered that they would no longer be able to carry out these training duties and it was obviously going to be necessary to establish operational training units in those commands to meet this requirement.

#### **Summary of Progress by April 1940**

When war began, existing schools were converted as far as possible to the planned War Training Organization. This meant that some courses were shortened, with practically no change of syllabus, and that the number of pupils at each school was considerably increased. These changes called for more aircraft, more staff, and more instructional equipment. There was some difficulty in providing the aircraft: barely enough twin-engined trainers for the service flying training schools or attack and target towing aircraft for the armament schools could be found. In many cases the available aircraft were far from suitable for the work; over two-thirds of the single-engined trainers were Hart variants, whose use entailed considerable conversion training after pilots left the S.F.T.S.; none of the attack aircraft had power operated turrets; and the attack and target towing aircraft were mostly of miscellaneous obsolete types likely to give trouble over serviceability and spares. Instructional equipment of all kinds was scarce, and supplies came forward very slowly. There was not enough accommodation for the schools' increased number of pupils, as well as a certain lack of instructors, and S.F.T.S.s found themselves increasingly handicapped by having few relief landing grounds and no local bombing ranges. War time conditions affected schools' work in various ways. The effect of black-out on night flying and maintenance had to be learned by experience, and there was some delay in obscuring buildings and in deciding the amount of light which might be used for night flying. The effect of dispersal (i.e., picketing aircraft in the open to minimize the damage that might be done by bombing) had also to be learnt by experience. Operational restrictions on flying,

to avoid confusion in the reporting of aircraft to Fighter Command, made it virtually impossible to use the east coast of England for training purposes, and caused a general migration of schools towards the west.

Apart from these changes of conditions and circumstances the war had no effect on training during the winter of 1939-40. There was no pressure from operational necessity, no urgency of casualty replacement and little interference by enemy action. It was as if some full scale peace-time exercise were being carried out against a background of war conditions. During this quiet period a very considerable training expansion took place which in theory, at any rate, went a long way towards meeting the principles required by the general growth of the air forces. The quality of the training had also been improved to a great extent, but it only went part of the way towards allowing the new aircraft and equipment to be properly and economically exploited. There was a general low standard in blind flying, in navigation, in the use of wireless aids and in armament. Nevertheless, with the recognition of the need for operational training the whole organization was taking shape in conformity with its tasks. The most serious deficiency was the lack of advanced training aircraft. No proper target, plan or ratio of production had been laid down for these vital aircraft and in this omission lay a real peril to the entire air effort.

On the subject of the elementary flying training schools the question arose as to whether it was best to continue the system of operation by civil companies (the staff of which had recently been put into uniform) or whether the schools should be put on a service basis. From the discussion which followed it was clear that the existing system was working well, the chief drawback being the question of the dual allegiance of the staff to their companies and to the Service, but it was decided that no change should be made. Finally it was stated that there would be no difficulty in providing for the unexacting aerodrome requirements of the 10 additional F.T.S.s. By the end of April 1940 the supply of pilots for the Royal Air Force proper came from 12 Service flying training schools in the United Kingdom, each dealing with 160 pupils on 16 week courses and each training both Group I (S.E.) and Group II (T.E.) pilots. The output was at the rate of 5,300 per year, and the 12 S.F.T.S.s were fed by 19 E.F.T.S.s working on eight-week courses, two of the latter giving advanced elementary training. There were also two S.F.T.S.s devoted to producing pilots for the Fleet Air Arm, and No. 4 S.F.T.S., Habbaniya, whose output went direct to Royal Air Force overseas units.

Armament training presented a somewhat confused and unsatisfactory picture. At the higher level there was not a suitable organization for co-ordination and control. Lower down armament training was split up into the various forms of activity, pilot (single and twin engine), observer and air gunner. The great practical difficulty was in finding ranges in proximity to the Schools. Armament training fell into two parts, firstly at the bombing and gunnery schools the observers had an eight weeks' course after the navigation course and the air gunners had a six week course after the wireless course. Secondly the pilots originally all carried out a 14 days' course at the end of their advanced training at S.F.T.S., but as already described, the bomber pilots armament training had been transferred to the

bomber group pool, while Fighter Command had not accepted this system and pilots for fighter squadrons were concentrated in four schools near ranges. Altogether the armament training facilities were overloaded.

It is of interest to summarize the achievements of expansion up to April 1940. The Metropolitan Air Force had risen to 11,800 aircraft compared with 6,650 in April 1939. During the year 9,000 aircraft had been delivered to the Royal Air Force so that the increase represented not only a numerical gain but also a substantial measure of re-armament with modern types. The ratio of aircraft devoted to training had also grown. In April 1939 the first line consisted of 1,700 operational and 1,400 aircraft in reserve and the training element to back this was 3,200—a proportion of just over one to one. By April 1940 the operational squadrons contained 1,880 aircraft whereas the training element consisted of 200 in non-operational squadrons, 400 in operational training units and 5,200 in training (with reserves). Over the period the training organization grew from 450 modern operational types to 1,250, the process being facilitated by the replacement of early marks of aircraft in the first line by later ones.

This transition was marred by a sharp rise in the crash ratio reflecting, amongst other things, a general lowering of training standards. During the period of five months from April to August 1939, 500 aircraft beyond unit repair capacity were crashed, of which 200 were 'write offs'. During the following five months of war, September 1939 to January 1940 inclusive, 800 aircraft beyond unit repair were crashed. The input of aircraft into training, including the operational training units, over the period was considerable and absorbed some 40 per cent. of the total output.

As regards training schools, in September 1939 the preliminary estimate was that a training organization of 45 elementary and 45 service flying training schools, with corresponding ancillary schools, would be needed. In November a target first line force was approved and a new training organization based on it which required a total of 203 schools.

## CHAPTER 5

### OVERSEAS TRAINING<sup>1</sup>

#### The Empire Air Training Scheme

Probably the most important single event in the history of training in World War II was the Empire Air Training Scheme. Without it there is little doubt that Britain could not have fulfilled her training programme. The first indication of the scheme came in 1936 when it was proposed that units not necessary in the United Kingdom should for strategic reasons move elsewhere. Canada was suggested as being suitable for several reasons. Training had been done there in 1917-18 with considerable success; Canada was well disposed towards the Royal Air Force and Canadians were very suitable for recruiting as pilots. Canada was more accessible than the Middle East and had the additional security of being next door to the United States whence she could be supplied if communications became difficult. In addition the weather for flying was far better than in the United Kingdom. Two years previously Canada had been asked to join in the 'Trained Cadet' Scheme which was working successfully in Australia. This was a scheme whereby pilots trained in Australia were given short service commissions in the Royal Air Force, and returned to the reserve of the Royal Australian Air Force at the end of these commissions. Canada had accepted this scheme in principle in June 1935. In August 1936 the suggestion to form a flying training school in Canada was discussed by the Canadian Minister of National Defence and Air Commodore Tedder. At this time, however, there was a strong feeling in Canada against being tied to any form of Imperial Defence Organization. As no decision was forthcoming from Canada regarding the proposal it was assumed in June 1937 that as far as Canada was concerned the scheme was dead.<sup>2</sup>

It was not until the outbreak of war that the possibility of training in Canada was again considered. Air Commodore McClaughry, after discussions with Group Captain Godfrey of the Royal Canadian Air Force, suggested that Canada might be more willing to concentrate on training than on the formation of operational units and that the War Training Organization should be applied in Canada and the number of flying training schools there increased. The question of finance was also discussed. It was likely that Canada would expect the United Kingdom to pay the cost of training as well as that of employment after training, but this was contrasted with a precedent of 1914-18 when Canada had borne the whole cost of Canadian personnel. Air Commodore McClaughry suggested that the Canadians might be trained as members of the Royal Canadian Air Force and that some squadrons could be manned entirely by Canadians.<sup>3</sup>

Training in Canada was again the subject at a meeting called by Air Marshal Portal on 10 September 1939 to 'go into measures necessary to provide the flying personnel who would be required to man the maximum number of aircraft that could be produced in the second and third year of the war'. The estimate was that some three to four times the output of

<sup>1</sup> A comprehensive and detailed account of all overseas training is given in Volume II.

<sup>2</sup> A.M. File S.38427.

<sup>3</sup> A.M. File S.56584.

pilots and crews planned for 1939-40, that is something over 20,000 per year, would be needed. The training organization necessary to produce such an output was too big for the United Kingdom and the Dominions would have to be asked to help on a very large scale. It would be necessary for Canada to train 8,000 men per year and also to devote her resources firstly to training and later to building an Air Expeditionary Force. A strong Mission would be needed to put forward these proposals.

On 22 September 1939 a proposal was made by Mr. Bruce (High Commissioner for Australia) which did much to widen the conception of training in Canada.<sup>1</sup> Mr. Bruce proposed that each Dominion should have its own Air Force in the field, but that training should be rationalised in the most economical way by concentrating all advance training in Canada; the other Dominions to carry out only elementary training. The advantages of doing all advance training in Canada would be:—

- (a) Freedom from enemy interference.
- (b) Easier transport of trained men and aircraft than to or from Australia.
- (c) Canada had greater production possibilities than Australia.
- (d) Proximity to the United States.

The proposal was considered in detail on the same day. An Air Force based on a monthly provision of 2,550 aircraft would have to be backed by about 45 S.F.T.S.s and 45 E.F.T.S.s turning out some 20,000 pilots per year, with the corresponding number of schools for training other aircrew. The existing Royal Air Force organization had 14 S.F.T.S.s and it was hoped to provide five more in the U.K. This left about 25 S.F.T.S.s to be allocated in Canada. The E.F.T.S.s necessary to feed these were to be divided between the three Dominions concerned—Canada, Australia and New Zealand. South Africa at this time was a doubtful quantity. New Zealand was already preparing to supply the Royal Air Force with 600 trained pilots per year, but her two schools had not then any modern types of aircraft and could only be counted as E.F.T.S.s. Of the remaining 23, 13 were allocated provisionally to Canada and 10 to Australia. The training of other aircrew was also to be concentrated in Canada and 12 armament schools, two general reconnaissance schools and two navigational schools were planned. When the scheme had been outlined it was discussed by the Dominion High Commissioners in London and then formally proposed by a telegram dated 26 September 1939 from Mr. Neville Chamberlain to the Prime Ministers of the three Dominions. A copy was also sent to the U.K. High Commissioner in South Africa for the information of General Smuts.<sup>2</sup>

The proposals were accepted in principle by the Dominions and a Mission headed by Lord Riverdale was arranged to leave for Canada early in October. Before they left the main requirements of the training scheme were discussed. The principal features were the number of aircraft necessary to establish the Flying Training and Armament Schools and the instructor requirements. As regards aircraft, in addition to those which could be supplied by Great Britain, it was hoped to make up the numbers from Canadian production

<sup>1</sup> Ibid.

<sup>2</sup> A.H.B. IIC/3/1.

and also from the United States. The personnel situation was that the Royal Air Force could provide no ground instructors or ground staff, about three to four hundred E.F.T.S. instructors and a flow of 360 C.F.S. instructors and 240 staff pilots per year. For the rest the Dominions would have to provide and train the men. The importance of centralising C.F.S. instruction in the United Kingdom, to ensure standardised training methods, was stressed.

### **The Riverdale Mission**

The Mission, consisting of Lord Riverdale, Air Marshal C. L. Courtney (taking the place of Air Chief Marshal Sir Robert Brooke-Popham who did not arrive until 14 November) and Mr. E. T. Hearle (who subsequently fell ill and was replaced by Air Vice-Marshal R. M. Hill), assisted by Mr. J. B. Abraham, G/C L. N. Hollinghurst, G/C J. M. Robb, G/C C. A. Gray, Mr. F. R. Howard and Mr. J. R. Smyth, arrived in Ottawa on 14 October to secure the agreement of the Dominion Governments for the establishment of the Air Training Scheme. Captain H. H. Balfour the Under Secretary of State for Air who was also in Ottawa, assisted in the discussions.

Negotiations began on the basis of recruiting pilots and aircrew in Canada, Australia and New Zealand, having their elementary training in their own Dominions and advanced training in Canada. Canadian training was to provide five-ninths of the flying personnel required by the Royal Air Force (that was about 11,000 pilots, 6,600 observers and 11,300 air gunners per year). The first scheme proposed that 48 per cent. should come from Canada, 40 per cent. from Australia and 12 per cent. from New Zealand. The remaining four-ninths of the estimated total requirements (20,000 pilots and 30,000 aircrew per year) were to be provided by the United Kingdom and trained in Royal Air Force Schools.<sup>1</sup>

From the beginning of the discussions Canada's attitude towards the scheme was cautious owing to the financial outlay which would be involved. Canada was committed to a heavy expenditure on her Navy and Expeditionary Forces and would have preferred her air contribution to take the form of operational squadrons rather than training effort. She considered the training scheme a British plan in which Canada had agreed to co-operate, but for which she was not responsible. Canada therefore argued that the United Kingdom should bear the major portion of the cost. Canada's total annual revenue was some five hundred million dollars and the original cost of the scheme appeared to be nearly twice that figure. Negotiations on the size of the contributions of each partner of the scheme and the form they would take; the question of arrangements being made to represent the Dominions by operational squadrons in proportion to their training effort, and the problem of who should control the scheme were also closely discussed. Eventually it was agreed that out of the total cost of six hundred and seven million dollars, up to 31 March 1943, Britain was to provide one hundred and eighty-five million dollars' worth of training aircraft and equipment (roughly 4,600 aircraft—almost all those needed for the scheme) and Canada three hundred and fifty-three million dollars, mostly in services, air-fields and installations. The balance was to be paid in dollars by Australia and New Zealand.

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<sup>1</sup> Report of Riverdale Mission, A.H.B. III C/4.

In November 1939 a meeting to discuss the scheme in detail was held at Ottawa between the representatives of the three dominions concerned. Australia and New Zealand, having training facilities of their own, objected to the scheme as proposed with the majority of the training being done in Canada when it might equally well be carried out in their own countries. The decentralisation and extension of training involved the establishment in the three Dominions of 25 Elementary Flying Training Schools, 25 Service Flying Training Schools, 14½ Air Observer Schools, 14½ Bombing and Gunnery Schools and 2 Air Navigation Schools. It was planned that this organization should produce annually 11,050 pilots, 6,370 observers and 10,725 W/T Air Gunners.

The allocations which had been made in the original scheme were altered and, of the 25 S.F.T.S.s, 16 were to be in Canada, seven in Australia and two in New Zealand. Canada was to supply 52 per cent. of the total pupils, which would include a number of pupils from the U.K. and Newfoundland (up to 10 per cent. of the Canadian quota), Australia 36 per cent. and New Zealand 12 per cent. Of the 26 E.F.T.S.s, Canada was to have 14, Australia nine and New Zealand three. Similar allocations were to be made for training other aircrew. The agreements with New Zealand and Australia were signed on 27 November, but negotiations between Canada and the Riverdale Mission continued. Canada insisted that training done in that country be controlled by the Royal Canadian Air Force. She also insisted that her share in the operational first line air effort should be fully acknowledged and, would not have the Canadian identity of her men lost in a Royal Air Force drawn from all parts of the Empire. The essential point was that Dominion reinforcements for the Royal Air Force should be unmistakably associated with the name of the country whence they came, preferably as dominion contingents under dominion officers. Canada also wanted full public acknowledgement that training was considered the most effective immediate help she could give in the war effort.

The most critical point in the negotiations was the insistence of Colonel Ralston (Canadian Minister of Finance) that all Canadian output from the training scheme be formed into R.C.A.F. Squadrons—a stipulation by which a large number of squadrons would be R.C.A.F. in name but preponderantly R.A.F. in fact, because Canada could not provide ground staff to match her planned output of crews. This stipulation was strongly resisted by Air Chief Marshal Brooke-Popham and when the agreement with Canada was signed, on the night of 16–17 December 1939, an article No. 15 was inserted. Similar articles had been included in the agreements signed earlier with Australia and New Zealand and stated that:—

‘The United Kingdom Government undertakes that pupils of Canada, Australia and New Zealand shall, after training is completed, be identified with their respective dominions, either by the method of organizing dominion units and formations or in some other way, such methods to be agreed upon with the respective Governments concerned. The United Kingdom Government will initiate inter-Governmental discussions to this end.’

The agreement with Canada, which was subsequently initialled in London for the concurrence of Australia and New Zealand formed the major part of the Empire Air Training Scheme but was not the whole of it. The arrangements made by the Riverdale Mission included the training organizations in Australia and New Zealand as well. They were called collectively, the Empire Air Training Scheme and covered:—

- (a) The setting up and operating of training organizations in Canada, Australia and New Zealand.
- (b) The numbers of aircrew to be recruited, and the numbers to be trained by each dominion.
- (c) The operational employment of dominion aircrew in the R.A.F. or in dominion units operating with the R.A.F.
- (d) Distribution of cost, rates of pay, training syllabuses, provision of aircraft, etc.

The Canadian part of the scheme was of particular importance, not only because most of the schools were to be in Canada, but also because the Canadian organization was to deal with pupils from Australia, New Zealand and the United Kingdom as well as with Canadians.

The whole scheme, in each of the three dominions, was planned in accordance with the war training organization except that navigation and armament training were to be carried out at separate schools. Time was needed to build up and equip the schools and to train the staff. No time schedule was laid down for Australia and New Zealand, but the Canadian scheme was to be completed by April 1942. Enough cannot be said to emphasise the importance of this agreement to the entire war effort. It was loyally and precisely carried out, in spite of the great distances separating the four partners and the many dislocations and impediments which their plans suffered through the changing fortunes of war.

#### **Training in Southern Rhodesia**

The Empire Air Training Scheme had been launched as a long term project and involved an immediate sacrifice of aircraft and equipment, then in short supply. This imposed a brake on the already slow expansion in Britain, an effort which became apparent when proposals were put forward for the development of training in Africa. Up to the outbreak of war, No. 4 S.F.T.S. in Egypt represented the sole training asset in that part of the world and its output of just over 300 pilots per year was devoted to the Middle or Far East. The school moved to Iraq in September 1939. Proposals for the establishment of an S.F.T.S. in Kenya had been abandoned but, as in New Zealand, there existed in Southern Rhodesia a small energetic community whose initiative had produced an Air Unit by the outbreak of war. This Unit comprised training as well as operational flights and needed only the provision of facilities to raise two more squadrons. This enthusiasm was finally directed by agreement into the establishment in Rhodesia of a Royal Air Force training organization to train British and Rhodesian personnel. It was planned to open three pairs of flying training schools in order to

produce 1,300 pilots a year. The first E.F.T.S. opened in May 1940 followed two months later by the first S.F.T.S. Eventually Rhodesia extended this scheme until a self-contained organization grew up by the end of 1941 consisting of 12 units including an I.T.W., a Central Flying School Flight and a unit for training rejects from the higher aircrew categories. The output, which consisted not only of Rhodesian and British, but also South Africans, Australians, Greeks and Yugoslavs, went to the Middle East. Over the war period nearly 10,000 aircrew were trained. The outstanding feature of the work in the Southern Rhodesian organization was the energy, foresight and enthusiasm displayed by the Government of that country and the Rhodesian Air Officer Commanding, in combating the difficulties of operating over long and unreliable lines of communication and lack of liaison in equipment matters.

### **Training in South Africa**

Meanwhile, however, South Africa had to suffer all the consequences of a delayed start and the severe restrictions imposed by lack of aircraft and equipment.<sup>1</sup> The foundation of South Africa's effort was the expansion of its Air Force, designed originally for the strictly limited task of defending the Union. When, therefore, steps were taken to expand the Air Force and assistance was requested from Britain for this purpose the South African Prime Minister, in December 1939, offered to make training facilities available for Europeans living in South Africa. This offer was accepted by Britain who asked if it would be possible to include pupils from the United Kingdom, it being understood that the control would be in the hands of the Union. This was agreed and negotiations proceeded with the aim of producing 2,470 pilots a year, which meant that after South Africa had obtained the 720 pilots a year, which she required, the remainder would be available for the Royal Air Force. Unfortunately it was evident to the Air Ministry that after meeting other overheads it would be a considerable time (1942) before resources would be available in quantity for the scheme. In the meantime negotiations continued and Air Chief Marshal Sir Robert Brooke-Popham, who had been the Royal Air Force representative in the Canadian negotiations, was sent at the head of a mission to South Africa. The story of developments in South Africa was, therefore, a checkered one entailing as it did after long delay, the building up on the small and scattered local training units an organization conforming to the general Empire pattern. On 7 March 1940 a Training Command had been established together with 12 Training Units while the organization was brought more into line with Royal Air Force methods.

The Mission from Britain arrived at the end of April 1940, and the immediate target for expansion embraced four pairs of F.T.S.s and three Combined Aircrew Training Schools designed to produce 136 pilots and 60 observers a month over and above South Africa's requirement of 60 pilots and 40 observers a month. Since no date for the arrival of supplies could be fixed the training scheme envisaged development in two stages; the first being designed to bring all local units up to R.A.F. organization standards

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<sup>1</sup> A.M. File S.2897.

and the second to form new schools until the total potential reached the figures mentioned above. Stage 1, which embraced two pairs of F.T.S.s and one combined aircrew school, did not begin until August 1941. In the meantime plans had been extended by the need to have training schools outside Britain during the crisis of the summer of 1940.<sup>1</sup>

#### **Proposals for Training in France**

At the outset of the war a scheme was put forward for training in France and an aerodrome site was chosen near Vendome. Early in 1940 the location of five S.F.T.S.s was authorised,<sup>2</sup> in the area West of Vendome. These schools were to be built by the Air Ministry, but as the grass for the aerodromes had not been sown, it was not anticipated that they would be ready much before 1941. The events of 1940, however, prevented any further consideration of training in France.

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<sup>1</sup> See Chapter 6.

<sup>2</sup> S.D. 155(330/40).



## CHAPTER 6

### THE CRISIS FOLLOWING MAY 1940

In April 1940 the lull which had followed the battle for Poland was broken when the Germans invaded Denmark and Norway, and these preliminary indications of a renewed general offensive swiftly materialised in the over-running of the Low Countries and the start of the Battle of France in May. By the end of June France had capitulated and Italy had entered the war. From that time onward the air war raged in earnest and the Metropolitan Air Force found itself heavily engaged with the consequent wastage of trained personnel and aircraft. Immediately there was an urgent demand for pilots in particular, an urgency which grew even more intense as the defensive fighter battle was joined by July 1940. Britain, throughout the summer of 1940, was thrown upon her own resources and it is therefore necessary to devote the immediately following part of the narrative chiefly to the great effort which was made by the Home training organization to replace casualties in the existing force, and to provide the men for the new units made available by aircraft production.

#### **Policy after the Collapse of France**

It is necessary to give some indication of the way in which high policy was readjusted to conform to a situation which, though perhaps clearly enough foreseen, nevertheless arose with such suddenness and completeness as to have a very severe potential effect upon all the long term plans for expansion which had been launched, and which were being implemented as efficiently as possible. The attitude of the British Government was made clear from the outset. Somehow, in the face of the most immediate danger, the British Isles, as the main base, manpower and industrial centre of the Empire, had to beat off attack whilst making provision for the future. Where necessary, short term sacrifices would have to be made to ensure immediate survival, but the main idea was to gain time until it was possible to strike back. At the outset, Britain's plans were based on the Empire sustaining the full burden of the war alone, with help of supplies from the U.S. Under the circumstances, therefore, during the defensive phase of the struggle, there rested upon the Royal Air Force and Dominion Air Forces a special responsibility. It was only in the air that the enemy could be effectively challenged; it was only from the air that the enemy was vulnerable; it was only by means of the use of air power that the disparity in numbers could be overcome by superior quality and training applied in accordance with the soundest principles. So it was that the air forces undertook to fight several long and deadly battles on their own. Apart from the contest with the Luftwaffe there was the war at sea, a parallel struggle which was waged throughout with sustained energy and mounting success. In this battle the air played a major part.

The war in the Middle East was likewise a long drawn out affair. The Axis and the British had to establish and maintain their forces over long and vulnerable lines of communication. The undeveloped state of that theatre meant that most of the trained men and material had to be fed in from outside. It was a long campaign for communications, each side trying

to sever those of the enemy while safeguarding its own. In the event the battle went to him who could first build up and complete his administrative preparations. The main prizes of the battles were airfields which gave greater scope to the wielding of air power. It may be claimed, therefore, that upon the training organization during the initial phase of the war, indeed up to the end of 1942, there rested a supreme responsibility for the continuance of the struggle.

Since training and operations went hand-in-hand, and since air operations in the late war were planned on the highest level owing to their strategic importance and to the large proportion of the national war potential which they encompassed, it is necessary to bear in mind the fact that training policy was intimately affected by strategic decisions and that it took its characteristic shape from them.

#### **Survey of Aircraft and Personnel Requirements**

The situation on the German break-through caused a very rapid survey to be made of the effort and requirements of the Royal Air Force for the year 1940. This survey was based on:—

- (a) A summary of operational aircraft available during the year.
- (b) Number of operational squadrons which could be maintained at sustained effort on the assumed wastage rates.
- (c) The requirements and outputs of aircrew to meet the effort and wastage of the first line.

It was found in making this survey that there were some 9,000 operational aircraft to equip a force which then existed (10 May 1940) of 125 squadrons, of which 57 were fighter, 21 were heavy and 20 were medium bombers.<sup>1</sup> To back this force, the total calculated output of aircrew up to the end of 1940 showed that whereas the requirements of observers and air gunners could generally be met, the pilot output would fall short by some 450. (This was to meet operational requirements and wastage only.) The assessment was based on the facilities which then existed in Britain because no potential pilots placed under training at the time (May 1940) would be available for operational squadrons by the end of the year. At the same time it was not expected that an increase in flying training facilities would affect the pilot position by the end of 1940. Nor was it thought that pilots produced under the Empire Training Scheme would do much to improve the position because the first arrivals were not expected until November 1940, and then only in small quantities. The main problem during 1940 therefore was to rectify the immediate deficiency of pilots. It was thought that the need was for a minimum addition of approximately 75 operational pilots a month.

Various potential sources of supply were then examined. The first source was the remnants of the Polish Air Force, some 350 of which were pilots, of whom 250 were operational. The second was the Fleet Air Arm, for which the Royal Air Force had been training 50 pilots every four weeks, making a total of 400 by the end of 1940. It was thought that 200 of these should be made available. The third source of supply was a combing of existing establishments to find pilots who could be released for operational duties. It was not anticipated, however, that much would accrue from this

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<sup>1</sup> A.M.S.O. Folder 329, 18 May 1940.

source, since it had already been tapped and in any case establishments were always most carefully investigated and controlled. A fourth source of supply, it was suggested, could be obtained by volunteers from the United States. It suffices to mention that the Eagle Squadron was an example of activities in this direction. The question, however, was hedged about with diplomatic and other considerations which prevented any large influx from this source. A fifth source of supply was the Dominions Air Forces which had a considerable number of trained pilots. This consideration, however, led to a clash between short term and long term plans.

This survey also covered the future of the Empire Training Scheme. There was a great temptation on the one hand to employ its resources to help in the immediate battle but, on the other hand, there was the view that it was by no means impossible that attacks on the British Isles would so interfere with training, either directly or indirectly, that the Dominions might eventually be the only reliable source of trained men. In spite of the immediate need, therefore, it was considered that long term requirements could not be ruled out, although the tendency at the outset was towards some form of compromise which, while retaining the essential elements of the Empire Training Scheme, would reduce its scope in order to throw up pilots for the first line.

So far as the organization in Britain was concerned no reductions could be effected until late in the year 1940 because in order to maintain the output required to balance existing aircraft production, the schools had to continue to function until the last possible moment. Even so, it was suggested that the decision to proceed with the expansion of British Schools should be reserved until later. In the main the temptation to plunder the training units was resisted; in retrospect it can be seen that in this attitude there lay a marked contrast to that of the Germans who on several occasions resorted to this expedient, with the result that the shortage of trained replacements forced a large German first line to scale down its operational effort in order to reduce wastage. It must however be admitted that the growing shortage of petrol for both training and operations had an equally disastrous effect. Nevertheless these were the seeds of a fatal disease whose growth was already evident as early as 1942.<sup>1</sup>

Another consideration which emerged was the question of interference with the programme of training as it had been planned. Investigation of short term measures had revealed a greatly increasing gap between aircraft and pilots available during 1940. The build-up of the Empire Training Scheme and the British training facilities had been designed to close that gap as quickly as possible. In the event of the training scheme being retarded, the position from the beginning of 1941 appeared to be that, whereas aircraft production was mounting rapidly, the provision of pilots would fall further and further behind, and the gap between pilots and aircraft would continue to widen. In addition a similar gap would appear with regard to the other aircrew categories. The immediate conclusion drawn from the initial survey of short term measures to meet the emergency was therefore to recommend that 'Every effort should be made to speed up in particular the Empire Training Scheme so far as the production of training aircraft will allow.'

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<sup>1</sup> A.H.B. Monograph. *The Rise and Fall of the German Air Force.*

### **Short Term Measures to Increase Pilot Output**

So far, then, the problem confronting the Air Ministry was how to meet the existing situation without throwing overboard all long term plans. It is now necessary to examine in somewhat more detail the short term measures which were taken after the analysis of the problem and of the factors immediately affecting it. The salient point was the fact that Britain was facing actual and immediate danger in its most pressing form, and that danger was thought to come chiefly from an enemy landing on her shores in conjunction with airborne operations once the British fighter force had been defeated. This threat of paratroop action had an immediate effect on the training position.

What actually happened (in the beginning) was that permission to start the proper co-ordinated measures for expansion was delayed until war was seen to be inevitable. Then everything was telescoped and started simultaneously. The balance between training and operations, manufacture of training and fighting equipment, technical tradesmen and flying personnel; between operational and training aerodromes and between fighter and bomber production was not determined to a proper time schedule. The result was a clash of priorities, a clash between the short term and the long term views. There was the constant struggle of restrictions and 'bottlenecks', whose removal entailed prodigious effort and expense in time and resources. The lesson that training expansion must precede operational expansion had still to be learnt in May 1940. Although everyone admits the supreme difficulty of foretelling exactly when war will break out, it seems evident that the air forces escaped the full consequences of this omission from plans only because air casualties during the first eight months of war did not reach the estimated rates for wastage.

From the training point of view the immediate problem had narrowed down to a question of meeting the need for more pilots. After the Dunkirk operations, Fighter Command found itself in immediate need of 500 pilots. To this had to be added the continuing demands for wastage replacements, estimated at some 3,000 a year for Fighter Command, 4,000 a year for Bomber Command, and 1,600 a year for Coastal Command, as well as deficiencies of about 350 pilots in Bomber and Coastal Commands.<sup>1</sup> Against these calls for pilots the service flying training school output was 5,600 a year, and in addition there were about 1,800 pilots undergoing further instruction, 1,800 employed as instructors and a further 2,700 employed on staff, administrative or technical duties.

The Cabinet were concerned at the shortage of pilots. They had for some time been aware that a limiting factor had been the production of aircraft and equipment, but they could not understand that because these deficiencies were in process of being rectified, the shortage of pilots had not yet disappeared. There was, therefore, an urgent call at high level for quick results, and the question was how to turn the existing deficiency into a safe margin of surplus and how to remove the basic training schools from the effects of British weather and operational interference. The remedy lay in long term measures whose effects could not be felt in time to meet the emergency, and therefore the only possible course was to increase the output from existing resources in established schools. The main difficulty was to make

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<sup>1</sup> A.M. Files S.1924, S.1925 and S.1887.

up a deficiency of some 500 pilots, for it was calculated that if this number had been available there would have been a reasonable margin to meet the shock of casualties and to save the training schools. It was therefore necessary to scrape together what trained pilots were available and thereafter to ensure that the schools were adequately staffed and equipped to produce sufficient pilots to replace wastage and to cover expansion.

It may be seen therefore that the immediate problems which faced the training authorities after the fall of France were the need to increase the output of pilots from existing schools in the United Kingdom while building up the overseas organization. In this latter respect Canada had the major part to play, and therefore, before proceeding to examine the measures taken by Britain it is necessary to see how Canada proposed to help, both in short term measures and in the long term plan.

#### **Canadian Offers of Assistance**

From the very outset, the Canadian Government took the initiative in making proposals to meet the situation. The chief consideration was whether or not to send to Britain the pilots then being trained as instructors in Canada for the Training Scheme. The British Government considered however that the efficient prosecution of the war could best be achieved by adhering to the plans laid down for the Scheme and by accelerating them to the utmost. At the same time there were certain measures which the Canadians had proposed of which two met with the Air Ministry's strong support. These were to accelerate the programme for the acquisition of aerodromes and landing grounds in case it were necessary to transfer schools from Britain owing to enemy action, and secondly to reduce operational squadrons on the west coast of Canada to a care and maintenance basis and to send their personnel to Britain as soon as possible. In addition it was decided to send two squadrons to Britain and to divert the output of Canadian Hurricanes to the Royal Air Force.

While therefore the temptation to 'eat the seed corn' had been resisted by the British Government, they felt compelled nevertheless to consider certain severe emergency measures of which two were particularly important, namely an embargo on the export of training aircraft overseas and the transfer to the Dominion of basic flying schools. In both these matters the Minister of Aircraft Production had a predominant part to play, since it was owing to his influence that the embargo was imposed and that the transfer of Schools was delayed. These were decisions which were both contrary to Air Ministry policy. In both the main motive of the Minister of Aircraft Production was to avoid the waste of time and resources involved in locking up aircraft in transit and in removing Schools from the close support of the technical resources of the aircraft industry; whereas the Air Ministry held the view that an essential part, and the most valuable in the long run, which Britain could play was to contribute to the initial overheads in starting the Empire Air Training Scheme. As regards the question of the transfer of schools, it would be a great relief from every point of view to remove, from all the handicaps and restrictions of war time Britain, an important element not essential to immediate defence, to the safety and settled conditions of the Commonwealth.

### **Embargo on Export of Training Aircraft**

On 21 May 1940 a decision was given to suspend the export of aircraft for training, in view of the Prime Minister's ruling that the aircraft should be retained for 'operational purposes in the near future in the life and death struggle which we might have to face in the next few weeks', even at the risk of jeopardising the future supply of pilots. At the same time the Minister of Aircraft Production stated that there were 'manufacturers of aircraft in the U.S.A. not already under contract to the Allied Governments to make operational aircraft who can deliver aircraft of advanced training types to Canada'. In his anxiety to free factory floor space and resources generally, for the production of fighters, the Minister concerned was prepared to make every sacrifice. In a sense he was justified by events because Canada did manage, from American and her own resources, to compensate for this unfortunate stoppage which represented a failure on the part of Britain to fulfil her bargain as negotiated by the Riverdale Mission. At the same time, the shortage was not so much aircraft as pilots, and the comparatively modest numbers of obsolete or training aircraft involved could have had no effect on any emergency. In the main, therefore, the most unfortunate aspect of this matter was the time factor, and the results hampered the Canadians in their effort to establish and operate the ambitious training scheme, according to the programme laid down. However a later report on the progress of the Empire Air Training Scheme at the end of June 1940 showed that except for a slight delay in opening Nos. 3 and 4 S.F.T.S.s, the scheme was progressing well ahead of schedule.

### **Controversy over the Supply of Single-Engined Trainers**

The other important matter connected with overseas training, namely the pressure towards the export of the basic schools to the Dominions, was also delayed because of short term considerations. This will be described in conjunction with the part played by the organization in Britain, upon which now rested the full burden of supporting Fighter Command in their task.

Here then, superimposed upon the long term plan to expand the training organization came an urgent need for the manufacture of fighter aircraft. The Air Ministry had handed over their responsibilities for aircraft construction to a new Ministry and an all out effort to step up the production and repair of fighters was undertaken. All other considerations concerning the long term construction plan for a balanced output were brushed aside, and it fell to the Secretary of State to modify this attitude and to keep in the forefront the need for the production of a due ratio of training aircraft and also of urgently needed spare parts. This was no easy task, nor is it surprising that he found it hard to cause the uninformed lay mind to understand the immense investment of aircraft and spares necessary to produce a flow of crews trained to modern requirements.<sup>1</sup>

An example of the size of this investment of total production in training is to be seen in the Singleton Enquiry figures covering the period September 1939 to November 1940 which may be said to have constituted the first great war-time expansion period. During that time the Service received from all sources 13,400 aircraft. Losses represented 6,000, and of the balance

<sup>1</sup> S. of S. Folder 268.

of 7,400 no less than 4,850 aircraft were absorbed by training and only 900 aircraft went to increasing the first line (plus 1,200 in reserve). Of the 4,850 aircraft devoted to training, 1,600 were to increase the strength of training and miscellaneous units (including O.T.U.s) and 1,500 to replace wastage in those units, 1,250 were sent overseas, 400 were, for various reasons, struck off charge, and 100 were allotted to the Director of Technical Development. Actually, of course, wrong conclusions could be (and were) drawn from such comparisons. The salient fact was that the operational units each had one main function to perform, whereas training covered a multitude of processes, many of which could produce a cost in outlay and wastage as heavy as operational wastage. Such outlay and wastage in training was cumulative and reached a high individual cost per head. Again it must be remembered that training was expanding at a greater rate than the operational first line because this was the only way in which ultimate expansion of the first line could be achieved. This investment in the future was a feature of planning, but it was not achieved without immediate cost and trouble, nor was the situation understood even at the highest level.

Thus, on 3 June 1940, the Prime Minister, who had previously been apprised of a temporary surplus of pilots which had accumulated during the period of calm in the summer preceding the fall of France, was suddenly told that as a result of the severe winter and other restrictions, there was an acute shortage of fighter pilots. He wrote to the Secretary of State for Air:—

‘This is the first time that this particular admission of failure has been made by the Air Ministry. We know that immense masses of aircraft are devoted to the making of pilots, far beyond the proportion adopted by the Germans.’<sup>1</sup>

In reply the Secretary of State explained that measures to speed up the output of the 12 S.F.T.S.s operating for the Royal Air Force<sup>2</sup> had been agreed, and that although the situation was not satisfactory:—

‘A far greater strain has been thrown upon the training system of Fighter Command than it was designed to bear. The Training Command is short of machines, instructors and flying grounds. It is not very short of machines in relation to its establishment, but an unduly high proportion of them are unserviceable, this in its turn is to some extent the result of a shortage of skilled ground personnel, and especially to a shortage of spare parts’.

During the exchange of correspondence on this subject the Prime Minister, in his natural anxiety over the fighter pilot position, was disposed to repeat his contention that:—

‘Either we devote too many machines to the training of each pilot (and should search for economies) or German pilots are inadequately trained. Over the last year our training organization absorbed 4,000 aircraft and only produced 2,500 pilots. The Air Staff complain that they lack modern single-engined training aircraft. I should be glad to see further particulars on this point. So I understand that we have since this war began produced more training aircraft than the Germans’.

<sup>1</sup> Actually it was estimated by the experts working under Mr. Justice Singleton that the Germans had absorbed 3,920 aircraft in training for a period of 15 months of war.

<sup>2</sup> See ‘The First Revise’, page 91.

In his reply the Secretary of State pointed out that the Royal Air Force still required to allocate proportionately more aircraft to training than the Germans because the latter had the start and had virtually completed their training organization while that of the Royal Air Force was still expanding. Owing to the time required to train a pilot, aircraft allocated to training did not become productive immediately and the number of aircraft absorbed the previous year appeared in consequence to be high in relation to the number of pilots turned out. The ratio was bound therefore to improve as the training organization reached its peak. On the other hand, the expansion of the German training organization over the same period was proportionately much smaller, and in consequence the Germans could show a better ratio of pilots to aircraft for the period. The Secretary of State concluded with the warning that there was no justification for assuming on existing evidence either that the British organization was unduly extravagant, or that German training was inadequate.

Regarding the shortage of single-engined trainers, it was pointed out by the Secretary of State that as long ago as 1938 when the prospective deficiencies were brought to light, the Air Ministry placed orders in America for the Harvard to supplement the Master, but out of 2,500 trainers delivered between April 1939 and March 1940, only 430 were of the advanced single-engined trainer types. In consequence it had not been possible to overtake the serious deficiency in aircraft of this kind which had existed for a considerable time, and which was still the limiting factor on the expansion of training. The production of Masters had been placed in the first priority. The truth was that while the Germans had produced the same number of trainers, they had enough to maintain their training organization. On the other hand, Britain had not yet produced enough to overtake the deficiency while at the same time meeting current wastage and providing for expansion.

From the foregoing correspondence it can be seen that the Prime Minister had, rather naturally, failed fully to appreciate the problems of expansion and modern training requirements which were only recently revealed by practical experience. In the main, it is true to say that the experts, having realised where the mistake lay, had taken all necessary steps to restore the position. It was only a question of time before stepped-up production overtook deficiencies. At the same time there was this mis-appreciation of the long term factors at a high level which had its dangers and entailed a constant struggle to maintain the planned programme of trainer production. From the record of correspondence between the Secretary of State and the Minister of Aircraft Production, it is plain that Lord Beaverbrook also shared the Prime Minister's views that there was a waste of resources. There was therefore not the necessary conviction behind the drive for more training aircraft on the part of the Minister, and it took all the tact, firmness and persistence of the Secretary of State to keep this issue constantly to the fore. Thus, on 6 June 1940 the C.-in-C., Flying Training Command, signalled the Air Ministry to the effect that the production of Masters and Oxfords was going to diminish below the anticipated output on which the Command's training programme had been based. This was due to the priority which had been given to operational types. The next day Lord Beaverbrook promised the Secretary of State to do all in his power to accelerate production of advanced trainers.

### **Revised Trainer Aircraft Production Programme**

The new M.A.P. programme issued in June 1940 reflected the recognition of the need to increase trainer aircraft production such as a doubling of Oxford production from 96 to 185 a month within a year, and stepping up Master production from 40 to 100 a month by June 1941. At the same time provision was to be made for 25 per cent. of material for spares over and above the number of machine sets. It was planned, however, that apart from this concession the greatest emphasis was laid upon the production of Hurricanes and Spitfires. The Air Ministry reaction was to recognize that it represented a plan to achieve the maximum acceleration of production on a short term basis within the limits imposed by the availability of material supplies, but that such an acceleration could only be achieved at the cost of the long term programme. They stressed that the production of operational types should be supported by an appropriate flow of trainer types and that the offensive side, i.e., bomber production, should not be unduly curtailed in favour of the defensive. In this latter respect it was noted that the remarkable acceleration of fighter types was not accompanied by corresponding development in regard to bombers. This aspect will be dealt with as the narrative of training proceeds; it suffices to say that it was at that time that the programme of operational types was seriously unbalanced with adverse effects on the expansion of Bomber Command after the Battle of Britain was over. This in turn caused a dislocation in training plans which was never satisfactorily remedied because the production of heavy bombers persistently lagged behind the schedule upon which training plans had been based. In a matter of detail it was also to be noted that no target towing aircraft were included in the programme, although it was understood that deliveries of Battle target towers were to continue for the rest of 1940 at least.

Finally, the Air Ministry stated that if improved deliveries of training aircraft could only be secured by the diversion of effort and material from the operational programme, this diversion should be made at the expense of the fighter programme and not the bombers. This suggestion showed how the Air Ministry were able to keep their eye on the long term plan despite the desperate situation then prevailing. The necessity for co-ordination of effort to produce a smoothly working war machine was becoming more and more important, yet the natural tendency was to become engrossed with considerations affecting the immediate operational picture.

### **Further Measures to Increase Pilot Output : 'The First Revise'**

The immediate effect upon the organization was what was later known as the 'First Revise'. The proposals to accomplish this originated at a Training Progress Meeting held on the 21 May 1940,<sup>1</sup> when it was decided to reduce the course for single-engined pilots (Group I) to 12 weeks, cutting bombing, reconnaissance, photography and air firing out of the S.F.T.S. syllabus, and secondly to start 'pre-fighter' training for Group I pupils at

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<sup>1</sup> A.M. File S.4928.

the two elementary flying training schools which were already doing advanced work. It was proposed to omit night flying for half the fighter pilot output but Fighter Command would not agree to this. Different course lengths for the single and twin-engined pilot training at once raised the question of specialising schools. One Service Flying Training School (Montrose) was able to start at once on 12 week fighter pilot courses, but the others had to wait for the necessary re-equipment with aircraft to be settled before they could begin to specialise. By the middle of June it was decided to have four S.F.T.S.s on Group I training and eight on Group II (twin-engined), with a 12 week course for Group I pupils and a 14 week course for Group II. The two schools training Fleet Air Arm pupils continued on the 16 week course. To provide the necessary flow of pupils from elementary training the F.T.S. course was reduced to seven weeks and their pupils increased by 15 per cent. A minimum of 50 hours flying was expected for each pupil. Specialising service flying training schools was a process which needed time; existing courses had to pass out from the schools and fresh courses had to start before it could be fully applied, and during the transition period mixed courses were passing through on a 14 weeks course. In all, the change and re-equipment of aircraft had to be spread over some three months, the aim being to complete the specialisation process by the end of September 1940. As usual the chief doubt in this was the supply of aircraft which, according to calculations, amounted to 144 aircraft per school in order to provide 100 hours flying per pupil. As it was there were not enough trainers to give S.F.T.S.s more than 108 aircraft apiece or 80 hours flying per pupil.

At the meetings which discussed these changes a good many troubles and difficulties at S.F.T.S.s were ventilated. Skilled men's time was being wasted; flying instructors had to do station duties, and maintenance tradesmen were employed on ground defence. Unserviceability was serious, spares were lacking, and cannibalism (process of taking parts from unserviceable aircraft to make others serviceable) was consequently rampant. Completing the syllabus to time was a problem as schools had neither the relief landing grounds nor the local bombing ranges needed for full and economical work. Both instructors and aircraft were scarce, and there was a constant compromise between efficiency and what could be provided. Something was done about each of these troubles, but every one of them needed considerable time to put right. Men to relieve instructors and tradesmen of non-specialised work had to be found and trained, but spares and aircraft had to be ordered and manufactured and relief landing grounds had to be built.<sup>1</sup>

In all, it was intended that when the 'First Revise' was complete the increase in pilot output from the 12 S.F.T.S.s would go up by about 20 per cent., that is to some 6,400 per year. Hardly was this scheme launched than it became clear that this rate of output would not be high enough. The problem was how to turn out more pilots without using more advanced trainers since there were no more to be had.

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<sup>1</sup> A.M. File S.2546.

### **Fighter Command Operational Training**

The problem of converting a hastily trained output so that it would be fit to take its place in the fighting line became urgent and it is necessary to examine briefly the fighter O.T.U. position. It will be remembered that the Commander-in-Chief, Fighter Command, had been reluctant in the early days of the war to allow all too few resources in operational type aircraft and manpower to go into the backing when his front line was so perilously small. By June 1940, however, the vigorous efforts which had been made to complete Fighter Command's preparations now made it all the more imperative that the squadrons should be supported by a proper backing for operational training, and it was agreed that every fighter pilot was to go through an O.T.U. on the same basis as that to which Bomber Command had already been working. At the beginning of the war Fighter Command had three operational groups supported by only one group pool. By June 1940, Fighter Command had been forced to spread themselves owing to the interest shown in the east coast of Scotland by the enemy and so a fourth operational group was formed and the whole of the Command was quickly reorganized to meet the imminent threat which followed the collapse of France, and the number of operational groups rose to five. Their backing in operational training resources was extremely slender. By that time they only had three O.T.U.s behind them. These O.T.U.s were all under the direct control of one of the operational groups (No. 10). The story of the struggles of the small operational training nucleus will later be described but on this point it can be said that the Battle of Britain revealed most clearly how essential was organized operational training within the training organization. It was only by the most drastic shortening of courses that the flow of pilots to the squadrons was maintained, and had the service flying training school organization been properly geared to the programme for first line expansion the Fighter O.T.U.s would have formed a most severe bottleneck. As it was it was necessary to resort to many expedients in order to give the pilots their conversion. In marked distinction to the attitude of Fighter Command towards the operational training problem, Bomber Command by reason of their complicated task in handling their heavy and complex equipment had long foreseen the vital importance of the operational training stage.

### **Bomber Command Operational Training**

By the middle of May the Commander-in-Chief Bomber Command again raised with the Air Ministry as a matter of the first importance his problems in connection with the Bomber O.T.U.s.<sup>1</sup> Both Bomber and Coastal Command had to give priority to the needs of Fighter Command, but nevertheless their resources were severely strained in attempting to strike back offensively at the enemy in accordance with their strategic policy. According to Bomber Command the squadrons could not possibly maintain a sustained air campaign unless there existed a powerful organization behind them for the provision of trained crews. There were at that time 23 operational bomber squadrons in England, six more in the early stages of formation, and a seventh in the shape of a New Zealand squadron. These units required a total of 600 crews but they contained at that time no more than 342. The monthly output of crews from the whole of the existing bomber operational

<sup>1</sup> Bomber Command File S.23616, 11 May 1940.

training organization was 78 (excluding those for Battles which were applicable to the Advanced Air Striking Forces only). At a conservative estimate the losses in sustained operations with 24 squadrons were estimated by the Commander-in-Chief to amount to 113 a month. It was therefore clear that far from bridging the gap between 600 required and the 342 actual crews, the amount was going to drop still further behind, and the bomber force appeared likely to fall to the strength which could be maintained by the existing small output from the O.T.U.s. This was estimated to amount to not more than 14 squadrons, of which only six would be heavy bomber units. The Commander-in-Chief therefore pressed most strongly for the expansion of his O.T.U. organization. At an Air Ministry conference which met on 14 May to discuss this problem it was considered that it would be necessary to evolve a short term programme to provide the most effective bomber force possible during the succeeding three or four months to meet what was obviously an all-out German effort to gain a decision in the summer of 1940. This was considered to be a matter of such urgency that Air Ministry plans for long-term expansion might have to be mortgaged. During the discussions a further complication emerged because in addition to meeting casualty replacements there was a commitment for providing reliefs for tired crews. This meant that for a force of 24 squadrons, 192 crews were required each month quite apart from the existing deficiencies which would have to be made up. The conference therefore agreed that O.T.U.s, to provide personnel for new units, should be formed at least six weeks in advance of the squadrons themselves, and that six new squadrons then forming in Bomber Command should be dissolved and used to bring the existing O.T.U.s up to establishment. Finally two more O.T.U.s were to be formed bringing the total requirement of O.T.U.s to nine, of which three were to be equipped with Blenheims and two each of the remainder with Hampdens, Whitleys or Wellingtons. This decision constituted an important step forward in the recognition of the part operational training had to play in first-line development since no other consideration could possibly have compelled the disbanding of six squadrons which were about to take their place in the line. These measures went a considerable way towards bringing the O.T.U.s up to establishment but there were also other problems connected with the shortage of airfields, particularly satellites, and there was trouble in providing the labour for them.<sup>1</sup>

Once Bomber O.T.U. capacity had been completed the next question was how to fill that capacity with pilots. The existing service flying training school output was estimated to be able to maintain the existing force at sustained rates of wastages. 216 pilots were being produced each fortnight, of which the allotment to Bomber Command was 73, but far more than this were needed by the O.T.U. organization. Various methods were agreed to find these pilots, the chief of which were milking of the training units, a general comb out of establishments, and a closing down of ancillary units. The Air Ministry meeting of 14 May 1940 represented a reversal of previous policy under which the formation of new squadrons was accorded priority before the expansion of the operational training units. In order therefore to bring the O.T.U. organization to a strength at which it could make good

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<sup>1</sup> A.M. File S.1925/II.

existing shortages and ultimately support the bomber force with a reasonable chance of expansion, three new operational training units were formed and the remainder were expanded to new establishments. A minor effect of this re-organization was that the training of Polish airmen was rationalised and concentrated in one O.T.U. There was also a welcome increase in the activity to provide runways on all newly-sown relief landing grounds so as to bring these into use at a much earlier date than would have otherwise been possible. This was to meet an agreed principle that thereafter each O.T.U. should have an adequate relief landing ground.

From the foregoing it can be seen that the impact of events on the Continent was to compel the introduction of various short-term measures to step up the numbers of trained personnel, particularly fighter pilots, but it was obvious that the time was fast approaching when careful co-ordination under centralised control would be the only thing to prevent complete chaos. Operational expansion under the pressure of events was found to be closely dependent upon training expansion, and furthermore both expansions had to be carefully co-ordinated if the general growth of the Air Forces was not to be seriously restricted.

#### **Appointment of Air Member for Training**

At a meeting held in the Air Ministry on 21 June 1940<sup>1</sup> the Secretary of State summarised the situation and said that, in his opinion, it was desirable to appoint an officer who would be in executive control of training in all its aspects, and who would also be responsible for following up the decisions taken. In his opinion this officer should be a Member of the Air Council so that he could work closely with the Air Staff and other heads of the Air Ministry. This view was shared by the Chief of Air Staff who emphasized the necessity for the centralised control of training and its careful co-ordination with operational requirements. This meant that the responsibility for war tactical training would be removed from the Air Staff and come under the new Air Member. The Department of Supply and Organization, which had had to bear the chief material burden of training, expansion and planning, also agreed with the idea. When the organization of the new department of training was discussed it became clear that its successful functioning depended upon a close link with the planning section in the department of the Air Member of Supply and Organization. It would therefore be necessary for training to have its own planning department. This proposal constituted the logical, final and inevitable result of a tendency which had been growing ever since it became clear that first line expansion and training were mutually dependent. Up to that time training had been seriously handicapped by lack of direct representation at the highest level since most of its problems had had to be handled by the Air Member for Personnel who was already overworked or by the Air Staff, who sometimes tended to overlook the claims of the training department.

At this stage it is expedient to give the exact terms of reference of the new Air Member for Training which concisely stated his dual responsibilities, firstly for the formulating and implementing of Royal Air Force training policy and secondly for ensuring that the training organization was adequate to meet the requirements of the Service. In an Office Memorandum the

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<sup>1</sup> A.H.B. III/31/1.

organizational steps to effect the decision to appoint an A.M.T. were set out and Air Vice-Marshal A. G. R. Garrod was appointed to the post. All departments of the Air Ministry concerned with training were to be placed under him, and he was to take up his duties on 8 July 1940.<sup>1</sup> His terms of reference stated that:

‘The Air Member for Training will be responsible for all Royal Air Force Training, whether in training schools and establishments or in operational units. He will formulate the training policy for the Royal Air Force and will ensure that this policy is properly understood and carried out in all Commands at home and overseas. He will also be charged with the primary responsibility for the supervision of the Empire Air Training Scheme.

It will be the duty of the Air Member for Training to satisfy himself that the training organization is at all times adequate to meet the requirements of the Service, and that additional facilities are provided as necessary to ensure that the intake and output of trained personnel of all categories are adequate both in numbers and quality. In formulating schemes for organizing the necessary training facilities the Air Member for Training will of course work in close co-operation with the A.M.P. and the A.M.S.O.

It is important that close contact should also be maintained between the Department of Training and the Air Staff. In order that training requirements may be taken fully into account in formulating Air Staff policy, the Air Member for Training will be a member of the Expansion and Re-equipment Policy Committee’.

The new appointment could scarcely have been called a sinecure since the Battle of Britain had already begun, there was an acute shortage of pilots and training aircraft, and a crisis was developing with regard to the growing shortage of wireless operators (air gunner). In addition the necessity for an adequate operational training organization having only just been recognised there was naturally anxiety with regard to this stage of training policy. Finally, the Empire Air Training Scheme, although in most able hands, was in itself a vast responsibility. It will be seen that expansion did not take place according to a well thought-out, timed and co-ordinated plan but that it was rather *ad hoc* in response to the demands of one crisis or another. The task was now to create a smooth running organization worldwide in extent and carefully controlled at a time of urgent crisis.

After the Battle of Britain was won, due in part to the fact that the training output not only kept pace with casualties but was able to show a surplus at the end, never again was first line expansion restricted by any shortages from the training organization. Once the crisis was over much was done to raise the quality of training. On the debit side, however, possibly the two outstanding features were the waste of time, manpower and resources involved in having large pools of trainees at various stages in the training pipeline, and the growing surplus of trained men towards the later stages of the war. The latter was unavoidable as the A.M.T. was bound to conform to the estimates of casualties which the Air Staff anticipated would be

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<sup>1</sup> O.M. 146/40.

suffered, particularly during the forward planning for the offensive stages of the war when the North African and Normandy landings were in contemplation. Owing to shipping difficulties the creation of large pools of cadets in transit was inevitable and was inseparable from world-wide and distantly separated training areas whose main reliance was not on air but on sea transportation.

#### **Review of Training Policy, June 1940**

At the end of June 1940 a meeting was held by the Air Council to review the main problems of training for the benefit of the new A.M.T. designate. The long range problem was to create sufficient air power to crush Germany by the formation of an air force flown by British and Empire crews but many of whose aircraft would be supplied by the United States. If full use was to be made of the improved prospects of supplies of aircraft it was also necessary to increase for the benefit of training the numbers of aircraft, aerodromes and instructors allotted to it. The short term problem was the existing deficiency of pilots, air gunners and wireless operators which made it necessary to get a large number of flying personnel into squadrons in the immediate future. This shortage was made worse by the fact that as expansion proceeded there was a growing demand also for the staff officer and instructor element whose experience of flying was indispensable. That these factors caused a serious drain on available pilot strength is best illustrated by two letters which passed between the Prime Minister and the Secretary of State:—

‘I am still concerned over the question of the employment of our pilots. According to figures which have recently been furnished by your Department, only three out of every 10 pilots with Wings are operational. This seems a very low proportion; of the remaining seven, two are pilots with Wings still under instruction, two are instructors, and the rest are Air Staff, Administrative, Technical or other non-operational duties. Thus more pilots are employed giving or receiving instruction than are actually serving as operational pilots in the squadrons.

Our methods of training have produced such good results that we must interfere with them as little as possible, but I do think these figures require some further explanation’.

It is, however, an indisputable fact that the growth of the machinery of organization must precede the growth of the organization itself. Thus, by early 1939, when expansion was becoming implemented to an ever-increasing extent, a further drain on the small cadre of experienced pilots was inevitable, since their knowledge and experience was indispensable in many vital staff functions and instructional duties. By the time of the Battle of Britain, the period to which the above letter by the Prime Minister refers, this drain on the limited supply of pilots was a serious embarrassment. An illustration of the situation was given in the Secretary of State’s reply (on 9 August 1940). After explaining that the pilots with wings had only done 80-90 hours flying and that they had to do 200 in order to be fit to operate, he also explained the necessity for the instructors, giving instruction not only to pilots but also to other aircrew categories. The ratio of instructors to pupils was one to six. Moreover, only a fraction of these instructors, i.e. those at operational training units, and some 250 in the whole of the

rest of training, were operationally qualified. The bulk of the instruction was being done by older men or men not qualified for operational duties. The same was true of the great bulk of the pilots employed on communications, ferrying and miscellaneous flying duties. He went on as follows :—

‘The proportion of pilots employed on staff, administrative, and technical duties is, as you say, not inconsiderable—something like 1,600 in all—though a certain proportion of these officers would not be suitable for operational duties. One reason for this figure is the policy which prevailed in the past of using general duties officers for technical duties, and another is the fact that a larger number of staff posts require recent experience of flying, and a considerable knowledge of the Service. Thus, such officers can only be posted to operational duties as, and when, they are relieved by other officers with similar staff and technical qualifications. There has already been a drastic comb-out which has not been subject to the limitations of age, and the number of non-regular personnel employed in staff posts in replacement of regulars is now considerable’.

In addition, then, to the various forms of wastage was that of miscellaneous wastage due to general factors such as enemy bombing, tropical conditions, etc., and to the drain of seasoned personnel to the staff ; to meet this, the addition of one Elementary and one Service Flying Training School was recommended.

However, certain favourable factors existed at the time, the chief of which was the increase in strength derived from the pilots of allied Air Forces who had taken refuge in Britain. The Air Council meeting, having indicated to the A.M.T. Designate the short term and the long term problems in general outline, proceeded to enumerate particular directions in which there were serious deficiencies, for instance the instructor position which was considered likely to be a limiting factor in the expansion of the training organization. The Central Flying School course had not been filled to capacity and although the formation of a second Central Flying School had been urged, the Air Member for Personnel had been unable to proceed with the matter. A number of non-C.F.S. trained instructors were also used but there was a limit to the number of posts that such personnel could fill. As regards the shortage of wireless operators (air gunner), which was causing such concern, steps had been taken to shorten the course of training and to reject more rapidly those entrants who were considered unlikely to qualify technically.

Finally, the suggestion was made that it would be desirable to review the possibility of moving Flying Training Schools as entities, that is by aircraft carrier to Canada and elsewhere overseas. Enquiries of an exploratory kind had already been made, but it was clearly necessary to await the Cabinet decision on the future of the Empire Training scheme, although at that time it was becoming obvious that the Cabinet had taken the long view that the Empire Training scheme was not to be sacrificed for short term reasons. In following up the questions which had been discussed at the Air Council meeting the new A.M.T. produced, towards the end of July, his preliminary survey of training made very much on the lines of the Air Council meeting to which reference has already been made. So far as the

short term position was concerned the length of the flying course had been reduced, the Service Flying Training Schools had been specialised into Group I (single-engined) and Group II (twin-engined), there had been a comb-out from non-flying posts of qualified pilots fit to fly, and arrangements were made for a number of foreign pilots to be passed direct to operational training units. The A.M.T. was therefore satisfied that nothing further could be done to produce results in this direction, indeed, the action that had been taken was, in his opinion, more drastic in certain respects than was desirable.<sup>1</sup>

The time periods of the flying courses had been reduced to the absolute minimum so that there was no margin for unforeseen contingencies. This reduction was already having some effect on the standard of night flying since with the reduced periods it was inevitable that the available nights likely to be suitable for night flying training were fewer. The recent comb-out had been extended to the training organization itself and it led to a dilution not only in the headquarters staff of Flying Training Command, but also in the instructional staffs at operational training units and at flying training schools. Personnel with considerably less than the normal experience had been sent to the Central Flying School course and even so one course was not filled; the result was a similar lowering in standard. Courses at other schools, such as the School of Air Navigation, were only partially filled since Commands had not been able to release personnel. The measures taken to meet the short term needs of the situation had thus weakened the whole training organization and the A.M.T. felt that it would have to be carefully nursed and that the measures would have to be reviewed as soon as practicable. A further reason for careful nursing for many months was because of the move of a number of training units out of the United Kingdom to other parts of the Empire. This was because training facilities had been seriously restricted, partly by the need to hand over training stations to operational squadrons, especially Fighter squadrons, and partly by the limitations imposed by enemy action. Training had been forced by the needs of the Fighter organization away from the east and south coasts of England and thus the air space for training was reduced, especially at night when night flying training had to stop when enemy aircraft were reported in the vicinity.

Although the transfer of training units to the Dominions allowed them to carry on their work without interference, there was an inevitable gap in the output flow during the period of the move. This gap was estimated to amount to at least two months' output for a move to Canada and to two and a half months' output for a move to South Africa. This meant, in the case of a move to Canada, a loss of at least 68 pupils for a Group II School and about 100 for a Group I School. For a move to South Africa the losses were estimated at 100 in each case. In spite of these considerations, it was considered essential to move three service flying training schools to Canada by the end of 1940, and one school of air navigation, with one air observer navigation school, to South Africa or Southern Rhodesia. Canada had been asked to prepare, before the winter of 1940, a total of eight sites for S.F.T.S.s, as a measure of insurance in case more of these schools had to be moved from the United Kingdom before the winter. In any case it was intended to use all these sites during the early part of 1941.

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<sup>1</sup> A.C. 5(40).

The deficiencies which handicapped the growth of the training organization resulted (by July 1940) in there being six service flying training schools less than were required to support the original planned output of operational types. There was an undoubted need to remedy the shortage of training aircraft and instructors, in order to build up and strengthen the training organization. The precise dates when it would be possible to form additional schools depended primarily upon the availability of instructors and training aircraft. In order to enable the training expansion to continue it was found necessary to select and screen starved pupils from the flying training schools and to draw seasoned personnel of the highest quality out of the fighting line for training as instructors. The formation of a second Central Flying School was recommended.

An approach had already been made to the United States Government with regard to the training of British pilots in the U.S.A. schools. The A.M.T. considered that every opportunity should be taken to press this request since Britain would gain additional pilots without the drain on her resources involved in forming schools to train them.

With regard to requirements in trainer aircraft, it was difficult for the A.M.T. to state his requirements since he had not received from the Ministry of Aircraft Production the full production programme for 1941 and 1942. This picture of the production position was urgently required in order that training requirements could be planned in harmony. Even so, preliminary calculations had revealed that trainer aircraft included in the programme were inadequate to meet training requirements. The A.M.T. went so far on this score as to say that for production purposes, the aircraft of advanced trainer types should in future be regarded as having priority, not only with, but above, the five operational types which had been given special priority by the Government. He also asked that very special steps should be taken to obtain an adequate provision of spares and other equipment required for training purposes.

#### **Proposal to Transfer Schools Overseas**

While the new A.M.T. was engaged on making his survey of the training situation and in taking steps to meet the existing crisis, discussions were held on another matter which has already been mentioned, i.e. the question of transferring basic training schools out of Britain to the security and settled conditions of the Dominions.

The fact was that the basic training organization in Britain upon which so much depended was hampered by too many restrictions. The needs of the air defence of Britain in all their forms, the congestion on the ground and in the limited air space and the vagaries of the weather all contributed towards moving the basic training out of Britain. The basic schools unlike the operational training units, were practically useless as a potential defensive factor in emergency and the resources devoted to them were sorely needed by the growing operational training and applied training requirements. Moreover, Canada was making rapid and efficient progress with her part of the Empire Air Training Scheme, and her initiative in offering help was an encouragement to transfer the burden. On the other hand such was the pressure upon the United Kingdom organization that the inevitable interruption in the flow of trained men which must have

resulted from the closing down of schools in Britain, their transit to and opening up in Canada, was a matter which required the most earnest consideration. It will be recognised that in these questions there was the usual clash between the long-term and the short-term viewpoint under existing conditions. Canada was quick to realise the changed situation, and already in May 1940 had expressed her willingness to give all possible help. She had intimated that the progress being made would enable the Royal Air Force schools to be accommodated in Canada with the least possible delay, and that interference with the Empire Training Scheme would not be serious.

By 8 July 1940 the Air Ministry decided that it was desirable to move four S.F.T.S.s out of the country immediately, and Canada, South Africa and Southern Rhodesia were considered as possible destinations.<sup>1</sup> Canada was the most suitable owing to its nearness to the resources of the United States and because of the availability of aerodromes and accommodation there. An official request was therefore made to Canada for the transfer of four schools on 13 July 1940, and this was rapidly followed on 18 July by a further request that 14 schools in all might be accommodated. These requests were agreed by Canada on 21 July, who added that the number of schools was so large that R.C.A.F. control would be necessary, and that aircraft shipments to the Empire Training Scheme should be uninterrupted.

The proposal to transfer Royal Air Force basic training schools to the Dominions was not accomplished without serious discussion at the highest level and it is of interest to survey the principal stages in this discussion which led to the final decision. The problem involved by the great increases in aircraft production showed, on the basis of the Ministry of Aircraft Production's forecasts, that it was possible to build up a force of over 4,000 first line aircraft by August 1941 compared with 2,700 in August 1940.<sup>2</sup> Such a force was estimated to require over 8,000 pilots and crews in the operational squadrons alone, compared with the 4,400 employed in August 1940. This great increase in production was not foreseen and was not preceded by a corresponding increase in the production of trainer aircraft or by an adequate expansion in the war training organization. It was considered by the Air Ministry that, for such an ultimate expansion, an immediate expansion in the training organization was required. In the circumstances then prevailing, this could only be achieved at the cost of a temporary restriction in first line expansion, since it was at the cost of this development that the necessary instructors and to a lesser extent the necessary maintenance personnel could be found. It was also considered necessary to build up a total of 6,000 trainer aircraft by March 1941, whereas the M.A.P.'s latest forecast for this type gave a total of only 4,200. It was clear therefore that measures would have to be taken to increase the production of trainers, an expansion of the training organization and a consequent increase in the flow of pilots into the Royal Air Force.

The Secretary of State in a paper which he wrote for the Cabinet examined the pilot position in the operational commands. Of Fighter Command he said that, during the fighting in France and Flanders, it had been realized that an increase in the establishment of pilots from 21 to 26 was advisable

<sup>1</sup> A.M. File S.5614 and E.T.S. 44(40).

<sup>2</sup> W.P.(40) 305.

for a squadron of 16 aircraft, but, owing to the intensity of the fighting it had not been possible to effect the change. During the fiercest activity the pilot deficiency in the Command amounted to some 300. By August 1940 it had come down to 74 on the increased total establishment of 1,460. In this the Poles in particular had helped considerably. The planned output of pilots from the service flying training schools during June and July of 1940 was 1,141 compared with 816 planned under the original programme. The Secretary of State went on to describe the concrete measures taken and projected to increase the flow to double the original programme, and also the arrangements that had been or which were being made to utilize the thousand or so allied pilots with operational experience. He also described the new schools to be opened in South Africa and Southern Rhodesia. Finally, after pointing out the difficulties of training in England which were imposed by enemy action and by the operational needs of the air defences, he said that arrangements were in hand to transfer four S.F.T.S.s, one air observer navigation school and one general reconnaissance school to Canada. Two navigation schools, one bombing and gunnery school and one general reconnaissance school were proposed to be moved to South Africa. In addition to this, a further seven sites were being selected in Canada. The consequence of these moves was considered to be unavoidable, but the effect of the move would not begin to be felt in the operational units of the Royal Air Force until the end of December.

The Ministry of Aircraft Production, however, objected to the Secretary of State's proposal to send the schools abroad.<sup>1</sup> They gave as their reasons:—

- (a) The M.A.P. could not service the aircraft required, or supply them with spares of which there was an extreme shortage at that time.
- (b) Even when this had been overcome, the process of shipment abroad would entail 'locking up' a large proportion of spares, amounting to perhaps one sixth of the total.
- (c) This would mean that a very high proportion of training aircraft would be idle, requiring the shipment of a large number to keep the schools working at full capacity.
- (d) The schools would be divorced from the skilled labour of the aircraft factories; technicians would not be available at the time; these personnel were small in numbers in Canada and such as there were would have to be trained in the new types with which they would have to deal.

As against this, the detailed reasons which impelled the transfer of schools were the extension of flying operations over England with a consequent restriction on flying training (particularly night flying). There was also the need in many cases to transfer training stations in Britain to operational units. The M.A.P. said that the Air Member for Training had estimated that two months' output would be lost for a move to Canada and two and a half months for a move to South Africa, while the former considered that this loss could be anticipated by finding overseas the necessary men, equipment and aircraft required by the schools. In other words, M.A.P. proposed that

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<sup>1</sup> W.P. (40) 323.

new schools should be formed overseas rather than that existing training establishments should be transferred. Furthermore, they considered that the elementary flying training schools could be transferred from aerodromes suitable for the service flying training schools to open spaces such as racecourses. They felt that the risk of casualties to training aircraft and to pupils should be accepted since the enemy would be wasting his time if he neglected 'more important objectives' to attack training aircraft. In any case, the Minister of Aircraft Production rejected the A.M.T.'s estimate of output loss on the grounds that the packing and shipment of the 2,500 aircraft (which was the A.M.T.'s estimate of the number to be moved by 1 January 1941) would lengthen the time to set up the schools. He considered that the trained instructors and training aircraft represented the last reserves and it would be folly to disperse them. Finally, he considered that so large a move must inevitably give rise to false rumours, and give the impression that the scale of enemy air attack on Britain was more serious than in fact it was.

Commenting on the M.A.P.'s remarks, the Secretary of State said that although there was a severe shortage of spare parts, the training types (Ansons, Battles, Harvards) were already in use in Canada, the Harvard being an American type. Stocks of spare parts were already in existence, those for the Battle and the Harvard being good, while the Anson and the Harvard were actually being built in Canada. This disposed to a considerable extent the drawback involved in divorcing the schools from the aircraft industry. The Secretary of State admitted that it was unfortunate that the skilled technicians of the M.A.P. would not be available, but the small technical staff of the Royal Canadian Air Force would be able to help. In addition, each school had its own establishment for servicing and, in addition, four Aircraft Repair Depots, three of which would be operating by October, would be available for this purpose. The South African position was not as advanced, but facilities would be extended in connection with the recently negotiated training plan. The Secretary of State did not deny that maintenance would probably be more difficult than in Britain, but he considered that this disadvantage would be far outweighed by the freedom from training restrictions and bombardment. He went on to say that personnel and aircraft could not be provided overseas. All Canadian resources, existing and prospective, were devoted to the Empire Training Scheme and aircraft were already short for the latter. All these considerations applied with even greater force to South Africa.<sup>1</sup>

Of the 19 aerodromes in use for the elementary flying training schools, 15 were unsuitable for service flying training schools, either because they were too small, or because their approaches made them unsuitable for night flying. In this respect something could however, be done, but there was great difficulty in finding natural sites. At that time, night training was stopped on receipt of a 'yellow' warning and even if night flying went on until the 'red' warning, restriction would be considerable. In any case, a number of Aircraft Storage Units were located at these aerodromes making it more important than ever that bombardment should not be invited by the display of the essential lighting which night flying required. There was, too, the consideration that if night flying training aircraft went

<sup>1</sup> W.P. (40) 327 and W.P. (40) 328.

above 3,000 feet they interfered with the work of the Observer Corps, also there was virtually no water round the United Kingdom over which flights could be made without interfering with the Radar warning system. The Secretary of State answered the M.A.P.'s figure of 2,500 aircraft required for export to the Dominions, by saying that this figure referred to the total shipments overseas (including not only the Canadian and African Training Schemes but also operational units overseas). The number of aircraft required by the overseas schools was 650. To counter the enemy's attack, which the Secretary of State thought would increase in intensity, an air force of much greater size than was then in existence would have to be built up.

' This force will leave little air space available for training purposes, and it may well be that by 1942 operational flying and operational training will occupy the whole air space available in this country. That is a larger view than I have taken hitherto, and, I hope, may not be proved correct in the event ; but the trend is there and is inescapable if we are to deploy our full resources against the enemy.'

The Prime Minister's judgment on the points of view of the Minister for Aircraft Production and the Secretary of State for Air was that, in view of the air battle in progress which showed no signs of diminishing, it would be unwise to take out of the country any large portion of the nation's reserves of men and aircraft.<sup>1</sup> The scheme for moving part of the training organization to Canada and to South Africa should, therefore, be postponed until the beginning of December. In the meantime efforts had to be made to continue night flying training as far as possible, and new methods such as infra red lighting of landing grounds would have to be devised. Seventy-five additional airfields were under construction and the Prime Minister ordered that another fifty should at once be selected and surveyed. Cement mixers and excavators were soon to be released from coast defence work, making it possible to push on more rapidly with aerodrome construction. He also ruled that every effort should be made in the three months interval, to prepare for the future arrival of training schools in the Dominions and that as much of local labour and material as was available should be used. The first Navigation School should go to South Africa as arranged, as the work of training in navigation was suffering especially from enemy activities over Britain, and eventually schools were moved ; three to South Africa and four to Canada. Thereafter, new schools were formed overseas.

#### **Transfer of Schools to South Africa : The Van-Brookham Agreement**

The proposed transfer of schools to South Africa represented a new and important element in the incipient stages of the growth of the training organization in that country. Since the arrival of a Mission, headed by Sir Robert Brooke Popham, in South Africa at the end of April 1940 the expansion of the existing training schools up to United Kingdom organization and establishments, and the development of auxiliary schools and maintenance organization had been proceeding, albeit slowly, owing to drastic

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<sup>1</sup> W.P. (40) 338; W.P. (40) 447.

limitations imposed by lack of personnel and equipment. The aim was to produce an output of 136 pilots and 60 observers a month over and above the 60 and 40 respectively a month required for the South African Air Force, and four elementary and four service flying training schools, together with three combined air observer navigation, bombing and gunnery schools would be required to fulfil the task.

By 1 June 1940 an agreement for the development on the above lines in two stages was signed by Sir Robert and Major-General Van Reynevelt. This was known as the Van-Brookham Agreement. As it stood, the first call on the output from the South African training organization would be to meet the needs of the South African Air Force. Ultimately, when Stage II of the expansion was finished, it was contemplated that this organization would be able to train 3,120 pilots and 1,050 observers per year, of which 2,080 pilots and 630 observers were for the Royal Air Force. It was to work on the R.A.F. syllabus of instruction; pupils from the United Kingdom were to go out to South Africa after their I.T.W. training, and payment was to be made on a capitation basis. The training organization which South Africa undertook to create was large. In proportion to the white population it was over twice as big as the Empire scheme to which Canada had committed herself. South Africa was handicapped by having few skilled mechanics and little industry to form a basis for the ground staff and repair organization. The internal political difficulties which formed a somewhat uneasy background to the scheme have been indicated and there was indeed a practical danger, in the form of sabotage, in locating schools in areas unfriendly to Britain.

By the summer of 1940 the imminent threat of heavy attack which followed the German conquest of France resulted in a request being sent to the Union of South Africa asking if she would accept four schools from the United Kingdom; all navigation or general reconnaissance training schools. The development of flying training in that country was considerably less advanced than it was in Canada, and plans for joint training had only been agreed some six weeks earlier and were still in a fluid and early stage. Notwithstanding the difficulties, on 26 July the South African Prime Minister accepted the proposals in principle. The schools were to be administered by South Africa through senior officers from the United Kingdom, and Britain was to bear the cost of and provide the equipment. These schools were to be additional to the 17 already planned in South Africa. This proposed transfer brought out a number of problems. Air observer navigation schools in the United Kingdom were civilian operated, but there were political objections to British companies operating schools in South Africa, and there were no suitable South African civil firms to operate them. They had, therefore, to be Service operated and the United Kingdom civil companies had to be compensated. Again, one of the chief functions of the School of Air Navigation was the teaching of astro navigation but there were no astro tables for the southern hemisphere and if the school went to South Africa the scope of its training was consequently limited. In addition, the shortage of Ansons for the schools was a further difficulty. In August, therefore, plans were changed and it was decided that two Air Observer Navigation Schools were to go to South Africa and the School of Air Navigation was

to go to Canada ; the transfer of the School of General Reconnaissance was still contemplated but the Fleet Air Arm School was to remain. Eventually it moved to Trinidad in West Indies.

Thus, it was finally decided to move two air observer navigation schools and one school of general reconnaissance to South Africa and this move was actually accomplished during 1940 in spite of objections by the Minister of Aircraft Production. No further attempts, however, were made to transfer more schools out of the United Kingdom. Thereafter South Africa was left to her own devices over the planning of a training scheme which, including the three transferred schools, had risen to a total of 20 training establishments. The story is one of serious handicaps which ranged from shortage of experienced staff officers to complications concerning the different organizations of South African and Royal Air Force Units. It was not until October 1940, that a British Air Mission was sent to South Africa to assist the Union.

## CHAPTER 7

### DEVELOPMENT AND REVISION OF TRAINING, MAY-NOVEMBER 1940

By the end of June 1940 the situation was that there were sufficient training aircraft for existing schools, but more schools were needed to produce the required flow of trained men to meet the M.A.P. programme. There was at this time an actual deficiency of seven S.F.T.S.s whose opening was held up for lack of Masters and Oxfords. There was also an acute shortage of target towing aircraft and also aircraft for wireless training. By the beginning of July 1940 it was clear that the M.A.P. were trying to make changes in their programme in the direction desired by the Air Ministry. There was, however, not only shortage of materials and certain machine tools, but also of manufacturing capacity.

On 9 July 1940 a table was produced by the Department of the Air Member for Supply and Organization which showed how great were the deficiencies of training aircraft and the large number required to meet the Aircraft Programme.<sup>1</sup> Thus, taking advanced trainers, Ansons, and elementary trainers as being the most urgently needed types, there were deficiencies on 1 July 1940 of 1,601 advanced trainers, 231 Ansons and 15 elementary trainers. The total requirements up to March including deficiencies to be made good, were estimated at 3,892 advanced trainers, 1,404 Ansons and 1,091 elementary trainers. In addition to these more intimate perplexities, there were the general reasons given by the Air Member for Training to the Air Council:—<sup>2</sup>

'Events have proved that undue reliance was placed for training purposes on aircraft which it was thought would be thrown up by operational units. This postponed the demand for specialised training types. Above all, there have been serious disappointments in the development and production of these trainer aircraft. The Don failed entirely and there have been successive setbacks in the production of the Master . . .

With regard to requirements in trainer aircraft, it is difficult to state our long range deficiencies since we have not yet received from the Ministry of Aircraft Production the full production programme for 1941 and 1942. We urgently require a picture of the production position throughout 1942 as a basis for the planning of training requirements.

In the meantime, preliminary calculations indicate, that the trainer aircraft included in the programme are inadequate to meet our training requirements. I would ask that for production purposes the aircraft of advanced trainer types should, in future, be regarded as having priority, not only with, but above, the five types specially selected. I would also ask that very special steps should be taken to obtain an adequate provision of spares and of the other equipment required for training purposes.'

<sup>1</sup> A.M. File S.5500.

<sup>2</sup> A.C. 5(40).

The new Air Member for Training, having previously been Director General of Equipment, had been taking stock of the training position, and had been responsible for the drastic but effective measures to increase the output of the training schools. In his opinion the important lesson was the vital need to plan to create margins or a buffer stock of trained personnel to meet unforeseen contingencies in precisely the same way as was already the practice with equipment. This outlook set the pattern to the whole training organization and, whatever its shortcomings, it can be said that the development of air power was never hampered by lack of aircrews once effect had been given to this policy. However, it was not possible to build up buffer stocks unless this were either done in advance of operational expansion or unless an immense effort were made to create a margin of income over expenditure.<sup>1</sup>

### **Co-ordination of Planning**

In order to understand the problems connected with the training organization, it is necessary to explain the successive steps that were taken in planning organization and development. In the first place it had been the practice in the past for the Air Staff to lay down the size of the front line which they wished to achieve by a given date, and all requirements had been worked out on that basis. For about two years, however, it had been accepted that the production of aircraft would be the limiting factor, and the planning of expansion programmes therefore had to start with the aircraft programme as a basis. The training organization had to be so framed as to enable the resultant force to be manned and maintained as it expanded. Since (in 1940) it took from seven to eleven months to train the crews for these aircraft, it was obvious that adequate training could only be carried out if aircraft production forecasts, however tentative they might be, were freely given as far ahead as possible. For example schools destined to open in January, had to be planned for, at least during the preceding August. At the same time, the aircrews which they would produce would not be available till the end of the following year, i.e. at least 15 months after the planning stage. Yet the aircraft production programme did not extend so far ahead. It was, of course, far from easy in the early days of the era of massed raids by the enemy and of the intense U-boat offensive for the Minister of Aircraft Production to be able to guarantee that his factories could sustain their output in the face of bomb damage and shortages of materials from overseas. Yet, without a long term forecast it was not possible to relate the rate of supply of trained aircrews to the production of operational aircraft. So here may be given one of many examples of the type of problem which had to be faced in building up a war effort.

Given the production forecast of operational aircraft, the following were the stages in the task of the planning staff of the Director of Organization:—

- (a) For each class of squadron, and for each type of aircraft within that class, the rate at which new squadrons could be formed and could come into operation was worked out with regard to the availability of aircraft only. In making this calculation, regard was paid not only to the rate of production but also to the state of existing reserves and to anticipated wastage rates. Allowance had to be

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<sup>1</sup> A.C. 5(40).

made for the time interval between the actual production of an aircraft and its completion by the installation, by the aircraft storage units, of all the many items of equipment necessary to fit it for delivery to the squadron. In the same way allowance had to be made for the number of aircraft concurrently required for the expansion of the operational training organization and for the time required for a new squadron to become fit for participation in operations when it would begin to incur wastage at war rates and to expend ammunition and bombs.

- (b) The resulting wastage of aircraft in numbers was translated into the numbers of crews expected to incur casualties by the application of factors, varying with each class of squadron. Thus could be assessed the expected wastage month by month of the crews for each type of aircraft. For example, early in 1940, in the case of fighter squadrons operating over the United Kingdom, the crew casualties were expected to be 40 per cent. of the aircraft casualties. In the same way, for aircraft operating over enemy territory the ratio would naturally be about 100 per cent.
- (c) Holding together the figures for all types of aircraft, the number of pilots of each class (e.g. bomber, fighter, coastal, etc.) and the observers, air gunners and wireless operators, required to be produced every month to maintain the expanded force, could be estimated.
- (d) The figures of pilot and other crew requirements month by month were then translated into the number of air training schools of each type which should have been in existence at correspondingly earlier dates to give the output required. At the same time the increases in establishments and wastage rates in training aircraft for this 'ideal' training organization were worked out.
- (e) It was invariably found that the training organization, actually in being at a current date, fell short of the 'ideal'. Thus, a comparison between the numbers of trainer aircraft required and those available at the time of planning provided an indication of the extent to which the whole programme could be fulfilled.

In fact, in July 1940, when the restriction of the supply of training aircraft was the deciding factor, there were in existence, worldwide, only 21 service flying training schools, this being the maximum number for which advanced training aircraft (Masters, Harvards, Ansons and Oxfords) were available compared with an ideal figure of 30. Previous experience of the production programme had thus shown that the future bottleneck for year (1941) would be training and aircraft, pilots, and perhaps wireless operators (air gunner). Other factors, such as availability of aerodromes and accommodation would not be limiting factors. The provision of flying instructors had of course, been related to the achievable (and not the ideal) number of schools, so that even if it had been found possible to obtain substantial additional numbers of advanced trainers, it would have taken time to train the additional instructors to match them.

Following the sequence of planning further, the next stages were to ascertain the rate of development of the force based on the availability of training aircraft and schools. The object here in describing these various stages in planning has been to demonstrate the effect of trainer shortages on plans for the development of the fighting element of the air forces. It is interesting to note however that in August 1940, when these features obtained, that the development of the service flying training schools was conditioned at this stage solely by this factor and by the shortage of instructors. The following table shows the planned development of S.F.T.S.s:—

Date	R.A.F. Schools	Empire Training Scheme Schools	Total	Ideal
August 1940 ... ..	16	5	21	30
September... ..	16	6	22	34
October ... ..	17	7	24	34
November ... ..	19	11	30	35
December ... ..	21	13	34	35
January 1941 ... ..	23	14	37	36
February ... ..	25	14	39	38
March ... ..	26	15	41	40
April ... ..	27	15	42	
May ... ..	28	15	43	
June ... ..	29	17	46	
July ... ..	31	18	49	

It can be seen from the table the extent to which the number of schools which could be equipped fell short of the theoretical requirement. Thus although the rate of production of trainer aircraft overtook the ideal requirement by January 1941, it must be remembered that the air forces were losing in the interval all the output which should have been available had the schools been formed according to first line requirements. Although these forecast figures were somewhat theoretical owing to the fact that actual wastages might not have come up to the postulated rates, at the same time in the event of a surplus of output over wastage, it could have gone into raising more squadrons.

- (f) The next step in planning was to give to the Air Staff the figures relating to the expansion which could be achieved, and to ask them for rulings as to where the deficiencies had to be borne in the different classes of squadrons. Until these rulings had been given it was not possible to work out the revised training organization, since each class of squadron had a different requirement in crews, which in turn meant different classes of schools for their training, different dates for the commencement of the training and different requirements of training aircraft.
- (g) When these rulings had been given, it was then possible to work out a revised rate of expansion, and in the light of this, the M.A.P. was asked to alter the balance of production as between training aircraft and operational aircraft.

At the meeting on 25 July 1940, to which reference has been made, it was found that all the planning work necessary to co-ordinate the different factors of the expansion programme was at the time being carried out by the staff

of the Director of Organization. It was felt, however that the existence of the limiting factors was not sufficiently appreciated by all the interested parties at a sufficiently early stage. In consequence the balancing between production of trainer aircraft types and of operational types, in degree and in time, always failed to be made. One of the results of this was that many of the Air Staff's plans proved administratively impracticable, because the training organization was always lagging behind the rest of the expansion. It was therefore agreed to recommend that a Committee should be appointed under the Chairmanship of the Air Member for Supply and Organization, to be known as the Development Committee, whose business it would be to review and co-ordinate at regular intervals the rate of development of the Air Force as a whole ; to ensure as far as possible that all the various factors were in phase ; and to arrange for necessary action to be taken to remove any restriction.

Actually this Committee soon lost its urgent *raison-d'être* because the link between the Department of the Air Member for Supply and Organization (Operations Forecasting section under Mr. H. O. R. Hindley) and the A.M.T. (Training Progress under Mr. Malcolm Laing) became so effective that co-ordination was automatic and continuous. The creation of the Committee, however, did very useful work in the preliminary stages of this new era of co-ordination of planning, and for this reason reference to its work will be made, particularly concerning the development of the Target Forces.

Discussion on the expansion of the front line squadrons and the detailed calculations which led to the resultant plans on Target Forces embodied every main aspect. In this, the factor of aircraft production played from now on a predominant part. For a period of over a year to come, the main consideration was still that of making good the deficiency of trainers—but the influence of this factor steadily declined and its place was taken by the more general question of the production of operational types, particularly the heavy bomber.

#### **Shortening of Training Courses to increase Pilot Output : The 'Second Revise'**

It will be remembered that the first shortening of elementary and service flying training courses (the 'First Revise') had taken place before A.M.T. had been appointed. While he was assuming control the demand for numbers of pilots still continued and was not satisfied by the first shortening of courses. As a concession, therefore, to the short term point of view the A.M.T. proposed the 'Second and Third Revises'.

In his preliminary statement on training (20 July) the A.M.T. put forward a plan for using operational aircraft to make up for the deficiency of trainers by transferring the armament instruction of twin engined pilots (Group II) from the service flying training schools to the O.T.U.s. This represented 14 days training time. The scheme, known as the 'Second Revise', was introduced during August and brought the S.F.T.S. courses to 12 weeks in duration while the bomber and coastal O.T.U. courses were lengthened to deal with the fortnight's instruction which had been removed from the basic training syllabus. This expedient was made possible by the fact that, under the measures taken to increase O.T.U. capacity at the Air Ministry conference

on 14 May 1940, the output from the O.T.U.s backing Bomber Command had gone up to some 2,180 a year and was planned to reach nearly 3,000 a year when all nine O.T.U.s were in full operation on six weeks courses. That output was, at least theoretically, enough to meet the estimated wastage for 24 first line squadrons but needed a great many more pilots (over 3,500) than the 1,900 a year then being received from the S.F.T.S.s as Bomber Command's quota.

When, after 18 June 1940, it was decided to use the eight Battle squadrons which had returned from France to step up Bomber Command's first line strength the need arose to provide trained crews to support 34 bomber squadrons.<sup>1</sup> By that time 11 O.T.U.s, some of them working considerably below full size, had been created and the theoretical output had risen to 3,000 a year, requiring an income of over 4,000 a year from the service flying training schools. During the summer of 1940 the bomber O.T.U.s did not receive anything like the income necessary to keep them working to full capacity. Fighter and Coastal Commands received priority in the output from the S.F.T.S.s and there was therefore idle bomber O.T.U. capacity. It can therefore be understood that it was possible to lengthen the O.T.U. courses from six to eight weeks and to increase the flying hours by about 25 per cent. The advantage of this measure was that the pilots received more flying experience on the types of aircraft which they were to fly on operations together with experience in the use of all the ancillary equipment. It also had the advantage of making training expansion a matter of forming more O.T.U.s which was easier at that stage than forming more S.F.T.S.s because operational aircraft were available and O.T.U. instructors did not need Central Flying School training. The 'Second Revise', however, made no very large increase in the output of pilots. The theoretical annual production went up by about 10 per cent. to 7,000, but the Battle of Britain was making it abundantly clear that the largest possible pilot output was an urgent necessity. There were only two ways of increasing the flow from the S.F.T.S.s by getting greater productive effort from the instructors and aircraft at the schools, and by cutting the time spent on the course still further. These possibilities were investigated during August, and the intensified use of instructors and aircraft was made the subject of an experiment; it was arranged that six of the S.F.T.S.s were to handle an additional 25 per cent. of pupils (i.e. four courses of 50 pupils each or a total of 200) with no increase in instructors or aircraft. It was arranged that if the experiment proved successful the other schools would also go over to the increased pupil population.

#### **The 'Third Revise'**

A further shortening of courses on the lines of the 'Second Revise', by transferring instruction from the S.F.T.S.s to O.T.U.s, was proposed in September 1940. The S.F.T.S. period was reduced to 10 weeks and the O.T.U. period increased by another fortnight (to 10 weeks for bomber and coastal O.T.U.s and six weeks for fighter O.T.U.s). The drawback to this scheme was that only 72 hours flying could be done in the 10 weeks and the question at once arose as to whether pilots would be capable of handling

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<sup>1</sup> A.M. File S.1925.

operational types of aircraft at O.T.U.s after a total of only 120 hours flying at the E.F.T.S.s and S.F.T.S.s.<sup>1</sup> Bomber Command considered that the curtailment would be successful if bomber pilots were selected early and given thorough training in instrument flying. On the other hand, Flying Training Command held that a 10 weeks course would be too short to allow enough attention to be paid to certain important exercises, such as navigation and night flying, which demanded considerable time and concentration but which required comparatively little flying. It may be said at this point that a strong cleavage of opinion between the Air Ministry and the Commander-in-Chief, Flying Training Command, became evident. It is not proposed to enter into a controversy in which both sides in a sense were right. Neither the Air Ministry nor Flying Training Command wished to see quality sacrificed for numbers, but from their higher vantage point at the time the Air Ministry could view the problems of the battle and expansion in general in greater perspective and the logic of numbers appeared inescapable. On the other hand, intimately concerned as he was with the day-to-day workings of his training organization which was bearing the main brunt of the crisis behind the first line, the Commander-in-Chief could see only too clearly that the lowering of training standards must inevitably lead to a deterioration in efficiency and an increase in wastage of all kinds.

By the end of September the 'Third Revise' was introduced and a general overbearing of 25 per cent. of pupils came into operation in the S.F.T.S.s. The theoretical rate of output became 11,200 a year, more than double what it had been in May and the planned supply of pilots became equal to the estimated demands of the first line and there was the prospect of a completely balanced flow to the O.T.U.s. During these successive revisions of flying training the advanced instruction given in the advanced training squadrons of the S.F.T.S.s had been so whittled down by successive transfers of training to the O.T.U. syllabus that there was practically none of it left. With the third revise the advanced training squadron stage was abolished and the S.F.T.S.s, except for the two devoted to Fleet Air Arm training, concerned themselves only with initial training squadron work. All these changes, which had happened rapidly and in little more than the duration of one S.F.T.S. course, were summarised in tabular form usually known as the 'batting averages'.

In the meantime most of the service flying training schools changed over to specialisation and were re-equipped with aircraft. This process of re-organization and intensified pressure was greatly helped by a summer of remarkably fine weather. On the elementary flying training school side a complementary re-organization had also taken place. By August the courses had been reduced to six weeks under the 'Second Revise', and to five weeks under the 'Third Revise', while populations were increased by 15 per cent. A minimum of 50 hours flying was, however, still expected from each pupil.

So far as the O.T.U.s were concerned the increase in course length to 10 weeks and the flying hours to over 85 resulted in a decrease in their output and a demand for more O.T.U.s, or failing that a lowering of standards to enable the output to be increased since Bomber Command was experiencing great difficulty in expanding. For this reason they were

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<sup>1</sup> A.M. File S.4928.

reluctant to introduce the measures brought about by the 'Third Revise' but were compelled to do so by the Air Member for Training who resisted, as far as he was able, any trend towards the lowering of standards.<sup>1</sup>

#### **Difficulties following the 'Third Revise'**

Towards the end of 1940 the S.F.T.S.s were beginning to find difficulty in carrying out the provisions of the 'Third Revise.' The programme called for 7,200 flying hours per month from 108 aircraft, but the shortage of spares and the coming of winter weather made it impossible to reach this target with the result that courses had to be extended; in fact no S.F.T.S. course was completed to schedule under the 10 weeks of the 'Third Revise' before June 1941. By December lack of spare parts caused 21 per cent. of the training schools' Masters and 13 per cent. of their Oxfords to be unserviceable, and much the same proportion of advanced trainers continued to remain immobilised for lack of spares until the following summer when matters began slowly to improve. The direct effects of bad weather in reducing the hours fit for flying was seriously aggravated by unserviceability of grass aerodromes caused by the heavy traffic, but it was noted that the flying times of No. 14 S.F.T.S. at Cranfield, which had runways, were markedly better than those of the seven schools with grass aerodromes. Another source of difficulty was night flying. At that time it was considered that only three aircraft could be operated at night at the same time from one landing ground, and the amount of night flying that could be done, therefore, depended not only on the hours of darkness and the fitness of the weather, but also on the number of relief landing grounds. The possibility of aerodromes being bombed by the enemy also came into calculations, and night flying was confined to the relief landing grounds unless it was essential to use the parent aerodromes; as each school had only one relief landing ground at this time the amount of night flying that could be done was severely limited. The amount of night flying per pupil in the United Kingdom S.F.T.S.s in the winter of 1940-41 averaged less than two hours.<sup>2</sup> Some slight improvement came about with the introduction of hooded goose neck flares which could be seen at 1,000 ft. but which were practically invisible from 3,000 ft. It was also decided to carry on flying after air raid warnings were received. All these difficulties caused pressure to find synthetic ways of simulating night flying such as the use of sodium flares and special dark glasses for use in day time. In general, though, it was obvious that basic flying training could not satisfactorily be carried out in mass under the handicaps which have been described. The importance, therefore, of the overseas training areas was becoming even more pronounced.

Similar difficulties occurred at the E.F.T.S. stage. By the end of 1940 there were still 19 elementary flying training schools feeding 12 service flying training schools in Britain together with a Polish School carrying out 'all-through' training. Extensions of courses during the winter of 1940-41 because of bad serviceability and weather were common and the consequent delays compelled extensions at the E.F.T.S.s. In fact, by December it was found that under the 'Third Revise' arrangements the five weeks E.F.T.S. course, giving a total of 35 hours flying (including 10 hours solo), was inadequate; the minimum number of flying hours was reduced to 42 without any

<sup>1</sup> A.M. File S.69865.

<sup>2</sup> A. H. B. IIM/A9/1.

lengthening of the course, but later in December another factor caused the extension of the course to six weeks. It was found that the suspension rate was too high, that is, too much satisfactory pilot material was being rejected owing to the short time available for training. It was also noticed that more accidents were occurring with the shorter courses. Not only did the E.F.T.S. course have to be increased to six weeks, but more of these schools were needed because they were required to feed not only the S.F.T.S.s in Britain but the two S.F.T.S.s transferred to Canada. The accident rate was growing more serious; during 1940 it had increased by approximately 50 per cent, thus accentuating the aircraft shortage, and at the same time lowering the standards of efficiency at the schools. The reasons for this increase were summarised by the Air Member for Training as: the three 'revises' in the summer of 1940, the shortage of experienced instructors and the fact that the recruits now coming forward were 'raw' compared with those trained during the early part of the war, most of whom had received flying instruction when members of the pre-war Volunteer Reserve.

#### **Summary of Acceleration and Expansion at Home**

In November 1940 the Secretary of State made a report to the Cabinet<sup>1</sup> on the achievements of training up to that time, and also an indication of the way in which training expansion would proceed. As will be appreciated, the main effort was to produce fighter pilots while the necessary expansion was going on. By the end of 1940 the immediate crisis of the defensive battle having been successfully overcome, the necessary redeployment could take place. It is therefore appropriate to summarise the position before describing the second, and offensive phase. Up to November 1940 therefore, all the measures of acceleration of training had been introduced throughout the training organization in the United Kingdom.<sup>2</sup>

The elementary flying training school courses had been reduced from eight to five weeks—and the service flying training school courses from 16 to 10 weeks while certain portions of the S.F.T.S. course's syllabus were transferred to the operational training units. A 25 per cent. overbearing of pupils was introduced at all elementary and service flying training schools, and allowance was made to increase course lengths by one fifth (i.e. to 6 and 12 weeks respectively) during the winter.

For the three months period—August to October 1940—the output of the S.F.T.S.s in the United Kingdom to the operational training units was 2,007 as compared with 1,428 under the original programme. The flow from the operational training units was 1,892. The formation of allied squadrons and the absorption of allied personnel into Royal Air Force squadrons had helped during the crisis. In addition to the Dutch personnel serving with Coastal Command, there were by November 1940, nine Polish and three Czechoslovak squadrons in Bomber and Fighter Commands as well as 150 pilots from allied air forces serving in Royal Air Force squadrons. Flying training facilities were then being organized to enable these allied squadrons to be maintained by their own nationals.

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<sup>1</sup> W.P. 40(447).

<sup>2</sup> W.P. (40) 305.

The improvement that had been effected during the three months period as a result of these measures may be seen from the following table which shows the posted strength of pilots in operational units:—

	Strength			
	27.7.1940	2.11.1940	Increase or Decrease	Surplus or deficiency on establishment
Bomber Command ... ..	1,198	1,368	+170	— 2
Fighter Command ... ..	1,411	1,797	+386	+70
Coastal Command ... ..	889	1,057	+168	+96
Army Co-operation Command	258	238	— 20	— 2
Northern Ireland ... ..	42	56	+ 14	—10
<b>Total ... ..</b>	<b>3,798</b>	<b>4,516</b>	<b>+718</b>	<b>+152</b>

Thus it can be seen that in spite of the critical Battle of Britain and of the strong competition in priorities between operational and training expansion, wastage had been made good and, in spite of heavy losses, a surplus was shown. In the operational Commands between August and October a wastage of over 1,400 pilots killed, missing and wounded had been made good. The pilot strength had been increased by over 700, and the Middle East Command had been reinforced. In addition 300 pilots had been sent on flying instructors courses in order to provide the instructional staff required for training expansion in 1941.

The position had been reached when pilot and aircrew output was greater than the requirement to maintain the existing establishment of the Air Force and it was anticipated that between 1 November 1940, and 1 March 1941, the accelerated flow of trained personnel would make it possible to increase the striking power and the defensive strength of the Royal Air Force by the equivalent of 30 squadrons.

#### Acceleration of Training Overseas

The Secretary of State was also able to report that the Empire Air Training Scheme had made good progress. In Canada, the opening of elementary and service flying training schools was well ahead of schedule, and during the succeeding nine months it was estimated that 3,420 pilots would be trained in Canada, 476 in Australia and 718 in New Zealand. In addition it was anticipated that the monthly outputs from the United Kingdom's F.T.S.s would rise from an actual 568 in October 1940, to an estimated 1,766 in July 1941, and that outputs from the Royal Air Force schools in Canada and Rhodesia would start to arrive in Britain and the Middle East for operational training by November 1940. South African output was, however, not anticipated until May 1941.

The measures of acceleration adopted in Britain under the 'Revises' were to be introduced by the Dominions when they felt able to undertake them. Canada planned to introduce the shortened 10 weeks F.T.S. course in December 1940. New Zealand was in process of introducing the 12 weeks course with the possibility of changing to the 10 weeks course, while Australia had started a 25 per cent. overbearing of pupil populations. Rapid

progress was being made with the development of flying training schools in Southern Rhodesia and in South Africa. There were also projected minor schemes for flying training in India, Malaya, Burma and in the West Indies.

#### **American Training Schemes**

Some progress had been made in negotiating training facilities in the United States, and there were three schemes under discussion. The first was designed to give training at selected United States schools corresponding broadly to elementary and advanced training in the United Kingdom. The success of the scheme depended upon the release of advanced trainer aircraft by the United States authorities. This was a matter of the greatest difficulty in view of America's own requirements, and, though the President had shown himself to be favourable, the Air Attaché had reported that progress would not be possible until after the election then pending. The question was, however, being taken up again.

A start was made with a second scheme for using facilities at United States schools to bring candidates from the United States who were already qualified pilots up to the standard of entry into operational training units in Britain. It was hoped that the 'Eagle' squadron (the pilots of which were drawn from volunteers from the United States), would be maintained from this source, and that, with the expansion of training in the U.S.A. it might be possible to form more American squadrons. The Air Attaché had reported that this scheme might also be the best approach to the larger scheme for all-through training.

A proposal was also being investigated for sending observers for general reconnaissance squadrons through a course which had just been started by Pan-American Airways for personnel of the United States Army Air Corps.

#### **Future Development of the Flying Training Organization**

The Secretary of State gave details of the results to be expected from the measures of acceleration introduced in Britain and already agreed overseas<sup>1</sup> which would produce a further material increase in the flow of pilots from the S.F.T.S.s. They showed an estimate of 1,059 for November 1940 compared with 671 previously planned, expanding to 2,139 by June 1941, compared with 1,740 previously planned. On passing out of the S.F.T.S.s, pilots then completed their training in the operational training units. For fighters, the operational training unit period was six weeks; for general reconnaissance (coastal) pilots eight weeks in addition to the course at the School of General Reconnaissance, and for bomber pilots ten weeks. Thus an average period of at least two months specialised operational training had to be added to the service flying training school output dates in order to obtain an estimate of the dates when pilots could be regarded as being operationally qualified.

The provision of operational training facilities to accommodate the greatly increased flow from the S.F.T.S.s in Britain and overseas threatened to be a problem of great magnitude, and it was necessary to allocate a considerable number of aircraft, personnel and aerodromes to build up the operational training units throughout the winter and spring (1940-41). In spite of intensive efforts to obtain an increased number of aerodromes in Britain the

<sup>1</sup> W.P. (40) 447.

demand for operational squadrons and for operational training units was going to be so great that it would be necessary to reduce to a minimum the number of aerodromes in Britain allotted to non-operational training.

Regarding this programme, the Secretary of State emphasised that it was based and depended upon the fulfilment of the Ministry of Aircraft Production forecast of 2 October 1940, and that it would be subject to delay to the extent that the planned production of trainer aircraft was not achieved. The instructional and maintenance personnel would be forthcoming to meet the programme, though a measure of dilution would be necessary.

Regarding aerodromes, the shortage of cement, other materials and labour made it impossible, within the time available, to provide in Britain all the sites required for the first line squadrons, the operational training units and for the expanding training organization. It was therefore fortunate that with the resources of the Empire and of their Air Forces it was anticipated that there would not be any difficulty in finding the sites required. Owing to the restrictions imposed on non-operational flying in Britain by the risk of enemy attack, and to avoid interference with the defence system, it was necessary to proceed with the formation of training schools overseas. This, then, was the position at the end of 1940.

**PART III**  
**CONSOLIDATION AND DEVELOPMENT PERIOD**  
**NOVEMBER 1940—SEPTEMBER 1942**



## CHAPTER 8

### AIRCRAFT PROBLEMS, EXPANSION AND OFFENSIVE PLANNING

By the winter of 1940, the first essential to British strategy, the security of the United Kingdom, had been assured. This security had been obtained due to the adequacy of Fighter Command, to which an unprecedented training effort had contributed no small part. At the same time the foundations of a properly co-ordinated training plan to meet future needs for the development of the Air Forces had been laid. The period following is one of consolidation and steady development. The crisis of the Battle of Britain was also a crisis for training because not only had the fullest possible expansion to take place simultaneously with rapid front line development, but the training organization itself was subjected to the direct impact of events owing to the absence of any 'buffer' stocks of trained pilots and equipment. In fact, the crisis started with a deficiency in these essential elements. From this time forward the training organization was shaped in accordance with long term plans based on the strategy of the Mediterranean offensive. Although this period, in the sphere of operations, saw disasters in Greece, Crete, North Africa and the Far East there were compensatory events of great importance, namely Lease/Lend (March 1941); the entry into the war of Russia (June 1941) and America (December 1941); and the opening of a bomber offensive (May 1942). These events, though they had immediate and evident effects in the operational sphere, had equally strong, though not so evident, effects upon training; effects which though sometimes unfavourable from the short term viewpoint were indispensable to the successful outcome of the long term strategy. From the training viewpoint the outstanding trends of this period were the change in emphasis from basic to operational training and the demand for quality as opposed to the previous urgent calls for numbers. Finally there were additional important factors in the appearance of the four-engined bomber and improved types of aircraft, the adaptation of radar and other technical and scientific defences.

#### **Build Up of the Bomber Force**

The emergency of May 1940, which lasted through the summer, had the effect of imposing certain short-term measures on long-term training plans and also on aircraft production policy. These measures were, owing to the ponderous nature of the mass production organization, to have an effect long after the need for them had passed. This resulted in a lack of balance between the respective rates of production of fighters and bombers to the detriment of the latter. In spite of this, by September 1940 the final steps were taken to redress the balance in favour of the bomber.

On 6 September 1940, the Prime Minister summed up his views on the subject as follows:—'The Navy can lose us the war, but only the Air Force can win it. Therefore our supreme effort must be to gain overwhelming mastery in the air. The fighters are our salvation but the bombers alone provide the means of victory. We must therefore develop the power to carry an ever increasing volume of explosives to Germany, so as to pulverise the entire industrial and scientific structure on which the war effort and

economic life of the enemy depends.' At the same time (5 September 1940) the Chiefs of Staff recommended the provision of a force of 1,600 heavy bombers for that purpose.<sup>1</sup>

The programme was approved by the Ministry of Defence as the target to be reached by the summer of 1942 and formed the basis of the production policy. Six months later when Lease/Lend and the large programme of heavy bomber production came into the picture the target was increased to 4,000 heavy bombers, to be provided as soon as possible. The implications to training of this planning for a large bomber force were that Bomber Command and the Bomber Squadrons in the Middle East were to be the largest training commitment, particularly in operational training. Previously during the Battle of Britain, Bomber Command had performed to take second place. Now the build up for the bomber offensive was to begin.

#### **Shortage of Advanced Trainers**

The low proportion of training aircraft and spares to operational types produced, created an unbalanced effect on the overall programme. This shortage was most hampering, and in November 1940 the Secretary of State for Air urged the Minister of Aircraft Production to increase the ratio of training aircraft.<sup>2</sup> He stated that, when expansion was completed and stability achieved, the proportion of training to operational aircraft required to maintain the force would be about twenty to eighty corresponding to the relative wastage anticipated. Such a condition of stability was, however, only a theoretical possibility and did not correspond to the situation at that time. The trainer output was seriously out of phase with the expansion which had already taken place. This expansion had only been made possible by the fact that the total wastage of operational aircraft during the progress of the war had been much below that which had been anticipated. Further expansion was now contemplated and since the rate was uncertain requirements of trainer aircraft could be estimated only as a percentage of whatever output of operational aircraft was in prospect. Therefore, at any given moment the output of trainers had to be 40 per cent. of the anticipated operational output six months later in order to avoid a deficiency in either aircraft or personnel.

Prior to the institution of the Ministry of Aircraft Production the rate of expansion was limited by the production of operational aircraft. The acceleration of that production, together with current experience of pilot casualties showed that expansion was governed by the numbers of pilots, observers and gunners that could be produced, rather than by the numbers of operational aircraft available. Existing plans for expansion were therefore based on pilot and crew training and that was based on the numbers of trainer aircraft available. The whole programme in fact depended upon the advanced trainer aircraft situation. The eventual adoption of the 40 per cent. principle by the Ministry of Aircraft Production in November 1940 enabled the planning in advance of reasonable proportions of operational and trainer types. It was several months, however, before the problem was settled because there seems little doubt that the Minister of Aircraft Production was

<sup>1</sup> W.P. (40) 352 and W.P. (40) 683.

<sup>2</sup> S. of S. Folder 268A.

more concerned with the output of fighter aircraft than of trainers and spares and the Secretary of State maintained continual pressure to ensure the flow of this essential equipment.<sup>1</sup> Whilst discussing the subject of aircraft production, mention must be made of the proportion of operational type aircraft absorbed by the training organization. In a paper on the allocation of output of operational aircraft between operational training units and the requirements and wastage in the front line, the training planners showed that, in the expansion proposed of 100 squadrons by June 1941, while the first line required an addition of 1,600 aircraft the training organization needed a further 1,700 operational type aircraft to back the expansion. In actual fact only a quarter of the production of operational types were used to augment the front line strength. The shortage of advanced trainers was largely responsible for the high proportion of operational type aircraft used in training at that time.<sup>2</sup>

#### **Shortage of Spares for Trainer aircraft**

A difference of opinion existed between the Air Ministry and the Ministry of Aircraft Production on the subject of spares for training aircraft. The Ministry of Aircraft Production claimed that during 1940 there had been a considerable drop in the number of aircraft unserviceable awaiting spares. This was acknowledged by the Air Ministry but they were concerned in convincing the M.A.P. that the position was by no means satisfactory. The improvement had been mainly due to diverting spares direct from the manufacturers to units; a practice which prevented the building up of 'buffer' stocks against the possibility of the manufacturers being bombed.<sup>3</sup> In fact, throughout 1940 there had been a steady increase in the daily average of diversion orders from twenty-three in January to one hundred and sixty-two in December which indicated the extent to which maintenance was dependent upon direct service from the contractors.

The maintenance position was serious throughout the whole training system, at home and overseas, particularly in Flying Training Command in view of the shortage of advanced trainers. An example of the situation in Flying Training Command was given by the Secretary of State in December 1940. There were then 1,110 unserviceable aircraft of which 531 were under repair at units and 410 were awaiting spares. The basis of working on a rate of unserviceability of 50 per cent. in Flying Training Command had been abandoned in June 1940 when training was accelerated. By the end of 1940 the proportion of unserviceability dropped to 33 per cent., and aircraft were being worked far harder than before. The average number of hours flown per aircraft at E.F.T.S. was 49 per month as compared with 26 the previous year (35 hours per month at S.F.T.S.). This was accomplished in spite of the fact that in 1939 there were none of the maintenance problems caused by dispersing aircraft out of doors in bad weather. Furthermore, there was not then the problem of 37 per cent. unserviceability due to lack of spares.<sup>4</sup>

<sup>1</sup> S. of S. Folder 268A.

<sup>2</sup> T.P./4/1, 10 November 1940.

<sup>3</sup> S. of S. Folder 268A.

<sup>4</sup> M.A.P./S. of S. File 13, 18 December 1940 and S. of S. Folder 268A, 18 December 1940.

In spite of these considerations it is evident from correspondence between the Secretary of State for Air and the Minister of Aircraft Production that the latter was by no means convinced of the seriousness of the trainer aircraft and spares shortage. He considered that there were ample trainer aircraft, but doubted whether proper use was being made of them. He felt that the maximum trainers were already being manufactured or bought from the U.S.A. He was also considerably alarmed at the crash rate and critical of the export of training material for the Empire Air Training Scheme. He stated that 1,134 aircraft and 1,969 engines had been shipped abroad. The Air Ministry, however, stood by their statement that 'the advantages to be derived from training in areas free from Command operational restrictions and air bombardment will far outweigh any such difficulties'.<sup>1</sup> There was no question of any extravagance in the supply of training aircraft to the Dominions. The aircraft establishments of the training schools remained the same as if they were located in Britain, although it was necessary to provide a larger supply of spares.

In conclusion it can be stated on behalf of the Ministry of Aircraft Production that insufficient guidance had been given to them on the provisioning for trainer aircraft.<sup>2</sup> The Air Council Committee on supply had made five requests for information of Air Ministry requirements in September and October 1939 without result and the final programme of trainer requirements was not sent to the Production Department until March 1940. As at least eighteen months were required after demands had been furnished in order to achieve any material change in output it is not surprising that there was a serious shortage.

#### **Target Force 'C'**

The first of the war-time expansion programmes (Target Force 'C') was introduced in December 1940. The programme aimed at a total of 438 squadrons to be formed by April 1942. In November 1940 the force consisted of 214 squadrons (176 R.A.F. and 38 Dominion).<sup>3</sup> The aircraft production factor, which has just been described, still constituted the main limitation to expansion, but a further restriction became apparent in the shortage of pilots although other classes of aircrew were not so difficult to find. In August 1941, for example, there were sufficient aircraft to form 123 squadrons but shortage of pilots limited expansion to 70 squadrons. The first essential to the fulfilment of Target Force 'C' was to increase the training organization as quickly as possible. There was, however, difficulty in anticipating the necessary balance between the requirements of the first line forces and the training organization.

At this time the expansion of the training organization centred on the service flying training schools and much of the early training effort was to enlarge these schools in order that they could take the majority of E.F.T.S. trainees who were waiting to pass through. During the Battle of Britain the main question had been whether to achieve a limited expansion with existing training resources or whether to expand the training. The decision

<sup>1</sup> W.P. (40) 327.

<sup>2</sup> M.A.P./P.M. 14 January 1941.

<sup>3</sup> T.P.42, 21 December 1940.

reached was to sacrifice the immediate first line expansion in order to enlarge a training organization which would make possible a far larger operational first line later in 1941.

Almost immediately following the introduction of Target Force 'C' a revision became necessary. This was the result of the acceleration of training under the A.M.T.s three 'Revises' and the revision of the rate of effort, aircraft wastage and crew casualties.<sup>1</sup>

#### **Training Requirements to meet Target Force 'C'**

Before the required expansion of the force could be assessed certain deductions had to be made from the output from schools in order to provide for the expansion of the training organization and to meet operational wastage of the existing front line. Taking pilot output for example: altogether it was calculated that a total of 38 S.F.T.S.s would be required to maintain Target Force 'C'. Approximately 20 were available at the time, and their output in December 1940 was 792 of which 150 were allocated for training as instructors, staff pilots, etc.

In order to meet the wastage of Target Force 'C' it was calculated that in all 178 schools would be necessary, working to lengths of courses designed to give the minimum adequate training required under pressure of war conditions.<sup>2</sup> Schools were also required for the expansion from 214 to 438 squadrons by April 1942. This number was calculated to be an additional 42½ per cent.; thus 254 schools were required altogether. But the number of schools required to maintain and expand an air force at a fixed rate of expansion were greatly in excess of those required for maintenance alone: on a force of 438 squadrons an expansion of less than 4 per cent. per month required 122 schools or more than 70 per cent. more schools than those necessary to maintain the force. At the end of 1940 about 210 trainees had to enter initial training wings for every 100 pilots finally drafted to operation squadrons. For observers the figure was over 150 trainees for each 100 drafted to the squadrons. So far as the pilot output rate was concerned, between September 1940 and September 1941 nearly 15,000 pilots were trained. (This figure rose to 27,000 by September 1942.) In spite of this, pilot output was still regarded as being the limiting factor.

It was calculated that a total aircraft establishment for 178 schools would be 8,800 initial equipment aircraft with almost 4,000 in immediate reserve. It was very much easier to produce aircraft than to train pilots and crews. With a pilot output rising from 1,000 per month to twice that within a year it was considered unlikely that the Royal Air Force could achieve an operational expansion of 14 squadrons per month, even though their initial wastage would only be incurred on an average first line of approximately 4,350 aircraft. The proportion of aircraft consumed by the training organization in an expanding force was some 70 per cent. greater than that required to maintain the static force. The numbers required to maintain the static first line of 6,000 amounted to no less than 8,267 aircraft requiring replacement in the training organization.

<sup>1</sup> Appendix D to C.W.E./E/17.

<sup>2</sup> T.P./42, 21 December 1940.

In order to expand the training organization it was necessary either to withdraw instructors from the final stages of training, thereby restricting the flow of availability for the operational forces, or to withdraw operational pilots from the first line. In order to staff the 178 schools necessary to maintain Target Force 'C' over 5,000 instructors and staff pilots were required. Finally, schools, training aircraft and instructors had to be available six months before their effect was felt in terms of operational expansion. The neglect of these factors was well illustrated at a meeting held by the Chief of Air Staff in December 1940 to consider future expansion in general and in particular that of the Metropolitan Bomber Force. The discussions centred round the production of a bomber force to attain parity with the German Air Force. It was estimated that the first line German bomber strength would be 2,250 by January 1942. As the bombers based in Britain had twice the distance to fly to their targets than had the enemy, parity could only be achieved with a first line strength of 4,500 aircraft. The meeting came to the conclusion that the main limiting factor was the supply of advance trainer aircraft. Because of this the Air Member for Training said there would be a shortfall of 1,000 pilots by March 1941 and a strong probability of losing a further 1,000 pilots if the provision of advanced trainers was not restored to the Ministry of Aircraft Production plan of 2 October 1940. It was agreed that this position should be brought to the attention of the Cabinet.<sup>1</sup>

The foregoing illustration indicates the magnitude of the problem facing Air Ministry at that time. It also brought forth some interesting information regarding the German training effort. Estimated German aircraft output was about 1,800 a month, 500 of which were trainers. It was clear that training expansion at least, had reached its peak.<sup>2</sup>

#### **Review of Training Programme by R.A.F. Development Committee<sup>3</sup>**

The revised rate of expansion up to Target Force 'C' was submitted to the Prime Minister and accepted by him as the rate of expansion towards which plans should be directed. The Secretary of State, however, had stated that the rate of expansion might be subject to unforeseen setbacks and that if at any time it seemed better to lengthen operational training unit courses at the temporary expense of forming new squadrons this would be done. The main elements in the plan for forming an additional 224 squadrons between November 1940 and April 1942 were fighters and bombers whose expansion, particularly the latter, was the main concern. Taking the Ministry of Aircraft Production forecast for advanced trainer aircraft of October 1940 as the basis, the rate at which S.F.T.S.s up to a total of 56 could be formed (assuming that the S.F.T.S. course would eventually revert to 16 weeks) was calculated. The result of this calculation was sent to the A.M.T. who had given estimates of the output of pilots to be expected monthly up to September 1941 and certain assumptions were made to give possible figures of pilot output in subsequent months. From this information, and in the light of recent revisions the rates of effort, aircraft wastage and crew casualties, the rate of Royal Air Force expansion was calculated.

<sup>1</sup> V.C.A.S./659, 21 December 1940, and C.A.S./Misc./29.

<sup>2</sup> S. of S./P.M., 18 December 1940.

<sup>3</sup> 2nd Meeting, R.A.F. Development Committee, 16 January 1941.

It appeared that with the exception of flying boats operational aircraft would be available to meet the needs of Target Force 'C', but further information about advanced trainer production had since become available. Even before the bombing of Coventry, which resulted in a decrease of the production of Cheetah engines (for the twin-engined Ansons and Oxfords), the output of advanced trainers had not come up to expectations although it was hoped to increase Master production by 40 a month within six months' time. New figures of production of advanced trainers were used to work out a new rate of expansion of the training organization and were referred to the A.M.T. to revise his figure of pilot output. It appeared after examination by the Training Progress Department that the output of pilots from S.F.T.S. up to June 1941 would show no cumulative decrease but that afterwards there would be a considerable decrease. This meant that up to August 1941 the same number of pilots delivered out of Operational Training Units could be relied on and, therefore, up to that date, the planned expansion programme could be made so far as the availability of pilots was concerned. After that date it appeared that the rate of expansion would be retarded but the assumption was made and subsequently confirmed that the Dominion Air Forces and the Royal Air Force Commands in non-operational theatres would bear the deficiency.

#### **Examination of Factors Limiting Expansion**

The Development Committee also examined factors limiting expansion. In the first place it was agreed that the production of pilots and observers had to be kept in constant relation, and for this purpose it would be necessary to divert a number of Ansons from the training of pilots to the training of observers. The Ansons taken from one service training flying school would be sufficient to equip 4½ per cent. air observer navigation schools and for the loss of some 60 pilots per month there would be a gain of some 160 observers per month. Concerning ground personnel it was anticipated by the Director of Manning that the total number of airmen required by the programme could be obtained, but there would be considerable dilution and at the same time greatly increased ground training facilities would be required.

It was stated that airfield requirements were expected to be met, up to June 1941, but there would be a deficiency of 25 by December 1941. In this connection reference was made to the requirements stated by the A.M.T. for Group satellites. Originally, A.M.T. had asked for two satellites for each night flying O.T.U. but, recognising that sufficient aerodromes would not be available, he had suggested that if each O.T.U. had one satellite and if the parent station could continue flying in 'Red' (Enemy present) conditions it might be sufficient if the Group had a further three or four satellites at its disposal. The A.M.T. stated that the O.T.U.s could just manage with one satellite each, but they had no margin. The A.M.S.O. agreed that the provisions of group satellites should be noted as a desirable requirement, which, however, it might not be possible to meet. Reference was also made to an opinion expressed by the President of the Aerodrome Board that aerodromes beyond the requirements of Target Force 'C' could not be found. An increase in striking power beyond that given by Target Force 'C' would probably have to be found by other methods, such as increasing the number of squadrons per station, or the number of crews per squadron or both.

On the question of pilot allocation, it was pointed out that there were other calls on the pilot output than to the main commands. Pilots were taken from flying for controlling fighters, or for administrative posts, and in this connection the A.O.C.-in-C., Coastal Command had stated that his battle and accident casualties accounted for less than 50 per cent. of the drain on his pilots. Reference was also made to the requirement of ferry pilots to fly American aircraft across the Atlantic, which might absorb as much as one month's output of pilots at the existing rate. The allocation of pilots coming from S.F.T.S.s was settled at monthly meetings held by the Air Member for Personnel. It was thought that the decisions of these meetings tended to be influenced by short term considerations, which might result in one particular command receiving priority over a longer period than was justified. Thus, Fighter Command probably received an unduly high priority of pilot allocation the previous autumn. In order to correct this, it was agreed that A.M.S.O.s and A.M.T.s departments should prepare a revised statement of allocation of S.F.T.S. outputs in percentage form, sub-dividing the allocation between the Metropolitan Air Force, Middle East and other requirements and that this revised table be sent to the Air Member for Personnel for his guidance as to the requirements for the long term allocation of pilots.

#### **Pre-Entry Training : Formation of the Air Training Corps**

Towards the end of 1940 the problem of providing some general system of training to cover the period between the date of leaving school and that of entry into the Royal Air Force had become more acute. Up to that time three schemes had been in existence and to some extent had covered this gap. These were, the University Air Squadrons; the Air Sections of the Officers Training Corps in Public and Secondary Schools; and the Air Defence Cadet Corps. Each of these schemes catered for a different section of the community. They proceeded independently and were dealt with by a diversity of branches within the Air Ministry. In a memorandum to the Air Council in November 1940<sup>1</sup> the Air Member for Training suggested that one organization under a senior officer should be created outside the Air Ministry to cover the whole field of pre-entry training. He also suggested that it should be based on the Air Defence Corps movement. It would be necessary to give the organisers and cadets official encouragement in addition to certain inducements and facilities to make the scheme worth while and attractive from the individual viewpoint. A proposal that a force to be known as the Air Training Corps should be formed was accordingly submitted to the War Cabinet and approved on 19 December 1940. The Corps was established at the end of January 1941, on a voluntary basis, and embraced all pre-entry training activities.<sup>2</sup> It proved very useful in bringing up to the required standard personnel who would otherwise have been educationally or physically unsuitable for training. 20,000 cadets (200 squadrons) were taken over from the Air Defence Cadet Corps in February 1941 and by the summer of that year the strength had risen to 146,000. The Corps reached its maximum strength in July 1942 with a total of 210,000 Cadets.

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<sup>1</sup> A.C. 101 (40).

<sup>2</sup> A.M.O. A.81/41.

This was the beginning of a trend which later was to assume growing importance to counteract the inevitable decline in the standard of air recruiting as the war progressed. It also did much to encourage the recruiting of suitable men and to give them the opportunity of preparing themselves while waiting to be called up.

#### **Target Force 'D'**

In February 1941 the ending of the pilot shortage became apparent when it was realised that the maintenance of Target Force 'C' on its completion would not absorb the pilot output available.<sup>1</sup> The Air Staff indicated that expansion beyond the limits of Target Force 'C' should be mostly in the direction of heavy bombers. This ruling was based on the fact that, on the completion of Target Force 'C', a high proportion of the defensive air requirements would have been met and that the main need would then be for additional offensive strength. On the basis of pilot output the further expansion achievable was referred to as Target Force 'D'. This Force was proposed to exceed 'C' by 18 and 255 squadrons in December 1941 and January 1943 respectively.

In November 1940 there were 214 squadrons at home and overseas; by the end of 1941 there were 219 squadrons at home and 76 overseas. Thus instead of the 438 squadrons intended there were 295 by the end of 1941. This was due to the fact that the assessment of the expansion was based on pilot output whereas it was already realised that the expansion would be limited by the production of bomber aircraft. Owing to the short term measures undertaken at the time of the Battle of Britain the production of heavy bombers had suffered in favour of fighter production. In consequence a preliminary survey of production revealed that the heavy bombers would barely suffice to meet Target Force 'C' let alone exceed it. The most determined efforts at the highest level were therefore continued throughout the rest of the war to overcome this unbalance between bomber and fighter. Under the circumstances it was suggested, therefore, that fighter expansion under Target Force 'D' might be accelerated instead of proceeding at the same rate as other types of squadron. It appeared likely that, such was the surplus of fighter aircraft and pilots, this expansion could be started about October 1941 and completed by April 1942 without detriment to the achievable bomber expansion: the only limiting factor was aerodrome space.

#### **Further Basic Training Considerations, February 1941**

The expansion picture of this time, February 1941, would not be complete, however, without the figures of trained personnel and schools. It was stated by the Development Committee that to meet the Target Force figures, there would be a need for approximately 7,200 observers and 19,000 wireless operators (air gunner) and air gunners by the end of 1941 and double that figure a year later. So far as pilots were concerned, the revised estimate of output showed a jump from 836 a month in January 1941 to over 3,000 a month by the end of 1942. This was, of course, because of the increasing dividends planned from the Empire Air Training Scheme and from the

<sup>1</sup> C.W.E./E./20/1, 19 February 1941—Second Meeting of R.A.F. Development Committee.

other forms of overseas training. It will be remembered that expansion plans at that time were based primarily on this forecast. At the same time it is necessary to stress once more that this represented the income from those long term measures for establishing a wide based training organization overseas. The numbers produced were most impressive but they were only basically trained. There was still the element of refresher training and operational training to be created to match this output and to convert it into first line pilots. The great technical advances had yet to make their effects felt and the bomber offensive had yet to make its demands for an ever increasing standard of skill on the art of the trained product.

All these things required an immense outlay in material resources and personnel, and there was the usual time interval to be surmounted before plans could be realised. Thus it was late 1941 before the growing need for quality could start to be met. Some idea of the implications of the expansion plans (C and D) can be gauged from the fact that the number of observer schools to meet the programmes had to be doubled by the end of 1941, while the gunnery schools had to be trebled. Although the need for observers was doubled there was the complication that these personnel had to combine the functions of navigating, bomb aiming and air gunnery. This required two different schools to train the one individual, and there were criticisms that observers grew out of practice in navigation while they were undergoing their armament training (i.e. bombing and gunnery). It was therefore decided to combine the two types of observer training into one establishment. An experiment was therefore started at one school (Millom) in February 1941, and by the middle of April 1941 it was judged to be successful. Combined courses of 18 weeks duration (12 navigation and 6 weeks bombing and gunnery) at six Air Observers Schools were introduced generally with a consequent saving in resources and improvement in the standard of observer training. This arrangement producing 3,500 observers a year was to last until the functions of the observer were split between the navigator and the bomb aimer under the 'New Deal' of early 1942.<sup>1</sup>

The development of aircrew showed that the trend induced by the new equipment and aircraft coming into the Service was to cause the specialisation of roles. This was the reason for the eventual splitting of the observer's functions which has just been mentioned. In the same way, in March 1941<sup>2</sup> there also appeared the need for a Flight Engineer in the new heavy bomber which was then making its appearance. This type of aircrew will receive more detailed mention later on, but here it is necessary to draw attention to the growth of specialisation and to its inevitable logistical repercussions. The trend of modern invention in war, much as it improved the performance, accuracy and power of weapons also entailed a larger and more complicated backing. In this backing training comprised a large part of the commitment with regard to establishments and personnel.

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<sup>1</sup> A.M. Files S.79588 and S.70633.

<sup>2</sup> A.M.O. A.190/41.

### **Continued Trainer Aircraft Shortage**

In March 1941 there were still not enough training aircraft being produced and, therefore, expansion was retarded. At the same time much was being done to overcome the handicap by the more intense use of those aircraft which were available. The position was that, since the previous November, only 77 per cent. of the programme figures for advanced trainers were actually built and the opening dates of new schools had to be delayed while existing schools were unable to produce their full output. This resulted in a temporary decline in the numbers of pilots produced, and by July 1941 the output of pilots was 560 below schedule.<sup>1</sup> This situation had political effects. The Canadian Prime Minister sent a personal telegram to Mr. Churchill on the subject, drawing his attention to the delay in the receipt of Anson aircraft and spares for Cheetah and Merlin engines. In his reply Mr. Churchill explained the effects of enemy action such as the damage of the Coventry raid to Cheetah engine production and also on the ports and in the Atlantic. He went on to show how, in spite of these handicaps, over 900 aircraft had been shipped representing 80 per cent. of the programme up to that time. There is little doubt, however, that the attitude of the Minister of Aircraft Production had not been helpful on the question of the export of trainer aircraft and spares and that the embargo of May 1940 was partly responsible for the situation.<sup>2</sup> In spite of the fact that Britain had to some extent failed in her part of the Riverdale Agreement, Canada had already taken steps to purchase complete American aircraft and engines, and to manufacture Anson and Cheetah engine spares and arrangements had been made to purchase American Wright engines to replace Cheetahs in the Ansons. To some extent, therefore, the Minister of Aircraft Production was justified, as regards Canada, in his contention that trainer aircraft and spares should be manufactured overseas thereby releasing British production for other work.

By May 1941, however, the position was improving. There were various reasons for this: the transfer of basic training overseas and the initial investments in material and personnel were having increasing effects. Also the trainer shortage had induced more efficiency in the use of existing equipment.<sup>3</sup> This was illustrated by the introduction of shift systems tried out both at Elementary and Service Flying Training Schools which increased the flying hours at the latter for example, from an average of 4,200 per month in 1940 to some 7,000 in 1941. At one school (Little Rissington) a figure of 9,000 hours per month was attained.

### **Offensive Planning, April 1941: Target Force 'E'**

Planning for the bomber offensive received new impetus after the passing of Lease/Lend which, with its promise of heavy bomber aircraft made it seem possible to create a heavy bomber force of over 4,000 aircraft. The Prime Minister's directive of September 1940 seemed to be best answered by a fresh target force which by April 1941 made its appearance. Previous target forces 'C' and 'D' had been based on the output of pilots and had aimed at a large bomber expansion, which was limited by bomber

<sup>1</sup> T.P. 7/2, 21 April 1941.

<sup>2</sup> S. of S. Folder 268A.

<sup>3</sup> A.C. 14 (40) and A.M. File C.S. 10488.

production capacity. The new target force 'E', freed from the limitations imposed by the shortfall of the training output, was based on purely operational requirements with 250 heavy bomber squadrons as the main feature. It contained fewer squadrons than Target force 'D', but this was compensated for by a great increase in bomb load. The rate of expansion aimed at a total of 227 bomber squadrons by the spring of 1943 and a further 100 heavy and medium squadrons by the end of that year.<sup>1</sup>

It was at this time that the first indications of the manpower problem became apparent. On 21 March 1941 the Prime Minister called for a cut of 50,000 men in the manpower demand and for the substitution of 50,000 women.<sup>2</sup> Despite the difficulties raised by this decision it was decided at a Special Air Council meeting on 26 March 1941 to maintain the expansion programme.

Target Force 'E' provided for full operational training in the Metropolitan and Middle East theatres. It followed therefore that in planning new squadrons, regard was paid mainly to O.T.U. output and not to S.F.T.S. output. The distinction was important because the forecast of pilot output from S.F.T.S.s for May and June was 3,680 and from O.T.U.s for the same period 1,800. By changing from S.F.T.S. output to O.T.U. output as a basis for planning, the curve of expansion became flattened because squadrons were brought into existence nearer the date on which they became fit for operations, due to the shorter period of preparation necessary.

The main requirement now being heavy and medium bombers, the problem was how to adjust both the production programme and the training organization to make effective the decision to create a strategic bomber force. Target Force 'E' represented a marked advance in the means of producing pilots and crews but the difficulty lay in matching this production of aircrew with operational training facilities, which demanded operational types of aircraft.

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<sup>1</sup> W.P. (40) 353 and S. of S. Folder A.H.B. ID/7/3a.

<sup>2</sup> M. 327/1, 21 March 1941.

## CHAPTER 9

### DEVELOPMENT OF OPERATIONAL AND OVERSEAS TRAINING

#### Operational Training

Training expansion up to the beginning of 1941 was mainly in the direction of basic training and from that aspect the position was not unsatisfactory.<sup>1</sup> The next problem was the provision of operational training facilities to keep pace with the expansion. This entailed heavy demands on the aerodrome space, operational type aircraft and staff pilots to equip the 20 additional operational training units estimated as being required during 1941. It was for Bomber Command in particular that operational training was most necessary. The overall expansion programme envisaged an increase in heavy bomber squadrons from the 32 existing at the end of 1940 to 100 by November 1941. Medium bomber squadrons were also scheduled to increase from 14 to 25 by June 1941. In order to meet this target a short term plan for the provision of operational training unit capacity in Bomber Command was laid down. It was based on the monthly import of pilots to that Command over a period of six months to the middle of 1941. The number of O.T.U.s required to cope with this output on the basis of an eight weeks' course, with intakes of 50 per fortnight, was planned to rise from 8 to 18 by June 1941, in the case of heavy bombers and from  $2\frac{1}{2}$  to 4 in the case of medium bombers. It can be understood, therefore, that a serious situation existed and it was considered that, unless operational stations were misemployed as O.T.U.s the only alternative was a reduction in the length of the O.T.U. course. This meant a lower standard of training followed by increased casualties, which in time would lead to a slowing down in the rate of expansion or a further reduction in the length of the O.T.U. courses. The operational training problem was intensified by the necessity of providing two pilots per bomber aircraft. It was not until early 1942 that Bomber Command went over to the single pilot policy and made a seemingly hopeless task into a practical possibility.

By the beginning of February 1941, the position with regard to expansion, as conditioned by the supply of basically trained personnel, was becoming more clear.<sup>2</sup> Royal Air Force Development Committee discussions on Target Force 'C' revealed that the S.F.T.S. output would be sufficient to match planned Royal Air Force expansion up to the end of June 1941, when because of delays in opening schools caused by the trainer aircraft shortage, it would begin to fall away in relation to requirements. Thus, the end of the restriction on expansion caused by pilot shortage was almost over. At the same time there was the operational training commitment.

#### Bomber Command

In Bomber Command the situation was that, at the beginning of May 1940, eight bomber O.T.U.s had been formed from the original Group Pools. Seven of these were to back the  $23\frac{1}{2}$  bomber squadrons and one was to back the Battle squadrons in France. Plans were made to make a further

<sup>1</sup> A.C.6 (41).

<sup>2</sup> A.C.12 (41).

seven of the former Group Pool squadrons into operational training units as soon as they had been reformed. The seven O.T.U.s turned out crews at the rate of 930 a year in the face of a conservatively estimated wastage of 1,350 crews a year. There was also the question of relief for war weary pilots which raised this estimate to 2,300 crews a year. It was stated at a conference held on 14 May 1940, that if the O.T.U.s were raised to full strength they could increase their output to 1,750 a year, and it was accordingly decided to do so, and to form two more O.T.U.s. To provide the resources to carry out this expansion, six of the seven Group Pool squadrons which were becoming operational were rolled up. The output of the bomber O.T.U.s went up to 2,180 per year and was planned to reach 3,000 when all nine O.T.U.s were in full operation. This increase barely met the wastage of 24 first line squadrons, but needed a flow from the Service F.T.S.s estimated at over 3,500 compared with the 1,900 a year then being allocated to Bomber Command. After June 1940, with the return of the Advanced Air Striking Force squadrons from France, Bomber Command's first line strength went up to 34 squadrons rising to 37 by August 1940. To provide the training backing for this force the O.T.U.s had increased to eleven, some of which, however, were working considerably below full size.<sup>1</sup>

Throughout the summer of 1940 operational training units in Fighter and Coastal Commands had had priority in pilots passing out from service flying training schools, with a resulting decrease of both trainees and instructors for similar units in Bomber Command amounting to 33 per cent. The introduction of the 'Second Revise' lengthened the bomber O.T.U. course from six to eight weeks and increased flying time from 60 to 75 hours in units equipped with Battles, and from 55 to 70 hours in those supplied with Wellingtons, Whitleys and Hampdens. The load on S.F.T.S., which formed a bottleneck in the flow, was lightened thereby though at the expense of a lower rate of output from O.T.U. The 'Third Revise' added two weeks to the course and further increased flying exercises to 90 hours for single-engined and 85 hours for twin-engined bombers. Although Bomber Command protested against the still lower rate of output, this measure became accepted policy. During the winter of 1940-41 entries from S.F.T.S. at a rate of over four thousand per year produced an output from O.T.U. of around two thousand seven hundred a year.

In January 1941, however, when the prospects of bomber expansion were examined, the outlook was far from satisfactory. Operational wastage was budgetted for at 2,650 pilots a year, while Middle East reinforcements required some 600 a year and withdrawals for instructor duties 540 a year. There was a surplus of S.F.T.S. output of some 1,000 per year to meet existing pilot deficiencies in Bomber Command and to form new O.T.U.s in advance of new operational squadrons they were to back. It seemed, therefore, as if bomber expansion was almost impossible. At the same time the first products of the overseas training organization were arriving and it was expected that after April 1941, some 8,000 S.F.T.S. pilots per year would be available for bomber O.T.U. training. This, however, re-emphasised the need for O.T.U. expansion. The problem was the provision of O.T.U. instructors which could only be met by withdrawing pilots from the first line and by

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<sup>1</sup> A.M. Files S.1925, S.60810 and S.4928.

dilution with inexperienced instructors. It was estimated in January 1941, that to cope with the increased flow of S.F.T.S. pilots which was anticipated after June 1941, an additional 11½ O.T.U.s, making 20 in all, would have to be opened in the first six months of 1941, if they were all to be trained. This commitment required over 600 instructor pilots which could only come from the first line which then numbered 1,120 pilots. Bomber Command was alarmed at the prospective dilution of the first line by new pilots, while the training authorities were insistent that the necessary O.T.U. facilities (including aerodromes) should be provided.<sup>1</sup>

In March 1941, it was decided to fix the bomber O.T.U. course at eight weeks and 55 to 60 hours flying. This did not, however, solve the O.T.U. shortage, and it meant that pilots would go forward to their squadrons with only 177 hours flying experience (50 hours E.F.T.S., 72 hours S.F.T.S. and 55 hours O.T.U.). There was, therefore, an urgent need for O.T.U. expansion. At the same time it must be realised that already some 40 per cent. of all Wellingtons in Britain were being used in O.T.U.s compared with 50 per cent. in the first line. The inevitable result of these conflicting factors was a lowering of training standards. This was discussed at an Air Ministry conference early in April 1941, and was accepted by Bomber Command later in that month. The bomber O.T.U. course was reduced from eight to six weeks; the output was doubled whilst retaining the same establishment of aircraft and the pilot instructors were reduced from 72 to 64 per O.T.U. This revised Wellington and Whitley course aimed at giving pilots thirty hours at the controls, including at least nine hours by night, and a further twenty hours flying as second pilot. At the same time the number of O.T.U.s was increased and reached sixteen by June 1941. The main cause of the O.T.U. problem was the two pilot policy for bomber aircraft.<sup>2</sup> During the discussions at that time Bomber Command had tentatively suggested reducing the bomber crew to one pilot, but it was not until the end of 1941 that this problem was again examined.

### **Coastal Command**

Almost from the beginning of the war Coastal Command had undergone a difficult time with its training and in 1940 had been compelled to do most of the operational training in the squadrons. When the war began the operational training organization to back Coastal Command was one O.T.U. (Silloth), the Torpedo Training School, and the Flying Boat Training Flight. In the spring and summer of 1940 Coastal Command re-armed from Ansons to Hudsons and Beauforts and the single O.T.U. was seriously over-loaded with work which had a disturbing effect on the first line squadrons. Courses were shortened to three weeks and two weeks respectively for the Hudsons and Beauforts, and in July 1940, a Blenheim conversion training commitment was added. The output from the O.T.U. was at a rate of 600 per year whilst that required by the first line was 1,700 per year. A second O.T.U. for long range Coastal Fighters was not opened until October 1940 and a third, a Beaufort O.T.U. was opened in December 1940. A fourth O.T.U. for flying boat training was started in March 1941, and two more completed the first expansion by July 1941. Whitleys and Wellingtons were also first

<sup>1</sup> A.M. File S.60810.

<sup>2</sup> C.A.S. Misc./35, 3 April 1941 and A.M. File S.69865, 12 April 1941.

used in the winter of 1940-41 and their training flights formed an element of No. 3 O.T.U. In spite of these increases the Coastal O.T.U. output remained at 600 per year during the first half of 1941 owing to increases in course length. On the other hand, the output from the General Reconnaissance School which had started in 1936 and represented an intermediate stage between the S.F.T.S. and the O.T.U. had rapidly increased. This accentuated the bottle-neck formed by the O.T.U. stage which was further complicated by the demands for Middle East reinforcement and wastage. By the middle of 1941, therefore, Coastal Command was experiencing a shortage of trained crews.

### **Fighter Command**

In Fighter Command the plan, as outlined by the A.M.S.O. was to have one O.T.U. for every ten fighter squadrons. Each O.T.U. would produce 34 pilots per month from a six weeks' course. The average casualty rate per ten squadrons was 26 per month over a year. On this basis the O.T.U. output would be eight more pilots a month than was likely to be required. The task of forming an adequate O.T.U. organization was considerable, and the A.M.S.O. had been compelled to suggest that the operational training of pilots required for forming new fighter squadrons should to some extent be carried out in the squadrons themselves. It was impossible, therefore, at that stage to increase the ratio of fighter O.T.U.s to squadrons to more than one in ten.

In commenting on the problem the Air Member for training stated on 15 December 1940,<sup>1</sup> that whether or not it was possible to work to the operational cycle that was eventually laid down depended upon the flow through the S.F.T.S. and O.T.U.s. The planned additional O.T.U. capacity was adequate to absorb the S.F.T.S. output during the first part of 1941. The shape of this capacity had, however, to be adjusted to give more precedence to Coastal Command requirements in view of the exigencies of the submarine war. This priority was to be at the expense of Bomber Command. The A.M.T. also stated that there was no possibility of relieving war weary pilots in addition to forming new squadrons, until after March 1941, unless the winter wastage fell below the estimated rate or an additional fighter O.T.U. were formed.

### **Canadian Operational Training Units**

In February 1941 a proposal was made to establish operational training units in Canada. The chief reason for this was the ferrying situation. The responsibility for ferrying American aircraft over the Atlantic had not then been fixed, but the training of the pilots was an Air Ministry responsibility and it was obvious that there were advantages in having an organization on the Canadian side of the Atlantic to carry out this task. The one difficulty was that this proposal contradicted the principle that O.T.U.s should be in the theatre of operations which they served. It was decided, however, that the advantages outweighed this disadvantage and it was proposed to establish a number of O.T.U.s in Canada as soon as possible. In addition to forming O.T.U.s which could train crews to ferry bomber aircraft across the Atlantic it was also decided to set up a fighter O.T.U. in order to train pilots on the locally produced Hurricanes. Actually only one Hudson O.T.U. was formed by June 1941, and it was not until 1944 that six were in operation.

<sup>1</sup> A.M.T./V.C.A.S., V.C.A.S./582.

### **Middle East Operational Training Units**

The considerations affecting overseas training in general have already been reviewed, it remains at this time to discuss the growth of the O.T.U. organization in the Middle East; since the basic training organization in Africa to feed that theatre was already appearing. It will be remembered that the policy with regard to the location of O.T.U.s was that they should, if possible, be in the same area as the squadrons they served. This was because of the obvious training and liaison value of such a policy and because the O.T.U.s formed a potential immediate reserve in emergency. At the same time the Middle East presented a complicated problem because everything had to be provided in that theatre since there were no resources to sustain a modern air effort. Suggestions, however, had been made as early as February 1940, that O.T.U.s should be established in that theatre and by early 1941 the planned flow of reinforcement to the Middle East was enough to keep three O.T.U.s fully employed and it was again suggested that two of these schools should be set up there. The Expansion and Re-equipment Policy Committee, however, decided to expand and re-arm the Middle East first line, as a matter of priority, and this was obviously necessary as its establishment contained a high proportion of obsolete aircraft. It was hoped that Italian opposition would be of such a nature as would permit operational training in the squadrons. It was not, therefore, until November 1940 that the Training Unit Reserve Pool at Ismailia, a miscellaneous collection of aircraft, instructors and pilots awaiting employment, was renamed No. 70 O.T.U. and was regarded as a nucleus for future development. About the same time (October 1940), South African squadrons went to Nakuru in Kenya to take part in the East African campaign and a small O.T.U. known as No. 1 (S.A.) O.T.U. was improvised in the same place to back them. By January 1941, the fighter element of No. 70 O.T.U. moved from Ismailia to Amriya near Alexandria and a Wellington training flight started at Kabrit. This latter was not, however, regarded as a bomber O.T.U. nucleus as heavy bombers were ferried direct to the Middle East from Britain and arrived initially flown by operational crews drawn from the Bomber Command first line. Later (in April 1941) No. 15 O.T.U. at Harwell was allotted exclusively to the task of training Wellington reinforcement crews for the Middle East.<sup>1</sup>

In early 1941, a number of bomber and fighter pilots were reaching the Middle East after O.T.U. training in Britain, but the majority of pilot replacements were coming direct from S.F.T.S.s in Iraq, Africa and Australia, and modern types of aircraft. In May 1941, it was decided that the Middle East theatre should be self-sufficient in O.T.U.s for all types except heavy bombers, flying boats and G.R. aircraft. At the end of April the staff for two more O.T.U.s had been shipped from Britain, but it was at the end of July that this number was increased by a further two units. In the meantime, No. 70 O.T.U. at Ismailia was moved to Kenya, and the South African O.T.U. at Nakuru was merged with it. The target was therefore four O.T.U.s in the Middle East of which two each were to train medium

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<sup>1</sup> A.M. File S.4663.

bomber and fighter pilots. This organization took a long time to develop and by October 1941, the following was the position:—

No. 70 O.T.U. Nakuru was at three quarters strength.

No. 71 (fighters and army co-operation) was at half strength.

No. 72 (medium bombers and fighters) was at one third strength.

No. 73 (fighters) was not yet in existence but a Maryland squadron had been withdrawn from the first line to train crews on the American types with which the Middle East was re-arming.

No. 74 (army co-operation) was formed from that element of No. 71 O.T.U. and moved to Lydda in Palestine.

It can be seen, therefore, that the O.T.U. position in the Middle East was far from satisfactory. In particular, the drain on Bomber and Coastal Commands to supply O.T.U. trained crews for the Middle East was heavy and formed the subject of many complaints. It is necessary, when considering the expansion problems of the Metropolitan Air Forces, to bear this factor in mind.

#### **Operational Fatigue : Institution of Operational Tours**

Whilst considering the problem of operational training it became evident that in planning the formation of new squadrons, it was not possible to consider that all pilots were available for expansion over and above what were required to replace the estimated wastage rates. These rates covered battle and flying accident wastage only and it was assumed that other deficiencies such as sickness or postings would be cancelled by returns to duty from the lightly wounded. No allowance had been made for wastage due to war weariness. It was therefore recommended that allowance for this should be included in the total estimated wastage rates. There would then be available a true measure for estimating the number of surplus pilots available for expansion or the size of the training organization required to support a given operational force. Experience alone could show what was a fair assessment of this factor of operational fatigue which varied with individuals as with types of squadrons and operational conditions. An Air Council letter was therefore sent to all Commands on 9 December 1940, asking for their views as to the establishment of a datum line, whether in terms of operational hours, sorties, or some other factor beyond which no pilot should remain without rest.<sup>1</sup>

The difficulties in establishing such a datum line were considerable because whatever factors were used, the question of degree of stress arose. For example 100 hours operational flying in one group of Fighter Command could easily be considered equal to 200 or more of similar flying in another group of the same Command. It was evident that the datum line when established should not be so low as to cause a rapid turnover, leading to a shortage of experienced pilots, nor should it be so high as to be impossible of attainment by the average pilot. At the same time it was plain that action could be taken immediately by moving fighter pilots to quieter sectors or other pilots to operational training units. After some discussion

<sup>1</sup> A.M.P./S. of S. Folder, December 1940.

the operational tour was fixed. In arriving at a final figure of the number of hours to be flown the training progress department estimated statistics of probable survival based on past experience in different types of squadrons. They took as a basis 25 per cent. and 50 per cent. probability of survival (or more strictly of not becoming a casualty). These figures assumed the skill of all crews to be equal and remained so throughout their operational career. While this was not in accordance with the facts (it had been found that the incidence of casualties was higher over the first dozen sorties), the proportionate relationship between the various types of squadrons remained the same. Broadly speaking, therefore, by the beginning of 1941 the probable life of a bomber crew was approximately double that of a fighter crew and the probable life of a general reconnaissance landplane was approximately four times that of a bomber crew. In this way was the tour expiry replacement rate calculated at that time.

In March 1941, the Air Council issued a letter laying down a general rule that so far as the war situation permitted, personnel should be relieved from operational flying after a maximum of 200 hours in one tour of operational duty.<sup>1</sup> Provision was made for the early withdrawal of those of less robust constitution, and for extension of the operational tour in such cases as flying personnel of general reconnaissance squadrons or of fighter pilots from areas where enemy fighter opposition was weak or absent. The pilots withdrawn from operational flying under this policy were to be posted as instructional staff to operational training units until existing deficiencies were met. Personnel withdrawn from squadrons in excess of requirements for O.T.U. instructors were to be posted to flying schools and other non-operational work. The Air Council appreciated that a number of pilots found the instructional work at O.T.U.s both strenuous and disagreeable, but they stated that unless a reasonable tour were spent on this work it would not be possible to obtain that continuity which was essential if training were not to suffer. The Air Council accordingly decided that the normal minimum tour of duty at an O.T.U. would be six months. As a general rule reliefs for personnel withdrawn from operational units were to be provided via operational training units from the service flying training schools, but this source of supply was also to be supplemented by pilots on the staffs of O.T.U.s who had not done an operational tour. The duration of second or subsequent tours was subject to the principles laid down for the first. It was considered desirable that there should be an interval of not less than six months between any two tours of operational duty.

One of the resultant advantages following the establishment of fixed operational tours was the establishment of a steady flow of experienced personnel suitable for employment as O.T.U. instructors. One of the key factors in O.T.U. expansion at this time was the provision of suitable instructors.<sup>2</sup> Just as at the beginning of the war, training expansion in general was held up by the opposing need for the element of experienced pilots in the first line to act as leaders and trainers for the new pilots, and for the same type of personnel to act as instructors in the training units, so was O.T.U. expansion held up for the same reasons. The only way in which satisfactory

<sup>1</sup> A.M. File S.61140.

<sup>2</sup> A.M. File S.7729.

O.T.U. instructors could be found was by using operationally experienced pilots being rested from duty with their squadrons and by augmenting them with a certain proportion of operationally inexperienced instructors from the training organization.

### **Overseas Training**

When working out plans for training, a target was fixed on the estimated monthly production of aircraft for operations. At the outbreak of war the target was set at a figure of 2,500 aircraft from British industry. As the war continued, and particularly when Lease/Lend supplies came to augment the home production, our planners became ambitious and aimed at too high a figure that was seldom reached; the number of heavy bombers in particular usually fell far short of the estimate given to the training branch several months earlier. Consequently with such a huge organization to control, spread almost world-wide, the training authorities had to watch this point very carefully. The Air Member for Training, remembering the shortages of equipment during the early days of war, legislated for 'margins' and 'buffer stocks' so as to ensure a sufficient supply of trained crews being ready just when they were wanted in Britain. The dangers for ships while the battle of the Atlantic raged at its fiercest added a further unknown quantity to the calculations for aircrew production. In the long-run these three uncertain factors: actual production of aircraft; shipping deliveries of crews; and war casualties, coupled with margins against unpredictable events, all contributed a share towards an over-production of aircrew that from 1942 onwards became a feature of the training story.

By early 1941 therefore when the organization for basic training was being expanded and located overseas the target for aircrew production was set at 50,000 per year, of which 20,000 were to be pilots. This required fifty-six service flying training schools. The task was therefore to locate all but two of the 56 S.F.T.S.s abroad, on the principle that basic training should be freed from the restrictions imposed by conditions in Britain, thereby freeing British resources for other activities, an important proportion of which could be used to create the operational and refresher training organization.

The original discussions of October 1940, on the Empire Air Training Scheme, which involved Canada, Australia and New Zealand, proposed that these three countries should train four ninths of the 50,000 aircrew (including 20,000 pilots). Accordingly the equivalent of 25 S.F.T.S.s were located in those countries. In addition, this trend towards the export of basic training had resulted in Canada accepting eventually a further 14 Royal Air Force S.F.T.S.s which were technically known as 'Transferred' schools on Canadian soil. There were also four S.F.T.S.s in Rhodesia, two in Britain and seven in South Africa, of which Britain was to receive five sevenths of the output which meant that the Royal Air Force had the equivalent of five S.F.T.S.s in that country. Fifty-one S.F.T.S.s were thus already located by agreement. This left five schools still to place. Arrangements had been made to form six British Flying Training Schools in the United States in March, 1941. These, however, were regarded by the A.M.T. as a form of insurance and were not counted against the total requirements of 56 S.F.T.S.s.<sup>1</sup>

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<sup>1</sup> S. of S. Folder 268B and E.T.S. 237(41).

### **Training in the United States**

One of the most important events during the war from the training viewpoint was the passing by Congress of the Lease/Lend Law on 11 March 1941. The immediate effect was the offer by America of 285 Harvard and Yale trainer aircraft as well as some operational type aircraft. General Arnold, the American Deputy Chief of Staff and Chief of the Air Corps and the British Air Attache had already discussed the possibility of training Royal Air Force personnel in the United States a few days earlier and from this meeting began the organization of R.A.F. training in the United States. Already, however, in June 1940, the possibility of training pilots for the Royal Air Force had been discussed with the American State Department as part of the emergency measures to obtain fighter pilots. These discussions were continued by the Under Secretary of State in August 1940, and eventually resulted in a 'refresher' training scheme for qualified pilots with eighty hours flying to receive 150 hours flying at three civilian schools in the United States. They then proceeded to Canada where they were tested and passed to British O.T.U.s. The scheme actually started in November 1940, and trained approximately 600 pilots over a period of eighteen months. Most of these personnel went to the 'Eagle Squadron' and, though there was a tendency for the later arrivals to fall somewhat below the standard initially set, there can be no doubt that this was a welcome contribution to Britain at a time of great emergency.

The 'Administration' (in U.S.A.) had for some time previously been sympathetic to the idea of a scheme for giving all-through training at civil schools in the United States which would be roughly equivalent to the training given at elementary and service flying training schools in Britain. It was not, however, until April 1941, that it had been possible to make any start on the scheme owing to the shortage of advanced trainers. On 6 March 1941, the Americans said that they were prepared to release up to 260 primary and advanced trainers during the following three months. They also submitted proposals, which were discussed with General Arnold and with the civil operators, for the establishment of six schools to be managed by civil companies including those participating in the refresher course scheme. The target was to produce approximately 2,000 pilots per year. Initially there were legal and financial difficulties owing to the dollar situation and the high cost. The problem was complicated by interpretation of the Lease/Lend Act. However, these difficulties were soon resolved and in a remarkably short space of time (the schools being built within three months) the scheme started to operate in June 1941, and ran until the end of the war when four of the six original schools were still operating. The pupils came from British sources, and the total number trained during the war was roughly 7,200.

This was only the beginning of even larger schemes which were launched in due course. One other source of American training inaugurated at this time was the result of an agreement reached with the Americans whereby they accepted batches of ten pupils on special navigation courses which had

been arranged for U.S. Army Cadets at the Pan American Airways Navigation School at Miami. The first batch began training in March 1941. Later the Americans offered the entire school (200 places) to Britain.<sup>1</sup>

#### **The 'Arnold and Towers' Schemes**

There were, of course, political, financial and legal difficulties in the way of the establishment of U.S.A. training. The Canadians, who were well ahead of their programme in setting up the E.A.T.S. Schools, were naturally somewhat chagrined that proposals for training in the United States were made. The chief attraction, however, was Lease/Lend, and for this reason, the Secretary of State decided on 25 March 1941, to ask the Americans for further training facilities.

In April 1941, General Arnold visited Britain and discussed training with the A.M.T. who gave him a straightforward account of the position and of his needs.<sup>2</sup> In general, the A.M.T. indicated that Britain required short-term help to increase the Royal Air Force hitting power in 1941 by reducing the number of men who would have to be withdrawn from the first line to instruct; and long term help to ease the strain on the expanding training organization.

The particular directions in which Britain asked for assistance were finding pilots for the Atlantic and African routes, instructors and fully trained pilots for operational work. This statement of need was met by a response which the A.M.T. described as 'magnificent'. General Arnold made various promises of which the chief was that one third of the United States Army's training capacity would be put at Britain's disposal. That is to say that capacity was to be made available by the end of 1941 for producing F.T.S. trained pilots at a minimum rate of 3,000 a year in the U.S.A. In addition to this, the full capacity of the navigational training school at Miami was also offered. The Arnold Scheme offer was made and accepted on 13 April 1941 and was followed a few weeks later by a similar offer by Admiral Towers to train British personnel in U.S. Navy flying training schools.

Up to that time, therefore, there were the Refresher Scheme, the British F.T.S.s, the Miami navigational training, and the Arnold and Towers Schemes all arranged to meet R.A.F. basic training needs. This, together with the S.F.T.S.s being set up in Canada, provided all the capacity and more, that was needed to provide personnel trained up to basic standard to meet all expansion plans. It will, of course, be realised that this account extends to plans and agreements only. The actual development was more slow, but the eventual outcome was very much as planned.

#### **South African Training Position**

While the schemes in Canada, Australia, New Zealand and Southern Rhodesia were forging ahead, South Africa was hampered by the slow build up of material and men, together with political, organizational and financial factors peculiar to herself. She was in the position of being the last to be dealt with and suffered in consequence throughout. In spite of this progress had been made and 12 schools were operating. In January 1941, a second S.F.T.S. and A.O.S. were opened. Shortages of all types of aircraft, however,

<sup>1</sup> A.M. File S.61719.

<sup>2</sup> E.T.S. 225(41).

greatly reduced the effectiveness of these measures and it was evident from the records that these handicaps resulted in a low output and a low standard of training. Owing to limited industrial resources and the absence of an aircraft industry South Africa was depending upon Britain for aircraft, equipment and key personnel. This, coupled with an initial lack of guidance caused a state of low morale throughout the organization. Nor was the atmosphere improved by the slow and complicated financial negotiations which were carried on simultaneously with the development of training. Finally, however, the agreement for the joint air training scheme in South Africa was signed in June 1941. The agreement covered the setting up of 24 schools and a unit for assembling and testing aircraft.

#### Factors affecting Overseas training

By April 1941 the following S.F.T.S.s were actually in operation :—

Canada	...	...	...	...	...	15
South Africa	...	...	...	...	...	2
Southern Rhodesia	...	...	...	...	...	3
New Zealand	...	...	...	...	...	3
Australia	...	...	...	...	...	4
Britain	...	...	...	...	...	11

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From this statement of the position in early 1941, it will be seen that actual development of the overseas basic training called into being by the plans and agreements which have been described was comparatively slow. This was due to aircraft shortage and to shipping difficulties in the main and was of course complicated by geographical and strategical factors. From the policy point of view, however, the focus of interest had moved on to the next stages, viz., operational training, and the organization to handle the influx of trainees into Britain from overseas.

The factors of geography and industrial development had, of course, a marked effect on the product of training. On the other hand, settled climate, good visibility and space and freedom from enemy interference all contributed to steady programmes, sustained outputs and to rapid progress in construction. The drawbacks were that the extremes of heat and cold had their effect both on pupils, staffs and maintenance personnel. Altitude, dust, and frost precluded the use of certain trainer types of aircraft such as the Oxford and Cornell. Distances to be travelled and the transit factor generally made supply problems far more complicated and introduced the need for refresher training after prolonged voyages. There was also the factor of acclimatisation and the use of special aids and equipment once Britain had been reached. These factors should be borne in mind when tracing the further development of overseas training and when taking stock of what had been achieved.

By summer, 1941, some 27,000 aircrew had completed their training for the air forces, while the target aimed at was some 50,000 per year when all the training schemes were fully working. At that time, however, South Africa and the U.S.A. had not yet started to produce results. The accelerated

Empire Air Training Scheme was under way and Canada, was going remarkably well and was ahead of schedule, whilst Australia and New Zealand maintained their targets and increased their flow of recruits for Canadian training despite shortages of aircraft and spares.

#### **Problems created by training Overseas : Introduction of Grading**

Meanwhile, on the purely training side, the problems created by the export of basic training were by November necessitating further additions to and improvement in the system. To start with, pupils were being selected at initial training wings for training overseas with the result that when they commenced their flying training overseas they were being eliminated at a heavy rate, especially in the American schools where the rate was over 50 per cent. Since the unsuccessful pupils had to be trained in other aircrew categories, this meant that a large proportion had to be shipped back to Britain since most of the non-pilot training was at that time carried out there.

Although in February 1941, an endeavour had been made to improve methods of selection of recruits at the initial training wing stage, the value of elementary flying training as the surest way of determining those who would be most likely to succeed as pilots was recognised. With the increase of overseas training during 1941, the problem of wastage during training became more important, until under the American training system, the elimination rate called for urgent remedial action. The obvious remedy, which the transfer of elementary flying training to Canada was making possible, was to use the E.F.T.S. facilities thus released in the United Kingdom for 'weeding out' pupils before they were sent overseas, thus cutting down the elimination rate and so providing smaller numbers of rejected pupil pilots for transfer to other forms of training.

Grading was introduced in its preliminary form at 20 E.F.T.S. flights in the United Kingdom in November 1941.<sup>1</sup> The course consisted of up to 15 hours dual instruction and normal *ab initio* ground instruction in a three weeks course. Pupils who showed promise of making satisfactory pilots could be taken off the course at any time after five hours flying and passed as fit to proceed for flying training overseas. Pupils not considered promising enough to be sent overseas went either to United Kingdom schools, if they appeared to be slow starters, or were transferred to other training. It was not until January 1942, that grading pupils were allowed to go solo if they could do so within the three weeks. The first outputs from the grading scheme went to 16 United States Army and Navy Schools, and as the flow increased, graded pupils were also sent to the British flying training schools in the U.S.A. and to South Africa. Thus, with this new addition to the training course, a great measure of economy was introduced and a step forward in selection methods and increase in quality was ensured.

#### **Growth of Personnel Reception Centres**

The flow back from overseas also made new demands on training resources. The periods of waiting at Personnel Reception Centres and the long voyages caused a deterioration in the skill of newly trained personnel. It was also necessary to remedy some of the unavoidable disadvantages of the overseas

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<sup>1</sup> A.M.T./447, November 1941.

system which were due to the good visibility and easy flying conditions of the overseas training areas. When pupils arrived in Britain they were unaccustomed to the bad flying conditions, the black-out and the special flying aids and procedures. There was also the consideration that they had to be usefully employed while awaiting O.T.U. training. This last consideration grew more and more important as time went on and as the O.T.U. difficulties increased. From the end of 1940 onwards, this element of refresher training had to be given in the O.T.U.s, but as the O.T.U. restriction increased and as the overseas flow grew in size, as already mentioned, a Personnel Reception Centre was started on 12 February 1941, with a capacity of 750. Its purpose was the documentation, posting, etc., of graduates from overseas and an elastic programme of ground training was arranged in order to occupy the waiting period. By the end of 1941, the numbers in the P.R.C. mounted so rapidly that its capacity had to be expanded at short notice to 3,000 and overflow accommodation had to be arranged at Hastings. By March 1942, another P.R.C. with an eventual capacity of 2,500 had to form at Harrogate.

#### **Formation of Advanced Flying Units**

Another link in the chain of pilot training was forged by forming advanced flying units in November 1941. Their main purpose was to acclimatise pilots trained in sunnier lands to conditions in the European theatre as regards flying in bad weather and in 'black-out' by night, in map reading and navigation over thickly populated areas.<sup>1</sup> It will be remembered that the S.F.T.S. organization in Britain was closing down and opening up in Canada by the end of 1941. The capacity thus left vacant became available for the new stage of refresher and advanced training. To begin with, three S.F.T.S.s started as Advanced Flying Units on 1 November 1941, and more had started by the end of the year. By March 1942, the number of pilot Advanced Flying Units had increased to ten. The course was first of three weeks duration but was increased to eight weeks in December 1941, for pilots destined for Bomber Command and four weeks for those intended for other Home Commands.

Originally it was envisaged that the crews should fly and train with the pupil pilots at the twin-engined Advanced Flying Units. Unfortunately the aircraft were not equipped with W/T and the flying needed by the pilots was not suitable for training observers and wireless operators. Observer Advanced Flying Units were therefore created by converting two Air Observers Schools at which a four weeks course was given. The importance of staff pilot and wireless operator training for this type of school will be dealt with later.

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<sup>1</sup> A.M. File S.75860.



CHAPTER 10

**THE WAR SPREADS AND EXPANSION DEVELOPS  
MAY—DECEMBER 1941**

Before describing the developments following the introduction of Lease/Lend some mention must be made of the progress and general improvements in training achieved during the preceding months. When the training plan had been first presented to the Cabinet it was stated quite clearly that it was a maximum which made no allowance for enemy interference or for exceptionally bad weather conditions. It was also already stated that the plan was based upon the M.A.P.'s October 1940 programme, and that in so far as production fell short of that programme, so would pilot outputs fall short of forecast.<sup>1</sup> It was admitted that in the original estimate only 20 per cent. allowance was made for course extensions during the winter months in Britain, as this had been the experience of the original 16 weeks S.F.T.S. course. In actual fact on the reduced 10 weeks' course, the drop in output resulting from extensions in the worst months rose to as high as 80 per cent. This caused a loss in output over the period of some 1,100 pilots, a proportion of which was due to restrictions imposed on night flying by enemy interference. For this reason, new forecasts of pilot output took experience of the severe winter of 1940-41 into account and allowances were made accordingly.

An analysis of pilot production as affected by shortage of trainer aircraft and spares shows the interdependence of the aircraft production and the training plans.<sup>2</sup> The following was the pilot output position from S.F.T.S.s from November 1940 to March 1941 inclusive as seen by the Air Ministry:—

	R.A.F. Schools	E.A.T.S.	Total
Programme <sup>3</sup> ... ..	4,008	1,973	5,981
Actual output ... ..	2,731	1,765	4,496
Difference ... ..	1,277	208	1,485
Difference as per cent. of programme ... ..	31 per cent.	10 per cent.	25 per cent.

The Prime Minister's adviser (Professor Lindeman), attributed this deficiency of one quarter mainly to the exceptionally bad weather in Britain during the winter of 1940-41, and partly to the shortage of advanced trainers, deliveries of which, according to the Air Ministry figures, were less than three-fifths of the forecasts given to them. Lord Beaverbrook, who had been Minister of Aircraft Production, objected to this on the grounds that if the trainer aircraft had been properly maintained, there would have been no shortage; he pointed out that on 18 April 1941, 1,186 out of 3,774, i.e. nearly one-third were listed as unserviceable. The Air Ministry reply was that over 400 of these aircraft were left unserviceable because the necessary spares were not available. Therefore, eliminating these, the number unserviceable was about 770, or one-fifth of the total strength. This meant that trainer aircraft were under inspection or minor repair for one week in every five. In the view

<sup>1</sup> W.P. (40) 447.  
<sup>2</sup> M. 596/1 dated 29 May.  
<sup>3</sup> W.P. (40) 447.

of the Prime Minister's adviser, this was reasonable in view of the relatively large number of hours flown by these types of aircraft. He concluded that there was a case for a drive for more advanced trainers and for the provision of spare parts, 'Otherwise our pilot output seems likely to be further impaired and therewith our whole expansion programme'.

#### **Plans for Further Expansion**

Plans for future development of training in spite of previous restrictions showed more confidence.<sup>1</sup> The number of E.F.T.S.s at the end of April 1941, was 59, of which 30 were E.A.T.S. schools and 8 Royal Air Force schools in South Africa and Southern Rhodesia, and it was proposed to increase these by a further 21 to 80 by April 1942. It was hoped during 1941 and early 1942 to match the 8 transferred Royal Air Force S.F.T.S.s in Canada with E.F.T.S. capacity and to obtain the elementary trainers in Canada thus making no further demands on British trainer capacity. S.F.T.S. expansion contemplated was also great. There were in existence by the end of April 1941, 38 S.F.T.S.s including 17 E.A.T.S. schools and 10 R.A.F. schools overseas, and it was proposed to increase these to 61 schools, an increase of 5 over the earlier programme.

By the spring of 1941, the advanced trainer situation showed promise of improvement in spite of a requirement of 2,000 Ansons for 1941 and a further 1,700 for 1942 plus an output programme of over 3,000 trainers of all types. In spite of the hampering shortage of advanced trainers, substantial progress had been achieved since the crisis of 1940. There had, by April 1941, been an overall 27½ per cent. increase in pilot strength. During the same period the strength of Bomber Command had risen from 1,147 to 1,451 pilots, an increase of 35 per cent. This increase had been effected in spite of the fact that over 300 bomber pilots had been sent to the Middle East during the period, mostly during the later months.

In the Metropolitan Air Force, since November 1940, 11 fighter, 5 coastal and 3 bomber squadrons had been formed. At the same time 12 bomber squadrons had re-equipped from Battles and Blenheims to Wellingtons, and there had been increases in the fighter establishment. Altogether this amounted to an equivalent expansion of some 25 squadrons. This represented a much smaller increase than the 14 squadrons a month envisaged; although Fighter Command was ahead of programme Bomber and Coastal Commands were seriously in arrear but, when the wastage of the Battle of Britain, and the dislocation to long term plans and the initial outlay on training expansion were taken into account, the result did represent a definite achievement.<sup>2</sup> Moreover it was a good basis for the future. Pilot production was by that time more than sufficient to replace wastage, although, owing to the severe winter of 1940-41 in addition to the other causes mentioned, there were not enough to allow unrestricted expansion until later in 1941. The prospects for 1942 were good. The Americans had made generous offers of training facilities, and by their promises of an increasing flow of aircraft, had enhanced the prospects of first line expansion. In addition due to the location of training in the North American continent and elsewhere, the restrictions imposed on Britain by the weather and the enemy were likely to be substantially eliminated.

<sup>1</sup> C.W.E./A/13, 7 May 1941.

<sup>2</sup> A.M. File S.70543 and E.R.P. 110, 14 April 1941.

### **Improvement of Training Methods**

The brief survey of the effect of expansion up to April 1941 would not be complete without an indication of some of the advances made in the improvement of training methods up to that time. It may seem somewhat paradoxical, but the fact remains that although the operational activities of the Royal Air Force tended to be undertaken more and more by night, the basic training syllabus was devoted to a large extent to day flying. In the E.F.T.S.s for instance, night flying was only done as an extra subject when the normal syllabus had been completed. This was largely because only a proportion of elementary trainers were equipped for night flying and because many E.F.T.S.s were located in the vicinity of aircraft factories where night flying was prohibited. It was not until July 1941 that 30 minutes' night dual flying, with priority for twin-engined pupils, was laid down for some of the E.F.T.S.s and was gradually extended to more during the autumn. The difficulties at the S.F.T.S. stage have already been described. The amount of night flying per pupil at the S.F.T.S.s in Britain during the winter of 1940-41 averaged only some one and a half to two hours,<sup>1</sup> and it was not until the 'New Deal' at the end of 1941 that any appreciable improvement was made in the night flying situation.

One of the most impressive and useful of all synthetic devices introduced during the war was undoubtedly the Link Trainer.<sup>2</sup> This instrument flying training device was undoubtedly a great factor in bringing the efficiency of pilots up to the standard required by modern aircraft. At the same time up to early 1941 there can be little doubt that it was not being properly used. An investigation by the Directorate of Flying Training in January 1941, revealed that the existing Link Training syllabus for S.F.T.S.s was obsolescent, that instrument flying instruction was neither standardised nor correlated with operational requirements, and that S.F.T.S. instructors were largely ignorant of the first principles of instrument flying and of its importance in operational work. In fact 95 per cent. of the instructors examined were not noticeably better on instrument flying than the average pupil turned out of a S.F.T.S., while a fair proportion of them believed that it was unnecessary for an instructor himself to be competent in instrument flying in order to teach it. There was an obvious need to correct a somewhat off-hand attitude of instructors towards this most important subject and by July 1941, instrument flying was standardised by notes laying down what should be taught at the Central Flying School and at the S.F.T.S.s. Instructors were thenceforward required to practise instrument flying for half an hour per week and the Link Trainer and instrument flying syllabus were revised.

It can be seen from the above survey of expansion that flying training was still dominated by logistics and that the consequent general lowering of standards had yet to be corrected. At the same time a change in emphasis can be discerned at the turn of the year 1940. The policy was to export all basic training overseas. Once the basic training organization had been deployed, improvements in quality were bound to follow. The next stage

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<sup>1</sup> A.M. File S.60029 and A.H.B. II M/29/16.

<sup>2</sup> A.M. File A.45454/39.

was to expand the operational training and to improve its quality of instruction. Owing to the vastness of the organization and to the large cost in resources it was not until the end of 1941 that any great change could be expected.

#### **Extension of Policy and Plans**

By the early summer of 1941 a stage had been reached where air expansion plans could go forward with greater assurance. At home training expansion had freed the Air Staff from many of their worries over the supply of pilots and crews, and United States and Canadian assistance was becoming much more effective. At the same time the influence of air power in war was being strongly emphasised by German air successes in the Mediterranean. This naturally re-inforced, if re-inforcement were required, the strength of the Air Ministry's case for a proper share of the national resources for expansion. In a Directive the Prime Minister gave expression to the policy which was to be followed. He ruled out all question of an advance in force against the German Army on the mainland of Europe and went on to say:

‘The above considerations and the situation as a whole make it impossible for the Army, except in resisting invasion, to play a primary role in the defeat of the enemy. That task can only be done by the staying power of the Navy and, above all, by the effect of air predominance.’<sup>1</sup>

The Chief of the Air Staff in an appreciation of the situation saw in this statement a ruling which made a clear cut allocation of responsibility between the Services. The aim was to win the war by building up a crushing measure of air superiority. The Navy had to keep open the sea routes, upon which the air forces depended to so large an extent for the supply of aircrews and material, and all these services had to defend the Home base and vital overseas territory against invasion.<sup>2</sup>

At that time each disaster, of which there were still to be many, demonstrated the urgent need for air power and thus the need for a sound training organization. At the same time, the Royal Air Force training organization was not without its critics because of its insistent demands for ever more men, aircraft, and equipment. A particularly strong critic was the ex-Minister of Aircraft production whose influence was considerable. We are indebted to this circumstance for a strong letter to the Prime Minister from the Secretary of State who, after objecting to criticism of his training organization and demonstrating the effect on training of the trainer aircraft shortage, went on to say:

‘Meanwhile let me place on record my own opinion that it will be in aircraft and not in pilots that there will be a shortage at the end of the year. In nine months' time we may be contemplating the increase of our establishments in order to absorb surplus pilots.’

In a war where there had been nothing hitherto but serious shortages, the prospect of a surplus opened up vistas of improvements and increased power. In spite of present disasters, and the ill-effects of the previous winter, the wisdom of the sacrifices made during the Battle of Britain was becoming

<sup>1</sup> W.P. (41) 69. Annex. 1.

<sup>2</sup> C.A.S./C.O.S. ‘The Air Programme’, 20 May 1941.

more apparent. At that time, the A.M.T.'s planning department considered that there was every reason to be sanguine regarding the adequacy of the supply of pilots in the future and that the Secretary of State's 'boast' to the Prime Minister would come true. In arriving at this conclusion, it may be of interest to show how it was estimated.<sup>1</sup>

#### **Example of Planning Methods**

The estimated output of pilots was allocated to O.T.U.s less 10 per cent. which was set aside each month to provide flying instructors for flying training schools, pilots for miscellaneous units, and so forth, but not staff pilots for O.T.U.s. Pupil wastage was then allowed for at 15 per cent. for fighters and  $7\frac{1}{2}$  per cent. for bombers— $7\frac{1}{2}$  per cent. and 5 per cent. were actually experienced. Wastage was then deducted at the full predicted rate for all squadrons which were operational plus an allowance of 15 per cent. to cover miscellaneous wastage and withdrawals. The O.T.U.s and squadrons were then formed from the pilots left over, the full establishment of staff pilots required to form each O.T.U. being deducted from the residual pool, the balance being available for the formation of squadrons. On this basis the total output of pilots was absorbed up to October 1941, but thereafter there was an estimated surplus. In November 1941, the growing surplus of pilots awaiting O.T.U. training contributed to the general training re-organization which started at that time. To follow still further this example of planning, the Training Progress department estimated that the above calculations allowed for a safety margin of between 1,500 and 2,000 up to the end of December 1941. In 1942 the calculation showed a considerable unabsorbed surplus every month. This surplus, together with a reduced demand for instructors was estimated to amount to a margin of seven to eight thousand pilots. In addition, there were further reserves in the form of two South African schools and one Australian school which were providing pilots for S.A.A.F. and R.A.A.F. home defence requirements. The outputs of these three schools amounted to some 1,500 pilots per year that had been excluded from the pilot forecasts, although the requirements of overseas and Dominion squadrons had been included in the Expansion Programme. Finally, except for the British Flying Training Schools in the United States which replaced three S.F.T.S.s due to form the forecast took no account of any flow from that country. The very generous allowance for contingencies in these calculations tended to swell the totals of pilots each year. But, having regard to the uncertain and spasmodic arrival of drafts from overseas, the surplus did not seem unwarranted to the A.M.T. and A.M.P. who faced some anxious periods when inputs to operational training could not be completed in time.

In 1941 only the first fruits of the overseas training organization were appearing and there was still an actual shortage of pilots. Over all calculations loomed also the uncertainty of the wastage factor. Actually wastage proved much less than forecast, though potentially, the reverse might have occurred. There was also the factor of the sea blockade. There was no instance of the sinking of a large consignment of trainees in transit, but again this might have happened. The shortage during 1940 was not easily forgotten. By the summer of 1941 also, it was clear that the forecasts about basic training

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<sup>1</sup> T.P. 6/1, 9 May 1941.

had been fairly accurate. The output from the Empire Air Training Scheme during April 1941, amounted to 592 compared with a forecast of 426. Arrivals in Britain amounted to 291 against planned arrivals of 245. There were also a further 200 pilots in transit, and output from the British S.F.T.S.s during April was 80 above the planned figure.

To cope with this added income of pilots, the revision of the bomber O.T.U. syllabus had permitted the O.T.U.s to meet requirements temporarily. The rate of formation of bomber O.T.U.s was limited to the rate at which Bomber Command could release pilots from the squadrons which in turn was restricted by the flow from the O.T.U.s for the first line. At that time Bomber Command were feeding operational pilots back into the O.T.U.s at the maximum rate that the O.T.U. output would allow, and there were hopes that the substantial increases in O.T.U. intakes would cause their output rapidly to increase. It may be seen, therefore, that in spite of the restrictions caused by shortage of advanced trainers, the bottleneck was undoubtedly at the O.T.U. stage, particularly in Bomber Command. This problem persisted to the end of the war. It must be remembered that first line and operational training were intimately connected and that the operational training element, which used operational type aircraft, was as expensive in men and material as the first line. First line expansion therefore depended more upon a delicate adjustment between the claims of training and operations than upon any hard and fast planning.

#### **Adjustment between supply of Aircraft and Crews**

The question of adjustment between the supply of trained personnel and aircraft received close attention in May and June 1941. This adjustment depended upon the uncertain factor of aircraft supply both British and American. Investigations carried out by the Prime Minister's advisers and the Air Ministry revealed the fact that while pilot and crew production was satisfactory, the great shortage was going to be in heavy bomber production. The position in mid-1941, became serious as it was estimated that in order to reach a first line bomber force of over 4,000 aircraft, nearly 20,000 aircraft were required in the year ending in the summer of 1942. The supply to meet this, based on an optimistic forecast of British and American production, was estimated at some 15,000. The Secretary of State summed up the position as follows :—

‘ Our present training programme is designed to produce the pilots necessary to carry out the planned expansion of the Royal Air Force up to the spring of 1943. This programme is the minimum necessary to achieve air superiority over Germany and I consider that the utmost efforts are necessary both in this country and in the United States, to ensure that we receive the numbers of pilots and aircraft we require.’<sup>1</sup>

Some idea of the change in the availability of trained personnel which had occurred may be gauged from the fact that before the Battle of Britain had started, the Metropolitan Air Force was more than 15 per cent. below its establishment of pilots. By the end of September 1940, in spite of the intensive air battles which had taken place in August and September, culminating in the decisive defeat of the German Air Force on 15 September, the pilot strength of the Metropolitan Air Force had increased by over

<sup>1</sup> S. of S. Folder, Encl. 32A, A.H.B. ID/7/3a.

25 per cent. and the squadrons were up to the 98 per cent. of their full pilot establishment. At the end of March 1941, in spite of the inevitable slowing down of the training organization by bad weather during the winter, and in spite of the heavy reinforcements sent to the Middle East, the pilot strength of the Metropolitan Air Force was over 40 per cent. greater than at the end of June 1940, and the squadrons were within less than 5 per cent. of their full pilot establishment—a deficiency of only just over 200 pilots. During the period from 30 September 1940, until the end of March 1941, which covers the Libyan campaign in which the Italian Air Force in Africa were practically annihilated, reinforcements which were sent from Britain and schools in Australia and Rhodesia enabled pilot strength in the Middle East to be increased from 567 to 993 pilots. From the end of March until the middle of June 1941, whilst the Middle East had been reinforced on a greater scale than during the previous period, the pilot strength of the Metropolitan Air Force had increased by a further 10 per cent. on that of June 1940, making a total increase of 50 per cent. in just under a year. The strength in the Middle East had increased by a further 15 per cent. to 1,082 during the same period making a total of 90 per cent. during the year and large reinforcements were still en route. Emphasis has been laid upon the pilot situation up to June 1941, because until then it was the limiting factor in expansion. Increasing dividends from overseas training were being received and gradually the restriction was removed. Those from overseas had to be brought to Britain involving sea voyages of several weeks and the carrying out of operational training after arrival. In general the average period in June 1941, between completion of S.F.T.S. training and the formation of a first line squadron was about three months.

#### **Future Policy for Pilot Training**

Despite the favourable pilot position the Air Council decided on 24 June 1941, that training should continue its high pressure.<sup>1</sup> Their opinion was that, although calculations showed a future theoretical surplus of pilots, many factors might operate against the realisation of the training programme as planned and unforeseen requirements might arise. If a surplus had in fact appeared possible the Air Council considered that the best course would be to utilise the wide margin of training capacity to give more training to a smaller number. In the meantime they ruled that any references to a surplus of pilots were undesirable but if unavoidable should only be made with discretion. Training expansion, therefore, was to proceed regardless of considerations which have been described, and it is now necessary to outline the arrangements which were made for the full deployment of the basic training organization which was considered necessary to meet future requirements.

By June 1941, the pattern was clear—basic training was to be expanded and concentrated in three main areas, viz.: The North American Continent, Australasia and Africa. Agreements and arrangements to this end had been made and it was but a question of time to bring these plans to fruition. In India a small basic organization had been established to meet the needs of the Indian Air Force but it was never intended to train personnel for the R.A.F. in any quantity, although as the war in the East progressed a large

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<sup>1</sup> A. C. Con. 12 (41).

operational training organization was built up. It will be appreciated that offers of help had come in from all parts of the Empire and in the case of Burma, Malaya, Bermuda and Trinidad, initial and elementary training had actually been started in a small way. It was evident, however, that shortages of material and skilled manpower were such as to render these schemes impracticable in the long run, and they were abandoned after the entry of Japan into the War. As it was, the Empire Air Training Scheme and the agreement for training in Africa had immense handicaps to overcome by reason of shortages of the main element of training expansion before they could become effective. In most cases syllabi and outputs were maintained except for armament subjects where shortages of aircraft, equipment and other facilities often proved insuperable. The credit for the remarkable general progress made must go in the main to the initiative displayed by local training authorities. It is noticeable, however, that this capacity to overcome the partial failure of the flow of supplies from Britain was most successfully shown by those countries which had aircraft manufacturing facilities at hand, or where advance provisioning action had been taken. This was, of course, to be expected, but it does not eliminate the credit due to the countries concerned and their individual local commanders and staffs for the sometimes extraordinary initiative shown in finding expedients. No criticism of the standard of the output can be made, except to say that the general syllabus of training particularly in night and instrument flying required revision during 1941.

#### **The Influence of World Events on Training**

The immediately preceding narrative will have shown that the first phase of expansion, that of the provision of basically trained personnel in mass, had reached a point which gave promise of development of quality in training and, in particular, improvement in the methods of conversion of these personnel into fighting crews. Up to the stage of graduation as fully fledged airmen, as distinct from specialised operational aircrews, the mass of personnel from the basic training organization was capable of being directed into whatever channel the operational situation demanded. The question now to be considered is the influence of world events upon training policy. It can be understood, for instance, that, if Germany had recommenced an air offensive against Britain, the air policy while developing a balanced first line, must have given priority to the defensive element of fighters, particularly night fighters, to some considerable extent. If, on the other hand, the enemy policy had been an all-out offensive, aimed at the strangulation of supplies, then the coastal element would have required strengthening. Similarly, if the Middle East had become the main focus of operations, the tactical bomber and fighter/army co-operation elements would have similarly needed reinforcement. The intensity of the wastage in any particular direction would thus have demanded proportionate organization to replace casualties, tour expiry and other attrition, and the flow of pupils would have been switched to meet the new demands of that organization.

One of the main things to be remembered about the training plans of Britain and the Empire up to mid-1941 was that they were on a scale commensurate with the task of waging a war of attrition against Germany on the assumption that external aid would consist chiefly of supplies of material. That was why Air Staff plans for a bomber force of over 4,000 heavy

bombers, which was the force considered necessary to smash Germany, were based on the idea that somehow Bomber Command must be expanded to that size and that the only outside help would come in the shape of American heavy bombers. These were long range plans on a large scale and, as has been seen, were laid well in advance. Quite naturally British plans after the fall of France were based on the hypothesis that Britain and the Commonwealth would have to stand alone and to defeat Germany with the help of Lease/Lend supplies from the United States. It can be seen that the laying down of the vast overseas air training scheme relieved Britain of much of the manpower commitment necessary to run basic training, and the necessity to manufacture its equipment after the initial overheads had been supplied, and build the necessary aerodromes and buildings. Britain was thus free to concentrate on building up a first line, with its operational training organization, which it was hoped would eventually be of sufficient size to influence the outcome of the war if not to be the decisive factor. The flying training organization was by that time sufficient to meet these plans, but the aircraft manufacturing capacity and the supply situation of heavy bombers from the United States were the limiting factors. Up to June 1941, however, a target in ultimate expansion had been laid down and plans to attain it had started. At that time, therefore, the air forces were faced with a great expansion, to meet which, in point of numbers, only the training organization was capable and ready. Resources in other types of manpower and material were limited and the emergency measures of the summer of 1940 were still in force with all their disadvantages in the form of shortened courses and an enforced lowering of training standard. There was, at the same time, an increasing pressure to raise training standards by lengthening courses and by improvements in the syllabus. It was obvious that the improvements required were going to take a long time to effect.

#### **Entry of Russia into the War, 22 June 1941**

At that juncture there occurred the first of the world events which were to alter profoundly the situation in Britain's favour and which had immediate repercussions on the training organization. On 22 June 1941, the Germans invaded Russia, and on the same day the Prime Minister broadcast a speech which showed that Britain was unreservedly on Russia's side. The effect on training was most auspicious. The first and most immediate benefit was the withdrawal of all but one German bomber Geschwader (K.G. 2 equipped with Dornier 217's) to the Russian front.<sup>1</sup> Thus the German air effort against the British Isles was curtailed, and at one stroke most of the urgent operational handicaps necessitating the export of training were removed. This is important to bear in mind because the aerodrome capacity which was becoming vacant by the move of the S.F.T.S.s was soon to be required for refresher training.

There was also another factor, the slowing down of first line expansion which, though it caused the Air Ministry much concern, helped to make possible the improvement of training for which the training department had long been waiting. As will be remembered, initially the Germans met with

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<sup>1</sup> A.D.I. (K) Report 12/1946.

one success after another, their armies investing Leningrad and Moscow and capturing Kiev, Kharkov, the Donnetz basin and Rostov-on-Don. The Germans relied chiefly on tanks and aircraft, in each of which they enjoyed superiority. Russian supplies were affected by the loss of the industrial Ukraine, and their deficiencies could not be met by their war factories in the Urals and had to be supplemented by shipments from the United States and Britain. This meant that American aircraft which had previously been destined for the United Kingdom were diverted to Russia and Britain also had to make a heavy contribution in fighter aircraft. This caused a slowing down in the rate of expansion of the first line forces by an initial estimated three months in time or ultimately by the equivalent of 80 squadrons, in terms of aircraft. The effect of these events upon Fighter Command was evident within a few months (by October 1941). On the one hand the scheduled expansion of Fighter Command had to proceed, while on the other the production of fighter aircraft to meet this expansion as well as the Russian commitment had not yet been adjusted. The result was that the Aircraft Storage Units were, when necessary, drained completely of aircraft in order to keep squadrons in being and as much up to strength as possible. Also in order to prevent the rolling up of squadrons, the allotment of fighter aircraft to training had to be cut and first line squadrons had to undertake more of the necessary operational training. The reaction of the training authorities to this threat to training was that, if necessary, Hurricanes were to be removed from the S.F.T.S.s which had been using them as an experiment, in order to strengthen the fighter O.T.U.s. The A.M.T. was against operational training in the squadrons because he considered that the supervision there would be of a lower order and the wastage of aircraft would be higher. He had, however, to accept this temporary position and Fighter Command itself had to restrict their operations to those of the most promising and least expensive kind.

° This was the first of the major dislocations caused by world events to British long term expansion plans. The flow of aircraft and aircrews was planned to coincide but now it was obvious that there were going to be aircrew surpluses under the emergency arrangement of the previous year. At an important stage in training history, the opportunity to lengthen courses was presented. A third repercussion also became apparent. From June 1941, until American re-armament became effective towards the end of 1942, Russia had to bear practically the full weight of the German land forces. As is well known, she was very hard pressed and appealed to Britain and America to do something to engage a substantial number of German divisions. In spite of the desire of the President of the United States and of the Prime Minister to help, there was little, except in the Middle East, that could be done on land. It was therefore towards the increasing weight and accuracy of the bomb tonnage that the Allies looked for some method to help the Russians and to hit Germany. The political pressure behind Bomber Command expansion thus received added weight. The picture of future training commitments was becoming more clear. The bomber offensive and the improvement of training were closely inter-related problems and it was in these directions that a major effort was required.

The added emphasis on bomber requirements and the investigations into methods of expanding Bomber Command revealed how severely long term plans had suffered from previous neglect of bomber production. As already explained, the Secretary of State had written to the Prime Minister calling for the maximum production of heavy bombers to match the increasing flow of aircrew. Training plans were adequate but strenuous efforts were necessary to produce the bomber aircraft, not only for the first line, but to equip the operational training organization. In reply to the Secretary of State's minute quoted above, the Prime Minister replied that 'The Air Ministry should frame their proposals observing what is involved in time and manpower.' This mention of manpower was to introduce the final, and in many ways, ultimate factor in the background to the story.<sup>1</sup> The Secretary of State's minute to the Prime Minister of 2 April 1941, on the subject of Target Force 'E' dealt very briefly with manpower as follows: —

'The great training organization we are building up will suffice to supply pilots for a force much in excess of the peak of 1941 expansion. The crews and ground personnel necessary to raise our striking force to the 4,000 mark by the spring of 1943 can be found if instructions are given now to work up to that figure. The total strength of the Air Force would be above 1½ million men.'

The time had come however when wider considerations were involved. The new offensive orientation of strategy<sup>2</sup> and the vast expansion plans of the armed forces and industry demanded that each Department should cost their proposals in terms of manpower. Owing to the huge training commitment the Department responsible was in some respects vulnerable to this turn of affairs. Discussion at Ministerial level demanded to know such things as full manpower requirements for Target Force 'C' particularly with reference to aircrew and skilled maintenance personnel, and whether there would be adequate facilities for intake and training.

#### **Prime Minister's Demand for Twice the German Strength**

On 3 July 1941, the M.A.P. produced a new programme of aircraft construction which drew from the Prime Minister a minute which showed his concern.

'Our estimate of German monthly production by numbers is 2,100 which is the numerical level at which we stand up till July 1942, and indeed thereafter, apart from the new projects. . . . Broadly, from the figures put before me the impression would be one of equality for the next twelve months, so far as British and German construction is concerned, leaving any increase to be supplied by our share of United States production! We cannot be content with the above situation which excludes all possibility of decisive predominance indispensable for victory. . . . In principle, however, we must aim at nothing less than having an Air Force twice as strong as the German Air Force by the end of 1942. This ought not to be impossible if a renewed vast effort is made now. It is the very least that can be contemplated, since no other way of winning the war has yet been proposed.'<sup>3</sup>

<sup>1</sup> S. of S. Folder, Encls. 32A and 36A, A.H.B. ID/7/3a.

<sup>2</sup> I.P. (41) 444.

<sup>3</sup> S. of S. Folder, Encl. 40A, A.H.B. ID/7/3a.

This was a most important ruling, because it finally set in train the concentration on bomber production which was to make the bomber force the chief training pre-occupation. It is incidental to the story that this aim was not possible of achievement but at the same time great efforts were made to achieve it, and there can be no mistaking its effect on training plans, or the shape it gave to them. From the training point of view the A.M.T.'s statement to the Air Staff may be taken as representing the position.<sup>1</sup>

<sup>1</sup> 'The latest R.A.F. Expansion Programme was based upon the M.A.P. Production Programme, and should provide some margin against possible improvement on that Programme.'

A joint minute by the Ministry of Aircraft Production and the Air Ministry informed the Prime Minister that his call for an air force twice as strong as the German Air Force was 'not practicable'. An additional output of some 70 bombers per month was possible by re-opening dispersed factories, but the introduction of the Warwick would have to be sacrificed for the continued production of the Wellington. This was most important from the bomber O.T.U. point of view as these units relied chiefly on the Wellington. The chief reason for inability to produce the required number of bombers was the shortfall of American supplies and the limit to British capacity. It was estimated that a thousand bombers per month would be required to meet the Prime Minister's demands, but there was a possibility of meeting them by equivalent bomb tonnage. This was the best that could be hoped for, but it did not alter the fact that it upset the harmony between training and aircraft production. At this point in training history it was obvious that shortage of aircraft was the main preoccupation of the authorities. As already stated, pilot production had proceeded well in point of numbers and the training aircraft situation for pilots was definitely easing. The restriction was in operational types and in aircraft for training aircrews.

#### **Target Force 'E' Revised, August 1941**

It will be remembered that Target Force 'E' was the first expansion programme which could be based upon the simultaneous availability of pilots and aircraft and that subsequently the factors of heavy bomber production, O.T.U. capacity and manpower threatened to limit the target. The outstanding point about this programme was the Prime Minister's call for a striking force twice as strong as the Germans by the end of 1942. By August when the actual front line strength was some 4,500 aircraft a revision of Target Force 'E' thus became necessary.<sup>2</sup> This programme, which aimed at some 615 squadrons equipped with 11,450 aircraft by the spring of 1943, had to be considered in relation to the size of the Air Force to which it was likely to be opposed. The German Air Force which it was estimated then numbered some 4,500 first-line aircraft, was still expanding and the aim was not merely to equal this expansion but to establish a decisive lead. The prime requirement was the establishment of decisive air superiority. To aim at any larger force would have been impossible, owing to material limitations. The main feature of the expansion was the development of the

<sup>1</sup> S. of S. Folder, Encl. 49A, A.H.B. ID/7/3a.

<sup>2</sup> C.W.E./E/31. 8 August 1941.

bomber force from its existing strength of 1,000 to a total of 4,500 mainly of the heaviest types. As the Chiefs of Staff stated in their review of war strategy:—<sup>1</sup>

‘It is upon bombing, on a scale undreamed of in the last war, that we found the new weapon on which we must principally depend for the destruction of German economic life and morale. To achieve this object within a reasonable time, the bombing offensive must be on the heaviest possible scale, and we set no limits to the size of the force required save those imposed by operational difficulties in the United Kingdom. After meeting the needs of security, therefore, we give to the heavy bomber first priority in production, for only the heavy bomber can produce the conditions under which other offensive forces can be employed’.

By that time the entry of Russia into the war was reflected in the target force and the setbacks received after the disaster in Greece and Crete and the growing threat in the Far East called for the provision of 750 additional aircraft for co-operation with the Army and the Navy, and 270 transport aircraft, making an overall total of 12,470 aircraft.

Although the original Target Force ‘E’ had suffered comparatively minor alterations, the A.M.T. on 15 August 1941, pointed out that additions amounted to nearly 1,500 landplanes. So far as the production of trained pilots was concerned, the increases made it essential that one-third of the output of the U.S.A.A.C.’s pilot training capacity, as it expanded, should be retained, regardless of their entry into the war, unless the Americans took over a proportionate share of the new Target Force. It was considered by the A.M.T. that the Arnold Scheme had hitherto been regarded as some measure of insurance against a failure by South Africa to keep up to schedule. (The South African scheme was experiencing difficulties and its output had fallen behind the planned figures.) The new requirement for Target Force ‘E’ increased the importance of an expansion of pilot training in the United States and of keeping the South African scheme fully up to schedule. In addition to the needs for pilot training, new schools were required for observers, wireless operators and air gunners, to match the increased number of pilots for the new Target Force ‘E’. In view of the great difficulty in carrying out observer training in the United Kingdom and in finding air gunnery ranges, it was considered that new schools should be formed in the North-American Continent. At this time a need was expressed for United States help in providing O.T.U. training for all aircrews destined for squadrons in the United Kingdom equipped with United States types capable of being ferried from the United States to the United Kingdom. So far as R.A.F. and Dominion Schools were concerned training expansion was almost complete. Other aircrew facilities were being planned to match pilot output and, although there was still much to be provided, progress was being made. Ground training facilities were also considered to be adequate for the Target Force.

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<sup>1</sup> C.O.S. (41) 505, Annex. 1.

### **Effect of Japanese Aggression, December 1941**

The Russo-German conflict had made for the final widening of the war as, on the one hand it brought the United States closer to the anti-Axis powers, and on the other it stimulated German efforts. It added to the confidence of Japan to overwhelm the Far East while Russia and Britain were pre-occupied in the West. On 7 December 1941, Japan struck successfully at every American and British base within her reach. On the following day the United States and Great Britain declared war on Japan.

The effects on training were very marked. There were, of course, immediate repercussions, such as the cessation of the small training schemes in Burma and Malaya. In the Pacific, the flow of initially trained Australian and New Zealand personnel to Canada under the E.A.T.S. arrangements was suspended for three months, and the flow of Australian crews to Southern Rhodesian schools ceased forever. The training schemes in the West Indies also died away owing to activities in the Caribbean. These results for training, however, were far surpassed by the effect of world events upon American public opinion. The reaction was to demand immediate participation by first line forces on the largest possible scale. Not only this, but there was also the feeling that in the Pacific lay America's theatre of war. The first reaction in the U.S.A. was to cause the President to decide that top priority should go to all production which was to come off the line in 1942, with the object of ensuring maximum equipment in 1943. The President also decreed that American aircraft should, as far as possible, be flown by American crews. This gave expression to the prevailing feeling that aircraft should not be given away to other nations which were required for the country's own expanding requirements in training and in the first line. America wanted to take over a proper direct share of the operational burden and was no longer concerned so much with being the 'Arsenal of Democracy'.<sup>1</sup>

The attitude of the Air Ministry and of the British Government was sympathetic to these natural feelings, but there was great concern for the effect which the drastic cutting down of American supplies of aircraft would have on the long term plans, which, it will be remembered, were based on Britain bearing the operational burden alone. The loss to British expansion amounted to some 122 first line squadrons and over 2,000 aircraft, and it was urgently represented to the President that this loss should be as gradual as possible and should be compensated for by the arrival of United States operational units to take their place in the line.<sup>2</sup>

Pending the revision of the Arnold/Portal Agreement on the supply of American aircraft to Britain, it was obvious that the only firm basis of planning was the programme of aircraft production by British industry, and even that was liable to fall short by anything up to 25 per cent. It will be appreciated, therefore, that the planning of training presented no easy task and depended more than ever upon intelligent guesswork and anticipation of the high strategic decisions which would have to be made now that America was herself an active belligerent.

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<sup>1</sup> S. of S. Folder, A.H.B. ID/7/3(b).

<sup>2</sup> L.M.A.B. (K2) 21, 3 July 1942.

### The 'New Deal' Proposals

Early in December 1941 the Air Member for Training submitted a paper to the Air Council outlining proposals for the overall improvement of training.<sup>1</sup> After reviewing the background to the problem the A.M.T. recapitulated the position of the duration and extent of the training syllabus. It will be remembered that the crisis of the summer of 1940 had shortened the courses finally from an official 205 hours to 177 hours for bomber pilots and from 180 to 162 hours for fighter pilots. These courses provided the minimum instruction necessary to enable a pilot to handle his aircraft under favourable conditions, but they gave too little background of general flying experience and this led to a higher accident rate at the later stages of training when flights were undertaken in more difficult conditions. A review of the number of aircraft written off per 10,000 hours flying during the period 1 January to 1 September 1941, revealed the following position:—

E.F.T.S.s	...	...	...	2.5	
S.F.T.S.s	...	...	...	5	
O.T.U.s	...	...	...	15, decreasing to 10	} Decreases largely seasonal.
Operational sqdns.	...	...	...	20, decreasing to 10	

It will be seen that operational aircraft were being written off at twice the rate of S.F.T.S. aircraft which, in turn, was double the E.F.T.S. rate. Clearly the skill of the pupil had not been increasing as fast as his advance to more complex types of aircraft. The total losses of operational aircraft through accidents amounted to about 170 a month—enough to form 10 new squadrons.

During 1941 therefore it can be seen that the standards of training had been largely dictated by necessity. By the end of 1941 with the target of front-line squadrons being shared by the Allies, the extent of the expansion of the Metropolitan Air Force could be cut down to a figure more approaching that which the United Kingdom could produce from her own resources. As a matter of interest, this brought the standard of training up to that which the Germans were reputed to give to their pilots viz.—between 220 to 270 hours over a period of 17½ to 23 months.

The Air Member for Training then went on to propose officially those measures which had been introduced in November 1941, namely the grading and A.F.U. stages for pilots, observers and wireless operators. He also proposed the formation of the Empire Central Flying School to set and maintain a high and uniform level of training standards throughout the Empire. Pending consideration of his paper by the Air Council, the Air Member for Training held a conference at the Air Ministry in December 1941, which was fully representative of all concerned with training and at which his 'New Deal' proposals were outlined. The new proposals for pilot training envisaged a 12 weeks' I.T.W. course followed by a three weeks' 'grading' course (to test the pupil's flying aptitude before sending him abroad for training); the E.F.T.S. course was to be extended to 8 weeks to allow about 80 hours flying, and the S.F.T.S. extended to 16 weeks with an average of 120 hours flying. After graduating pilots would proceed to Advanced Flying Units in the U.K. (4 weeks with 30 hours flying for single-engined units, and 8 weeks with 60 hours flying for twin-engined units) before passing

<sup>1</sup> A.C. 70 (41)

on to an O.T.U. The O.T.U. courses would range from 6 to 12 weeks according to the type of aircraft used and flying hours would be between 40-80 hours. These proposals, which would roughly double the flying hours given to pilots before they reached an operational squadron, received a warm welcome and general agreement. It was apparent that great importance was attached to the improvement in night and blind flying training which was proposed.

The importance of the training of other members of aircrew was not overlooked and in particular it was agreed to allot seven of the existing air observer schools to meet the monthly requirement of 650 observers. The course was to be a minimum of 25 hours in six weeks. In addition two air observers' schools were to remain in their original role to carry out the training of observer wireless operators, who were also to undergo basic signals training in Technical Training Command before doing the combined air observer course in navigation and armament. Regarding air gunners training it was stated that the immediate requirement for the non-Empire trained air gunners was the equivalent of four and a half full sized air gunnery schools as follows:—

2 for Wireless Operators (Air Gunner)—480 pupils.

1½ for 'Straight' Air Gunners—360 pupils.

1 for Flight Engineers (Air Gunner)—240 pupils.

It was also stated that by the middle of 1942 the equivalent of two and a half additional schools (one for 240 pupils and two for 180 pupils each) would be required.

Finally, on the subject of the elementary flying training schools, the question was considered whether there were advantages in retaining E.F.T.S. capacity in Britain to feed transferred S.F.T.S.s or whether this capacity should itself be transferred. The conclusions reached were that there were considerable advantages in retaining this capacity in Britain, even though it might not be required for elementary training. The most important of the reasons given was that the aerodrome capacity of 43 flights would become redundant and, generally, could not be used for operational purposes. The E.F.T.S.s could, however, be used for other purposes such as glider pilot training, fleet air arm training, and 'grading'.

#### **Summary of Improvement in Basic Training**

At this stage it would be as well to summarise the effect of the A.M.T.'s new proposals. While to assess a concrete standard was difficult, a comparison of the training given under each scheme indicates the improvement to be expected. The new scheme:—

- (a) Doubled the total flying time on all types.
- (b) Passed the pupils to the O.T.U. trained in beam approach, with the standard in instrument flying which that entailed.
- (c) Increased the flying time at night by about five times.
- (d) Took the training in navigation to a far higher standard.
- (e) Introduced elementary training in bombing and gunnery.
- (f) Gave the Dominion trained pilots an acclimatization course in the U.K. before their O.T.U. training.

The extent of the improvements envisaged under the 'New Deal' can therefore be seen to have constituted an important step forward in the attainment of quality.

Later in December 1941, the A.M.T.'s proposals to increase the course lengths were the subject of discussion by the Air Council<sup>1</sup> and the Commands, particularly Bomber Command, where the problem arose in its most acute form. In the meantime, however, on grounds of emergency, instructions were given, in anticipation of approval, for the extension to 16 weeks of the S.F.T.S. courses in Canada, New Zealand, and Southern Rhodesia. (Courses in Australia and South Africa had remained at 16 weeks.) In the main there could be no quarrel with the need for a revision of training, but the implications were serious, chiefly in the organizational aspect. It was unfortunate, for instance that a revised estimate of requirement in advanced trainer aircraft, which did not allow for the new proposals, had just been put to the Ministry of Aircraft Production. There was the embarrassing possibility that this estimate would now have to be revised. There was also the fear that what was now a surplus of trainees ex S.F.T.S. might become a deficit which would not balance aircraft output, and particularly new demands for aircraft from developments in the Far East.

The cost in units and aircraft also had not been measured and there was likely to be the anomaly of increased training overheads for a reduced target force. There was also some criticism that, with the transfer of basic training overseas, the Air Member for Training would lose touch with the organization for whose syllabus he was responsible. Anxiety as to whether the basic training organization was sufficient was also apparent. There was mention of a desire for 'Arnold' capacity to be increased, a quite impracticable proposition since the 'Arnold' capacity itself was soon to be lost as America progressed with her expansion plans. Moreover it was not considered that the standard of navigational training was as inadequate as that of pilot training, none the less it was hoped that by laying additional emphasis on astro-navigation and on the Observer A.F.U. stage, this form of training would be further improved. In general it can be said that the new training proposals met with approval in principle, subject to discussion with commands and investigations into the logistical aspect.

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<sup>1</sup> A.C. Con. 24 (41).



## CHAPTER 11

### BOMBER COMMAND OPERATIONAL TRAINING

On 26 August 1941 a conference, held at Bomber Command<sup>1</sup> to discuss operational training, revealed that the situation was most unsatisfactory. Although the Command were endeavouring to carry out the training programme, based on shortened course lengths, the operational training units were reluctant to pass out pupils until they had reached a satisfactory standard. The result was that the syllabus hours were exceeded, the flow to the squadrons was not maintained and the pool of S.F.T.S. trained pupils awaiting O.T.U. courses was steadily increasing. The conference agreed that the O.T.U.s should be compelled to maintain the length of courses as laid down with an allowance of an extra week's extension in special cases. The course lengths, then fixed at six weeks, were to be extended to eight in October and November, and ten in the succeeding months until February. The courses at other O.T.U.s were to be extended in proportion.<sup>2</sup>

It had now been accepted that the policy of giving the whole of operational training at O.T.U.s was sound. Thus the measures which had been taken under the 'Second Revise' of July 1940, whereby two weeks training were removed from the S.F.T.S. course and added to the O.T.U. course, had been reversed. The S.F.T.S. courses were now increased and the O.T.U. courses decreased by two weeks. As will be shown later this decrease was not workable especially under the two-pilot policy. With the added effects of the British winter the bomber O.T.U.s were faced with a difficult task which became increasingly impossible as so little night flying was included in the basic training syllabus and the need for a higher operational standard was increasing owing to the importance of the Bomber offensive. The crux of the problem was the availability of instructors and aircraft. The instructor position could only improve with the slowly increasing flow back from the squadrons of tour-expired crews and this flow could only grow with the expansion of the first line. So far as the supply of aircraft was concerned the time was approaching when Bomber Command was to re-equip from twin-engined to four-engined types. As the twin-engined element declined in the first line so they became available for the O.T.U. organization while conversely as the proportion of four-engined aircraft grew so did the requirement for conversion training. The introduction of new types of aircraft led to controversy regarding their allocation. The A.M.T. wished the O.T.U.s to have the first allocation but the Air Staff were of the opinion that if aircraft of the newest types were delivered to squadrons they could be used for many purposes, including training during operational lulls. The particular case in point was the allocation of Wellington Mark II's which were then being introduced into the service. The Director General of Organization pointed out that to allocate one of these later marks to each O.T.U. would mean retarding the formation of one complete squadron.

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<sup>1</sup> S. of S. Folder, A.H.B. ID/7/1(a).

<sup>2</sup> A.M. File S.69865.

### **The Low Standard of Training in Bomber Command**

By October 1941 it was becoming obvious that the shorter O.T.U. courses were not satisfactory and that outputs were falling behind programme. Congestion in the training organization was growing and Bomber Command asked that the winter length of course be increased by two weeks to twelve, principally because of the difficulty of doing enough night flying.<sup>1</sup> Paradoxically, while the bomber O.T.U.s were trying to maintain their output, the first line squadrons were becoming congested with new crews to whom it was not possible to give enough flying. The reason was the shortage of aircraft coupled with heavy losses, the blame for which was stated by the C.A.S. to be the high percentage of raw and inexperienced crews resulting from too great a shortening of the O.T.U. courses. He insisted that it was the responsibility of Bomber Command to ensure that no crew was sent on operations unless they were considered to be sufficiently trained. The responsibility however extended beyond Bomber Command and this was recognized by the training department. The Command had made numerous representations that the standard of pre-O.T.U. training was far from satisfactory, particularly in night flying instruction. Previously the training authorities had been compelled to accept a lower standard of training because of the exigencies of operational expansion. The time had arrived when the drawback of concentrating on quantity to the detriment of quality was being emphasised. By November 1941 it became impossible for the first-line squadrons to accept any more crews from O.T.U.s and there was therefore an almost complete block in the flow of bomber crews through the training organization. Bomber Command then extended the O.T.U. course from 30 hours at the controls to 45 hours in order to retard the flow. This change involved no lengthening of the current winter course but implied a basic duration of eight weeks.

The culminating point in the O.T.U. situation was reached when, in December 1941, the Commander-in-Chief wrote to the Air Ministry stating that the standard of the crews was so poor that not only did the bombs often fail to reach the target area but future expansion was threatened owing to the high wastage rate suffered. The trainees were arriving at their squadrons in such a low state of training that non-operational flying in the squadrons amounted to over 40 per cent. of the total flying time. It was unfortunate that this coincided with a partial failure in aircraft production. The result was that valuable aircraft were damaged resulting in the incapacity of the crews and limiting the training which could be given at the O.T.U.s and in the service squadrons. The trouble was that from the elementary stage the pilots and observers were not getting enough night flying nor sufficient medium and heavy bomber experience; in fact pilots were leaving their squadrons after a tour of operations having averaged only 300 to 350 hours solo flying throughout.<sup>2</sup>

### **Proposals to Improve the Standard of Training**

To remedy this situation the A.M.T. advocated a minimum of 300 hours' flying experience for pilots before they joined an operational squadron, whilst those destined for heavy bomber squadrons direct from O.T.U.s should have 350 hours. This was desirable but at that time impossible of attainment

<sup>1</sup> A.M. File S.69685.

<sup>2</sup> A.M. File S.77400.

until the capacity had been further increased. In the meantime the following standards could be realised:—

Elementary aircraft ... ..	80 hours
Advanced aircraft ... ..	150 hours
Operational aircraft ... ..	30 hours

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Although the amount of night flying given in Flying Training Command had been increased pupils were doing an average of only nine night landings each, whilst the 12 hours' night flying averaged by Canadian trained pupils was not carried out in blackout conditions. In the Service squadrons of Bomber Command 95 per cent. of operational flying was done at night whereas 95 per cent. of training flying was done in daylight. This anomalous situation obviously called for a revision of training.

A conference was held at the Air Ministry on 19 December 1941 to discuss these proposed improvements in the standard of training in Bomber Command, and there were several aspects to be considered. Apart from the congestion which resulted from the shortening of the O.T.U. courses the squadrons, owing to winter inactivity and shortage of aircraft, were severely diluted with new crews whom they were unable to train properly. As it had not been possible to form more O.T.U.s immediately and thus combine a higher standard of training in those units any increase in the standard of O.T.U. training presented an obstacle to the training programme and would not only have stopped expansion, but would have reduced to some extent the first line. Various expedients were suggested such as doing more intensive training in the squadrons by standing down one-third of the Bomber force at a time for three months. This proposal was not acceptable nor was the idea of transferring the purely conversion training and a proportion of aircraft to the A.F.U.s, as it would have entailed an uneconomical use of the very limited number of medium bombers. A further complication existed in the fact that Bomber Command was in process of re-equipping with four-engined bombers. This involved introducing conversion training. Conversion of crews from medium bomber O.T.U.s to heavy bomber types had been carried out at Nos. 26 and 28 Conversion Flights and at No. 25 O.T.U. This provided some information on the various alternative organizations which might be set up. At that time the formation of separate Conversion units, independent from O.T.U.s, had not emerged and consideration was being given to the way in which this aspect of training could be united with operational training.<sup>1</sup>

Owing to lack of co-ordination and to the fact that Bomber Command had not been adhering to the O.T.U. course lengths laid down by the Air Ministry standardisation had almost disappeared. It was proposed therefore that pupils be kept strictly to courses, of which there would be three at each Wellington and Whitley O.T.U. and four at the others. The final point of importance was the delay in passing out personnel from Bomber O.T.U.s, some of whom were there as long as 17 to 22 weeks against a planned course of six to eight weeks. This hold-up was dislocating the

<sup>1</sup> S. of S. Folder, A.H.B. ID/7/1(a).

programme throughout the whole training organization. It was also observed that, at a time when personnel were getting increased training, the intakes to bomber O.T.U.s were steadily declining owing to the greatly increased time which was taken to pass out pupils; as a result there were over 1,000 pilots waiting for O.T.U. places who should by then have been undergoing such training. The A.O.C. of No. 6 Group (the O.T.U. Group) considered that the difficulty was due to:—

- (a) Shortage of aircraft in O.T.U.s accentuated by a shortage of spares.
- (b) Difficulty in getting in the night flying time due to failure to take advantage of the weather; the need to avoid unnecessary risks at that juncture and the poor type of instructor available, a number of whom had not qualified as captains of aircraft during their operational tour.

He also said that he did not think outputs had been unduly delayed during the summer months but the difficulty arose in the winter.

During further discussions it became clear that the hold-up in the O.T.U.s was mainly, if not entirely, due to the difficulty of getting in the necessary number of hours night flying. The Commander-in-Chief, Bomber Command, said that it was useless to send pilots to squadrons until they had done their night flying because squadrons were already congested and could not undertake this training. The urgent need for more night-flying training had been emphasized by photographs of the results of the raids. There were other and minor troubles concerning details of the organization and administration, but this lack of night flying schools emerged as the outstanding complaint. The Air Member for Training said that somehow or other the existing congestion at the Bomber O.T.U.s had to be overcome. If the night flying bottle-neck could not be removed, and partly O.T.U. trained pilots could not be absorbed in Bomber Command squadrons, then it would be necessary for these aircrew to be sent elsewhere, and it was suggested by the A.M.S.O. that they would be very welcome in the Middle East where the night flying experience was not so necessary. Finally, mention was made of the standard of training of observers and wireless operators (air gunner), and the A.M.T. explained that it was proposed to include advanced flying unit training for these aircrew. Difficulty had been experienced in extending night flying instruction for observers owing to the unsuitability of the Botha for night flying, a shortage of Ansons and experienced instructors.

#### **General Résumé of the Problems of Broken Operational Training**

From the meetings and discussions which took place at the end of 1941 it is clear that the crux of the training problem was at the O.T.U. stage, particularly the bomber O.T.U. stage, since Fighter and Coastal Commands did not voice any particularly outstanding criticisms. Bomber Command were not satisfied with the standard of the pre-O.T.U. training. They had suggested that a better elementary training aircraft than the Moth should be used, and had expressed strongly the view that more pre-O.T.U. night flying training should be given. Their proposal involved approximately a threefold increase in the night flying training given in the S.F.T.S.s and a fivefold increase in the A.F.U.s. It was thought that the requirement might be met in part by increased use of radio telephony in advanced trainers and also

by the use of sodium flares which, used in daylight (the pilot wearing dark goggles) could simulate night landing conditions. The proposal would, however, necessarily entail the provision of additional equipment and airfields. At the same time the A.F.U. capacity would have to be doubled. As an interim measure it was suggested that airfields intended for bomber squadrons not yet formed could be made available, and plans were actually laid for 12 A.F.U.s to be opened at half strength pending the supply of more Oxford aircraft. The detailed proposals involved the question of the allocation of aerodromes and operational aircraft between training and operations and this was a matter for the Commander-in-Chief Bomber Command and his staff.

There was also the view expressed that more operational aircraft should be made available for O.T.U. training; indeed the opinion (not endorsed by the A.O.C.-in-C.) had been expressed that 50 per cent. of operational aircraft should be devoted to training. This suggestion was answered by pointing out the effect that this proposal would have in reducing front-line expansion. As it was, at that stage one in three operational aircraft was being used for training. There was also the consideration of what would happen when further expansion of the front-line took place. It seemed that measures should not go too far in pre-O.T.U. training if all resources were used; the problem was how to maintain the improved standard when expansion took place. More flying training schools would be required and a year's notice would be necessary in order to arrange for additional training capacity. This was, of course, the long term aspect, but in the meantime something had to be done to raise the existing standard of aircrew training.

The discussions which took place in December 1941 on the A.M.T.'s proposals served to illustrate the bomber O.T.U. short-comings. On the one hand over 1,000 pilots at Bournemouth were awaiting O.T.U. training for which they were over-due. On the other hand Bomber Command was endeavouring on its own to better the night flying standard of the trainees, some of whom were taking over 17 weeks to pass through the O.T.U.s and already there was a 50 per cent. wastage in training. This attitude of Bomber Command, though understandable, threatened to wreck completely the whole of the training plan, since those pupils who did not come up to standard could have been passed through and sent to the Middle East. In addition they increased, without consulting Air Ministry, the length of time at the controls to 45 hours for Wellington and Whitley O.T.U.s. Meanwhile Fighter Command O.T.U.s were working according to programme. The same could be said to a slightly lesser extent of the Coastal O.T.U.s.

One of the main troubles with regard to the bomber O.T.U.s was the two-pilot policy, as resources did not permit a thorough training of each individual bomber pilot. This shortage of resources was aggravated by the serious rate of unserviceability of O.T.U. aircraft. In a report made late in December 1941 the Inspector General stated that the greatest cause of inefficiency in the O.T.U.s was the low rate of serviceability. He mentioned that there were usually less than 50 per cent. aircraft available for training and this number was often seriously reduced during the day's flying by petty unserviceability due to the failure of some part of their elaborate equipment. The causes were many, but chief among them was the fact that the aircraft were old, had had hard usage and that the technical organization

required revision. This state of affairs received urgent attention ; a Service Engineer Officer on the staff of the A.M.S.O. was sent to investigate and to make recommendations on the position in January 1942. The result was apparent by June 1942 in a re-organization of the technical staff in Bomber Command, in methods of working, in the education of technical officers, in maintenance planning and in efforts to increase the establishment of aircraft in the bomber O.T.U.s. In this latter respect however, there was slow progress owing to supply difficulties.

#### **Introduction of Conversion Training for Heavy Bomber Crews**

An excellent illustration of the complications of the operational training position can be gauged from the fact that, while the A.M.T. was in process of putting through his 'New Deal' proposals under the shadow of the problems of expanding the power of the bomber offensive, the re-equipment of Bomber Command with heavy bombers was introducing an added consideration. As the first trickle of four-engined heavy bombers into the first line began to appear—Stirlings in August and Halifaxes three months later—the procedure was to convert a squadron by allotting to it a few (four) heavy bomber aircraft as a conversion flight with which to train the first line pilots in the squadron. Replacements to meet wastage were similarly converted and were drawn from operational crews, of medium squadrons. This was known as 'creaming off'. It was envisaged by Bomber Command that when the heavy bombers reached 40 per cent. of the total first line strength, this practice of creaming off medium bomber operational pilots would no longer be possible and separate heavy O.T.U.s or similar units would have to be formed. Initially it was thought that a heavy element could be added to the existing medium O.T.U.s.

From the planning point of view the issue was not quite so simple, because the relative rate of expansion of the heavy and medium squadrons was the governing factor, owing to the fact that the proportion of crews required for expansion was considerably in excess of that required to meet operational wastage in the squadrons already formed. That is to say, the O.T.U.s had to continue to supply crews to meet the demands of the medium squadrons plus the numbers required to man new squadrons and to meet wastage in those squadrons. Therefore the correct line of approach was that heavy conversion units were to be formed at a point where the percentage of the total O.T.U. output required to meet wastage and expansion reached 40 per cent. for heavy bomber types. The distinction was important, because if heavy conversion units were to form when 40 per cent. of the first line consisted of heavy bombers, under plans then agreed, there would be 30 heavy and 54½ medium squadrons in Bomber Command by May 1942. Whereas the crews (156 heavy, 140 medium per month) had to be trained by that time and therefore the appropriate training units had to be formed and working in time to produce them. This implied that they should have been formed by December 1941.<sup>1</sup>

The implications of the re-arming of the bomber first line with heavy bombers were in fact that a new stage of training was being introduced between the O.T.U. and the squadron, and that this commitment threatened to be very costly in the scarce heavy operational types of aircraft. According

<sup>1</sup> T.P./A.M.T. 4/1, 12 December 1941.

to the first draft of a new programme 'F' the expansion of heavy squadrons was to be from 15 in December 1941 to 25 a year later. The medium squadrons were also to increase from 48 to 52. To meet this expansion the monthly crew requirements were to be 66 heavy and 211 medium crews rising to 406 and 244 respectively over the same period. In the same way the number of operational aircraft required in the O.T.U.s was estimated to rise from 158 heavies and 947 mediums to 420 heavies and 1,672 mediums. This operational training commitment threatened the entire expansion programme with at least a 25 per cent. reduction in strength and naturally caused much concern. The whole question hinged on the number of hours instruction to be given to each of the two pilots of the bomber crew. It had been proposed to Bomber Command that pilots proceeding direct from O.T.U.s to heavy bomber squadrons would require 55 hours at the controls on medium bombers, followed by 20 hours on heavy bombers. Bomber Command asked for 60 hours on mediums, but the O.T.U.s were provisionally planned on a basis of 55 hours. When medium crews were 'creamed off' from squadrons, they would only have done 45 hours at the controls in their medium O.T.U.s, the balance of their experience having been gained in medium squadrons. They would then require 20 hours at the controls to convert them to heavies.

In the initial stages of heavy bomber production, the resources available were too small to enable full sized heavy O.T.U.s to be formed at once. To overcome this difficulty, and to enable squadrons to form in parallel with the training capacity required to back them, conversion flights and conversion units were introduced at the end of 1941.

The sequence was roughly as follows:—

- (a) As each squadron started to re-equip with heavy bombers, a Conversion Flight of four aircraft was attached to it. This enabled the crews to convert during the period of re-equipment, and thereafter provided sufficient backing to meet wastage by converting crews 'creamed off' from medium squadrons.
- (b) As the number of heavy bomber squadrons of each type increased, Conversion Units of 16 aircraft were formed (by October 1942). These Conversion Units could at once draw crews from existing medium bomber O.T.U.s without incurring the delay which would arise if new heavy bomber O.T.U.s were formed in their entirety. The crews from the medium O.T.U.s had of course to complete a larger medium syllabus as they had not received any squadron experience.
- (c) These Conversion Units were intended to form the nucleus around which complete heavy O.T.U.s could be built, as and when aerodromes and medium bomber aircraft became available. (Actually, as will be seen, the heavy O.T.U.s did not follow this pattern, but the Conversion Units were merely enlarged.)<sup>1</sup>

The effect of this procedure was that, during the first two stages a heavy drain was put upon medium bomber O.T.U.s both to feed the conversion flights via the squadrons and to feed the conversion units direct. Had the

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<sup>1</sup> S. of S. Folder, A.H.B. ID/7/2(a).

old medium bomber syllabus been adhered to, this drain could have been met, but the new syllabus instituted without warning by Bomber Command, left a deficiency in medium O.T.U. capacity.

#### Summary of Bomber O.T.U. Requirements in 1942

The requirements (dated 25 February 1942) of O.T.U.s in Britain up to the end of 1942 were stated to be as follows:—

	March	June	September	December
Heavy ... ..	9	14	20	30
Medium ... ..	10	8	8	8
Light ... ..	2½	1½	2	2
Total required ... ..	21½	23½	30	40
Total planned ... ..	19	24	25	25

From this statement it is evident that the position would deteriorate after June 1942 and that the Air Ministry was going to be hard put to it to meet the anticipated rapid increase in requirements. The Department of the Air Member for Supply and Organization visualised that at least some of the leeway would have to be made up by keeping heavy bomber conversion units or flights on operational stations, allowing the O.T.U. station proper to operate a full quota of 54 medium bombers instead of 39 medium and 16 heavies. The fundamental solution of providing more stations was not capable of realization in 1942 because of the fact that 18 aerodromes had been earmarked for American bomber squadrons. Those considerations show how the division was growing between the O.T.U.s equipped with medium bombers and the heavy bomber conversion element, which was tending to be located in close proximity to the heavy squadrons. Thus the trend was growing towards the distinct Heavy Conversion Unit fed direct by a medium bomber O.T.U., instead of conversion flights drawing crews from squadrons for conversion training.

To return, however, to the main O.T.U. problem, none of the measures so far undertaken could solve the outstanding difficulties of the bomber O.T.U.s which were that the standard of training was too low, the resources inadequate at best, and the numbers requiring training too great. Even the extension of the instruction to 45 hours was only turning out pilots to second pilot standard for the medium bombers. Since May 1941, the Air Ministry had been working to a plan which envisaged a total of 25 O.T.U.s to support some 250 heavy and medium bomber squadrons. On that basis, one O.T.U. would have supported 10 squadrons. Under the new proposals, some 50 O.T.U.s were required for about 220 squadrons. One O.T.U. with 54 aircraft would thus support four heavy bomber squadrons or 6½ medium squadrons each with 16+2 aircraft. It followed that about 2,700 aircraft would be needed in the O.T.U.s to support a front line of about 3,960 aircraft, i.e. the equivalent of about 70 per cent. of the first line would be in the O.T.U.s. The effect of this increased demand for operational aircraft for training amounted to a reduction of about 20 per cent. in the total number of squadrons at the end of 1942, and about 8 per cent. at the end of 1943.<sup>1</sup>

<sup>1</sup> A.C. Con. I (42).

It seemed clear that a substantial increase in training was necessary and that it would diminish the planned bombing effort. With the existing standards of training, however, effective bombing was not being achieved with more than a limited proportion of the total strength, and the suggested re-organization promised to produce a more effective effort from a smaller first line, as well as reducing the wastage rate. These were considered by the Vice-Chief of the Air Staff to be vitally important issues which could not be judged on figures alone, and he proposed to the C.A.S. that he should call a conference to discuss these matters as early as possible.<sup>1</sup>

The C.A.S. agreed to holding the conference but observed, with regard to the question of the amount of training to be given to heavy bomber pilots, that it seemed to depend on whether the policy was to make a first or a second pilot. If the pilot product of the O.T.U. were intended to become a captain after very short operational experience as second pilot, then he considered that the 12 weeks' training in the O.T.U. with all that that implied could be justified. If, on the other hand, he was to become a second pilot and to operate in that capacity for some months before he became a captain, would he not have forgotten much of what he learnt? Here then the C.A.S. touched on a problem which was soon to arise, that of the abolition of the second pilot, the arguments concerning which will be discussed later. The C.A.S. stated:—

'I do not at all shrink from the idea of 70 per cent. of the front line in the O.T.U., provided that as a result we obtain a really highly trained and competent product. The scale of attack that we could deliver with a given aircraft production depends far more on wastage than on the number of aircraft employed in training.'<sup>2</sup>

In response to these observations the A.M.T.'s reply made plain the trend of his policy. He believed that it was necessary to cling to the principle that every crew sent forward from an O.T.U. should be trained to be able to undertake operational duty straight away. If the O.T.U. product were not of this standard but had to drain the squadron's strength immediately on arrival, the squadrons would not be able to stand the additional burden caused by supplying experienced crews to newly forming squadrons and to new O.T.U.s at the rate necessary to expand the bomber force. The A.M.T. believed that it was largely because Wellington and Whitley pilots, trained to second pilot standard only, had been sent forward, that the unsatisfactory state of affairs existed. If the crew went forward capable of carrying out operations immediately there might be an exchange of captains within the squadron for the first, second or third sorties, but this would be of such short duration that it would not affect the issue. In short, the A.M.T. felt that if the above principle were not adhered to the dilution factor would restrict the planned expansion.<sup>3</sup>

#### **Revised Policy for Pre-O.T.U. Training**

Accordingly the Chief of Air Staff called a conference to consider the implications of the new training plans.<sup>4</sup> Actually two conferences were held and the first was to review pre-O.T.U. training. Under the 'New Deal' it was proposed to give pilots 300 hours at the controls plus a further 50

<sup>1</sup> S. of S. Folder, Encl. 16A, A.H.B. ID/7/2(a).

<sup>2</sup> S. of S. Folder, Encl. 17A, A.H.B. ID/7/2(a).

<sup>3</sup> A.M. File S.77400/1, Encl. 39B.

<sup>4</sup> C.A.S. 782, 11 Feb. 1942.

hours for those destined for bombers. The point in mind when this course was chosen was the need for the standard to be sufficiently high to lead to a substantial reduction in the wastage of aircrew and aircraft. At the same time it was considered desirable that the courses should not be increased to such an extent as to rob the pupils of their keenness. The new proposals provided for totals of 240 to 290 hours for bomber, night fighter and general reconnaissance pilots and 210 to 260 for others. These totals, together with 80 hours at O.T.U.s, were designed to produce pilots with adequate day and night flying experience to enable them to participate in operations immediately on joining their squadrons. This was a most important and fundamental decision, the practical recognition and fulfilment of which was to set the seal on the early aim of the Director of Training who had laid down the practice in October 1939 that 'the war system of training should deliver pilots fit to take their places without delay in the first line squadrons'. The totals represented a considerable increase over the lowest reached during the shortest courses of instruction, but were not more than was necessary under existing conditions and represented the most economical employment of resources. The operational commands had concurred in this proposal except that Bomber Command considered that 50 hours solo night flying should be included in the period of training. It was not practicable however, under the circumstances then existing, to provide this amount of night flying nor was as much as 50 hours considered essential with the greatly improved standard of training then contemplated.

The next problem to be considered was whether the proposed standard could be reached and maintained. Regarding the S.F.T.S.s it was considered possible, subject to confirmation by the A.M.S.O., to give the necessary training in the schools already planned so far as the year 1942 was concerned, provided that the population of the schools overseas could be increased to 240 and that the existing training facilities in the United States could be retained. The difficulty was appreciated in finding all the capacity required for the A.F.U.s in Britain and it was suggested that pupils and aircraft might be distributed on operational aerodromes, some of which, were not being used to the fullest extent. In the general discussion which followed the A.M.T.'s proposals, the A.M.S.O. said that a year previously the Air Ministry had been fairly confident that an increased and adequately trained flow could be maintained from the shortened courses which were then introduced. The new proposals represented a tremendous swing of the pendulum and he wondered if they were not going too far in the other direction. It was possible that the total period for a pilot training abroad might be as much as 18 to 19 months before he reached a squadron. Mention was also made of a proposal by Flying Training Command that there should be a six months Initial Training Wing course, the main object of which was to discipline the pupils and to give extra instruction in ground subjects so that they could more readily absorb instruction at a later stage in their training. It was considered doubtful, however, whether these reasons held good in view of the increased course lengths now proposed.

There followed an argument concerning the A.F.U.s. The Director of Bomber Operations said that the operational commands had asked for more night flying, and this was one of the reasons for accepting the setting up of A.F.U.s. He complained that little night flying was being done at

these units and to that extent they might be regarded as a luxury. It was explained, however, by the Director of Flying Training that the A.F.U.s had only just started and that it was not possible to do much night flying because of the absence of the necessary aids and radio equipment, but the intention was to do 50 per cent. of the flying at night. On the other hand night flying was not, of course, the only function of the A.F.U. The Deputy Chief of the Air Staff said that the operational commands were of the opinion that the A.F.U.s should be absorbed by the O.T.U.s. He himself thought that the 60 hours flying proposed at these units was excessive. It was pointed out that if A.F.U.s were absorbed into O.T.U.s the result would be that more O.T.U.s would be required. It was also suggested that economies might be effected by combining the pilot and observer A.F.U.s but it was pointed out that the seating capacity of the aircraft would be fully occupied. Finally, in reply to the Chief of Air Staff, the Air Member for Training said that he was satisfied that the new scheme would produce all the crews required during 1943. If the circumstances warranted it, he could once more shorten courses, but this would have unfortunate repercussions throughout the training organization at home and abroad.

The Chief of Air Staff, in commenting on the proposals before him, said that some 50 per cent. of accidents involving write-offs were due to lack of skill on the part of pilots; the need for an improved standard of training was therefore apparent. He felt that it would be excellent if a reduction of the wastage in crews and aircraft could be achieved by the improved standard of training, but it depended on the A.M.S.O.'s ability to find the necessary resources for the new training programme under discussion and on the ability to maintain an adequate output of aircrews under the new conditions. The A.M.S.O. was then invited to give an assessment of the cost of the new scheme. This assessment was given in the form of a consideration of the main factors affecting training expansion, viz. aerodromes, aircraft, personnel. The aerodrome situation was always somewhat precarious but the move to place two bomber squadrons on each station, together with a bold assumption that the A.M.T.'s proposal to increase S.F.T.S. populations was feasible, indicated that no S.F.T.S. capacity, beyond that already planned, would be required during 1942. The decreases in the production of advanced trainers had to be stopped; in fact production had to be increased again. Master trainers, due to go out of production by February 1943 were continued at 40 a month; Oxford production, scheduled to drop to 115 a month was retained at 190; and Anson production would have to be stepped up from 100 to 130 a month. In addition Cheetah engines would have to be produced in greater numbers. It was doubtful whether 108 trainer aircraft per S.F.T.S. was adequate, in view of the spares difficulty, and it was therefore assumed that 135 would be required. The A.M.T. said that, if the flow of spares were no better than in the summer of 1941, he agreed that 12 to 15 aircraft per S.F.T.S. would be needed over and above what would otherwise be sufficient. This indicated the wastefulness caused by an inadequate supply of spares. So far as Canada was concerned with 108 aircraft plus an adequate supply of spares there would be no difficulty in training a population of 240, although it was agreed that it would be rash to assume that an adequate supply of spares would in fact be available. As regards personnel, the A.M.S.O. estimated that the new programme of

pre-O.T.U. and O.T.U. training would require some 83,000 additional personnel including 5,000 officers. This, it was considered, would probably require a high level approach to the Ministry of Labour in view of the large number required.

The Chief of Air Staff said he was prepared to approve the Air Member of Training's proposals on the understanding that if it were not found administratively possible to implement the scheme fully, the A.M.T. would adjust the training periods so as to provide the necessary flow of aircrew.<sup>1</sup> It was further agreed that it would be necessary to watch closely whether reduced wastage of operational type aircraft might enable expansion to be accelerated, thus demanding an extended flow of aircrew. Steps were to be taken to ensure the additional production of aircraft and spares required, and the Ministry of Labour consulted regarding the additional personnel required. In view of the urgent need for more night flying training both in A.F.U.s and O.T.U.s, full advantage was to be taken of the existing lull in the enemy activity over Britain, to release the restrictions which had been imposed by Fighter Command.

It may thus be said that the first obstacle had been surmounted and the A.M.T. had received C.A.S.s qualified approval for the pre-O.T.U. portion of the 'New Deal', in spite of the greatly increased cost in terms of manpower and material that these involved.

#### **Further Measures to Improve O.T.U. Training**

The second conference held by the Chief of Air Staff was to consider the A.M.T.'s proposal for improvements in O.T.U. training.<sup>2</sup> These were not designed to make any material change in the organization of the O.T.U.s, other than the bomber type, in the United Kingdom. The discussions which had taken place showed that with the standard reached in basic training by pilots sent to bomber O.T.U.s, it had been impracticable to adhere to the syllabus and great difficulty had been experienced in bringing pilots to the standard required for bomber squadrons. The principal drawback had been the two-pilot policy which had the result that neither type of pilot was adequately trained and the squadron had an unfair training burden thrust upon them. In fact 40 per cent. of the squadrons' flying time was devoted to training. The proposals to increase O.T.U. training from 30 hours agreed in April 1941 to the 45 hours imposed in November 1941 by Bomber Command (although not officially sanctioned by the Air Ministry until February 1942) were designed to ease the situation under the old two-pilot scheme. Even so pilots were spending very lengthy periods in bomber O.T.U.s mainly on account of the difficulty in completing the required amount of night flying. A most difficult situation had in fact arisen and it was becoming increasingly hard to provide the necessary O.T.U. facilities. The proposal therefore to dispense with the second pilot came at the right time for it solved the problem of dealing with numbers, and it allowed a greater number of hours (20) to be devoted to training the bomber pilots up to the enhanced standard which was becoming ever more necessary.

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<sup>1</sup> C.A.S. 782, 11 Feb. 1942.

<sup>2</sup> C.A.S. 782, 12 Feb. 1942.

Firstly the conference was asked to decide whether the O.T.U. courses should aim at providing crews fit to undertake operations immediately or just after posting to squadrons. It was explained that the bomber squadrons had been unable to give trained second pilots additional flying training to bring them up to the standard of first pilots and this had led to difficulties in strengthening the squadrons. If the requirements of expansion and wastage were to be met all pilots posted to squadrons as second pilots had to become first pilots within three months of joining the squadron. In this connection the C.A.S. enquired whether crews trained as crews were ever sent on operations straight from an O.T.U., and if so whether the practice was a success. He was informed that this was normally done in the case of the one-pilot Blenheim and Hampden bombers and had been quite successful. The Bomber Command representative said that one of the main difficulties was that squadrons had an establishment of 40 pilots against an establishment of 16 aircraft and owing to the weather, low wastage and other causes, it was not possible to train adequately in the squadrons crews from the short O.T.U. course. Every effort was being made to do so and 40 per cent. of the total squadron flying time was being devoted to training. He considered it essential that aircrews should be operationally fit on arrival in squadrons from the O.T.U.s. There was general agreement that O.T.U. courses should aim at producing crews fit to undertake operations immediately on posting to squadrons or with a very limited number of sorties under an experienced captain.

#### **Introduction of the One-Pilot Policy for all Bomber Aircraft**

In considering the desirability of reducing the number of pilots in each medium and heavy bomber crew to one, and the simplification of training which would result, it was considered that this should not be allowed to outweigh the aim of operational efficiency. The achievement of this aim was to be found in improving crew organization and training rather than in reduction of the size of the crew, unless this reduction resulted at the same time in better organized and more efficient crews. In this connection it had been represented that the presence of a second pilot was more an embarrassment to the first pilot than an assistance. He felt the responsibility of allowing the second pilot to undertake a proportion of the flying which he himself could carry out more efficiently. There were four reasons under which arguments might be advanced for the inclusion of a second pilot:

- (a) Fatigue during flying.
- (b) A precaution against one pilot becoming a casualty.
- (c) To allow one of the pilots to act as Captain of aircraft and to supervise and co-ordinate the work of other members of the aircrew.
- (d) In certain types of aircraft a second pilot might be required to assist the first pilot with the controls where such assistance could not be undertaken by a Flight Engineer.

On the other hand, it was stated that one-pilot crews were accepted for Hampden and Hudson aircraft, and that although these aircraft had ranges comparable with other medium bombers, operations had been carried out with success and without undue fatigue of the pilot, provided that they were

kept in a physically fit condition. There was no evidence that there had been failure in the German Air Force due to crews of such aircraft as the Ju.88's, Heinkel 111's and Dornier 217's being composed of one pilot only.<sup>1</sup>

Bomber Command had come to the conclusion that it was wrong to train a pilot to fly and then to use him as a second pilot with little hope of giving him the necessary experience to qualify as first pilot. The large number of pilots in squadrons with two-pilot crews made it extremely difficult to arrange flying training practices for all the pilots. The opportunities for going on operational sorties during the winter months were limited, and in aircraft which were not fitted with adequate dual control, the first pilot was reluctant to allow the second pilot to fly the aircraft. The result of all this was that the skill of the second pilots deteriorated. It was suggested by Bomber Command, however, that if the establishment of pilots were cut from 40 to 20 plus an extra six to be used on flights of extreme range and to allow new pilots to be initiated, it would be possible for the new pilots to be sent on their first few sorties with the best type of captain and they would soon be capable of becoming first pilots. It was essential that all pilots selected for medium and heavy bombers should be fit for training as captains. The C.A.S. considered that the proposal would be well justified if it produced one well trained pilot instead of two badly trained pilots. On broad operational grounds he saw no objection to changing to a one-pilot basis for Wellingtons and Whitley aircraft. On the question as to whether a second pilot should be retained on the four engined bombers, Bomber Command were of the opinion that he should be, but the C.A.S. was not convinced of the need for a second pilot for those types of aircraft and felt that to be consistent one system should be maintained, otherwise the same difficulty would continue in training second pilots to become first pilots.

The impracticability of the two-pilot policy can be understood from the fact that, working back from the operational training stage to basic training, a total output of over 4,500 pilots per month would have been necessary if the two-pilot crew in medium and heavy bomber squadrons was maintained. Whereas on the one-pilot basis the total output of pilots required was about 3,500 per month and this could very nearly be met by the S.F.T.S.s already planned. A further argument against the two-pilot basis was that its fulfilment was beyond the capacity of the aircraft industry whilst even the one-pilot basis meant that requirements were still in excess of probable supplies.

#### **Revised Syllabus for Bomber O.T.U.s**

Following the one-pilot proposal came the question of the amount of hours which could be given at the O.T.U. At that time on the medium bomber O.T.U. course both first and second pilots were being given 45 hours each, a total of 90 hours. In addition the A.M.T. had recommended to the A.M.S.O. that he should plan the heavy bomber O.T.U.s (conversion flights and units) on a basis which allowed 55 hours at the controls of the medium bomber for each pilot, and 20 hours at the controls of the heavy bomber for each pilot. Bomber Command had recommended 70 hours at

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<sup>1</sup> A.M. File S.77400.

the controls for the first pilot and 20 hours for the second, while for heavy bomber training this period on medium bombers should be followed by 20 to 30 on the heavy bomber for the first pilot only. The Command further recommended that if the one pilot crew were accepted, the pilot should be given 90 hours at the controls of the medium bomber type, and 20 to 30 hours for the heavy bombers. In short, what Bomber Command wished to do was to devote the training hours saved by abolishing the second pilot to the further improvement of O.T.U. training. The A.M.S.O., however, was concerned at the increasing proportion of operational aircraft required for O.T.U. training as the aircraft could only be supplied at the expense of the fighting element. On the assumption of 90 hours O.T.U. training for two pilot crews some 50 per cent. of the operational aircraft would be devoted to O.T.U. training. It was also not going to be easy to find aircraft, airfields and the personnel required for the additional number of O.T.U.s demanded. From the A.M.S.O.s point of view, it was important that he should be able to work on a forward plan, if only on a short term one. The immediate and pressing problem was to provide O.T.U.s on the basis of 45 hours per pilot at the controls in Whitley and Wellington squadrons, for which only provisional approval had so far been given.

The result of these considerations was that the conference agreed, pending general consideration of the one pilot proposal, that planning for O.T.U.s should be based on the following times:—

- (a) For medium bomber O.T.U.s both first and second pilots would receive 45 hours at the controls.
- (b) For heavy bomber O.T.U.s both first and second pilots would receive 55 hours at the controls of the medium bomber and 20 hours on the heavy bombers.

A final point which emphasized the nature of the training scheme was brought out in a suggestion that in view of the possibility of the introduction of the one pilot scheme, it might be advisable to reduce the flow at the initial training wings stage immediately. The A.M.T. successfully opposed this suggestion on the ground that it would not be wise to do this before the new policy had been decided. The flow which was then entering the I.T.W. would not reach the squadrons until well on into 1943 and it could not be foreseen what the aircraft production situation would be at that time. It was possible that every available pilot would then be required.

#### **Summary of Developments in O.T.U. Policy**

Generally speaking, the result of the C.A.S.'s two training meetings on 11 and 12 February 1942, was that the A.M.T.'s pre-O.T.U. training measures were agreed to the extent that they proved administratively possible. So far as the O.T.U. measures were concerned, a decision was held up pending further examination of the proposal to eliminate the second pilots. The lengthening of the O.T.U. courses and the heavy conversion flights and units was agreed as an interim decision to allow planning to proceed. The consequences of this policy were by now becoming apparent. So far as pure flying was concerned it meant that twice the pilot training capacity

was necessary to produce the crew for one bomber. At the O.T.U. stage very limited capacity was taken up with trying to train both first and second pilots to a reasonable standard. Now, with the new proposals for greatly increased length of courses the position was becoming intolerable at the O.T.U. stage. The result of these facts was that the Air Ministry and Bomber Command were giving serious thought to the proposal for eliminating the second pilot in bomber aircraft.<sup>1</sup> It was found that this proposal had an important bearing on the number of advanced trainer aircraft which would be required. On the two-pilot basis the requirement was for 6,000 as against 3,800 on the one-pilot basis. This was only one of the repercussions. The C.-in-C., Bomber Command was clearly reluctant to introduce the one-pilot scheme and had made provisos which could not be met and his opposition had to be broken down, as it was clear that the new standard of training could only be maintained by adopting the one-pilot scheme. There was a danger however that, if the Air Ministry planned on a one-pilot basis, in the event of any setback there would be no margin left to maintain the improved standards of training. It was only by the margin of capacity which the one-pilot scheme would create that it could be hoped to hold the proposed new pre-O.T.U. training standards without incurring an aircrew deficiency within a year. Without this margin it would not have been possible to meet a shortage of A.O.S. and O.T.U. capacity in North America by converting S.F.T.S.s. A further point was that a decision to adopt the one-pilot scheme would be practically irrevocable since it would take up to three years to go back to training on a two-pilot basis. A further consideration was the effect of this new policy on the supply of instructors. It was pointed out that whereas under the proposals, there would be fewer tour expired pilots available from the operational squadrons; on the other hand, the requirements in the O.T.U. would also be less. It was hoped that the establishment of instructors per O.T.U. would fall from a figure of a little over 70 to a little under 50, of whom only 30 need to be operational pilots.

#### **Review of World-wide O.T.U. requirements and locations**

During the middle of February 1942 the Air Member for Supply and Organization undertook to review the world-wide requirements of O.T.U.s during the period when training policy was undergoing a most significant change.<sup>2</sup> The review also came at a time when there had occurred a tremendous extension of the war with the entry of Japan against the Allies. The definite limits to conveying in ships aircraft and personnel (particularly to India and the Far East) turned this review into a statement of an aim for those localities—an aim which was not attained. The factors which governed the location of O.T.U.s for any theatre of operations were the source and supply of aircraft and crews, the desirability of placing such training units within the area controlled and directed by the Commander-in-Chief of the force in which they would operate, and the potential use of the operational types and crews, both screened and under training, as reserves in certain contingencies.

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<sup>1</sup> A.C. Con. 4 (42).

<sup>2</sup> E.R.P. 169.

Pending the decision on the two-pilot policy the estimate of the number of O.T.U.s required was very large and amounted to something in the order of 66½ O.T.U.s in place of the 37½ which were in existence at that time to meet the commitments of the Metropolitan Air Force and to supply Bomber and Coastal crews for overseas (mainly the Middle East). All told, some 84 O.T.U.s were considered to be ultimately necessary, and there was a strong move to locate operational training units in Canada and the U.S.A. largely because of this commitment.

A review of the operational training organization outside the United Kingdom showed that the Middle East was being reinforced largely by O.T.U. outputs from the United Kingdom and only day fighter, light bomber and Army Co-operation crews were being trained locally at five O.T.U.s, none of which were working to full capacity. India, Australia, New Zealand, and the Far East were considered as being one theatre as the problem of aircraft and aircrew supply, flight delivery, and shipping were, to a large extent, common to all these theatres. In all, six O.T.U.s were required to support that theatre: one long-range fighter, one general reconnaissance, two fighter, and two light bomber O.T.U.s. One fighter and one bomber O.T.U. should be located in India, and the remainder in Australia unless the Pacific shipping facilities became inadequate in which case all except the general reconnaissance O.T.U. would have to be located in India.

Canadian requirements could be met from the proposed North American resources in all classes except fighter and army co-operation. It was considered that special arrangements would presumably be made by the Canadian Government in regard to these last two categories.

Several types of O.T.U. were becoming increasingly out of phase with the expansion programme. This had been aggravated by requirements of policy, particularly the increase for all aircraft and crews to the Middle and Far East which had to be met without time being allowed for the O.T.U. backing to be adjusted. The capacity of every type of O.T.U., with the exception of Coastal Command Hudson and Beaufighter O.T.U.s, was insufficient to meet even the existing demand, and the position would grow steadily worse as the front line expanded.<sup>1</sup> It was essential that O.T.U. capacity should be developed in anticipation of, instead of in response to, front line demands. It had to be realised that no return was gained from a heavy bomber O.T.U., for example, until approximately four months after its opening date. Two to four weeks were required for the instructors to convert to the types and for the O.T.U. to settle down before pupils were received. The O.T.U. course for heavy bomber training extended to approximately three months in the summer. At that time only two new bomber O.T.U.s were due to open, and it was also practically certain that the heavy and medium bomber O.T.U.s required to match the United States production would be well in arrear of the date required and that aircraft would, for a time, be coming forward without crews to fly them. In general it could be said that crews were being sent overseas and planning was taking place to expand at home faster than existing O.T.U. backing could stand. O.T.U.s were not being formed properly in advance of crew requirements

<sup>1</sup> E.R.P. 170.

and the situation was that the Air Forces were living on capital and tending to train crews in squadrons while at the same time partially trained crews were piling up at Bournemouth waiting to go into the O.T.U.s. It was therefore urgent that the O.T.U. position should be restored so as to be in phase with the other elements of expansion. Delay in restoring the position threatened to create later a sudden big expansion of O.T.U.s which would throw an impossible burden on the squadrons through having to provide the O.T.U. instructors.

## CHAPTER 12

### THE AMPLIFICATION OF TRAINING PLANS TO MEET FURTHER EXPANSION

Whilst discussions and planning were proceeding on the problems of Bomber Command and operational training two important events occurred in the latter part of January 1942. The first was the issue of a new expansion programme and the second, the Aircrew Training Conference.<sup>1</sup>

The new expansion scheme was known as Target Force 'F' and was based on the one issued in May 1941. It reflected the changed position regarding supply of aircraft from America and showed that the target for the bomber force was little more than that which could be provided from British bomber production alone. The total target was only slightly less than the previous one. The main feature of the scheme was that the margin created by the saving in heavy bomber production was utilized in expanding other arms of the force—notably the Tactical Air Force, general reconnaissance and transport squadrons. Shortly after this scheme had been produced and circulated for domestic planning, the Air Ministry received the revised forecasts of British and American deliveries. In spite of disappointment in the short fall from America, it was decided not to alter the basis of planning but to proceed as originally intended. The latest Target Force was so designed that the maximum flexibility of the air forces was secured by maintaining a strategic reserve, nominally shown against the Metropolitan Air Force and other Commands, but which, in fact, could be moved about as exigencies dictated. Furthermore, the Air Ministry had taken a conservative view of their hopes from aircraft production, particularly American production, based on the Arnold/Portal Agreement. It is important to note that in this connection the Government were making strong efforts through the R.A.F. Delegation in Washington and the British Air Commission to impress on the United States authorities the need for ensuring adequate production of trainer aircraft to match the production of combat aircraft a year ahead. The allocations of trainer aircraft in 1942 thus normally governed the allocations of combat aircraft in 1943. The main implication of uncertainty as to the allocation of American combat aircraft in 1943 was that of personnel and training. Until the Air Ministry knew what would be the share of American aircraft in 1943, they could not assess accurately the number of personnel who would be required, nor could they be certain as to the size of the training organization which they had to build up and maintain. There were other implications, such as the production of bombs, aviation fuel, aircraft equipment, and airfields, but these were minor compared with planning a co-ordinated training effort.

In examining the new Target Force it was made clear that the intention was that, if early in 1943 it were decided that the heavy bomber operational front line could be stepped up rapidly, it could be accomplished by stopping O.T.U. expansion and diverting to operational squadrons. It was thought that by that time there would probably be in existence sufficient O.T.U.

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<sup>1</sup> C.W.E./E./35, 31 Jan. 1942.

facilities to maintain a force slightly larger than the interim target of 2,400 bombers. If such a decision were taken, no further O.T.U.s would be opened and the force would be stepped up as rapidly as possible to the maximum which could thus be maintained. This would automatically postpone further expansion to the ultimate target of 4,000 bombers until such time as the preliminary O.T.U. expansion could be resumed. Target Force 'F' excluded the home defence requirements of Canada, Australia, and New Zealand. All the figures therefore related to requirements for forces in British spheres of strategic responsibility (including South Africa). The target date for completion was 1 September 1943, except for 100 heavy bomber squadrons (at 16 I.E.) to be completed between that date and 31 December 1944.

#### Training Organization to support Target Force 'F'

To support Target Force 'F', the training organization envisaged was to be considerably expanded owing to the 'New Deal' proposals and because the main item of bomber expansion still required allowance to be made for two pilots per aircraft. Thus, owing to the particular difficulties which attended bomber expansion, the programme was in two parts, the first exclusive of bomber requirements (a) and the second including them (b). The picture of monthly requirements was thus:—

	(a) (Excl. Bomber)	(b) (Incl. Bomber)
Pilots (ex-S.F.T.S.) ... ..	2,500	3,100
Navigators and Observers ... ..	1,600	2,100
Air Bombers ... ..	800	1,250
Air Gunners and W.Ops./A.G. ... ..	3,100	4,450
Flight Engineers ... ..	750	1,200
Total per month ... ..	8,750	12,100

To meet these requirements there were to be 39 S.F.T.S.s against a theoretical requirement of 58 (all for bomber) by the end of 1942. In 1943 four more S.F.T.S.s were due to open in Canada bringing the total firm assets up to 43, leaving a deficiency 15 S.F.T.S.s. This gap was more than bridged by expectations from the equivalent of 11 schools in the United States and the exportable surplus from eight schools in Australia and the equivalent of two in New Zealand.

#### The Aircrew Training Conference

The second important training event which took place in January and February 1942 was the Aircrew Training Conference. Delegates from all the overseas training theatres except Rhodesia (the A.O.C. of the Rhodesian Group had discussed training plans with the Air Ministry but had been compelled to return to Southern Rhodesia before the conference assembled), together with representatives from the Admiralty, and observers from the United States attended. This was an opportune moment because the early concentration of pure training in Britain had by that time been successfully transferred overseas where the various schemes had reached or were reaching full size. This transfer, in addition to the continuous process of development, had given rise to a number of problems. Also it was necessary to prepare for the new types of aircraft and equipment appearing in the service and to

consider what additional training was necessary to make the most effective use of that equipment. Finally it was apparent that in the future, aircrews would require increased training and experience before proceeding to their operational squadrons and the time had come to revise the syllabus of instruction. Discussions on the 'New Deal' were then in full progress, so an opportunity for a wide discussion and interchange of views and experience was made possible at the most appropriate time. The opportunity was also presented to the British Government and to the Air Ministry to pay tribute to the work of the Dominions and to the U.S.A. for their invaluable help and to re-state the vital importance of training to the war effort.

It was natural that the Air Member for Training should first outline his new proposals for improved training, whose object it was to attempt to provide a pilot with 300 hours total flying experience (350 in the case of heavy bomber pilots) before joining his squadron. Since much of the burden of this was to fall on overseas training, the A.M.T. expressed the hope that the Canadian S.F.T.S.s could achieve 150 hours on a 16 weeks course, but in any case he hoped that all pilots trained overseas would get 200 hours as a minimum. (Elementary 70 hours, advanced 120 to 150 hours.) It must be remembered that an important proportion of the overseas training output was destined for the bomber squadrons, and it was plain that much of the O.T.U. improvement and bomber expansion depended upon whether the overseas schools could increase their pupil populations to provide the greater flow required. This was, of course, prior to the decision to have only one bomber pilot in the crew, but even so, the 'New Deal' itself, apart from numerical considerations postulated an enhanced effort in order to raise the quality of instruction. The effort involved in raising the hours of basic instruction from 122 to 200 at least was of itself a formidable task and demanded a far greater output from existing resources. That this was possible was proved by the Little Rissington experiment and the overseas training Commands had to be induced to conform to the new trend. It was also necessary to give Dominions representatives some explanation of the new advanced flying unit stage for overseas trainees which had been introduced, and to show the need for 'Grading'.

The 'New Deal' arrangements were agreed by the Conferences as detailed proposals for the improvement of training generally. Since much of what was discussed came at an important moment in training history it is advisable briefly to survey some of the outstanding decisions which were made.

#### **Revision of Instructional Methods : Formation of an Empire Central Flying School**

Firstly it is apparent from the report of the Conference<sup>1</sup> that owing to the fact that the bulk of elementary and advanced training was done overseas, there was a very strong need to arrange a link between operational units and the training organization. If this were not done there was a danger that owing to the wide dispersion of training, local methods might be introduced which, though unobjectionable on trainer types of aircraft, were unsuitable for the faster and heavier operational types. For this reason the proposal was put forward to form an Empire Central Flying School, and agreed by all concerned.

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<sup>1</sup> S.D. 349.

The course was designed to ensure that pilots destined for the staffs of the flying instructors schools throughout the Empire had themselves flown the latest operational types and discussed the latest developments in operational flying technique. This ensured that flying should be taught in a uniform manner and against a common background of knowledge. As a further insurance against the growth of local practices in the method of handling aircraft, it was agreed to recommend that the establishment of flying instructors schools should be increased to permit of regular visits being paid by members of the staff to all elementary and service flying training schools and advanced flying units, with the object of ensuring that only approved methods were taught. Thus the machinery was set up to control and guide instructional technique along the soundest and most practical lines on a world-wide basis. The Empire Central Flying School represented another stage in the extension of a system; originating in the Smith-Barry School at Gosport, and developing through the Central Flying School, which was to ensure the perpetuation of the doctrine of sound basic skill in pure aviation now to be allied to the latest technical and operational developments in applied flying.

From the immediate and practical point of view, one of the most satisfactory aspects of the re-organization of training was the effort which was made, of which the Empire C.F.S. was an outstanding example, to improve the standard of instruction. One of the most unsatisfactory aspects of the dual expansion of the first line and the training organization had been the dilution of experienced instructors with S.F.T.S. pupils. In addition, the most suitable instructor material, i.e. those who had completed an operational tour, were not available in any numbers because the expanding operational training organization needed them. Thus the pure flying training was robbed of an element which would have been of great value, and the keenest and best of the product of the pure flying training was being absorbed before the operational stage. To remedy or at least to alleviate the disappointment to those concerned, it was decided to lay down a tour for instructors, which amounted to between 12 and 18 months, after which they could go forward to operational work. It was also recommended that flying instructor capacity should be established on this basis so as to enable the turnover of instructors to begin as soon as possible. Eventually it was intended that all instructors would be found from suitable pilots who had completed an operational tour, but for the time being it was necessary, in order to achieve the turnover, to withdraw from 12 to 15 per cent. of the output of every S.F.T.S. course as instructors. Those not required by the overseas schools were needed to staff the new A.F.U. organization in Britain. Finally, in order to provide an incentive to instructors to improve their efficiency, it was agreed to recommend that the system of Central Flying School categories should be re-introduced in countries where the practice had been discontinued on the outbreak of war. Passing on from consideration of the instructor problem, the conference considered the standard war syllabus for pilot training, and as a result it was revised, and measures to ensure that it was completed were laid down. In the main the trend of improvement was in more thorough ground instruction and emphasis on more night flying and precision flying.<sup>1</sup>

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<sup>1</sup> S.D. 349, Appendix, Section IV p. 31 et seq. and A.P. 1388.

### **Selection and Specialization of Pupils**

The next problem was the selection of pilots for the types of aircraft for which they were best suited. There were three points for consideration: firstly, how early in training could the characteristics of pilots be assessed; secondly, assuming that selection were made at that stage, how much were the pilots to be told; and thirdly, what degree of specialization could be achieved in their subsequent training before they reached the O.T.U. On the first problem concerning early methods of selection, it appeared that the only satisfactory method at that time was some form of practical flying test, such as had been carried out by the grading schools. Experience in Britain had not encouraged the view that flying characteristics could be distinguished with sufficient certainty at the pre-flying stage, and further research was needed before this form of testing could be accepted. Selection at the F.T.S. stage depended upon the ability of the instructor to detect the special characteristics which distinguished the bomber and fighter pilot. It was agreed that there were doubts on this point, but it was conceded that it might, with guidance, be possible to make a broad classification at that stage. On the subject of what the trainees should be told concerning their future, it was considered essential that cadets should receive an accurate account of the methods by which they would be selected for the type of aircraft they would fly, both during training and subsequently on operations. Impressions which cadets gained during their training were sometimes regarded by them as promises, which led to disappointment when it was later found that they could not be fulfilled. This matter was considered of sufficient importance to justify special instructions being drawn up and issued to the chief instructors at E.F.T.S.s.

The third point, that of the degree of pre-O.T.U. specialization, was complicated by the fact that the ratio of 'twin-engined' to 'single-engined' pilots required was rising. At that time (January 1942), it was three to one, rising to four to one by the end of the year. Unfortunately the production of advanced trainer aircraft was such that the S.F.T.S.s were established in the proportion of roughly two twin-engined to one single-engined, and a proportion of pilots destined for twin- or multi-engined aircraft had to carry out the whole of their basic flying training on single-engined types. The task, therefore, was to re-allocate the existing resources so as to ensure that pilots should reach the operational theatre having received the final stage of their training in approximately the right proportions by types and to the correct syllabuses. It was realised that there were administrative difficulties which might prevent this, but it was agreed that the principle to be followed was that cadets should as far as possible be trained not only for the type of work for which they were most suited, but also in the proportion needed by the operational force. The conference took note that the problem arose, not from any training consideration necessitating the use of both single- and twin-engined aircraft in training, but because both types of advanced trainers were in production. Also, while the single-engined type in its existing form did not fully meet navigational requirements, the twin-engined type was not up to aerobatic specification.

Thus, it is clear that the neglect in providing an advanced trainer in harmony with modern trends and in sufficient quantities was a serious handicap to training. At that time the provision of a standard twin-engined trainer which was fully aerobatic would have solved the problem of early selection and specialization.

The last important matter to be discussed in relation to pilot training was the question of the more efficient use of existing facilities in the S.F.T.S.s. The Little Rissington experiment undertaken in the summer of 1941 was intended to explore the possibility of a considerable increase in the pupil population of the standard S.F.T.S. having two relief landing grounds. It had proved that by spreading the flying programme over 24 hours and by relating it to the available maintenance organization, more flying hours per aircraft were attainable. This, together with better methods of organization proved that it was possible to do 10,000 hours flying a month in fine weather with the standard establishment of 108 aircraft providing adequate spares were available. (Shortage of spares had resulted in the permanent grounding of the equivalent of 15 aircraft.) After a visit to Little Rissington and after discussions there, the conference agreed with these conclusions.

The above discussions concerning the training of pilots, indicate the progress of consolidation of training expansion which was so necessary after the over-rapid and somewhat *ad hoc* measures which had had to be taken. There seems to be no record of any major divergencies from a uniform doctrine of training, and but minor differences in method. The whole overseas training plan had been implemented, and at that time it was necessary only to make minor adjustments to a vast, complex, but well-built, organization.

#### **Revised Observer Syllabus: Navigator and Air Bomber Categories Introduced**

The aspect of the training of the other members of the aircrew also came at a time when important changes in crew composition were being brought about by the progress in re-arming with improved types of aircraft. The most important of these changes was the fact that the observer was being over-loaded with work. Already modern progress had divorced piloting from the other aircrew functions. Now the importance of fast and accurate navigation was growing with the increasing performance and range of the later types coming into service. The time was at hand when the observer or navigator could no longer combine his work with the actual aiming of the bombs. At that time (January 1942), however, dissatisfaction with the standard of navigation and of bomb aiming resulted in efforts to improve the training of the one individual responsible for both. Already steps had been taken in the United Kingdom to improve the standard of training by arranging for observer pupils to undergo a six weeks elementary ground navigation course between the I.T.W. and A.O.S., and an Elementary Air Observer School was opened at Eastbourne in October 1941 with a capacity of 2,000 pupils. The introduction of this additional stage also had the advantage of allowing the A.O.S.s to concentrate on the flying side of training. The principal change from the previous syllabus was in the direction of welding together all aspects of navigation so as to ensure that they were taught concurrently. Thus it was agreed that the time necessary to train

an observer to a satisfactory standard of efficiency would be approximately 36 weeks, which it was suggested might be made up as follows: ---

Initial Training Wing ... ..	12 weeks
Elementary Air Observer School ...	6 weeks
Air Observer School (Navigation, Bombing and Gunnery) ... ..	18 weeks

It must be realised that the plan was to rely on overseas training resources for basic navigation training, and the Conference agreed in January 1942 to provide elementary air observer schools in the various training theatres as an additional step to improve the ground training of the observer pupils. This was all part of the 'New Deal' proposals which not only envisaged improvements in observer training by increasing the hours flown on the 18-week course from 98 to 130, but which also proposed to start a new step in the training sequence in the shape of observer A.F.U.s to replace the air observer schools whose functions were to be transferred overseas.

By this time, however, the observer function was becoming too much for one individual, and it was necessary to make both navigating and bomb aiming the separate responsibility of two individuals. The need was clearly recognised and accepted by all concerned, but the trouble was the usual one of organization and supply. The navigation and armament training of the observers had only recently in (mid-1941), been amalgamated with the object of raising the standard of training of the observer and of economy in resources. There was also the point that the observer course could not be appreciably shortened by the removal of bombing training from the syllabus. For this reason for some time there was resistance to splitting the observer role. Instead proposals were made to assist him on the last stages of the journey to the target by training one of the two wireless operators (air gunner) as a relief navigator to take his place when he was engaged on the run in to the target. With the new improved bomb sight (Mark XIV), bombing techniques and complicated fusing used, in addition to the need to man the front turret, the bomb aimer functions demanded personnel of the same character and education as the observers.<sup>1</sup>

Discussions at the C.A.S. meetings on 11 and 29 March 1942 revealed the steady progress of ideas towards the establishment of the bomb aimer function while at the same time a clear picture of the difficulties involved was presented.<sup>2</sup> The new observer syllabus called for a total of 130 hours flying, of which 18 hours were occupied in bombing and 12 in gunnery; navigation and combined exercises took up the remainder of the time. In order to separate this amalgamated training, the A.M.T. proposed to give the navigator 80 hours, of which 50 would be as first navigator, and the bomb aimer 50 hours of which 30 were to be on armament training and 20 on map reading. This represented a compromise which involved a lowering of standards of training.

However, by the middle of April 1942 the A.M.T. introduced to the Air Council the measure to have two new crew categories of navigator and bomb aimer. He explained that this involved the revision of the arrangement whereby air observers training had been amalgamated on a course of 18 weeks

<sup>1</sup> S. of S. Folder, Encl. 38A, A.H.B. 1D/7/2(a).

<sup>2</sup> A.M. File S.79362.

instead of 24 ; the proposal also involved an increase of one observer A.F.U. in 1942 and additional facilities in Canada in 1943. After some discussion on the name of the new aircrew category, it was decided to adopt the title of Air Bomber in preference to Bombardier which was already an Army rank. It was also subsequently decided that the status of the air bomber should be equal in all respects to the pilot and the navigator.<sup>1</sup>

#### **Training of Air Gunners**

During the course of 1941, the number of 'straight' air gunners required had increased considerably, while the total gunnery training capacity available had not kept pace with this demand. In September 1941 an experiment in using air observer school facilities for the training of air gunners had been started at Penrhos. A small number of wireless operators were given a nine weeks course covering air operating and air gunnery, and the results were successful both from the signals and gunnery aspects. The accommodation at air observer schools was, however, taxed almost to the limit by the number of observer pupils under training and there was little room for the wireless operators (air gunner). While Penrhos continued to produce a small flow into O.T.U.s, other air observer schools started similar training to produce wireless operators (air gunner) for their own staffs only and no permanent increase was obtained from the experiment. During the Conference it was strongly urged, mainly as a result of experience in the Middle East, that air gunners should be trained in the maintenance as well as in the use of their weapons. It was proposed that air gunners should be given technical training as armament tradesmen before going to air gunners schools. This proposal had in its favour the argument that men awaiting training as straight air gunners, of whom there were no less than 5,000 at that time, would be given useful employment instead of passing the time in demoralising idleness. There was, however, difficulty in finding room for them at the School of Technical Training and it was decided at the end of March 1942 to provide for maintenance instruction by a preliminary I.T.W. course (also called an Elementary Air Gunners School course) of 12 weeks duration.

#### **Revised Heavy Bomber Crew Policy : Wireless Operators and Flight Engineers**

Experience had shown that the second wireless operator (air gunner) was in practice seldom used for wireless duties. The tendency was for the better of the two to be used as wireless operator and for the other to become solely an air gunner, thereby causing his skill to degenerate and to waste his wireless training. The records contained very few instances of an aircraft being brought home with the help of the second wireless operator. Bomber Command therefore recommended that the establishment of this category of aircrew be reduced from 40 to 26 per squadron of 16 I.E. aircraft.<sup>2</sup> At the same time in relevant types an additional air gunner or bomb aimer would be necessary in order that the turret, which was at that time manned by the second wireless operator (the mid-upper), should continue to be manned.

Bomber Command also recommended that for four-engined heavy bombers a pilot's mate should be provided who would be trained in the duties of flight engineer and in those ancillary duties concerned with the manipulation of

<sup>1</sup> S. of S. Folder, Encls. 37A and 50A, A.H.B. ID/7/2(a).

<sup>2</sup> A.M. File S.77400/1, Encl. 50A.

such controls as the under-carriage, flaps and airscrew pitch levers, which at that time were performed by the second pilot. At the Air Ministry Meeting held on 11 March 1942, it was agreed:—

- (a) That in those aircraft in which a flight engineer was already carried he should be trained at the O.T.U. as a pilot's mate, and that an additional flight engineer would not be required.
- (b) That the pilot in Fortress and Warwick aircraft should be assisted by a member of the crew trained as a pilot's mate. It was not yet possible to say definitely which member of the crew this would be. This decision applied only to Fortress aircraft employed as bombers. G.R. Fortresses were to carry two pilots.
- (c) That no pre-O.T.U. training would be necessary for the pilot's mate.
- (d) That the flight engineer should be trained as an air gunner as a part time job as and when required.

By the end of March 1942, the long discussions on the revision of heavy bomber crew composition, which had been holding up the completion of discussions on training requirements generally, came to a satisfactory end. These proposals, as we have seen, were discussed at a conference held by the C.A.S. on 12 February 1942. This led to further consideration by the Air Officer Commanding-in-Chief, Bomber Command, followed by a meeting under the chairmanship of the Deputy C.A.S. on 11 March 1942. A further meeting held under the chairmanship of C.A.S. at which the Air Officer Commanding-in-Chief, Bomber Command, was present was held on 29 March 1942, and at this meeting general agreement was reached on future crew composition.

The main decisions were:—

- (a) That all medium and heavy bomber crews should have one pilot only.
- (b) That the functions of the observer in medium and heavy bomber squadrons should be divided between a navigator and a bomb aimer.
- (c) That the number of wireless operators (air gunner) in the bombers should be reduced from two to one per crew. A straight air gunner would be substituted to man the dorsal turret where applicable.
- (d) That a pilot's mate should be provided for each bomber aircraft. (The flight engineer would undertake this task where the crew included this type of aircrew member.) In the event of the pilot being unable to fly the plane his task would be to fly the aircraft back over friendly territory by use of the automatic pilot, and thereafter the crew would normally bale out.

#### **Central Gunnery School Development**

In conformity with the trend at that time, at the beginning of 1942 the Central Gunnery School was expanded by adding a Fighter Wing for training pilot gunnery instructors who were to have duties in Fighter Command analogous to those of Gunnery Leaders in Bomber and Coastal Commands. The existing organization for training gunnery leaders became the Bomber Wing and the two wings worked together in air exercises. These changes

came into effect when the C.G.S. moved to Sutton Bridge in March 1942. As with other forms of training, one of the main difficulties with regard to the training of gunnery leaders was the difficulty in obtaining enough pupils with operational experience, with the result that a number of commissioned air gunners were sent direct to the Central Gunnery School after their basic training. Armament training overseas was subject to the same handicaps and shortcomings as in the United Kingdom. Attack aircraft and target-towers were very scarce, while instructors with first-hand experience of air fighting were practically non-existent. There was also difficulty in obtaining equipment.

### **Initial Training Considerations**

From the above outline of the main developments in the training of aircrews it can be seen that there was a marked tendency to increase the quality of training by preliminary ground instruction as well as by increasing flying instruction. In one form or another, each category of aircrew training had a bottleneck in the applied flying stages. This, as has already been demonstrated, caused an accumulation of trainees waiting their turn to pass through those stages. Thus, the tendency to improve training by preliminary ground instruction and to keep the trainees occupied can be easily understood. The overseas initial training organization underwent much the same development as in Britain. The period of training lengthened from four to eight weeks, though there were variations for different types of aircrew. Initial training was done, as a rule, in the country of recruitment but pupils from Britain or Australia trained in Rhodesia were given an I.T.W. course (after early 1941) in Rhodesia. Pupils destined for the 'Arnold' Schools in America went through a pre-flight course at Montgomery, Alabama, in addition to the I.T.W. in Britain. Canada had a preliminary Manning Depot stage which corresponded roughly to the Air Crew Reception Centre and made considerable use of the initial training period to select men for training according to their aptitude.

The 'New Deal' re-organization increased the periods of initial training for pilots and observers from eight weeks to twelve, and for 'straight' air gunners eight weeks were laid down. In addition both observers and air gunners underwent elementary air observer and gunnery school stages respectively. These plans were endorsed by the recommendation of the Air Crew Training Conference. This account of the more important matters which were discussed by the Conference has thus given an opportunity to review a large part of the training field. The report reveals how large was the measure of agreement and co-ordination of effort which had been achieved and it was most useful for further improvement and liaison at an important time. Speeches made at the time by the C.A.S. and A.M.T. showed clearly how concerned was the Air Ministry to concentrate on quality.

## THE SITUATION FOLLOWING THE INTRODUCTION OF THE 'NEW DEAL'

The new system for training brought into force following the 'New Deal' discussions remained broadly the same until the end of the war. Although not ideal it did effect a compromise between the prohibitive demands of the ideal and the waste of a too hastily trained first line. There was only a small margin for the needs of first-line expansion after wastage and training requirements had been met. In fact both these factors needed careful balancing if there was to be anything left for the equipment of operational squadrons. The recent great technical advances and the progress of the war had created a paradoxical situation in that the cost of manpower and material had increased for a diminished first line.<sup>1</sup> Notwithstanding these facts, the Air Council supported the 'New Deal' measures and were prepared to face the manpower and financial battles which inevitably ensued. In their view the re-organization went a long way towards adjusting the balance between numbers and quality in the training output, although it must be realised that the effect of these changes would not be felt for at least a year. The abolition of two pilots from bomber aircraft had, theoretically, halved the pilot training requirements but this saving was immediately taken up by the extended courses: it was only the margin which was made available by this step which enabled the 'New Deal' to go through at all. There were at the same time many adjustments which had to be made, and inconveniences to be suffered, as well as the added numbers of schools and aircraft required, before the sudden measures necessary to implement the new reforms could show effects in the minimum time.<sup>2</sup>

### Effect of the 'New Deal' on Pilot Output

The first effects were, somewhat naturally, felt in the flow of personnel. The switch over in the bomber O.T.U.s from 45 hours' to 80 hours' instruction for each pilot resulted in an interruption in the flow of trained crews to the bomber squadrons, while at the same time the flow into the O.T.U.s was held up and caused a block which was felt right back in the S.F.T.S.s whose course lengths were increased to hold back their output for a period of about eight weeks. The immediate effect was that for the six weeks ending 9 May 1942 the flow of pilots into the O.T.U.s averaged just 51½ a week as compared with 190 in the week ending 22 November 1941.<sup>3</sup> The extension in flying hours resulted in the crews already at O.T.U.s remaining for a further period of three to four weeks. This caused a four-week hold-up which was increased by the abolition of the second pilot for another period of four weeks while the pupils at second pilot standard were brought up to first pilot standard. The reduction of surplus crews in O.T.U.s which had built up prior to April 1942 was carried out during April and May and by the middle of June the O.T.U.s were reasonably near the established population figure.

<sup>1</sup> A.C. 27 (42).

<sup>2</sup> A.C. Con. 7 (42).

<sup>3</sup> S. of S. M. 3869, 5 June 1942.

The main congestion was in the reception centre at Bournemouth and on the deferred service list of those awaiting to enter the service. Twenty thousand of the potential pilots on this list were held up longer than was anticipated, although 3,400 were called up immediately. This interruption in the flow of pupil pilots did not last long, however, because the excellent weather in the summer of 1942 enabled the O.T.U.s to achieve the additional flying hours required in considerably less time than anticipated. The first output of single pilot crews trained to the new 80 hours' syllabus had, by the middle of May 1942 already been passed into Bomber Command and thereafter there were reasonable prospects that the flow outwards would proceed according to plan. Some adjustment was necessary, however, in the case of the six additional pilots per squadron, who were established to allow a margin for second pilot operational experience and for incidental non-effectiveness.

In general the squadrons suffered initially from a large measure of dilution with new pilots. This was not considered to be a limiting factor in expansion since it had been decided that five experienced pilots were enough for a squadron on forming and that the number of staff pilots in each O.T.U. could be reduced to 45, of whom only 30 were required to be operationally experienced. On that basis expansion as well as the formation of two new O.T.U.s a month could take place. The difficulties which were being suffered by Bomber Command in expanding the number of their squadrons also helped at that time, thus the strength of pilots in that Command compared with establishment was fairly satisfactory, there being only a small deficiency (about 100) at the end of March 1942.

The fighter O.T.U.s were in a somewhat different position, having effected only the pre-O.T.U. aspects of the 'New Deal', which, it will be remembered had concentrated on the bomber O.T.U. problem. In June 1942 there were eight fighter O.T.U.s which took in courses every eight weeks. During the winter of 1941-42 these O.T.U.s were suffering from over-population owing to a restriction in outward flow caused by the weather, a restriction which was not removed until an improvement occurred in April. By June 1942 the fighter O.T.U.s were taking in courses regularly according to programme, except that the night fighter O.T.U.s were slightly effected by lack of operational aircraft. This planned intake was slightly lower than that of the autumn of 1941 owing to the results of the improvements arising from the introduction of the 'New Deal'.

#### **Output of Non-Pilot Aircrew**

It may be seen so far, that the effect of the 'New Deal' on the pilot position was a great basic improvement, and a reasonable solution to the bomber O.T.U. impasse which was threatening the whole development of the bomber offensive. The position with regard to the other members of the aircrew was not immediately so satisfactory. There were difficulties caused by the splitting of the observer functions, since there were no trained bomb aimers immediately available. Recourse had to be made to measures of improvisation, and the method used was to employ the wireless operators who had been made surplus on the abolition of the second wireless operator (air gunner). The use of these personnel filled the gap while nominal rolls

were compiled and information gathered from the squadrons. This information was not available until June 1942. In the meantime, by mid-May arrangements were in hand to start a flow of potential air bombers to air observer schools for training, the first intake being provided from personnel who had been graded in the E.F.T.S.s. There was some reluctance on the part of observers to become bomb aimers and their selection was left to the O.T.U.s. In general the shortage of bomb aimers was overcome by shortening the observer A.F.U. courses and by taking pupils off their training very early in the course. At the end of 1942 the position was such that they had to be fed into O.T.U.s direct from the P.R.C., and it was not until February 1943 that the first basically trained bomb aimers began to be available. However, by May 1943 the position was satisfactory.

The reduction to one wireless operator (air gunner) caused embarrassment because it approximately doubled the former period of nine months training on the ground. On the other hand the production of 'straight' air gunners was accelerated with little difficulty and many pupils awaiting entry into other aircrew courses volunteered for training as air gunners because of the short training syllabus.

#### **Advanced Flying Units**

As already indicated, the 'New Deal' had many repercussions on the planning and organization of schools. The new feature, the 'Advanced Flying Unit', was part of the price which had to be paid as a result of the transfer of the majority of the pre-O.T.U. training out of the United Kingdom. Personnel trained in Britain were able to go direct to O.T.U.s after getting their blind approach training on the Lorenz beam. It will be appreciated that this addition to training had its repercussions on the side of personnel, supply and organization. In particular it was stated that a total of 35 additional aerodromes would be required by the end of 1943 for pilot A.F.U.s there being sufficient for the observer A.F.U.s by using existing air observer schools. It was also hoped that the additional capacity for general reconnaissance schools, air observer schools and air gunner schools, required as a result of the new training programme, could be found in Canada by increasing the population of existing schools.

#### **Operational Training Units**

On the subject of O.T.U. training, the one pilot proposal had been generally accepted. Instructions for the change-over to this basis had been given on 5 April 1942 and the squadrons and the O.T.U.s were swinging over as fast as possible. This meant that an increase in O.T.U. capacity was inevitable (because one pilot would get 80 hours flying as against 30 hours each for two pilots). On the basis of Target Force 'E' 17 additional O.T.U.s were required, and this involved 34 airfields. Such an expansion of training meant that operational expansion was found to be retarded a good deal and this was accepted by the C.A.S. So far as the establishment of new O.T.U.s was concerned, it had been agreed by A.M.T. that as an interim measure conversion to heavy bombers in the United Kingdom would be undertaken at conversion flights located at operational aerodromes. This change in policy reduced the number of O.T.U.s which would be required to support the medium and heavy bomber squadrons equipped with British types at

home and overseas. Thus, instead of the 19 extra O.T.U.s which it was estimated would be required by the end of March 1942, only 10 additional O.T.U.s were considered necessary to support the existing force in Bomber Command, taking account in this figure of the added flying hours instruction demanded by the new one-pilot policy. In addition three O.T.U.s more were required to provide pilots for overseas. There were in fact 14 O.T.U.s in existence in May 1942 but as two of them were not fully operative until their satellites were ready, they could only be regarded as being equivalent to 13 O.T.U.s in full operation.

It was stated at the same time that it was the Air Ministry's intention to form two O.T.U.s a month from May to the end of 1942, but to do so it would be necessary to divert to training six operational stations, each with one satellite, until O.T.U. aerodromes were forthcoming. The warning was given, however, that unless there was a marked improvement in the output of medium bombers complete to operational standards, these new O.T.U.s would be considerably below full strength. The difficulty in this latter respect was the propellor shortage, a large number of Wellington aircraft being in storage units waiting for propellers, and in some cases, constant speed units as well. However by mid-April 1942 there were 866 aircraft in Bomber Command O.T.U.s against a total establishment of 877. By that time also the drive for more spares was beginning to show results in the considerable decrease in the numbers of Wellingtons unserviceable for lack of spares.<sup>1</sup> Considerable progress had also been made in introducing the intensive reforms decided upon as a result of the special investigations which A.M.S.O. had caused to be undertaken into the maintenance system in Bomber Command O.T.U.s. In the heavy bomber conversion units and flights the position was considered to be tolerable with a strength of 95 aircraft against an establishment of 124.

#### **Trainer Aircraft Policy**

So far as trainer aircraft were concerned, a total of 285 per month were required. The aircraft for training in Canada had to be exported there and the additional requirement was 830 twin-engined trainers in 1942 and 1,480 in 1943. The chief difficulty at that time (April 1942) was the bottleneck caused by the shortage of engines and airscrews. It is interesting to note that the position regarding Britain's commitments, in respect of aircraft for training schemes overseas generally, was that arrears had been made good. Including aircraft for which shipping had been arranged, 7,200 had been sent. This represented about 98 per cent. of obligations, and in addition over 300 aircraft had been lost at sea in transit.

It will be realised that by May 1942 the crux of the training aircraft problem was the supply of operational type aircraft for pilot and crew training. Apart from medium bomber types, the shortage was in respect of target-towers, particularly in Canada; for crew training and also to meet the needs of the Army and Navy for a high speed target-tower of some 300 miles per hour performance for anti-aircraft gunnery. The problem was one of shortages and priority and in the long run the general supply position never permitted much latitude in this direction. The main struggle was to produce aircraft for first line development and for operational training

<sup>1</sup> C.A.S. 3165, 13 Apr. 1942.

backing. There was little margin left over, except for unwanted and obsolescent types, for gunnery training. Especially there were no resources to meet the requirement of a high speed target-tower for the other services.<sup>1</sup> In this question of the supply of operational type aircraft for training, as already indicated, there was a delicate adjustment which had to be made between the rival claims of training and first line developments.

On the question of whether aircraft should be allotted to O.T.U.s even at some cost to the first line, the C.A.S. ruled that the responsibility for deciding in what proportions the aircraft should be allotted could be better discharged by the Commander-in-Chief, Bomber Command than by outside authority. He stated that there was no risk of the Commander-in-Chief starving his O.T.U.s of aircraft since to do so would very soon reduce the effort he could maintain with his first line. The right of intervention accorded to the A.M.T. in this matter was all the safeguard required. By the end of May 1942 however, the aircraft position in the Bomber O.T.U.s had deteriorated, there being a recorded shortage of 142 aircraft in a return dated 22 May. This was due to the bottleneck of propellers in the aircraft storage units. In addition there was a delay, just at the wrong time when the weather was so fine, at two O.T.U.s for which no aircraft could be provided.<sup>2</sup>

The Secretary of State therefore raised the issue as to whether aircraft should be provided for O.T.U.s at the expense of the operational effort. He once more queried the C.A.S.'s ruling as to the right to intervene with Commander-in-Chief, Bomber Command. The C.A.S. recognised that this matter raised an important strategical issue. The declared policy was to assist Russia by an ever-increasing and sustained bomber offensive. The following months promised to be the most critical period for the Russians, during which they needed all the assistance they could be given. A reduction in the operational effort during the summer in order to provide the full planned requirements in crews from the O.T.U.s by the autumn of 1942 would have meant a reduction in aid to Russia at the very time when it was most essential. As it was, the bomber offensive had been curtailed in the winter of 1941 in order to build up for an offensive during the summer of 1942. The C.A.S. held that it would be difficult to justify a further conservation in order to build up for an offensive the following winter. He went on to remark,<sup>3</sup>

' When resources are limited in both aircraft and fully trained personnel, their distribution between training and first line units is always a matter for compromise, the object of which must be to balance the requirements of a planned expansion programme against immediate strategical considerations.'

The C.A.S. saw no difficulty in the question of how and when A.M.T. was to intervene with the Commander-in-Chief, Bomber Command. A.M.T. was responsible for ensuring that so far as possible the flow of trained crews from the O.T.U.s matched the anticipated requirements of the operational units. If at any time he foresaw a serious shortage of crews it was his responsibility to represent the position to the Command.

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<sup>1</sup> C.O.S. (42) 153rd Meeting.

<sup>2</sup> S. of S. Folder, Encls. 56A and 57A, A.H.B. ID/7/2(a).

<sup>3</sup> S. of S. Folder, Encls. 59A, A.H.B. ID/7/2(a).

### **Further consideration of Target Force 'F'**

It was at the end of January 1942 that Target Force 'F' appeared as a modified form of Target Force 'E' Revised and which reflected the changes brought about by the original American embargo on the export of their aircraft. The key item was still the strategic offensive which aimed at producing, instead of over 4,000 some 2,400 heavy bombers in the first line. This was the most important aspect of planning, and most other considerations took second place to this bomber development. In May 1942, when it appeared that the Americans might modify their attitude on the aircraft question, and in order to make provision for their declared policy of building up their forces in Britain, Target Force 'F' was again discussed.<sup>1</sup> One effect of the American policy was immediately apparent in the cutting down of the figure of Metropolitan fighter squadrons from 89 to 75. The higher figure was what was considered necessary for the defence of the United Kingdom, but the balance was to be made up by the United States fighter squadrons taking over the defence of Northern Ireland.

On the all important subject of the bomber first line of 2,400 heavy aircraft, the stated intention was that, if in 1943 it were decided that the heavy bomber operational first line should be rapidly increased, it could be accomplished by stopping O.T.U. expansion and by diverting resources to operational squadrons. From this it can be seen how closely training and first line developments were interlocked. It was estimated that by that time there would probably be in existence sufficient O.T.U. facilities to maintain a force slightly larger than the interim target of 2,400 bombers. If such a decision were taken, no further O.T.U.s would be opened and the force would be stepped up as rapidly as possible to the maximum which could thus be maintained. This would automatically postpone further expansion to the ultimate target of 4,000 bombers until such time as the preliminary O.T.U. expansion could be resumed. First line development was thus regarded as being conditional on operational training development which had to precede it. It was fully recognised that the first line development could no longer be viewed in isolation as in the early days.

At the same time other trends were noticeable; one was the growing requirement of transport squadrons, for which British targets were considered to be too low. It was apparent, even at that time, that the R.A.F. relied chiefly on America for the supply of transport aircraft, a state of affairs which can hardly be regarded as satisfactory in view of the importance which air transport operations assumed towards the end of the war and after. Another item was the provision which was made for some 15 fighter squadrons whose allocation was to be 'according to strategic developments'. The use of fighter squadrons in Army support roles later became well known, and it is here that the margin which made this possible began to be created. Finally it was obvious that for purposes of presenting the British case to the Americans another expansion programme based on Target Force 'F' was required. Target Force 'F' was thus to be of short duration, but it was the first to show the influence of the joint Anglo-American plans for the future conduct of the war.

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<sup>1</sup> E.R.P. Committee Meeting, 7 May 1942.

### Adjustment of Training Plans to Accord with the Supply of American Aircraft

The drastic revision of plans caused by the shortage in American supplies of aircraft was modified somewhat by May 1942, and it was for this reason that strenuous efforts were made to explain the results of that policy to the Americans. In order that they should see the position from first hand, General Arnold and Admiral Towers came to London in the middle of May 1942 and investigated the whole position. It was pointed out to them that any sudden cessation of the supplies of American aircraft, particularly to the Middle East, would be nothing short of a disaster and could not be accepted as it had been firmly assumed that the Americans would stand by their obligations and British plans had been laid accordingly. On the other hand, at the outset the United States had planned a training and first line expansion of such dimensions as to imperil supplies of aircraft to British operational units then actively in contact with the enemy.

The British task was to point out, in the light of practical experience, the difficulties of realising an over-ambitious programme and to persuade the Americans to accept a more realistic target. They had to be convinced of the practical necessity of continuing sufficient allocations to maintain and equip existing and projected squadrons of the R.A.F. and Dominion Air Forces, for which United States Army Air Forces could not be substituted without weakening the total war effort. The whole future distribution of the United States Air Forces as at 1 April 1943, was based on an expansion rate which was considered by British experts to be unattainable in practice. For example, during the period May 1942 to May 1943 the British Air Forces with the large resources and experience which had been built up during two and half years of war expected to expand from a first line of 5,500 aircraft to one of 9,500; an increase of 73 per cent. In the same period the United States Army Air Corps, coming new to the task of expanding and fighting simultaneously, expected to expand from 3,000 to 9,000 aircraft, an increase of 200 per cent.

In order more clearly to demonstrate the British methods of planning, the Air Ministry produced a table showing the relative proportions of operational aircraft allotted to operational training and to the first line:

Type of Aircraft		U.K.		U.S.A.	
		1.4.1942	1.4.1943	1.4.1942	1.4.1943
Heavy and Medium Bombers	Front Line	1,473	2,448	668	2,701
	O.T.U.	939	2,850	424	1,040
	%	87%	116%	63%	39%
Light and Dive Bombers ...	Front Line	426	1,296	239	1,181
	O.T.U.	232	504	295	883
	%	49%	39%	123%	75%
Fighters ... ..	Front Line	3,010	4,222	1,621	4,245
	O.T.U.	969	1,503	688	2,315
	%	32%	36%	42%	54%
Heavy and Medium Flying Boats	Front Line	183	315	372	732
	O.T.U.	49	85	189	385
	%	27%	27%	51%	53%
Heavy, Medium and Light G.R. Landplanes	Front Line	710	818	13	288
	O.T.U.	215	401	—	50
	%	30%	49%	—	17%

From this it could be seen that the British allowance for backing the first line generally compared favourably with the American basis, bearing in mind that the British first line was incurring war wastage and the Americans were not. The exception was in heavy and medium bombers, where the British proportion was in excess of the American. The reasons for this were firstly that they were considered to have underestimated the bomber operational training commitment, and secondly that the effects of British weather conditions demanded that the R.A.F. should require more aircraft to turn out the same number of crews. In Britain the average was 35 hours per month per aircraft on charge whereas the weather conditions in the United States allowed twice that amount of hours per aircraft. Furthermore, recent allocations to O.T.U.s in 1942 were based on the requirements of a large expansion in 1943 and later. Finally included in the figures were the many obsolescent operational types used in training. In fact, the British surpluses were more apparent than real. In due course, therefore, the Americans appeared satisfied that there was a case for continuing to supply aircraft to Britain. On the return of General Arnold and Admiral Towers to Washington, the President indicated that the substitution of his forces for those of the British in order to achieve a first share in the operational theatres, should not prejudice the war effort during the transition period, and the Arnold-Towers-Portal agreement which was signed in Washington on 21 June 1942 laid down that the United States undertook 'to continue in 1943 the allocation of the necessary aircraft to meet attrition in British Squadrons using American aircraft operational on 1 April 1943 (total 3,048 aircraft) and in their supporting operational training units . . .

The net result of all this was an obvious further slowing down of first line expansion and thus a further opportunity for training to consolidate the backing behind the first line which had already been achieved. On the other hand it was obvious that training plans were now out of balance with the reduced flow of operational aircraft. Thus it was that no further service flying training schools were necessary in Canada and arrangements were made to hold up the two remaining to be opened. In addition, Britain had to forgo the arrangements made with General Arnold to train British pupils in the one-third capacity in Army Schools which he had previously made available. The navigational training with Pan American Airways was also given up as was the Refresher Training Scheme. The British F.T.S.s in the United States were reduced to five and the Towers Scheme to the training of pilots only. Finally, plans to set up in the United States, a Training Group, O.T.U.s, and an I.T.W. were shelved, as the basic training facilities which already existed were ample to meet the reduced British plans which now rested mainly on what operational aircraft Britain could produce for herself.

The decision resulting from the aircraft agreement was that so far as possible supplies of American aircraft were to be concentrated in the Middle East and Australia. British aircraft were similarly to be devoted to the expansion of the air forces in Britain. From the training point of view this represented a simplification of an already intricate task.

### Use of Training Resources for Operations

While the authorities were re-arranging the training pattern, with particular attention to Bomber Command, the struggle to expand the first line itself with limited resources entailed the use of the costly operational training element to increase the effect of the new idea of massed raids. Bomber Command was in a difficult position owing to its training and re-equipment problems; it was not ready for a great effort. Politically it was most desirable that something should be done to help the Russians. The Americans could not be ready, until towards the end of 1942, to deploy their air and land forces in strength, and the land forces in the Middle East did not consider themselves able to re-equip and build up their backing to mount an overwhelming offensive against the Afrika Corps until June at the earliest. As we have seen, the measures to build up for the bomber offensive were proceeding on a long-term plan, but current difficulties were very great. At the same time, Bomber Command did have latent resources in the increasing O.T.U. organization which was equipped with twin-engined bomber types then becoming obsolescent. These resources were immediately available and would permit a substantial addition to the Bomber offensive against Germany.

Much has been said for and against the use of training units to meet operational emergencies, but it is obvious that the practice is a form of consumption of the 'seed corn' which can have but fleeting advantages and which must be paid for in the long term. There are various examples of the use of training units in emergency, such as the use the Germans made of them in 1940 and later in their attempts to evacuate the personnel of Von Paulus' armies surrounded at Stalingrad between November 1942 and January 1943. On the British side No. 4 S.F.T.S. at Habbaniyah played a decisive part in the failure of the pro-German rising in Iraq in May 1941, an effort which ended with the closing of the School. A further example, perhaps the most outstanding, was the consistent use of training resources in the various emergencies in the Western Desert. This policy was not so much the use of O.T.U. personnel and aircraft, but rather the continued failure to strengthen and build up the Middle East O.T.U. organization. This policy made that theatre dependent upon the United Kingdom for an important element of fighter, bomber and coastal crews, thereby causing a drain on the limited Metropolitan O.T.U. capacity, while at the same time causing a congestion of semi-trained personnel in the Middle East.<sup>1</sup>

The potential reserve and internal security value of training units had always been recognized, and various 'Banquet' schemes for an emergency existed in all countries of the Commonwealth. The use of the bomber O.T.U.s is, however, an example of such a scale that it serves as a good subject for an examination of the precise advantages and cost of such schemes. The first use of the bomber O.T.U.s was on the spectacular '1,000 Bomber' raid on Cologne on the night of 30-31 May 1942. Thereafter, these O.T.U.s took part in a further six raids wherein they twice visited each of the three major targets of Essen, Bremen and Dusseldorf.<sup>2</sup> They

<sup>1</sup> A.M.T. Folder, A.H.B. IIC/38/1.

<sup>2</sup> Appendix 'A' of O.R.S. (B) report No. S.70 dated 23 Oct. 1942.

despatched a total of 1,666 sorties, dropped 180 tons of bombs within three miles of the target, inflicted an estimated 6.4 per cent. increase in material damage, 107 aircraft were lost and 180 damaged. This last item increased the total cost in aircraft of the raids in which they took part by 83 per cent.

There were two distinct phases in this era. The first consisted of the first three raids in which elaborate preparations were made. (Preparations for the first two of which began on 26 May and training was not resumed until 3 June.) The loss in crew output was estimated at 60 crews who arrived a week late at their squadrons. More serious was the loss of 12 O.T.U. and two heavy conversion instructors, rather more than two per cent. of the total strength in 'screened' crews.<sup>1</sup> The second phase, involving the remaining four operations carried out (plus one which was cancelled) was on a more rational basis, involving only 24 hours warning and the use mainly of pupil crews on the last week of their training. Furthermore they were used only under specially favourable weather conditions. The last raid was on Essen on the night of 16-17 September 1942.

It is not necessary to enter into an analysis of the operational factors involved, but rather to indicate the policy effect and the general Air Ministry attitude to this venture on the part of the C.-in-C. Bomber Command. In this aspect there are two main considerations, i.e. the logistical and the imponderable. From the logistical view the balance was definitely on the debit side. The O.T.U. organization was not organized or designed for operations. It suffered interruption to the smooth and even routine so essential to sustained output, loss of material and personnel extremely difficult to replace, and confusion in planning owing to lack of agreed policy. On the credit side, there was a great increase in morale both among instructors, pupils and ground crews. Strenuous efforts minimised the damage and loss of time, and the atmosphere in the training units concerned was greatly improved. For this reason the A.M.T. was not unfavourably disposed and it was on the Organization side of the Air Ministry that the chief objections were heard. In the balance, as a short term practice soon abandoned, it may be said that the advantages for the O.T.U.s, particularly on the political and moral side outweighed the disadvantages, while the help given to the bomber first line bridged a time interval which otherwise would not have been accomplished. On the other hand the effect on the new and struggling heavy conversion element was very much to be deplored. It took too long to prepare the all too few heavy aircraft for operations; took up too much valuable instructional time and was altogether too wasteful in resources.<sup>2</sup> It must be remembered that heavy bomber production and heavy conversion training were becoming the critical point of the whole flow of bomber training. It may be said therefore that it was this factor which, in the long run, proved decisive. One outstanding feature was the fact that it proved the 'New Deal' to be capable of producing crews who could participate in major operations immediately on the completion of their O.T.U. training. This was the acid test of the new policy and the results proved its complete success.

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<sup>1</sup> S. of S. Folder, Encl. 66B, A.H.B. ID/7/2(a).

<sup>2</sup> S.108/83/AIR., 31 July 1942.

### **The Ottawa Air Training Conference**

One final landmark in the long series of discussions and measures to improve and consolidate training occurred in May 1942. This was the Ottawa Air Training Conference attended by the representatives of the Empire partners, the United States, and most of the other Allied air forces.<sup>1</sup> The origin of this conference lay in the fact that although by the end of 1941 all the planned Empire Air Training Scheme Schools (numbering 70), had opened, by early 1942 further capacity was required. This was due to loss of 'Arnold' capacity in the United States as a result of her entry into the war, the extension of courses under the 'New Deal' and the need for further crew training capacity under the revision of crew functions. Furthermore Britain needed further capacity in her own organization for the refresher training and to accommodate the American units arriving under 'Bolero'. This threw an added burden upon Canada for basic training. Altogether the equivalent of a further 15 schools was required in Canada. There was also at that time a need to discuss the organization for administering the 'Transferred' Royal Air Force schools in Canada, and the relation of the Empire Air Training Scheme to the training effort of the United States. Finally it was felt that the outbreak of war with Japan had created fresh problems for all the partner Governments which would benefit by discussion.

The original idea for the Conference was thus the continuation and extension of training in Canada beyond 31 March 1943 when the existing Agreement expired. Further aspects, however, increased the scope of the discussions to embrace the standardisation and co-ordination of all systems of aircrew training. Thus it was that the United States proposed another conference to co-ordinate all the different training schemes in North America. After a meeting between the American President and the Canadian Prime Minister, it was announced that the two conferences would be amalgamated, and as the Governments of Norway, China, and the Netherlands had small training establishments in North America, it was decided to invite them to send representatives. Finally, because the other allied Governments might misunderstand the reason for limiting representation to those concerned in North American training, all the Allied nations were invited to participate.

The main questions for discussion remained, however, primarily those concerned with continuing and expanding the Joint Air Training Plan (as it was sometimes also called), but these were discussed by sub-committees composed of representatives of those countries directly concerned; questions of more general interest to the Allied Nations were included in the agenda. The opening speech of Mr. C. G. Power, the Canadian Minister of National Defence, is of interest because it gave a view of the crisis of June 1940 from Canadian eyes.

'The wisdom of the decision made in 1939 to establish on this continent an air training plan of immense proportions has never been open to question. The most severe test came in the summer of 1940. Actual training had barely begun before the German advance in the West upset all previous strategical calculations.

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<sup>1</sup> E.T.S. 495 (42).

In the face of the immediate danger, long term planning seemed entirely out of place. Many doubted whether there would be a long term. To help in the short run Canada threw everything we had into the Battle of Britain, everything, that is, except the British Commonwealth Air Training Plan. It remained intact because the partners in the plan, Canada, Australia, New Zealand and the United Kingdom had faith in British courage and British determination.

Britain herself, though hard pressed and almost in dire need, persisted in her training programme through those days and nights of the battle for her survival, and indeed for her very existence.

The result of that persistence is that today she has the aircrew, pilots, observers, gunners, to permit her not only successfully to defend the air over her own island fortress, but, day after day, and night after night, to carry out offensive operations over occupied Europe and Germany itself.

It is necessary at this point to emphasise that neither the 'New Deal' nor any other plans would have been possible had it not been for the vision and exertions which made possible the Empire Air Training Scheme.

#### **Revised Empire Training Agreement**

The Air Training Conference opened in Ottawa on 19 May 1942 and as a result of the discussions which took place there, a revised Agreement was signed on 6 June 1942.<sup>1</sup> This new Agreement superseded the original Riverdale Agreement of December 1939, was operative from 1 July 1942 and lasted until 31 March 1945. Under this revised Agreement, all the training establishments in Canada came under one Canadian organization. Thus the 'transferred' Royal Air Force schools were merged into the Empire Air Training Scheme which now became known in Canada as the British Commonwealth Air Training Plan. Instead of supplying the R.A.F. schools and 10 per cent. of the E.A.T.S. capacity, Britain was to supply enough pupils to keep filled not less than 40 per cent. of the combined training organization in Canada. The numbers of pupils to be supplied by Australia and New Zealand remained substantially as before (nearly 3,000 a year from Australia and just under 2,000 a year from New Zealand). In consequence of the revised crewing of the bombers, adjustments were necessary in the Canadian organization. While pilot and wireless operator (air gunner) training capacity was more than sufficient, an additional monthly output of 2,270 other aircrew members was needed. It was therefore agreed that the Canadian Government should proceed with the development of all training capacity which had been planned or projected. These arrangements entailed expanding air observer school capacity to an equivalent of nine schools during 1942, as well as the equivalent of two and a half general reconnaissance schools and two and a half air gunners schools. They thus catered for the new air bomber category and for the doubling of the 'straight' air gunner commitment.

In addition to the four Canadian O.T.U.s which were in operation by that time, it was agreed to bring the total number planned up to eight. So far as the pilot training was concerned it was agreed to wait until 1943 before opening the additional two E.F.T.S.s and four S.F.T.S.s which had been planned. The new reorganization in Canada brought the total number of schools in operation or to be formed up to 104.

<sup>1</sup> E.T.S. 480 (42).

**PART IV**  
**THE PEAK IS REACHED AND THE DECLINE BEGINS**



## CHAPTER 14

### EXPANSION LIMITATIONS: A REVIEW OF TRAINING STANDARDS

By the middle of 1942 a stage in high level policy had been reached when planning was confronted with various obstacles which eventually caused the cessation of expansion and a decline in training. The process was gradual because the Air Council did their utmost to overcome the handicap of manpower shortage, the greatest of the obstacles. This was accomplished mainly by carrying deficiencies on establishment or, in other words, maintaining a general rate of expansion with fewer men than was theoretically necessary and by making sacrifices in non-essentials. Everything possible was done to avoid the run-down of the training organization because it was realised how swiftly any weakness therein would re-act on the first line effort. Training had to be the first to expand and the last to contract if the first line were to sustain a prolonged war involving heavy wastage. This final part of the narrative shows how the Air Ministry re-acted to the pressure of increasing restrictions and how the decline in training eventually began.

#### **Revised Expansion Programme : Target Force 'G'**

On 2 April 1941 the Secretary of State for Air in a minute to the Prime Minister had stated that in order to reach a first line bomber force of over 4,000 by early 1943 it was necessary to produce 7,000 heavy bombers in 1941 and 12,000 in 1942, in addition to a large flow from America. As it transpired largely increased programmes had been adopted in both countries but the American aircraft had been almost entirely absorbed by the needs of over expansion, and the British programme was not due to be completed until late in 1943. Thus by the end of 1941 the position was that only half the requirements in heavy and medium bombers had been received and the proportion in 1942 did not appear likely to improve. It was not possible at that time to recast the expansion programme to conform with the Arnold-Towers-Portal agreement but the general idea was that the deficiencies of the Royal Air Force were to be compensated for by the arrival of the United States bomber squadrons. The failure to reach planned expansion in Britain and the Middle East was attributed partly to the shortage in bomber output and partly to the diversion of Bomber Command squadrons to India, the Far East and the Coastal Command. Also there was the growing commitment to be fulfilled in respect of airborne forces. This position regarding the supplies of aircraft not only governed the formation of new units but also the supply of trained crews, as the whole programme depended on the policy to form and to operate the necessary operational training units. There was no lack of basic material for crews provided that the aircraft could be obtained. It was, therefore, essential that every effort be made to maintain and if possible, exceed the planned output of bombers in the United Kingdom.

In August 1942 a revised Target Force 'G' was produced showing a decrease on the estimates for Target Force 'F'. The new force aimed at 546 Squadrons of which United Kingdom heavy bomber element was to be some 144 Squadrons.<sup>1</sup> The Air Council on 19 August 1942 decided to put

<sup>1</sup> C.W.E./E/40, 18 Aug. 1942.

forward Target Force 'G' to the Defence Committee on strategic grounds as the target to be achieved by December 1943 in all categories including heavy and medium bombers; the difficulties and implication of achieving it in these latter categories were to be stressed. At a meeting held on 27 August, A.M.S.O. pointed out that to provide O.T.U. capacity for the realisation of the target of 144 bomber squadrons by December 1943, would require the production in the first quarter of 1943 of 1,200 medium bombers in addition to the existing programme. If this were not done the target could not be achieved until September 1944 even if all medium bombers were withdrawn from Bomber Command for the formation of the O.T.U.s. It was thus apparent that the realisation of Target Force 'G' by December 1943 would be impossible.<sup>1</sup> The conclusion drawn was that any decision to provision on the basis of achieving such a target would involve a large scale waste of manpower and equipment. In amplification of the way in which numbers would fall short of the target it was explained that the first step would be to adopt a reasonable programme for building up to 135 heavy bomber squadrons by the end of 1943 on the basis that the main hope of obtaining extra aircraft must lie in the second half of 1943. The extra heavy bomber requirements of such a programme were found to be some 700 in the first half of 1943 and 1,700 in the second half. That such extra supplies would be forthcoming was, in itself, a sufficiently formidable assumption but it led on to the virtual impossibility of providing an extra 1,200 medium bombers in the first quarter of 1943 for the operational training units. It thus appeared that the provision of the medium bombers required in the early stages for the O.T.U.s was a certain cause of failure to achieve the target, even without a shortage of heavy bombers themselves for the squadrons. Therefore, as an alternative line of approach, consideration was given to the maximum rate of building up to the medium bomber element of the O.T.U.s to provide trained crews for heavy bomber squadrons. The assumption was made that all available medium bombers, after allowing for overseas and G.R. requirements, should, from the end of 1942, be used for the O.T.U.s. On this basis there would only be sufficient crews to reach 110 heavy bomber squadrons by the end of 1943, and the 135 would not be achieved until about September 1944. Even a programme on this basis required a steady production of 630 heavy bombers a month from January 1943 onwards, compared with the existing full M.A.P. programme which mounted to 600 per month during 1943 and only reached a peak of 625 per month in March 1944.

#### **Examination of O.T.U. Training Standards**

It was on these grounds that the A.M.S.O. advised the Secretary of State that any decision to provision on the basis of completing the bomber element of Target Force 'G' by the end of 1943 would be wholly unjustified. There was evidence that at that time the growing cost of training and the very obvious way in which it complicated the task of expansion caused even the Chief of the Air Staff some doubts. He said that it seemed unwise to plan so far ahead as 1944 on the basis of production possibilities as foreseen at that time (August 1942). Other factors might emerge and before March 1944 it might be established that too high a standard of training was being

<sup>1</sup> S. of S. Folder, Encls. 21A and 23A, A.H.B. ID/7/4(a).

attempted. For example he stated that a cut in flying hours, say, from 110 to 90 at the O.T.U. stage would make a great deal of difference in the number of bombers available for the front line. In fact, this higher basis of planning necessitated that all other factors of expansion, including especially, training, would have to be increased with a consequent waste of national resources. Thus, on the subject of training aircraft, scrutiny had revealed the startling number of aircraft allocated to training. Something between 25 per cent. and 30 per cent. of heavy bomber aircraft were in conversion and miscellaneous units, while there were three or four medium bombers in O.T.U.s and miscellaneous units for every one in the front line.<sup>1</sup>

The question of the amount of flying done by operational aircraft in the O.T.U.s was raised, and it was suggested that the amount of flying hours instruction given might be cut down. The possibility of giving shorter courses to more promising pupils was also mentioned in this connection. The A.M.T., however, observed that there would be no gain in curtailing flying hours per pupil if wastage were increased. The training standards had been adopted as a result of past mistakes, and despite improved training, 5,000 aircrew a year were still being lost in flying accidents. The Americans got more flying hours per aircraft on charge, but their aircraft were not dispersed and their establishments were larger. The dispersal of aircraft on stations accounted for an appreciable loss of flying time. The suggestion for shorter courses for good pupil pilots was already met in practice because the period of 80 hours at the medium bomber stages was an average figure. The A.M.T. was supported by the A.M.S.O. who said that the number of operational aircraft used for training could not be cut down while the existing training policy stood. In spite of these arguments, the Secretary of State ruled that the possibility of cutting down the flying hours and of increasing the flying of O.T.U. aircraft should be examined. As matters turned out, nothing could alter the logic of the fact that operational efficiency and aircraft safety depended upon quality in training, nevertheless, the above quoted examples illustrate the attitude towards the training commitment.

In spite of the uncertainty surrounding the soundness of the inflated basis of planning, the A.M.T. stated that the production of trained personnel was to proceed on the basis of the full approved programme and the fact that there might be more trained men than could be used at a particular moment was accepted. It was difficult to accelerate the training flow at short notice, and personnel were then being taken in for manning the 1944 squadrons and what was done in 1942 committed the Air Ministry for 1944. He considered that a cut in training periods might prove to be uneconomical both in personnel and aircraft. In the main, therefore, the tendency disclosed by this Target Force was to retract in that it was now more in line with experience of actual production. It represented a rather serious retreat from the previous estimate that 4,000 heavy bombers were required to finish Germany. On the other hand, now that the Americans were determined to play their full part operationally, the effect of the original estimate was to be the same, but merely with this difference—that now the target would be shared, and on Britain's part the Royal Air Force would expand just so far as British production would permit.

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<sup>1</sup> A.C. Con. 14 (42).

### Co-ordination of the Bomber Offensive : Training Aspects

By 15 July 1942, the size, the importance and the introduction of new scientific devices in Bomber Command necessitated intensified measures to co-ordinate all aspects of the problem of the striking force. The many production disappointments in heavy bombers had resulted in a great disparity between the previous conception of a first line bomber force of 4,000 aircraft and the figure of about 1,300 which was forecast at that time for early 1943. A number of factors were mentioned in explanation of this difference:—<sup>1</sup>

- (a) The reduction in deliveries from America.
- (b) Considerable diversions overseas and to Coastal Command.
- (c) Increase in O.T.U. training.
- (d) The fact that the target of 4,000 had been planned for a much later date than early 1943 after which on the current programme a considerable expansion would take place.

The C.A.S. drew attention to the large number of bomber aircraft assigned to O.T.U. and conversion courses. (There were, in July 1942, 933 Conversion and O.T.U. aircraft compared with 600 heavy and medium bombers in the front line.) He suggested that A.M.S.O., before including them in Target Force 'G' calculations, should make certain that the training organization was not larger than was really required. In reviewing the training output to meet the bomber expansion programme, the Air Member for Training stated that the supply of basically trained aircrew available in the United Kingdom would be more than adequate to match the forecast expansion of squadrons.<sup>2</sup> On the other hand the planned length of the advanced flying unit course for 'twin-engined' pilots had not been achieved by that time owing to shortage of A.F.U. capacity, and this shortage was considered likely to persist throughout the period under review. It was consequently necessary to feed pilots into the operational training units after somewhat abbreviated A.F.U. training. The A.M.T. observed that the number of Operational Training Units given in the programme would be adequate to match the forecast expansion of squadrons at their full establishment (which was to be raised from 54 to 66 aircraft) and provided that training was not restricted by lack of satellite aerodromes or by runway construction.

On existing plans, it seemed probable that there was going to be a somewhat greater number of O.T.U.s than those given in the programme, but as the supply of aircraft would necessarily result in the average strength of each O.T.U. being correspondingly reduced, the effective capacity available would be the same. It was also considered that it was always desirable to have aerodromes ready in advance of expansion, as then, when aircraft did become available, expansion could be more promptly effected. At the same time it was agreed that conversion flights and units should be concentrated into units of 32 aircraft, and that these new conversion units should provide both for wastage and expansion. On the estimated rates of aircraft effort and with a 30 hours syllabus per pilot the numbers of heavy bomber conversion aircraft shown in the expansion programme were adequate to meet the planned expansion. It must be pointed out at this juncture that it was then (July 1942) contemplated that the operational training organization would participate in operations.

<sup>1</sup> C.B.O. (3), 10 July 1942 C.B.O. 1st Meeting, 15 July 1942.

<sup>2</sup> C.B.O. (2), 9 July 1942.

### **The Development of Navigational Aids : Navigation Training**

The next aspect of training which received attention at the discussion on the co-ordination of the bomber offensive was navigation.<sup>1</sup> It was stated (by A.M.T.) that the percentage of aircraft which reached and bombed their targets was still far too low, and the training of the crew in navigation had to take a share of the blame for this state of affairs. At the same time, many of the tasks were beyond the capacity of even the most highly skilled and experienced individuals, and complete success awaited the provision of further aids to navigation then being introduced. In his survey of the previous two years progress in navigational training, the A.M.T. claimed that the improvements achieved would have been more rapid and more certain had there been a strong direction on policy matters. This lack of policy direction had been felt throughout all branches of navigation, and, since training was based on operational requirements, the handicap had been felt there also.

The existing training aim was that every navigator, whilst not deeply versed in theory, had to be competent to navigate by using all known techniques, if necessary, by rule of thumb. To help implement this policy training had been taken over from civilian firms, the pre-O.T.U. flying hours had been nearly doubled (from 62 hours in 1940 to 122 hours in 1942), and the traditional method of interspersing air work with classroom work had been abandoned and elementary air navigation schools established. At these schools, before going into the air, the navigator covered the whole syllabus so far as this was practicable in a classroom. He was, therefore, able from his first flight to derive the maximum benefit from the air practices. There had also been development of synthetic devices in preparation for and in supplement to air exercises which gave practice in navigation under conditions which simulated those in the air.

The pilot was the captain of the aircraft. It was considered essential therefore that he should be sufficiently well trained in navigation to supervise the work of the navigator. The A.M.T. did not claim that this aim had been fully achieved but he stated that such steps as had been practicable had been taken in the direction of improving the navigation training for pilots. These were, briefly:—

- (a) An increase in the total period of ground and air training.
- (b) A more complete syllabus to cover not only pilot navigation but also a general knowledge of navigation technique. The need for pilot co-operation was stressed.
- (c) Greater emphasis on navigation at the Empire Central Flying School which was intended to lead to greater weight being given to this subject during elementary and service flying training school training.

It was also considered that the air bomber should know the general principles of dead reckoning navigation, for he had to work in close touch with the navigator and the pilot during the approach to the target. His own training was mainly devoted to map reading and target identification, a task calling for intelligence and a good memory. In order to avoid delay in introducing the scheme, the early courses were cut down below the desirable minimum and it was proposed to increase the time under training as resources permitted. The Air Member for Training, in touching on the

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<sup>1</sup> C.B.O. (5), 31 Aug. 1942.

subject of basic general education, stated that individuals selected for navigator (and also pilot and air bomber) should not only have a high degree of intelligence, but also a minimum general educational standard equivalent to that of about secondary school education at 16 years of age or beyond. It was a fact that during the period April to July 1942 one-third of the candidates classified as navigators had only elementary school education although about 17 per cent. of these had received further education of a technical nature. With the limited manpower available in the country it was inevitable that some reduction of standards should occur in those volunteering for aircrew, but the A.M.T. considered it impracticable to expect such individuals to complete their service training unless they could first be afforded means of improving their general education.

The Air Training Corps had been doing excellent work in giving preliminary training to prospective aircrew members, but it was evident that this organization could not add substantially to the general education of an individual. As an example, in an examination for the Proficiency Certificate II only 10 per cent. of those sitting passed in navigation, and the comments of the Board made it clear that the chief reason was lack of full-time and progressive instruction. The A.M.T. then foreshadowed the pre-entry educational scheme which came into effect in March 1943, and was officially known as the Pre-Aircrew Training Scheme.

So far as navigation instructor training was concerned, the standard laid down for the short navigation instructors course was such as would provide instructors competent to handle any stage of basic training in navigation, but the A.M.T. said that until the operational commands were in a position to release navigators who had completed an operational tour, the instruction would continue to be somewhat academic. There remained the problem of training navigation specialists. In the past these were individuals of wide practical experience with a superficial scientific training but with little knowledge of the theory of navigation. Their training had not so far required original thinking which would stimulate and guide progress. Previously the navigation specialist was regarded as an individual who could navigate with reliability on a long distance flight. In the future it was the aim to provide for the navigation specialist technical training of a high order based on a sound knowledge of mathematics and physics. This training would be designed to stimulate and guide him to original thinking in research, but it was essential that he should be employed in close association with flying so that he could exert an authoritative influence in squadrons and groups for the advancement of navigation. In order to meet the requirements of specialist navigation officers in the future, it was decided to pass a few selected individuals through a specialist course of six to eight months at the Central Navigation School. The course was soon to start with 12 pupils at a time and places could be offered to the Dominion Air Forces.

In general the Air Member for Training was satisfied that the standards laid down for basic navigation training were reasonably adequate to meet requirements, provided that they could be reached by all navigators, but the experience of instructors was still far below what was necessary. He stated that it would assist very considerably in training if there could be established some small authoritative body which could devote attention to problems of navigation generally and co-ordinate effort in the navigation field in

all its phases. In this manner the application of operational lessons to training could be speedily secured and the development of navigational aids would progress more quickly than in the past. He recommended the formation of a small committee to direct the general policy of navigation throughout the force. The A.M.T.'s representations in this matter were quickly acted upon. In September 1942 a new appointment was created of a Deputy Director of Operational Requirements (Navigation) who was specially appointed to ensure closer co-ordination between all concerned with navigational training, with its results and with the development, production and fitting of navigational equipment. Moreover a newly constituted Air Navigation Committee was considered to be the most suitable body in which the many problems of navigation affecting policy, development, production, and training could be resolved.<sup>1</sup>

#### **Effect of Middle East reinforcement on Bomber Command Expansion**

It was during the Co-ordination of the Bomber offensive meetings that the crewing position in Bomber Command drew attention to the Middle East training position.<sup>2</sup> The C.-in-C. Bomber Command complained that his O.T.U.s were suffering from serious deficiencies both in instructors and maintenance personnel. The shortage of instructors was such that pilots were being withdrawn from squadrons before completing their operational tours in order to staff the O.T.U.s. The fundamental cause of this shortage was, in the C.-in-C.'s view, the flow of pilots to the Middle East and India and the small numbers of these which returned. He stated that 2,300 pilots had been sent out and only 300 had returned.

This drain of operationally trained crews was one of the causes of the slow build-up of Bomber Command and was a source of much complaint. At the same time it must be realised that owing to the situation in the Middle East their O.T.U. organization was slow in starting and difficult to maintain. The main trouble was the supply of aircraft and equipment. Fifteen months earlier, in March 1941, the C.-in-C., Middle East, had stated that he had only been able to improvise, and at that inadequately, by stripping one medium bomber squadron of all its aircraft and by keeping fighter units below strength. He created O.T.U. training staffs out of tired pilots and crews but found himself in a vicious circle because he did not possess the trained pilots to replace them and could not do so with his existing resources owing to the low O.T.U. output. By May 1941 the Middle East had been forced to use two medium bomber squadrons to supplement the operational training organization owing to the fact that they were deficient of 94 Blenheim pilots and there were 102 awaiting training. The trouble was that neither the Australian nor the African organizations which fed the Command gave full operational training. The heavy wastage occurring in the Middle East at that time was more than could be replaced locally even with the temporary diversion of squadrons for training. In May 1941 the Air Ministry had planned to provide three O.T.U.s for the Middle East of which two ground echelons (one medium bomber and one fighter) were despatched in that month. By June 1941 there were 946 crews in the Middle East and 1,200 pilots, yet even this was not enough, and urgent measures were taken to fly out 20 Blenheim crews to that Command.<sup>3</sup>

<sup>1</sup> C.B.O. 2nd Meeting, 2 Sept. 1942.

<sup>2</sup> A.M.T. Folder, A.H.B. IIC/38/1.

<sup>3</sup> C.A.S. 3086, 11 June 1941.

### **Review of O.T.U. Training Overseas**

By July 1942 the position of operational training in the Middle East necessitated a review of the position and of the policy with regard to the supply of trained personnel and aircraft to that Command.<sup>1</sup> The salient point once more was the shortage of aircraft and the frequent emergencies which forced the diversion of all resources into the first line to the detriment of the O.T.U. organization. The flow of semi-trained personnel from South Africa and Southern Rhodesia caused a pool of pupils awaiting O.T.U. training in the Middle East and a further 300 in India. These therefore had to be shipped to the U.K., while at the same time O.T.U. trained personnel from Britain were being flown or shipped out to the Middle East. When these became tour-expired, they formed a large pool of personnel who were used on all kinds of tasks. Few of them found their way back to the United Kingdom, much to the concern of formations such as Bomber Command who were always in great need of staff pilots and instructors for the expanding operational training organization so essential to the first-line expansion. The commitment in trained crews which had to be supplied by the U.K. organization was 215 crews per month (rising to 327). It can therefore be seen that there was an obvious need to strengthen the Middle East O.T.U. position. At that time (July–August 1942) these O.T.U.s were exceeding their planned outputs but were even so not absorbing all the waiting pupils that were required. It transpired at an Air Ministry meeting at the end of August 1942, that the flow of operational type aircraft to the Middle East could but slowly be improved. Therefore the Inspector General's suggestion that Harvards should be used in the meantime to offset the deficiency of O.T.U. aircraft was reluctantly agreed to in spite of the unsatisfactory nature of such a course, involving as it did, further training in the squadrons.

In India, much the same situation obtained. There the plans for the O.T.U. build-up included one light bomber (Vengeance) O.T.U. and one single-engined O.T.U. in addition to the small fighter O.T.U. already in existence. Neither the aircraft nor the staff position permitted their functioning before early 1943. It was therefore obvious that there would continue to be an unsatisfactory training position in those Commands and that their meagre resources would have to be supplemented by a flow of trained personnel from Britain. In addition to the added burden on the British O.T.U.s, there was also the fact that a large number of men would be permanently locked up in transit. It is therefore important to bear this overseas commitment in mind when any comparisons are made between the cost of training and the first line effort of the home squadrons.

### **Allocation of Bomber Crews between Overseas Commitments and Bomber Command**

While measures were thus being taken to consolidate and to improve the training position there was growing a threat to the whole development of the service in the increasing shortage of manpower and in the failure of bomber production to come up to programme. The stage has therefore been reached where an understanding is required of what was taking place in the sphere of high policy in the middle of 1942. Although the position at home was not unsatisfactory the Secretary of State continued to observe

<sup>1</sup> A.M.T. Folder, A.H.B. IIC/38/1.

the returns of crew strength. He had repeatedly been assured that the flow of trained personnel was well phased with the forecast of aircraft production and that there was no reason to expect a shortage. Nevertheless, from the returns of establishment, strength and efficiency of pilots in the Metropolitan Air Forces, he saw that the pilot strength of Bomber Command had fallen from 2,241 at the beginning of 1942 to 1,389 on 1 August 1942. The training authorities, however, had every reason to be satisfied by the way things were going. During the first seven months of 1942 the personnel of six squadrons had proceeded overseas, also five squadrons had been transferred permanently and two temporarily to Coastal Command—all these from Bomber Command. This represented an establishment outgoing of 329 pilots, and to meet these establishments, provide for wastage and to fill the shipping 'pipe-line', not less than 1,125 pilots had been despatched overseas during this period.<sup>1</sup>

When these facts are borne in mind, it will perhaps be realised how important were the secondary activities of Bomber Command in the training of crews and in the raising and despatch overseas or to other Commands of new squadrons. There can be no doubt that this constant drain, so vital for such theatres as the Middle East was none the less a great restriction on Bomber Command expansion. In fact, in August 1942 in a letter to the Secretary of State, the Commander-in-Chief, Bomber Command, complained that since September 1939, 2,137 bomber O.T.U. trained pilots had been sent to the Middle East, of which number 157 had been returned.

'As matters stand at present there is little hope of any expansion when we go on pouring bomber trained pilots down the sink in this fashion. It simply means that half our O.T.U. effort is permanently wasted in giving the highest type of bomber training to pilots who thereafter never bomb...'

Another reason for the drop in strength often repeated, was the effect of the 'New Deal' which had resulted in an immediate reduction in pilots of 527. So far as crew strength was concerned, in spite of the losses of squadrons to other Commands, the effective crew strength had shown a healthy and sustained increase since May 1942.

The O.T.U.s were taking in the maximum number of crews which available aircraft would permit them to train. On the other hand the 20 Wellington and Whitley O.T.U.s in Bomber Command were some 300 aircraft short of the 54 aircraft establishment which had just been approved. The A.M.T. felt that when additional Wellingtons became available they should be equitably distributed between O.T.U.s and squadrons. He held the view that while O.T.U.s and Conversion Units were being used on operations, there were strong arguments in favour of replenishing O.T.U. deficiencies before allocating additional aircraft to squadrons. In support of his contention that up to August 1942 this balance had been correctly maintained, the A.M.T. stated that the number of aircraft in squadrons averaged approximately 700 in the months May to August; over the same period, the number of effective crews rose from 750 to almost 900. Thus the deficiency of aircraft in O.T.U.s did not prevent them from rather more than maintaining the number of aircraft allocated to the front line during that period. This was after allowing for the replacement of squadrons transferred to other commands.

<sup>1</sup> S. of S. Folder, A.H.B. ID/7/2(a) and A.M. File S.1080.

The position by 27 August 1942 was that, excluding the Czech flight, there were 20 Medium O.T.U.s made up as follows:—

Established with 66 aircraft	...	1 O.T.U.
Established with 54 aircraft	...	9 O.T.U.s
Established with 40 aircraft	...	5 O.T.U.s
Established with 36 aircraft	...	2 O.T.U.s
Established with 27 aircraft	...	3 O.T.U.s

On these interim establishments (totalling 905 aircraft) the O.T.U.s were deficient of 127 aircraft, but on the basis of 54 aircraft per O.T.U., the deficiency was 302. Actually, it was stated, the full 54 establishment would at that time have been an over provisioning. Apart from the Ventura and Mitchell squadrons which were just forming, the aircraft strength of Bomber Command was still 700. This was the correct relationship to the strength in the O.T.U.s, which was 778 aircraft, until the flow of aircraft increased. The point was that when the flow of aircraft increased, it was necessary that the O.T.U.s should receive priority in allocation, as the existing aircraft strength in O.T.U.s was sufficient for maintenance only, but not for expansion. Any attempt in the past to allocate more aircraft to O.T.U.s could only have been effected by reducing the front line, which had remained static for three months. As an experiment one O.T.U. was established with 66 aircraft. If the experiment was successful, A.M.T. stated that it would be extended to the other O.T.U.s as and when the aircraft became available.

Although training was keeping pace with the practical needs of Bomber Command, the position of that Command, owing to the prevailing habit of drawing upon it for the requirements of other Commands, was far from healthy, and the Air Staff began to realise the need to resist all further calls on Bomber Command if the continuance of what the Prime Minister called the 'woeful shrinkage' of Bomber Command's strength were to be avoided.<sup>1</sup> The following table is interesting in this connection:—

Date	No. of Squadrons	Total I.E.	Crew Strength	Crews fit
29.5.1942	44	720	941	851
19.6.1942	45	736	780	674
10.7.1942	46	752	899	664
31.7.1942	46	768	896	663
14.8.1942	46	760	796	585

It can be seen that the crew position was just keeping pace with the aircraft position. The limiting factor was the supply of operational aircraft both to the first line and to the O.T.U. organization.

#### **The Prime Minister's Demand for 50 Bomber Squadrons by the end of 1942**

It has so far been seen how training, in conformity with war developments was adapting itself to the enhanced standards demanded of it, and how it had been reorganizing and deploying during the lull in expansion which followed the entry of Russia and the United States of America into the war. The period which followed once more saw training facing demands created

<sup>1</sup> V.C.A.S. 3968, 23 Aug. 1942, S. of S. Folder A.H.B. 1D/7/2(a).

by the extension of first line activity. Whereas before training was geared to a strategical plan which assumed that Britain, the Commonwealth and her European Allies had to carry out that plan with their own first line forces, after the end of 1941 this burden was shared by the United States. The end of 1942 was to see the turn of the tide with the German defeat at Stalingrad and Alamein and the Japanese reverses in the Pacific theatre. In the meantime affairs were mounting to a crisis with the German offensives by October 1942 threatening both Stalingrad, Cairo and the oil of the Caucasus and the Middle East.

It was imperative for the sake of allied unity and for the successful outcome of the war, that Britain should make the utmost efforts in the western operational theatres. This was, moreover, at a time when the British manpower situation was becoming daily a more onerous factor. The phase about to be described, is therefore dominated by two factors, the need for an important degree of offensive power and the increasing restrictions on that development exercised by the manpower shortage. Chronologically, the first landmark was a demand in the middle of September 1942 by the Prime Minister that the number of squadrons in Bomber Command should be increased from the existing 38 to 50 by the end of the year. In parallel with this effort came an intensification of the manpower problem in relation to the new Target Force 'G'. The difficult situation thus created involved the training authorities to a great extent and, as will be seen in due course, the latter factor brought about eventually the reduction in basic training while the former extended the applied and operational training activities.<sup>1</sup>

Having been convinced of the need for heavy bombers, the Prime Minister followed the development of Bomber Command with the keenest interest and growing disappointment. He had agreed to the great expansion of the Ministry of Aircraft Production and to other methods of increasing bomber production, only to be informed of successive decreases in the programme. This led the Prime Minister to make his demand that there should be 50 fully operational squadrons in Bomber Command by the end of 1942. He proposed examining the various external commitments which had hampered Bomber Command in its growth, i.e., Coastal Command, Airborne Divisions and the overseas flow.<sup>2</sup> This request by the Prime Minister involved various short term measures at the expense of the long term plan, and while the latter plan was adversely affected, it was probably all to the good in the long run that Bomber Command should have been relieved of the constant drain on its strength by external commitments. A heavy burden was, of course, placed on the Ministry of Aircraft Production, and they had to make a special effort to produce an increased output to make this short term expansion possible. They stated that it was hoped to produce 260 heavy bombers in excess of those produced in the previous quarter. This, however, did not satisfy the Air Ministry, as the output was below the current programme which they had already published. However, very great efforts were made to step up production.<sup>3</sup>

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<sup>1</sup> S. of S. Folder, A.H.B. 1D/7/4(a).

<sup>2</sup> S. of S. Folder, Encl. 42A, A.H.B. 1D/7/1(a).

<sup>3</sup> A.C. Con. 15 (42).

### **Proposals to Achieve the 50 Squadron Plan**

In his reply to the Prime Minister by way of preliminary indication the Secretary of State said that 41 squadrons (25 heavy and 16 medium bomber) would be formed by October 1942, and 50 (34 heavy) by the end of the year. By April 1943 the figures would have grown to 40 heavy and 12 medium bomber squadrons and by July 1943 they would be 52 and 9 respectively. The very small increase between January and April of 1943 was, of course, marked, but the effort to achieve the 50 squadrons by January 1943 involved bringing forward aircraft out of the aircraft storage units more rapidly than usual, so that the later flow would be smaller, while at the same time wastage would be incurred by a greater number of squadrons. Thus, expansion after January was bound to be retarded to some extent, although this was more than offset by the value of having a greater number of squadrons operational. Simultaneously, the operational training organization had to be enlarged to 8½ H.C.U.s and 15 O.T.U.s (requiring 272 and 990 aircraft respectively) by the end of the year.<sup>1</sup>

The dominant factor in this problem was the supply of aircraft which governed both the formation of squadrons and the training of crews. New squadrons, to be operational by the end of the year, had to be formed before the end of November 1942, so that from the production standpoint October and November were the vital months. The Minister of Aircraft Production, in response to appeals by the Air Ministry, promised to supply 780 heavies during the three months September to November, which foreshadowed a probable failure to reach the target by five squadrons. Against this deficiency could be set the agreement of the First Sea Lord to return to Bomber Command two of the four medium bomber squadrons then on loan to Coastal Command. There was thus a final gap of three squadrons to be bridged, and the Secretary of State proposed that various organizations should suffer temporarily. His proposals were to suspend the flow of bombers to the Airborne Forces for two months (they already had 100 medium bombers and required an equal number to meet expansion wastage,) and to cut down the flow of heavy bombers to the Middle East from eight to four a month. There was a deficiency of 120 crews, which could be overcome by various expedients. Crews were to be found by accelerating the return of tour expired crews from the Middle East and withdrawing Bomber Command crews from Flying Training Command and non-operational units. An increased supply of maintenance personnel to Bomber Command was an indispensable requirement of the plan. This was perhaps the hardest to achieve, and entailed, besides all-round cuts, provision for a progressive development of training capacity to match the accelerated rate of expansion. The most serious brake in the past on bomber expansion had been the extraneous commitments from which it was hoped the Command would now be freed by this new drive, which would increase the hitting power of the bomber force by more than half.

In the middle of October, the Prime Minister concurred in the Secretary of State's proposals. Towards the end of October, the Chiefs of Staff also agreed to the proposed 50 Squadron Plan, with the modification that personnel should be found without taking any technical tradesmen from Coastal

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<sup>1</sup> S. of S. Folder, Encl. 7A, A.H.B. ID/7/4(a).

Command squadrons. This was in response to very strong representations from the Admiralty. By the end of October, the Prime Minister realised the restriction was going to be production of aircraft, and queried the demands made in ground staffs.

'There is no use in making enormous ground staffs and pegging out claims in every direction when, in fact, you will not have the aircraft to fly.'

To this minute the C.A.S. explained that there was no intention of pegging out claims for manpower or material, but the expansion was based entirely on the best estimate they could make of aircraft output. He explained that the periodical forecasts which the Air Ministry produced had two main purposes: to ensure that demands for manpower, airfield and ancillary equipment of all kinds were kept in step with each other and with the supply of aircraft forecast from time to time; and to show how far the Air Force resulting from the production programme could be made to meet broad strategic requirements in the different theatres of war.

He forecast that the expansion programmes would have to be revised, in view of important decisions in the bomber programmes which were soon due, and in view of the visit of the Minister of Production to Washington, and the possible results of expectations of aircraft from the United States. In addition, the requirements in different theatres of war would probably change. The C.A.S. summed up the position by comparing Bomber Command to a residuary legatee who, with virtually fixed resources and a wide variety of fixed commitments, could only meet new demands at the expense of capital. In effect, therefore, the strength of Bomber Command in heavy and medium bombers remained by the end of November 1942 more or less the same as it had been at the beginning of the year. All this now promised to change with the screening of Bomber Command from outside demands.<sup>1</sup>

By the end of November, when the numerical expansion should have been completed, there actually were 51 squadrons established with a shortage of 154 aircraft, but the number of squadrons estimated to be operational by the end of the year were only 45. The reason was, of course, the production short falls, particularly in heavy bombers. The Wellington squadrons were retarded by the annoying failure of the constant speed units and deficiency of spinners. In general, the production of bombers fell short of programme by no less than 32 per cent.; in particular only 71 Lancasters were delivered against a programme of 130. The Secretary of State later pointed out to the Prime Minister at the beginning of 1943, that if it had not been for low wastage during the preceding quarter the shortage would have been much larger. There were actually 44 squadrons operational by the target date and the training of the remaining seven and three further squadrons which started to form in December was held up by unfavourable weather. In addition to the production disappointments for the front line, O.T.U.s and conversion units were 77 aircraft short of their establishment. The result was that if the weather improved, it was expected to have 53 heavy and medium bomber squadrons operational by the middle of February

<sup>1</sup> S. of S. Folder, Encls. 17A, 42A, 54A and 65A, A.H.B. ID/7/4(b) and C.A.S. minute 5662, 9 Nov. 1942.

1943. In spite of the restriction on the flow through O.T.U.s and conversion units caused by the weather, there were enough crews to man all available squadrons.<sup>1</sup>

The above account of the 50 Bomber Squadron Plan is valuable only for its illustration of the way in which expansion worked. On the face of it, it did not achieve any more than had been planned, but it did focus much needed interest from a very high level on an arm which was vital and which was always suffering from the revision of priorities. It was, however, viewed as a failure, or at least a disappointment by the Prime Minister and his immediate advisers.

'No doubt there are always very good reasons for failure, but I am surprised to note among them the 50 Squadron Plan. Considering what sacrifices were made for it in other directions, one had hoped for a large and substantial expansion, as promised, from the end of the year.'<sup>2</sup>

So much then for the '50 Squadron' plan, whose results brought about the concentration of resources to expand the bomber offensive while it caused the cessation of the practice of using O.T.U.s and conversion units on main operations. It will have been noticed how great a factor was the supply of aircraft to training and in this respect it is of interest to consider the question of the allocation of aircraft production between operational training and the first line squadrons.

#### **Summary of Improvements in Training**

The picture on the training front was certainly brighter. In particular, progress had been made over the whole field of navigational training and the scheme for improving the basic educational standard of aircrew recruits had now reached an advanced stage of preparation, and the first courses were expected to start in February.<sup>3</sup> A committee on air navigation had been set up in the Air Ministry to deal on a high level with all matters of navigation policy, equipment, training and practice. The standard training syllabus for ordinary navigators was much extended, and all instructors were now trained to what was formerly regarded as specialist standard. In addition, an entirely new eight months' course was started with the object of turning out really first-class navigation specialists. The general ground organization of Bomber Command was showing much improvement. There were sufficient airfields to cope with expansion. The flying control organization was developing satisfactorily. In addition to all this, some important aids to the mass control and safety of the bomber force were being introduced. F.I.D.O. and Beam Approach were helping to overcome the menace of bad visibility while the importance of the development of radar and its practical application in the shape of vastly improved navigational aids, such as 'Gee', 'H2S' and 'Oboe', put an entirely different complexion both on general navigational problems and on the control of large numbers of bombers in a restricted space.<sup>4</sup>

<sup>1</sup> S. of S. Folder, A.H.B. ID/7/4(b).

<sup>2</sup> M.66/3, 16 Feb. 1943.

<sup>3</sup> A.H.B. ID/7/4(b)

<sup>4</sup> S. of S. Folder, Encl. 89A, A.H.B., ID/7/4(b).

At the time when bomber expansion was being actively pursued comparisons were frequently made between the number of operational aircraft employed in training units as opposed to those on the strength of first line squadrons. The reason was that most people were ignorant of the great difference there was between maintaining a static force of a given number of squadrons and supplying an organization to provide trained crews for an expanding force. The planning staff demonstrated at the time that for a static force, 90 operational aircraft were required on the establishment of training units for every 100 in the first line squadrons, but for an expanding force the figure might be as high as 150 for every 100 in the first line squadrons, dependent upon the rate of expansion. In this, the great factors were, of course, effort and wastage. Wastage could be controlled, in fact was controlled, by limiting the bomber effort, but discounting artificial limitation, wastage depended upon standards of skill and there was a very close relation between wastage and the amount of training given, as demonstrated during the 'New Deal' discussions. This fact accounts for the growing cost of training which had to be balanced against considerations of supply and operational effort. While much depended upon the operational situation, the principle emerged that a limited expansion and effort was preferable to the rapid degeneration which a lowering of training standards and a decrease in training costs would have entailed.



## CHAPTER 15

### THE EFFECTS OF THE MANPOWER SHORTAGE ON THE TRAINING ORGANIZATION

When considering the cost of training, the all important factor of manpower must be taken into account. Its presence was felt in every phase of the problem. Manpower was needed not only to supply the raw material for aircrew and to maintain the training organization but also to manufacture the aircraft and ancillary equipment. To examine the position it is necessary to revert to June 1942 when the Prime Minister was faced with manpower demands for a new Target Force 'G' amounting to 184,000. His reaction was to impose a 50 per cent. cut in the Air Force Figures.<sup>1</sup> The Secretary of State accordingly instructed the A.M.S.O. to draw up a plan for introducing a full 50 per cent. cut. The scope of the reductions intended was two fold ; firstly in various items of policy and secondly in the review of existing establishments. Under this review came the training organization and an examination of the possibility of curtailing training or the alteration of the location of training units in order to save overheads and transport time. It was found possible eventually to reduce the demand by half mainly by stringent economies and the sacrifice of certain long term measures but without touching the training organization.

There can be no greater example of the importance with which training was regarded than the fact that the Air Council considered that it was premature to review the length of the training courses and the types and locations of schools. The new policy, which was designed to improve the operational effort and to reduce wastage had only recently been approved and it was felt that the effects of policy had not yet had time fully to reveal themselves. The Air Council were satisfied that a shortening of courses would lower the quality of output with a resultant increase in wastage. The preliminary economies in manpower had therefore been made without rescinding any major items of policy. This meant that while such organizations as repair and maintenance, R.A.F. Regiment, Balloon Command and overseas squadrons had, by means of administrative streamlining, suffered substantial cuts without appreciable loss of efficiency, the training organization had been left largely undisturbed.

#### **Manpower Survey by Ministry of Labour**

In September 1942 a further manpower crisis arose owing to the fact that out of 425,000 personnel authorised by the Cabinet, only 396,000 had actually entered the Service leaving a shortage of 29,000. When the Ministry of Labour manpower survey was produced in October 1942<sup>2</sup> the full extent of the situation was revealed. Mobilisation had gone further by October 1942 than it had by the end of the first world war. 30.1 per cent. of the total population was serving in the forces in 1942 compared with 28.8 per cent. in 1918. It was not, however, enough. The Services were asking for between half and three-quarters of a million more personnel for the following year and the war industries needed over half a million more men and women for

<sup>1</sup> M.377(2), June 1942.

<sup>2</sup> L.P. (42) 235, 20 Oct. 1942.

the period. This shortage of manpower could have but one result and that was a form of rationing in accordance with priorities laid down at Cabinet level. In November 1942 a ministerial committee appointed to examine the establishments of the three Services, reported that they saw no alternative but the fixing of a total for each Service and allowing them to make the best possible use of available resources within that limit. So far as the Royal Air Force was concerned, their estimate of the manpower required by the latest expansion programme was so large that in fact it restored all the previous cuts which had been made and acquired more besides. Of the numbers required for R.A.F. expansion over the period July 1942 to the end of 1943, 208,000 were necessary to provide for expansion and 125,000 to replace wastage besides 139,000 women. This large element of wastage, both in ground and aircrews, was always a marked feature, and it is important to realise how heavy and constant a degree of wastage there was. Even the wastage rate for Royal Air Force ground crews was estimated as nearly 30,000 a year while the figure for aircrews was over 50,000 a year.<sup>1</sup>

The expansion programme on which the manpower demands were based assumed a target force rising from 332 first line squadrons of all classes in September 1942 to 635 squadrons by the end of 1944. To back this expansion, there was estimated to be a parallel need for an expansion of the operational training organization of comparable proportions. The number of O.T.U.s and conversion units was estimated to rise from 49½ (22½ Bomber, 11 Fighter, 8 Coastal, 5 Middle East and 3 Canadian) in September 1942 to 82½ (46 Bomber, 14½ Fighter, 7 Coastal, 6 Middle East, 2 Indian and 7 Canadian) at the end of 1944, while provision had also to be made for refresher and crew training establishments. Such then was the position. It appeared that in all, counting the demands of the war industries as well as the Services, the demand was for 2.5 millions and the supply was 1.6 millions.

#### **Examination of Training Establishments**

Bearing this situation in mind, the wisdom of locating so much of the training overseas will be apparent. Even so, the gap between supply and demand in Britain was such that even further inroads on the non-essential industries, drastic economies, and increased supplies from the United States of America, could not fully restore the position. It was obvious that a further cut was necessary, and it was a question of how this was to be made. From the Royal Air Force point of view, the Air Council once more turned to possible domestic economies, and again the training organization came under discussion.<sup>2</sup> The need for the 'Grading' system was queried, and it was suggested that the South African Air Force could release large numbers of Royal Air Force personnel if they took over the training organization in South Africa. Even the Royal Air Force personnel serving in the Dominion 'Article XV' Squadrons were the subject of comment. At that time the Air Member for Training was able to satisfy the critics by his argument that it was wrong to assume that it was possible to reduce the quality of the crews being produced. The accident rate showed that the training standard was still not high enough and the cost in men and aircraft wasted was still too heavy. The South African organization would

<sup>1</sup> MISC. 36/42/1, S. of S. Folder 524A.

<sup>2</sup> A.C. Con. 19 (42).

have suffered severely had the Royal Air Force element been withdrawn. As regards the 'Article XV' Squadrons it was pointed out that Canada's position throughout had been that, on the initiative of the British Government the Royal Canadian Air Force had concentrated to a large extent on the training of aircrew personnel. This had necessitated the provision and employment in Canada of ground personnel who would otherwise have been available for service with their squadrons overseas.

Once more, therefore, training had passed through a severe crisis without suffering from any policy decisions which might have impaired its efficiency. It merely suffered from the general effects of the manpower shortage. This, of course was an internal matter, but it reflects the importance attached to training by the Air Council. From the external point of view, the Air Forces as a whole awaited the decision of the Prime Minister as to the way the available manpower was to be apportioned. By that time the tendency was to treat each service and its associated supply industry as one and to make a broad allocation which would be shared subsequently by mutual arrangement.

#### **Reduction of R.A.F. Manpower Allocation**

In order to understand the eventual decisions reached by the Cabinet, it is necessary to make a brief survey of its assessment of the strategical position on which the manpower allocations were made. This was contained in a paper written by the Prime Minister at the end of November 1942, wherein he showed that his greatest pre-occupation at that time was the U-boat peril.<sup>1</sup> Other dangers had receded and except for the Mediterranean theatre, it was possible to relax the upkeep of the static defences. So far as the Royal Air Force were concerned, it was considered more important to increase the output of aircraft than anything else. On this reasoning the Prime Minister made the necessary manpower economies by heavy cuts in the demands of the fighting services. The Air Ministry demand for 472,000 men and women was to be cut by 225,000 but the Ministry of Aircraft Production was spared with a cut of only 75,000 out of an original demand for 603,000. Thus the anti-U-boat naval elements, and the production of aircraft received priority and all else suffered a pro-rata cut, the Royal Air Force receiving only half of their demand. There was, however, the proviso that every possible step should be taken to avoid a reduction in striking power. Even so it was estimated that, taking into account the prospects of production and the supply of equipment from the United States of America, there would be a loss of 71 Squadrons by the end of 1943 and of 108 Squadrons by mid-1944.<sup>2</sup>

As roughly 174,500 men and women had already entered the service since July 1942 the effect of the Prime Minister's cut was to reduce the quota for 1943 from 297,500 to 72,500. The manpower position by the end of 1942 was therefore that the authorised intake into the Royal Air Force until the end of 1943 was 60,000 men and 12,500 women, most of the former being needed for aircrew. It was therefore obvious that the ground trades were going to have to bear an increasing deficiency of strength compared with establishment. The readjustments necessary within the Service to enable planned

<sup>1</sup> W.P. (42) 556.

<sup>2</sup> A.C. Con. 21 (42).

expansion to proceed to the greatest possible extent were facilitated by the fact that it was possible to retrench on defensive measures. The end of 1942 was marked by a definite turn given to offensive preparations and by the policy of the Air Council to proceed with expansion plans regardless of deficiencies in manpower. The training organization had not suffered except in the general sense of universal establishment deficiencies but it was decided that publicity in support of aircrew recruiting should be suspended for the time being. This was in many ways unfortunate because although the supply of the pilot, navigator and air bomber category was satisfactory, there was a deficiency of other categories which it had been hoped would be remedied by a vigorous publicity campaign coupled with the lowering of the call up age to 18. Under the reduced allocations there was even a threat that Air Training Corps personnel might have to be rejected. The Air Council, however, decided that it was doubtful if there would be a greater yield from the Air Training Corps than was required, so that danger was averted for the time being.<sup>1</sup>

#### **Repercussions on Training : Establishment of the Pre-Aircrew Training Scheme**

The most significant repercussion of the events which have just been described was to make the training authorities more determined than ever to concentrate on improving the quality of the reduced numbers of aircrew recruits. Already in August 1941, when he attended the meetings of the Committee on the co-ordination of the bomber offensive, the Air Member for Training had considered what steps could be taken to improve the educational standard of those airmen medically suitable for the P.N.B. category but who had not reached a basic educational standard adequate to enable them to absorb and derive full benefit from the subsequent courses of instruction.

In 1942 it was found that a considerable proportion of recruits selected as pilots had received little more than elementary education whereas the pre-war standard had been School Certificate. Under the exigencies of the times that proportion was bound to grow, with a consequent increasing elimination rate of otherwise suitable material. Between fifteen and twenty thousand young men were in this educationally deficient category, and it was therefore proposed to introduce a special course for them on general educational subjects prior to the start of their training in order to fit them to absorb instruction on service subjects when they entered the Service. The proposal meant that this number of young men would be taken off the deferred service list six months early but, in spite of the repercussions on the manpower position, it was considered that the possibility of their deduction from the service manpower allocation was acceptable. The Air Council, in approving this scheme known as the P.A.C.T. (Pre-Air Crew Training) Scheme,<sup>2</sup> were impressed by the fact that during the previous year I.T.W. wastage had increased from about five to ten per cent., and it was likely that in future at least one third of the P.N.B. category aircrew entered would be educationally deficient. The number of pupils for this scheme was to be built up to 6,000 if possible on a six months' course and they were attached

<sup>1</sup> A.C. Con. 20 (42) and A.C. 80 (42).

<sup>2</sup> A.C. Con. 21 (42) and A.C. 89 (42).

to various civilian educational establishments all over Britain. At the same time they came under Service administration and were called up at the age of 17 $\frac{3}{4}$  so that they could start flying training at 18 $\frac{1}{4}$  and would be fully trained and ready for operations at the age of 19.

#### **Training Implications of the Casablanca Conference**

The Casablanca Conference was held to outline the overall world strategy for the year 1943. It had important implications for training. The European theatre continued to have top priority with all that that entailed for Bomber and Coastal Commands. In addition, plans for extensive land operations with tactical support were well advanced. There were requirements for a great expansion in fighter and light bomber types for tactical work; glider training for airborne operations was to be intensified and it was plain that operations in Burma were impending. The special problems of the South-East Asia theatre required the building up of a powerful air transport force to be located in that area. Training commitments under the new strategic decisions were therefore extended while restrictions in manpower pressed heavily on all preparations. Thus it can be seen that many of the assumptions and bases of calculation, on which Target Force 'G' had rested, were in need of revision. On the one hand, air commitments were rapidly increasing, while on the other, the fundamental factor of manpower was proving to be a restriction requiring much ingenuity to mitigate, since it could not be overcome. It was only by strict internal economies and re-organization, by carrying an increasing shortage of men in the ground organization, and by general tightening of efficiency that the increased numbers of men required to handle the new equipment and aircraft coming into the service could be kept within bounds.

It was at the end of 1942 that the Planning Staffs were faced with a dilemma. On the one hand was the pressure to continue with expansion regardless of growing manpower deficiencies because of all the measures which had been taken and the commitments which had been made, while on the other it was becoming increasingly clear that expansion could not continue at its previous rate. The difficulty was therefore that if this were admitted, there would have to be a considerable reduction in the size of the overseas training organization. This, after the Dominions had been pressed to develop it to the projected size. As the consequent reduction of intakes into the training machine would be in British personnel this meant that there would be increased pressure from the Dominions to convert their resources into first line squadrons, a measure to which the Air Ministry was opposed because of the inflexibility which would result. In any case Canada had incurred considerable additional expenditure on the strength of the Air Ministry's undertaking to supply a given quota of personnel for training. If this undertaking had to be revoked the reduction of their training organization presented political difficulties.

There was also the argument that Britain had made strong representations to the United States of America for the supply of aircraft to meet expansion plans. During conversations in Washington the American staff had argued that the Royal Air Force should equip squadrons from American to British

types of aircraft instead of expanding, and that the resultant gaps in the British strategic requirements should be filled by American units. In the British counter-arguments it was repeatedly emphasised that the greater part of the personnel for those squadrons had already been called up and were under training, and that the proportions of experienced aircrews in the Royal Air Force being much higher than in the American Air forces, American aircraft would come into contact with the enemy more quickly if assigned to Britain. The United States of America had in their possession complete details of the current aircraft production and Royal Air Force expansion programmes. Any large changes in either of these programmes as a result of manpower cuts would inevitably be regarded by them as a deliberate breach of faith, since allocation of American aircraft had been made on the assumption that these aircraft would be manned.

#### Revised Expansion Programme : Target Force 'H'

In the main, therefore, the trend of the new programme<sup>1</sup> (Target Force 'H') was to continue with a modified expansion by spreading the reduction resulting from the Prime Minister's manpower cuts over all branches of the service, yet at the same time aiming higher than was practically possible. This expedient caused much concern within the Air Ministry departments responsible. In the long run a reduction of the training organization was inevitable. The effect of these factors was reflected in the new expansion programme, since it became increasingly evident that unrestricted expansion could no longer proceed. Target Force 'G' was out of date because it was not only certain that the calculated requirements of personnel would exceed the available supply, but also the general tempo of the war was accelerating. The planning machinery was being outrun by the course of events as the strategy of the war passed into the offensive phase. Target Force 'H' therefore reflected both the limitations of manpower and the new offensive design in its effort to reconcile strategic requirements as nearly as possible with the probabilities of aircraft and personnel supply. By comparison with Target Force 'G', the new programme showed a cut from 600 squadrons to 517, a reduction of 83 squadrons. Broadly the cuts, due fundamentally to the shortage of manpower were as follows:—

						per cent.
Bombers	...	...	...	...	...	14
Fighters	...	...	...	...	...	12
Coastal	...	...	...	...	...	11

The programme in general presented a more aggressive design, which maintained bomber expansion with a target of 110 bomber squadrons in addition to those elements which would eventually be required for operations in support of a Continental army. Coastal Command continued to receive strong support, while the build-up of transport aircraft continued to be based upon hopes of American aid. It can be seen that the principle of flexibility had been maintained in spite of the fact that a stage had been reached when there was an increasing demand for specialization.

In view of the stringent economy which alone could make possible any compromise plan, it was necessary to ensure that the training organization to back the first line expansion should not grow bigger than was necessary

<sup>1</sup> C.W.E./E./47.

to support the actual number of first line aircraft. By allowing expansion to proceed naturally at a rate determined by the production of aircraft and their ancillary equipment, the necessity for accelerating the formation of O.T.U.s and A.F.U.s could be avoided, although the heavy conversion unit problem was rather different. A special feature of the programme was the fact that the Ministry of Aircraft Production abandoned the previous practice of publishing inflated programmes of aircraft construction. The new Target 'H' figures were related very much more to actual experience of production<sup>1</sup>. The position was as follows:—

	aircraft
Actual output in 1942 ... ..	17,730
Programme for 1943 ... ..	22,681
Giving an increase of ... ..	4,951 or 28 per cent.

In addition, the Minister of Production who had been on a visit to the United States of America, reported to the Cabinet that negotiations with the Americans on the subject of production had been most successful and that the President had put into a secondary position the policy that American aircraft must be flown by American crews. In its place he had wholeheartedly supported the 'principle of impact'. This meant that considerably more aircraft could be obtained than merely the requirements of attrition, especially in relation to the commitments of fighters for Russia and the requirements for transport aircraft.<sup>2</sup>

#### **The Creation of Aircrew Reserves: Personnel Reception Centres**

The effect has so far been seen of the manpower shortage on the higher policy of the Royal Air Force and of its effects upon training generally. There are, however, certain aspects which have not been examined, namely, the question of the creation of 'pools' of aircrew, the operational tour policy and its effects on the supply of instructors. These were questions which arose from the manpower stringency and, since they invariably came under discussion when wider considerations of manpower were raised, it is of interest to know how policy had developed in these directions. In particular, while the remainder of the Air Force were suffering from severe manning handicaps, there was general knowledge of large numbers of aircrew waiting in the reception centres.

It was considered by the training authorities that it was essential to maintain a working stock at the P.R.C.s to guard against shipping delays and other contingencies.<sup>3</sup> The necessary minimum size of this stock was considered to be in the region of 7,500 aircrew of all categories. This gave an average length of stay of about six weeks, of which three weeks was in any case taken up by documentation, kitting and leave and the remaining three weeks represented the shipping margin. Unfortunately, to be sure of never having less than 7,500 aircrew of all categories at the P.R.C.s, it was necessary to hold a figure much in excess of this during the winter and spring. The reason for this was that while the overseas training organization produced aircrew at a steady rate all the year round, the O.T.U.s in Britain

<sup>1</sup> S. of S. Folder, A.H.B. ID/7/5(a).

<sup>2</sup> W.P. (42) 568.

<sup>3</sup> S. of S. Folder, A.H.B. ID/7/1(a).

absorbed aircrew at a very much lower rate (nearly 50 per cent.) in winter than they did in summer. In consequence the flow of aircrew to Britain was in excess of requirements during the winter, but was below requirements during the summer, although the average flow over the year matched the average requirement. The excess flow during the winter caused the P.R.C. population to build up to some eleven or twelve thousand by the early summer, and this figure fell again to 7,500 by the start of the following winter, as the summer rates of withdrawal were in excess of its flow from overseas. It was anticipated, moreover, that the provision of additional schools in Canada during 1943 would absorb part, at least, of this winter surplus. In the meantime a programme of useful and progressive training was planned for all aircrew awaiting posting to A.F.U.s or O.T.U.s.

Though excellent in theory this policy had two disadvantages in that it tied up men at a time of manpower shortages and it took too little account of its repressive effects on aircrews who had travelled far to join in the war. The disabilities inherent in the system formed part of the price exacted by the submarine menace. Any convoy delay of four weeks would have reduced the actual stock to a fortnight's supply and this was the minimum period for administrative processes and leave. Thus, unless a minimum six weeks stock were planned, it was certain that, in the event of a shipping delay, such as occurred twice in the previous summer, it would not be possible to feed the A.F.U.s and O.T.U.s. When the previous delays had occurred, the fighter, coastal and army co-operation O.T.U.s had had to be starved for three weeks in order to maintain the flow to Bomber Command. It can be seen, therefore, that the sometimes vast holding of aircrews in the P.R.C.s was the inevitable price which had to be paid for exporting training overseas in the face of the submarine menace. Whatever else had to be sacrificed, a constant supply had to be available for feeding in to the advanced stage of training. If this had not been done, there would on the one hand have been a glut of semi-trained material overseas, and at home all the undesirable devices for meeting shortages whose effects would have been seen in shortened courses and a lower standard of training.

#### **Analysis of the Operational Tour Policy**

A second and more technical aspect of the use of manpower was the question of instructors for the operational training organization. This was not so much a question of numbers, but the more involved one of the balance between first line expansion and its supporting organization. Here, the flow back from the first line depended upon the policy which was adopted with regard to the length of the operational tour. This had so to be adjusted that it ensured a fair return for the large training overheads, while at the same time it was short enough to allow a fair chance of survival for the individual, and reasonable numbers to be made available for instructional duties.

The rates upon which calculations had been based regarding operational tour policy had, since the Battle of Britain days, been considerably amended in the light of operational experience, and in January 1943 a table was produced which was based upon up-to-date rates of effort and wastage in

the Metropolitan Air Force and which gave the true probability of survival under these rates :

Type of Squadron	Length of Operational Tour in Hours	Percentage of Crews not becoming killed, wounded, missing or prisoners of war	
		After one Tour	After two Tours
Heavy Bomber ... ..	200	16	2½
Medium Bomber ... ..	200	18	3
Light Bomber ... ..	200	4½	—
Day Fighter ... ..	200	27½	7½
A.I. Night Fighter ... ..	200	51	26
T.E. Intruder, Fighter Bomber and Bomber Recce. ... ..	200	13	1½
S.E. Intruder, Fighter Bomber and Fighter Recce. ... ..	200	2	—
Long Range G.R. (Heavy Bomber) ...	800	51	26
Medium Range G.R. (Medium Bomber)	500	47	22
Short Range G.R. (Hudson) ... ..	500	28	8
Sunderland Flying Boat ... ..	800	38½	15
Catalina Flying Boat ... ..	800	55½	31
Torpedo Bomber ... ..	300	2	—
Coastal Fighter ... ..	200	24½	6

While it was likely that actual survivals would be in excess of the rates that had been worked out, owing to withdrawal of personnel before the completion of their full operational tour, it was thought unlikely that they would reach the figure given in the original estimates. On the other hand, the term 'survival' referred to all aircrew personnel who were not killed, wounded, missing, or prisoners of war. Wounded amounted to some six per cent. of the gross losses, and Bomber Command had evidence to show that at least 20 per cent. of the crews lost over enemy territory were, in fact, prisoners of war. Taking the prisoner of war figure as being 30 per cent. of the gross losses, then the heavy bomber position at the end of one tour was calculated to be approximately :—

	per cent.
Killed or missing ... ..	54
Prisoners of War ... ..	25
Wounded ... ..	5
Free and uninjured ... ..	16

These figures were sufficient to raise a considerable amount of interest in high quarters and the matter was pursued. At that time (January 1943) it was known from previous experience what was the percentage of gross aircraft wastage which involved full crews, and the actual figures for the summer of 1942 were used for this purpose. The wastage of aircraft was forecast from the rates of effort and wastage laid down by the Air Staff and new rates had just been agreed which, in most cases, were more favourable than those recently experienced. The experts were therefore reasonably certain that the crew casualty rates upon which they were working were realistic estimates slightly biased by optimism.

In addition to actual casualties, replacements had to be allowed for crews completing their operational tour. For planning purposes a replacement rate was used which assumed that all wounded were unfit for further service;

and ignored the possibility of a second tour. This, therefore, allowed a small margin in hand for unforeseen circumstances, and this practice was continued regardless of the outcome of official discussions on the second tour. The chances of completing an operational tour were assessed by assuming that if on an average one complete crew became casualties for every so many sorties, then the proportion that could be expected to complete an operational tour was a matter of mathematical fact; unfortunately the chances got worse, not on the principle of addition but multiplication. Thus, when the Commander-in-Chief, Bomber Command said 'the crew are asked to face a 1:20 risk of failing to return sixty times in their operational career' he was saying that only about 4 per cent. would complete their tour. To put it another way, although the chances of completing any one sortie remained 20:1 for each individual sortie right up to the end, the chances of completing sixty sorties were not, as might be inferred from the C.-in-C.'s remark, 3 to 1 against but nearly 25 to 1 against. Fortunately the actual position was not quite so bad as the C.-in-C. inferred. The casualty rate was about one crew every 22 or 23 sorties, and the existing operational tour of 200 hours (or 40 sorties) gave a chance of completing the tour of about  $4\frac{1}{2}$ :1 against.

It was most unfortunate that the term 'survival' should have come to be used in lieu of 'completion of tour'. Throughout the examination the figures given for chances of completing an operational tour excluded all casualties. The chances of survival had, of course, to include those who were wounded and who became prisoners of war. The proportion of casualties who were wounded was known. In arriving at the percentage of those who might expect physical survival the following assumptions as to the percentage of killed and missing who might be prisoners of war was made up as follows:—

	per cent.
Heavy and medium bombers ... ..	30
Day fighters ... ..	20
Night fighters, long range and medium range, general recce and flying boats ... ..	Nil
All other classes ... ..	10

It was clear from all the facts at the Air Ministry's disposal that the chances of completing two tours was not good in most classes of squadron. On the other hand, it was difficult to see where squadron and flight commanders were to come from if the second tour were vetoed. Possible courses of action which suggested themselves were:—

- (a) A second tour of half the length only for selected personnel in Bomber Command, Fighter Command (except A.I. night fighters), Army Co-operation Command, and torpedo squadrons.
- (b) No restriction on second tour for other classes in Coastal Command or for A.I. night fighters.
- (c) No restriction on crews who had done one operational tour in a comparatively dangerous class, plus an O.T.U. tour, being transferred for their second tour to a comparatively safe class, and vice versa.

### **Effect of the Length of Operational Tours on the Supply of Instructors**

In May 1943 an awkward situation arose in connection with the length and number of operational tours and of the subsequent instructional tours because the Canadian Government asked that Royal Canadian Air Force aircrew personnel who had completed their first tour of operations should be accorded the privilege of spending their leave in Canada. The Air Ministry had previously examined this proposal and had come to the conclusion that it would be impracticable. In May 1943 the proposal was re-examined.<sup>1</sup> This was chiefly because the Canadians were aware of the fact that the current incidence of casualties for second tour personnel was so high that the number available for repatriation was practically negligible. In reply to this proposal the Air Ministry pointed out that up to this time Bomber Command crews had been expected to complete 200 hours on their first operational tour at the current average of five hours per heavy bomber sortie. This gave a total of 40 sorties, and the chance of successfully completing a first tour of 40 sorties was in the region of 16 per cent. It had now been agreed that hours should be ignored, and that the first tour should be fixed at 30 sorties, followed by a second tour, after a period of duty as an O.T.U. instructor, of 20 sorties. It was stated that the chance of completing a first tour of 30 sorties successfully was approximately 25 per cent. Taking into account operational and training wastage in O.T.U. and heavy conversion units, an establishment of 148 pilot instructors in operational training units plus an establishment of 68 pilot instructors in heavy conversion units was estimated to produce an average of 100 heavy bomber crews per month over the year. Therefore, given a nine months period of instructional duty between tours, a total of 216 pilot instructors would produce 900 operational heavy bomber crews. Since only 25 per cent. of the crews produced could be expected successfully to complete a first tour of 30 sorties, the number of crews available for instructor duty over a nine month period was 25 per cent. of 900 or 225 crews. This number of crews only just covered the numbers required to replace the establishment of 216 O.T.U. and H.C.U. instructors who would by then have completed their nine months instructional tour. It could thus be stated categorically that unless personnel were withdrawn as instructors before completing their first tour, practically 100 per cent. of those who successfully completed their first tour would be required as instructors. It was therefore clear that the Air Ministry could not agree to Canadian personnel returning to Canada on leave before they had done one instructional tour. This was especially so because Dominion personnel were ultimately to constitute some 40 per cent. of the first-line strength. On the other hand, in planning the expansion of Bomber Command a second operational tour had never been counted upon except in order to obtain volunteers for Squadron and Flight Commanders. Thus it could be fairly said to the Government of Canada that after completing one operational and one O.T.U. tour, Royal Canadian Air Force personnel could return to Canada for leave, but that the British Government expected sufficient suitable personnel to return as volunteers to complete a second operational tour as a squadron or flight commander. So far only pilots had been considered. In the case of other aircrew the position was somewhat easier as the establishments of heavy conversion units and O.T.U.s contained similar numbers of

<sup>1</sup> A.M.P. 4865, 11 May 1943.

instructors and other aircrew categories. Bomber Command was taken as an example since it absorbed a greater proportion of the total aircrew output.

It can be seen, therefore, from the figures given above that under 20 per cent. of the pilots fed into Bomber Command and slightly more for the fighters were available for instructional duties at the end of their operational tour. This resulted in these men becoming very hard worked and compelled to do a much longer instructional tour than was desirable or laid down. Even less surprising is it that before the O.T.U. stage, the training organization should have had to rely upon the best of the pupils passing through, since obviously there were not sufficient survivors from operations on bombers and fighters to staff the basic training organization.<sup>1</sup> During the first 18 months of the war all instructors had to be found by taking the best of the S.F.T.S. output as no ex-operational pilots could be released from the attenuated first line. Owing to the rapid expansion of the flying training organization, the supply of suitable personnel was hardly adequate to meet the requirements of new schools and any turnover of instructors to operations was out of the question. Later, when the tempo of training expansion had slackened, a small turnover became possible within the limitations of the instructor schools' capacity. At the same time, the operational commands had completed the bulk of their O.T.U. expansion, and it was hoped that ex-operational pilots, surplus to the requirements of the O.T.U.s, would be fed back into the basic training organization. Accordingly, after consultation with the Air Member for Personnel it was decided that the ideal policy would be to pass instructors forward to operations after one year's instructional duty. This would provide a welcome increase to the flow into operational Commands, as over 10 per cent. of the pilot intake into O.T.U.s would have had an additional three hundred to five hundred hours' flying experience.

The necessary flying instructor school capacity was created both in Britain and overseas, but the expected flow back from the Commands did not materialise. In consequence instructors' schools intakes could not be provided on a scale sufficient to produce a 100 per cent. annual turnover, and in fact the period was nearer two years than one. Inability to produce the requisite numbers of instructors from the S.F.T.S.s was due to the fact that only some 15 per cent. of the S.F.T.S. outputs were in any case suitable to be trained as instructors, and by the time the S.F.T.S.s overseas had taken their requirements, there was insufficient material left to meet the requirements of the A.F.U.s in Britain. Apart from the fact that perpetual 'inbreeding' of instructors from S.F.T.S.s was undesirable, a leavening of ex-operational personnel was obviously of great value to the training organization; this was a further reason for requiring the return of personnel from the operational Commands, but the intake depended upon the policy on the length of the operational tour. In the reverse direction the operational Commands were continually pressing for instructors to be passed forward to them, and in consequence, at no small cost to the training organization, some 150 to 200 pilots a month, with up to 18 months' experience as instructors, were released for operations. It may be appreciated, therefore, that by not offering up suitable material for training as instructors, the commands caused

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<sup>1</sup> S. of S. Folder, A.H.B. ID/7/2(a).

a lowering of the standard of instruction which in the long run was against their own interests. At the same time, as the figures show, they had not much choice in the matter.

#### **Manpower Deficiencies : The Threat to Training Standards**

So far as the manpower situation had revealed itself, by early 1943, the Cabinet had approved the Prime Minister's proposed allocation of manpower which cut the total original demands of all the Services and their supply industries by over half and which reduced the Royal Air Force demand by 225,000. When full provision had been made out of this figure for aircrew requirements there was estimated to be an overall deficiency of 83,000 or 8.5 per cent. in the ground trades of the Royal Air Force.<sup>1</sup> Economies were made all round but still the shortage compelled the A.M.S.O. and the A.M.P. to present a paper to the Air Council pointing out that deficiencies might be substantially reduced by a review of existing training periods and standards. Two examples were quoted: the shortening of ground training courses and a reduction in the pool of aircrew personnel in transit to or from overseas training. In addition the planning figures concerning aircrew and training aircraft wastage were considered to be too high. In the first case the population in technical training courses was as much as 100,000, and it was suggested that if courses were cut on the average by two weeks in length throughout 1943, 550,000 more airmen would be available for unit employment. In the second instance, the 'pool' of aircrew personnel waiting to go overseas for training, or who had returned from training appeared to be between 8,000 and 10,000 men. A reduction in these numbers would enable more airmen to be entered for ground duties, and it would also reduce the domestic establishments of the personnel despatch centres and personnel reception centres. In making these suggestions, the two Air Members concerned (A.M.S.O. and A.M.P.) appreciated the A.M.T.'s attitude on the subject of standards of efficiency and training, but they felt that the question of shortening technical training courses offered scope for enquiry.<sup>2</sup> In their view, no way of relieving the manpower situation should be overlooked and possible risks would have to be accepted.

It was only natural that, after effecting domestic economies in other directions, they should look to the training organization for some contribution. The Air Member for Training maintained, however, that it was his responsibility to strike a balance between quality and quantity in training and in this he received the support of the C.A.S. The pool of trainees in the Personnel Despatch Centres and the Personnel Reception Centres, he explained, was really the result of the economical nature of overseas training. Continuous training to capacity created a flow to the 'pool' which was less than the outward flow in summer but greater in winter. The arrangement was part of the price of exporting training and the period could have been lessened if air transport had been available. The A.M.T. stated that he would be grateful if a method of meeting the fluctuating operational demand could be found but he knew of no way of reducing the six weeks' period spent in the pool without the risk that the front line would go short of personnel or Advanced Flying Unit training would have to be eliminated.

<sup>1</sup> A.C. 29 (43).

<sup>2</sup> A.C. Con. 7 (43).

The A.M.T. therefore, was able still to maintain his training standards and organization in the face of the gravest threat which had yet arisen. The progress of events, however, continued to increase the threat. Plans under the new Target Force 'H' for the Air Forces, and the rival claims of the other expanding services demanded that once again further bids for manpower should be made.<sup>1</sup> In May 1943 the Director of Manning warned the Air Staff that the other services were submitting manpower demands. In addition the Minister of Labour pointed out in a memorandum to the Cabinet that further allocations to the services would have to be made to prevent them running down through wastage. In particular the Royal Air Force required 85,000 men and 15,000 women to maintain Target Force 'H' expansion. The position was such that the Air Ministry decided that normal bargaining methods were useless in the face of the great disparity between supply and demand. They decided therefore to state their minimum demands and to let their case rest on its merits.<sup>2</sup>

At the same meeting, the grading course of eight weeks in which 12 hours flying was done was criticised as resting on an over-elaborate organization and the question of the need for two Groups seemed due for reconsideration. On this point the A.M.T. said that if grading were not done in the United Kingdom the whole of the grading capacity and more would have to be provided overseas. The grading system had paid in ensuring quality in the flow of trainees overseas. As for the question of the group organization only small staffs were concerned and it seemed doubtful whether re-organization into one group would result in economy in view of the travelling which would then be involved. Incidentally there was also, at a later Meeting in August, a strong move to have 'Grading' established under No. 54 Group on the score of manpower saving. This was, however, strongly opposed by A.M.T., A.M.S.O. and C.-in-C. Flying Training Command, chiefly on the grounds that the I.T.W.s had been installed with some difficulty in localities chosen for the facilities available and not for their proximity to airfields. If the grading course were fitted into the I.T.W. course, it was claimed that personnel would have to be sent long distances by road to do their flying. To effect the combination of the two courses, either the location of the I.T.W.s would have to be changed or airfields would have to be built near them.<sup>3</sup>

In June 1943 the Secretary of State summarised the position as follows:—

'The problem is how to make the best possible use of the residual margins of manpower in the country. The most economical use of manpower lies in air power.'

From the records of discussions on manpower at Cabinet level at that time it is evident that the bomber offensive continued to enjoy the highest priority and that, in particular the needs of the Ministry of Aircraft Production were considered to be of paramount importance. This will appear in due course. The training organization, however, was in increasing jeopardy. The accent was definitely on first line development now that the end of the war was coming into view. On the necessity for operational training there could be no argument, but the very success of the basic training organization overseas was to make it increasingly evident as time went on that there were

<sup>1</sup> C.W.E./E/47.

<sup>2</sup> S. of S. Manpower Folder, May 1943 and L.P. (43) 115.

<sup>3</sup> A.C. Con. II (43).

sufficient basically trained personnel to meet the capacity of the operational training organization. When the time came for training to suffer heavy manpower cuts, it would be in this direction that the sacrifice would have to be made. For this reason, training was intimately concerned with the manpower battle then being waged at Cabinet level. The upshot of these discussions was that in spite of a manpower deficiency amounting to some 100,000 men and women the Air Staff were determined to proceed with their expansion plans. This meant an inevitable undermanning of all units, and although a call for stringent economies led to a saving of 30,000 personnel a ground deficiency of 18 per cent. was threatened by the end of 1943.

In general the two main effects of the manpower situation on training were that the operational Commands were seriously hindered in their training and operations, and that the problem of finding a sufficient number of personnel suitable for aircrew training out of the available allocation became increasingly difficult.<sup>1</sup> In July 1943, it had been planned to call up from the deferred list some 13,000 candidates in August and September 1943, and 16,500 for the period October to December 1943, for aircrew training. Since men on the deferred list counted against the manpower allocation there was difficulty in substituting other personnel if these intakes were not forthcoming.

At the same time the Prime Minister was not satisfied with the manpower situation regarding the Royal Air Force. He considered that further reductions could be effected.<sup>2</sup> However, a Cabinet committee formed to investigate the situation discovered nothing to the detriment of the Royal Air Force. Moreover, they were impressed by the high cost in time and resources in training the modern aircrew. The numbers under aircrew training were based upon the wastage estimated by the Training Progress department, and it was stated that of the total aircrew then being entered, 90 per cent. were absorbed in making good wastage and 10 per cent. were for expansion. While it was true that requirements were assessed in relation to the future, the wastage allowance could not be reduced in view of the intensity of operations and the arrangements for operational tours. Also the aircrew wastage was related to aircraft wastage; if the latter were to decrease, more squadrons would be formed with the result that crews were required for expansion instead of wastage.

In August 1943 an attempt was also made by the Chief of Air Staff to obtain some relief from the burden of manpower deficiency. On a visit to Canada he informed the Canadian Chief of Air Staff of the problem and asked if any help could be forthcoming. Investigations revealed that in April 1943 the Canadian authorities had been notified that 5,640 more men would be required if all Royal Canadian Air Force 'Article XV' units in the U.K. and elsewhere were to be 100 per cent. Canadian. The position by August 1943 was that existing Canadian units were almost completely manned by Canadians. There were, however, to be further expansions of Canadian operational units and the tendency had begun to drain Canadian Service manpower in order to extend the operational first line. This tendency was later to entail the winding up of the Canadian flying training organization and may be regarded as the first step in that direction.

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<sup>1</sup> W.M. (43) 100.

<sup>2</sup> M. 476/3.



## CHAPTER 16

### THE REDUCTION OF TRAINING

In July 1943 a further revision of target forces became necessary owing to the impact of the manpower shortage.<sup>1</sup> The most important change from the training aspect was the decision to equip Bomber Command exclusively with heavy bombers. It was not possible to compensate immediately for the loss incurred by this decision—although the effect was gradual as Wellington medium bombers continued to operate until early October. While the medium bombers were to be removed from the operational first line the Ministry of Aircraft Production estimate of Wellington production decreased by two hundred. In view of the O.T.U. requirements this was a complication because Bomber Command were asking that there should be a more rapid modernisation of the marks of Wellington to be used in the O.T.U.s supporting the heavy bomber squadrons (i.e., Wellington Mark X's instead of Marks IC and IIC). On the other hand, the benefit derived by the operational training organization can be gauged from the fact that by the end of 1943 the medium bomber O.T.U.s had nearly 400 Wellington X's against an original estimate of 200. This would not have been possible if the first line had continued to use Wellingtons.<sup>2</sup> A further aspect of the new bomber policy was that once Bomber Command had gone over completely to heavies the heavy conversion unit commitment attained its full importance. The balance between training and operations in terms of heavy aircraft became critical. The C.A.S. in July 1943 made enquiries concerning the number of heavy bombers allocated to squadrons and training units, and, it was shown that at the beginning of June 1942 the number of heavy bombers in conversion units had been 137 compared with 327 in the squadrons—a proportion of 42 per cent. A year later, when the squadron strength had more than trebled, the proportion was 47 per cent. but thereafter as the rate of expansion eased the proportion was estimated to decrease to about one-third. At the same time it was demonstrated that for a static force just over a quarter would be required to maintain it.

#### **First Proposal for the Contraction of Training**

From the foregoing picture of expansion it will have been appreciated that the early conception of the task of the R.A.F. had caused the laying down of training and aircraft production programmes of such a size that, despite manpower shortage the Air Staff were determined to proceed with expansion at a rate made possible by these elements; up to September 1943 this had been made possible by economies and by the increasingly efficient use of available personnel. It is therefore true to say that it had not been necessary to make any sacrifices on the level of main policy. The necessary scale and tempo of preparations for an Allied invasion of the Continent, plus the political necessity to make a gesture in participating in the Pacific war, entailed a first line development of such proportions as to make policy sacrifices inevitable. There was also the question of operations in Burma

<sup>1</sup> S. of S. Folder, A.H.B. ID/7/5(a).

<sup>2</sup> S. of S. Folder 5602.

which were going to make heavy demands on the creation of an air transport force. Altogether the pressure to make some important sacrifice was becoming so great that in September the C.A.S., purely in an exploratory way, asked the Air Staff to study the possibility of front line expansion at the expense of training. He envisaged a stage in the war in Europe when it would be strategically sound to accomplish this, i.e., when the long term objectives had been reached and all available strength could be brought to bear against the enemy. The extent of this cannibalisation would, of course, be conditioned by the need to maintain the necessary force required for the war against Japan. He pointed out that the overall manpower strength was only just holding its own in 1943 and could hardly hope to do so in 1944 and that therefore this cannibalisation of the training machine, which could only be justified on strategical grounds, might probably be the sole alternative to the cessation of expansion and later the contraction of the force. Any such process could not fail to be extremely intricate and would require most careful planning.<sup>1</sup>

Further impetus was given to this trend by the progress of discussions during September 1943. At a meeting in the latter part of that month, attended by an American representative (Mr. Donald Nelson), the Minister of Labour outlined the existing manpower situation. He showed that Britain was maintaining an army on the Continental scale, a great Air Force and Navy, and a considerable defence force together with an enormous supporting munitions production.<sup>2</sup> Commitments for an all-out flow to bring the war to a successful end in 1944 were such that a further decision had now to be faced. In order to bring the maximum strength to bear against the enemy it was obvious that reserves would have to be depleted. These reserves lay in the training organization. An assumption had to be made as to when the war was likely to end and, having done this, the flow of trainees in the pipeline had to be stopped and personnel diverted into the front line squadrons to a proportionate degree.

#### **Revised Expansion Programme : Target Force 'J'**

The final outcome of the combined pressures of manpower and strategic commitment entailed, as already mentioned, the revision of Target Force 'H' and the issue of a new expansion programme which became known as Target Force 'J'. This programme reduced the number of squadrons to some 520 but increased the number of aircraft in them. This was obviously intended primarily to save manpower overheads, but it was plain that since the training and the aircraft construction programmes permitted the maintenance of the rate of expansion there would be a further struggle to find the supporting manpower for the ground staff for this force. As the gap to be bridged between the supply of manpower available for the Services and their demands was thought to be as much as 700,000, it was obvious that something drastic would have to be done. The planners were now thinking seriously along the lines that the assessment of the numbers required in 1944 would be materially affected if, as the result of the adoption of a firm assumption regarding the date of the termination of the war with Germany, it was decided that the front line could be expanded at the expense of the training

<sup>1</sup> C.A.S. Archives, Sept. 1943.

<sup>2</sup> M.P.C. (43), 7th Meeting, 23 Sept. 1943.

organization. The effects of the various hypotheses in this connection were at this stage being actively explored. This new Target Force 'J' had been based on expectations of aircraft supply and on the assumption that by June 1945 when the programme was due to achieve its peak, both Germany and Japan would still be in the war. This being so, aircrew had still to be entered into training as they would be required 18 months later. Even if the war with Germany were over by June 1945 it was argued in support of the Air Ministry's demands that it was unlikely that less air power would be needed for dealing with Japan than the force at which the Air Ministry were aiming. Although wastage and therefore aircrew training requirements would be lower in respect of the Japanese war itself, a large force would be necessary in Europe, and considerable resources would be needed for transport. It is apparent now, from the proceedings of Air Council meetings and high level discussions, that the Air Council were extremely reluctant to cease the intake for aircrew training and to wind up the training organization. This would have been an irrevocable step, and the front line would have run down very rapidly in the face of operational wastage if both the German and Japanese wars had proceeded simultaneously. The Air Forces were particularly vulnerable owing to the length of the aircrew training periods in comparison with the other two Services.<sup>1</sup>

The manpower requirements of the R.A.F. during 1944 were based upon the hypothesis that the war in Europe would continue to be waged until at least the end of 1946. A calculated aircrew wastage of 72,700 submitted to the War Cabinet was based upon a full scale operational effort by all Commands at their fully expanded strengths during the whole of 1945-1946. On this assumption, these demands to meet the expansion were reasonable, but as the supply fell a long way short of the demand, it was considered probable that the War Cabinet would be compelled to forecast a date by which the war in Europe would end, and that the War Cabinet would instruct the Service Ministries to re-submit their demands in the light of their forecast. Knowing as they did, that but a fraction of the Service demands could possibly be met, the Air Council had most carefully to consider their approach to the Cabinet on this vital question. The method by which demands were formulated was as follows: It rested with the A.M.S.O., subject to financial concurrence, to fix establishments and to calculate the wastage of aircrew personnel; A.M.P. was responsible for deciding the numbers to be taken in for training and for calculating the wastage of ground personnel; and it rested with P.U.S. to determine civilian requirements, which, for the first time, were now included in the Royal Air Force manpower demand.

#### **Co-ordination of Aircrew Requirements in order to Disperse the Aircrew Surplus**

At this period (October 1943), in the preparation for the periodic manpower battles in the Cabinet, the preparation and analysis of the various components of Royal Air Force demands revealed an embarrassing surplus of trained aircrew personnel. The C.A.S., expressed his concern at the surplus of crews in the home commands, particularly in Fighter Command where the strength

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<sup>1</sup> A.C. Con. 14 (43).

of pilots was nearly 1,000 more than the establishment maintained against possible future operations.<sup>1</sup> He appreciated the reasons for the surplus, namely that expansion had not gone exactly according to plan, that the actual wastage rates proved lower than those estimated and that the inflexibility of the training machine prevented immediate adjustments being made. The figures indicated, however, that the situation had got somewhat out of hand.

The objections to this over-large surplus were not only the insufficient use of valuable manpower, but that the situation would lead to the less experienced crews being given insufficient employment and experience of actual operations with a detrimental effect on their morale and discipline. The C.A.S. suggested that the trouble possibly lay in the fact that the Air Staff might not have been given sufficient guidance on policy. It was agreed, generally speaking, that this was so. Remedial measures had, however, been taken prior to the C.A.S.'s minute.

A meeting was held by A.M.S.O. on 31 August 1943 at which it was revealed that in the past the responsibility for watching the crew position and for co-ordinating action between the three Air Members concerned had not been clearly defined. Thus overseas crew reinforcements were determined by the A.M.S.O.'s Department, overseas postings were carried out by A.M.P. and the training flow was planned by A.M.T. It was agreed that a monthly meeting should be held to examine the crew position in each Command at Home and overseas, both in the light of current trends of crew production and in the light of future operational demands. This meeting was to be attended by A.M.S.O., A.M.P. and A.M.T., as well as by the Vice-Chief or the Deputy Chief of Air Staff who would be asked to advise on future operational requirements. Upon A.M.T. was placed the responsibility for producing the figures to be considered at the meetings, and for co-ordinating the preparation of all replies on behalf of the C.A.S. to enquiries on aircrew matters received from the Secretary of State.

As regards the particular situation under review, i.e. that of the Fighter Command surplus, a meeting was held by the V.C.A.S. in September 1943 at which measures were taken to reduce the situation to normal by early 1944. These measures included the temporary conversion of two fighter O.T.U.s into 'Tactical Exercise Units' in which some of the surplus could be held pending absorption into squadrons; a reduction in the intake rate; an extension of the course at the remaining five O.T.U.s, and the release from squadrons of 75 operationally experienced pilots a month for six months for training as flying instructors and fighter controllers. This state of affairs encouraged A.M.T. to ask for 100 more pilots a month from Fighter Command for flying instructor training alone in order to put a stop to the current undesirable practice of 'creaming off' pupils from S.F.T.S. outputs to provide instructors. The most he could obtain, however, was 75 pilots a month. In Bomber Command the surplus was actually a planned build-up to ensure that squadrons had enough crews in hand to maintain operational effort during the winter period when O.T.U. and H.C.U. outputs were sub-normal. Bomber Command had suggested that to this end there should be 28 crews per squadron of 20 U.E. aircraft. The bulk of the surplus in Coastal Command was on types where there were large demands for overseas reinforcements. This review of methods of co-ordinating aircrew

<sup>1</sup> C.A.S./A.M.P., 22 Oct. 1943.

planning resulted in closer collaboration with the Air Staff and in a more frequent review of wastage rates with a consequent saving in margins of aircrew personnel.

It was at this time that the basis of calculation for the flow of aircrew wastage rates was raised in view of the fact that a surplus of aircrew was apparent. This was a very difficult problem as no one knew what wastage was likely to be in air battles which could only be dimly foreseen. The wastage rates were under constant review in the light of experience and were never fixed, and the reason for the existing surplus of pilots was that up to March 1943 the practice had been to include a number of tolerances to meet unforeseen contingencies. By September 1943 it was decided that Commands should meet contingencies from savings, and that tolerances in planning were to be dispensed with.<sup>1</sup>

### **The Continued Expansion of the Training Organization**

Notwithstanding the severity of the manpower restrictions which were increasingly being felt in the autumn of 1943, and in spite of the inconvenience of the run down of the overseas training organization, there occurred a paradoxical increase in the establishment of Flying Training Command. This was due to two factors: first, that the Expansion and Re-equipment Policy Committee held the view that the training commands were still 'the goose which laid the golden eggs' and without their valuable product the other Commands could not carry on; and secondly, that the substantial increase in Flying Training Command establishments was necessary because an A.C.R.C., 2½ I.T.W.s and 5 A.F.U.s remained to be formed under the current expansion scheme. A flying instructors school and the Elementary A.G.S. were to be expanded and there was an added commitment for glider training which involved the formation of several new units.

It was considered vital to keep Flying Training Command at a strength which would feed Bomber Command with trained material as the need for an all out bomber offensive would not allow a smaller backing.<sup>2</sup> Flying Training Command had in times past suffered heavy cuts and had made considerably heavier proportionate reductions than any of the other Commands. In fact establishment cuts had amounted to 10 per cent. as compared with 7 per cent. for Bomber, 3 per cent. for Fighter, and 1.75 per cent. for Maintenance Commands. The position by mid-October 1943 was that there was a steady flow through the training machine up to the O.T.U.s and H.C.U.s when the weather factor came in and formed a bottle-neck.

### **Assumptions on the Date of the End of the War**

In October 1943 the Minister of Labour reported that by the end of the year the mobilization of the nation would be practically complete. The total intake from all sources in 1944 would not be sufficient to replace ordinary wastage, and there would actually be a deficit of 150,000 even if none were called up for the Services.<sup>3</sup> He stated that the situation in 1944 presented a new problem which could not be solved by proportionate cuts in the demands of the service and supply departments, but which required

<sup>1</sup> A.C. Con. 14 (43).

<sup>2</sup> A.C. 68 (43) and A.C. Con. 15 (43).

<sup>3</sup> M.P. (43) 472.

a fresh review of the uses to which the available manpower was to be put. He indicated that it would be necessary to make an assumption as to some approximate date up to which the maximum provision had to be made for the Forces.

The question as to how manpower in 1944 was to be used depended on what assumption was made about the duration of the war with Germany. There appeared to be two broad alternatives:—

- (a) It could be assumed that the maximum effort had to be made in 1944 and that Germany would be defeated at the end of that year. On this assumption there could be a great saving in munitions and trained men as well as a substantial cut in the training and ancillary organizations.
- (b) Alternatively, it could be said that manpower plans had to be based on the assumption that war with Germany would continue well beyond the end of 1944. In that event the fact would have to be faced that the Forces and munitions industries had been built up to levels which it was impossible to maintain over a prolonged period. On this assumption planning would have to commence immediately for a progressive reduction in the scale of the war effort.

Whichever the alternative chosen, increasing reliance would have to be placed on the United States effort. The choice between the two alternatives would determine the form which the assistance would take. If the first alternative were chosen, the United Kingdom war effort would be unbalanced and United States help would be required to provide a larger proportion of the equipment of the Forces. If, on the other hand, the second course was chosen, additional help from the United States would have to come in the form of more fighting units and their equipment. Manpower policy for 1944 had, therefore, to be based on either of these two alternatives. The Prime Minister inclined towards the first alternative, and to this end he instituted measures to examine the implications of the adoption of this alternative to British plans.<sup>1</sup>

The Air Ministry, having been following the policy that, notwithstanding manpower difficulties, a reduction in the striking power of the Royal Air Force was to be avoided, considered that this policy could no longer be continued. In anticipation of the position which was now clearly recognised, a meeting had been held in the Air Ministry in September 1943, one of the results of which was that a study was put in hand to ascertain what would be the effect on Royal Air Force requirements if the European war was assumed to end by autumn 1944. It was already clear that the adoption of some such assumption would enable an immediate and substantial reduction of training capacity to be made, thus transferring manpower to fill deficiencies in the front line. As many of the aircrew training courses took as long as 18 months to complete, an alternative assumption that the European war would be over by early 1945 would have a similar effect, but less immediately. It was, however, stressed that once executive action had been taken on this basis, the training machine could not be moved again from reverse to forward gear in time for action to be effective.

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<sup>1</sup> M.P. 43 (I), 8 Nov. 1943.

In the meantime organization and administrative arrangements were being planned to deploy some 249 squadrons against Japan by July 1945 on the assumption that the European war would end in the autumn of 1944. It was clear that the Air Ministry demand for 158,000 (i.e. 142,000 for the service proper, and 16,000 for civilian staff) could not be met, and therefore, pending the findings of the Cabinet Committees, the Air Ministry reduced their demand to 107,000 for Service personnel. The main reasons for this were that revised rates of aircrew wastage had been approved and some of the tolerances in the training organization had been eliminated. Although this figure of 107,000 was required almost entirely to meet wastage, the necessary resources to provide for expansion could be found in outputs of the training organization from previous manpower allocations, and from personnel released by the reduction in the training organization to the benefit of operational requirements.

#### **Inter-Service Manpower Decisions : Fleet Air Arm Requirements**

The consideration of the Manpower problem before the Cabinet, was complicated by Naval demands which had steadily risen from 40,000 to 67,000 on the score that they wished the Fleet Air Arm to participate in the element of insurance which was made in Royal Air Force plans on the assumption that the German war would continue until the autumn of 1945. It was suggested by the Navy and agreed by the Ministerial Committee that the Admiralty and Air Ministry should devise a plan whereby up to 17,000 men could be trained during 1944 for air duties in such a way that they could be used in 1945 either in the Royal Air Force or in the Fleet Air Arm. The argument was that if the basic assumption was realised and Germany were defeated by the end of 1944, the needs of the Fleet Air Arm would be greater. If, on the other hand, war with Germany continued into 1945, deployment against Japan would be delayed, and these men would be used more effectively in the Royal Air Force. The idea was that in this way a double insurance would be secured for a single premium.<sup>1</sup> The matter was not quite so simple as that, however, and the Secretary of State pointed out that the continuing expansion of the Royal Air Force was confined wholly to the heavy bomber squadrons, and that the allocation of 50,000 men was to meet operational wastage in 1945. Thus, if the war with Germany were to continue beyond 1945, the impact of Bomber Command upon the enemy would be diminished at what would be a critical period unless wastage were made good by the supply of aircrews to the high and extremely specialised standards of Bomber Command. He questioned the ability of the Navy to produce this number of aircrews at short notice, and was certain that they could not be provided in the categories required.<sup>2</sup> On the other hand, in relation to the numbers of suitable men that could be provided for the Royal Air Force, the Fleet Air Arm requirement was very small, and the skilled ground personnel and crews could easily undergo the short course required to convert them to Navy requirements. On completion of the war with Germany the Navy would be in a position to select from the Royal Air Force the types of aircrew they wanted who possessed the required qualifications and experience. The upshot was that it was decided that the Admiralty and the Air Ministry should settle

<sup>1</sup> M.P. (43) 6th Meeting.

<sup>2</sup> W. P. (43) 546.

this matter direct. When the representatives accordingly met on 13 January 1944 it transpired that the Admiralty did not want aircrew at all but wanted skilled and semi-skilled maintenance ratings, and it was agreed that the whole of the 17,000 should be entered into the Royal Air Force for training but that when the Armistice was concluded, 3,000 of these would be made available immediately and 14,200 would be supplied within the following six months.

#### **The Decision to Reduce the Training Organization**

At the beginning of December 1943, the Cabinet agreed with the recommendations of their Committees,<sup>1</sup> and the Royal Air Force received out of their reduced demand for 107,000 men and women, some 50,000 men and 20,000 women.

In the face of this allocation there were three courses of action<sup>2</sup>:—

- (a) To proceed with the expansion programme, keeping the training organization going on the assumption that war with Germany would continue indefinitely. This would involve a deficiency of 37,000 at the end of 1944 or approximately three per cent. of establishment.
- (b) To cut the expansion programme or reduce present strength so as to eliminate this deficiency without any contraction of the training organization.
- (c) To proceed with the expansion programme as planned (bringing all units up to establishment during 1944) until the autumn of 1945, at the same time reducing the training organization so that by that date the numbers of aircrew completing their training would be no more than required for the Japanese war.

The first two courses were ruled out as it was felt that there was little likelihood of the war with Germany extending into 1946, and if the training organization were retained at a level to meet German war wastage rates there would have been a very large surplus built up. The third course offered a nine months insurance factor and at the same time allowed for a concealed margin in that if the European war had ended before the end of 1944 there would have been a build up without wastage. When considering these factors it must be remembered that the effect of the reductions would not be felt for 18 months but once this had started it would take a similar period fully to repair the effect of the cuts if this had been made necessary by the war going on beyond the end of 1944.

The Air Council decided, therefore, to proceed with the front line expansion programme as planned, bringing all units up to establishment during 1944, until the autumn of 1945, at the same time progressively reducing the training organization so that by that date the numbers of aircrew completing their training would be no more than required for the Japanese war. The 40 per cent. represented the difference between wastage rates for the European War and those for the Far Eastern war.<sup>3</sup> This decision meant that a good deal of preparatory negotiation was necessary with the Dominions. The question of lengthened courses and closing down schools on account of the existing surplus of aircrew which had now become manifest had already been broached with the Canadians.

<sup>1</sup> W.P. (43) 164.

<sup>2</sup> A.C. 79 (43).

<sup>3</sup> A.C. Con. 17 (43).

The stage had thus been reached that while still planning to achieve expansion scheme 'J' and thus maintaining the maximum offensive effort during 1945, it was decided to scale down substantially the manpower requirements for the training organization during 1944-1945. The two main factors which enabled this decision to be effected were the reduced rate of aircrew production, and the elimination of margins in the training organization. The rate of production of crews was calculated to meet revised replacement requirements on a new basis assuming that wastage rates in the future would be of the same order as they had been during the year 1943 during which increasing superiority had been achieved over the enemy's Air Forces. It was also assumed that, except in Bomber Command, there would be a substantial proportion of crews available for a second operational tour. This was a reversal of previous policy which provided a hidden margin. As regards the second factor it had been the policy in the past, while expansion was still proceeding and before the existing degree of air superiority had been attained, to allow margins of safety in the training organization. These margins took the form of 'pools' of aircrew personnel at all stages of training over and above the numbers of pupils actually under training. They enabled sudden demands to be met and provided insurance against irregularities of shipping and losses at sea. The combined effect of the two new decisions was that in future there would be no reserve in the training organization to meet intensive demands. There did, however, exist certain factors of safety which could be set off against the loss of flexibility.<sup>1</sup>

The time had therefore come when, except for Bomber Command, expansion was virtually completed. A measure of superiority over the enemy in the air had been achieved and there was reason to hope that this measure of superiority would increase rather than diminish in the future. A considerable reserve of aircrew existed in squadrons and O.T.U.s and this provided in itself an insurance against any sudden intensification of effort. In addition there had been a marked improvement in the regularity of shipping, and the success of the anti-U-boat campaign had considerably reduced the risk of losses of aircrew during the sea passage. Although action had been initiated to reduce margins and eliminate pools of personnel in the training pipeline, there was still some time to go before the full benefit of the policy could be felt, since accumulated surpluses could only be absorbed over a period. In addition to this, planning was now proceeding on the basis that Germany would be defeated by the autumn of 1945. This assumption automatically created further surpluses which again would have to be absorbed. The elimination of these margins in pools did not mean that training capacity was to be reduced below the level ultimately required for the maintenance of the front line, but resulted in considerable savings in overheads and in a substantial reduction in aircrew intake requirements for the year 1944. For example, all P.N.B. aircrew intakes were stopped in November 1943 in order to absorb a surplus existing in the aircrew reception centres and it was not proposed to resume P.N.B. intakes until April 1944. In short, a new phase had begun so far as the aircrew training organization was concerned in that the Air Ministry had planned to meet theoretical requirements only. The next programme planned to reduce still further during the autumn of 1945 the training organization so that it would meet

<sup>1</sup> A.C. 90 (43).

the theoretical requirements of the Japanese war and the policing of Europe. Once training capacity was closed down it could only be brought into being again after a considerable lapse of time, and it was this consideration which weighed heavily in the future decisions which had to be taken when considering the second phase of the war against Japan in relation to the estimated date of the defeat of Germany.

In January 1944 the Cabinet Committee appointed by the Prime Minister to investigate the Royal Air Force manning situation made its report.<sup>1</sup> From the training viewpoint its findings were of interest. There was some criticism of the use of tour-expired aircrew on instructional duties. The figure of 5,000 crews in the home establishment was contrasted with the output of over 11,000 pilots from O.T.U.s in the United Kingdom. While making due allowance for overseas re-inforcements and the replacement of casualties, the committee observed that there remained a substantial residue to replace tour-expired aircrews. The Committee also made a serious objection to the numbers under training at home which it was stated were to be 206,991 at the end of November 1943 out of a total of 822,195 personnel. They considered that this number was too high but realised the recent policy decisions would result in an increase in the front line of some 12 per cent. at the expense of training. The Committee also found that over 25 per cent. of the strength of the Royal Air Force in the United Kingdom was made up of personnel employed on duties connected with the servicing and repair of aircraft and equipment, and were impressed by the strikingly high cost in manpower of training and maintaining an extremely specialized operational force.

#### **Steps to Reduce the Overseas Training Organization**

Of the many reactions to the proposals before the Ministerial Committee on Manpower the one that necessitated urgent consideration was the run-down of the Empire Air Training Scheme. Whatever the assumptions as to the date of the collapse of Germany it was necessary to begin measures to curtail the scheme, as this was the only way in which such a relatively small allotment of manpower in 1944 could be managed. If the assumption were that the war in Germany would be over in the autumn of 1945 these aircrew intakes would start to be reduced in the spring of 1944; if, however, the assumption were that the war would be over four months earlier, then it was considered by the Air Ministry that reductions would have to take place immediately (November 1943).

On his visit to London at the end of October 1943, the High Commissioner for Canada, Mr. Malcolm McDonald, had a general discussion on this subject at Air Ministry. The specific point under discussion with him concerned a relatively small reduction of intakes (and therefore schools) due to an adjustment as a result of experience in the crew replacement rates. Mr. McDonald was, however, informed that these proposals might well prove to be only a preliminary to a wider programme for reductions later. When the High Commissioner discussed this matter with the Canadian Prime Minister, Mr. Mackenzie King, the latter fully understood the reasons for the reduction, and in fact welcomed them on some grounds. The Prime Minister pointed out, however, that this was bound to become public knowledge sooner or later and that unless the matter were well handled it

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<sup>1</sup> W.P. (44) 58.

might cause serious misunderstandings in the United States. He recalled the situation which arose in the summer of 1943 when Colonel Ralston announced reductions in Canada's home defence army. The significance of that announcement was completely misunderstood in the United States, and caused much criticism of Canada to the effect that she was reducing her war effort at a time when the Americans were being asked to increase theirs. Even worse criticism might result, it was suggested, in the matter of reductions in Royal Air Force training schools, unless it were carefully explained to the Americans, especially in view of the effort entailed in the Japanese war. The Canadian Prime Minister suggested that the reasons for reducing the training effort should be most carefully explained both privately and later publicly. As the A.M.S.O. explained to the official Committee, an allotment of only 35,000 men to the Royal Air Force during 1944 would compel the Air Ministry to ask Canada to make drastic reductions in the training organization in that country, almost at once. This allowed but little time to take the steps suggested by the Canadian Prime Minister, and would entail political difficulties with both the Canadian and American authorities. On the other hand, it was pointed out that the full allotment of 50,000 would allow a breathing space of three or four months during which to prepare the ground.

In order to plan, in detail, the training organization which was required in the light of the contemplated progressive reductions, it was necessary to decide on two matters. Firstly, the size, composition and distribution of the force which the training organization would be required to back from October 1945 onwards, and secondly the form and extent of the contribution which the Dominions and Allies would be willing to make after October 1945.<sup>1</sup> Decisions on these two points were the subject of a discussion between the Chiefs of Staff and the Governments concerned. Pending these decisions, however, it was necessary to begin progressive reductions at once owing to the length of the training courses.

Preliminary information on the size of the force required indicated that 490 squadrons would be necessary, exclusive of those required for Dominion Home Defence. Sixty-three of these squadrons were for the United Kingdom, 207 squadrons were earmarked for the Japanese war, and the remainder were required for policing Europe and for miscellaneous tasks. These plans could not be put into effect without discussing them with the Dominion Governments and partners in the training plan. The Dominions were proud of their training schemes and, from some points of view, it was natural that they should regret the closing of their schools, especially as this was likely to involve them in political difficulties of their own. Negotiations for reductions had to be managed with the greatest care, especially as it could not be disguised that Britain was assuming that war with Germany—though not with Japan—would be over by the autumn of 1945. The Prime Minister had therefore been approached on these lines and asked for permission to consult the Dominions. He signified his agreement to this course at the beginning of February 1944, and steps to open the matter were taken.

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<sup>1</sup> A. C. Con. I (44).

#### **Signing of Power/Balfour Agreement, 1 February 1944.**

The Under Secretary of State for Air, Captain Balfour, and the A.M.T. had in the meanwhile gone to Canada at the end of January to explain to the Canadian authorities the basis of the reduced aircrew training programme. The result of this was the signing of the Power/Balfour Agreement of February 1944<sup>1</sup> in which it was agreed, in view of the large reserve of aircrew already trained or under instruction, to begin a gradual reduction of intakes to close a number of schools. At the same time the Air Ministry were anxious to spread reductions in training evenly over the various Empire organizations—except Australia and New Zealand where it was assumed that their training capacity would be planned to requirements in the South-West Pacific. In March 1944, the Secretary of State, through the Dominions Office, notified South Africa and Southern Rhodesia of the proposed reductions amounting to about 40 per cent. of their training organization.

Early 1944 thus saw the beginning of the decline of the training organization with the invasion of Europe still to come, the Japanese war raging unabated and operations in the Mediterranean still in full swing. This illustrates clearly the time lag there was between decision and execution, and how those responsible for planning had to legislate for war conditions which would obtain up to a year and a half ahead.

#### **Provisional Bomber Expansion Programme**

At the beginning of March a provisional programme to cover the period up to the end of 1945 was issued for planning purposes. This programme showed probable expansion in the number of heavy bomber squadrons in Bomber Command from 69 in March 1944 to 118 in September 1945. A few weeks later, however, certain alterations in the estimated rate of effort and wastage reduced this programme to 99 squadrons by September 1945.

The main basis of this revision was that the reduced number of squadrons should operate at a higher intensity of effort. There was not, therefore, a corresponding loss in the number of operational sorties which it would be possible to fly. In fact, so far as Lancasters were concerned—and this type was providing two-thirds of the heavy bomber sorties, rising to three-quarters by the end of 1945—it was anticipated that there would be a greater number of sorties flown during the following six months, although a decline thereafter, due to higher rates of wastage anticipated under winter conditions, was considered to be inevitable. The Halifax effort in contrast showed a decline and it was estimated that the cumulative deficiency of sorties would amount to as much as 8,000 less by the third quarter of 1945.

One of the factors in this reduction in Bomber Command was the bottleneck in the operational training organization. Up to this stage there was a congestion of crews awaiting vacancies in the O.T.U.s, but this was not such an important consideration compared with the shortage of aircraft, particularly of Lancasters. This position revealed the growing efficiency

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<sup>1</sup> M.2. (44).

of Bomber Command and the increasingly good use they were making of the aircraft at their disposal. Of course, this result would not have been possible in the face of the heavy losses which had been experienced in the earlier stages of the war. The bottle-neck in the O.T.U.s and H.C.U.s was rather a serious one, but the trouble was that had the size of the units been enlarged to any considerable extent, it would have only been at the expense of the operational squadrons as regards aircraft. The governing factor was aircraft availability in determining how large a number of heavy bomber squadrons could be supported by the new rates of effort and wastage.



CHAPTER 17

**THE OUTCOME OF THE TRAINING REDUCTION,  
APRIL-SEPTEMBER 1944**

By April 1944 the Royal Air Force were confronted with important issues regarding the long-term planning policy. The position was dominated by two major uncertainties, the date when the European war would end and the strategy for the war in the Far East. It was considered possible that the latter might be determined first, in which case it might be feasible to plan a further reduction in the training organization before the defeat of Germany was in sight.<sup>1</sup> The problem was that if training were allowed to run down before the end of the German war the size of the front-line force would, in the face of continued wastage rates, diminish very rapidly. But if too large a training organization were maintained then the supply of manpower for post-war civilian reconstruction plans would be jeopardised. The matter therefore required very careful consideration. Steps had already been taken to reduce training, in accordance with the Air Council decision,<sup>2</sup> so that by October 1945 the output of trainees would be equal to the needs of the 490 squadron force. Agreement on this basis had already been reached by the A.M.T. with the Canadian Government. The reduction planned amounted to 40 per cent. of the training output with the result that there would have been a very steep decline in the front-line strength had the German war continued beyond September 1945. The decline amounted to a reduction from some 530 squadrons in September 1945 to approximately 360 in the last half of 1946.

It was estimated that the Royal Air Force would require about 395 squadrons one year after Germany was defeated. This figure was regarded as fairly firm although the composition might vary. The War Cabinet then asked for a revision of the combined Service-Munition programme.<sup>3</sup> Owing to the time factor the Air Ministry could not await the production and examination of this review. The whole basis of the 490 squadron assumption was therefore challenged. It was found that the additional saving in British manpower from a reduction of training capacity, corresponding to a difference of 95 squadrons, was not appreciable as the reduction would affect a considerable number of Canadian ground personnel who were manning the training organization, but only a small number of Royal Air Force personnel. The figures for British personnel were:—

Second half of 1944	...	...	...	2,000
First half of 1945	...	...	...	4,500
Thereafter	...	...	...	2,000 for each six months.

The additional savings in Canadian personnel were estimated to be considerable and of the possible order of 5,000 in 1944 and 15,000 in the first half of 1945. This reduction had been calculated by the Air Staff in order to avoid an undue diminution of the size of the Royal Air Force. They took into account the fact that the majority of the Allied Air Forces

<sup>1</sup> A.C. 17 (44); A.C. 4 (44) and A.C. Con. 15 and 18 (44).

<sup>2</sup> M. 17 (43), 7 Dec. 1943.

<sup>3</sup> W.M. (44)48.

would return to their own countries after the end of the German war, and the bulk of the reduction of 95 squadrons was to fall mainly upon Dominion and Allied squadrons. There was thus a reduction of only 24 Royal Air Force squadrons; the saving in ground personnel was predominantly Canadian, since the greater portion of the training organization was manned by the Royal Canadian Air Force, while the saving in Royal Air Force manpower was largely confined to aircrew intake.

#### **Expansion limited to Bomber and Transport Squadrons**

Between the middle of April 1944 and September 1945 the Royal Air Force was planned to expand in heavy bomber and transport squadrons only. Owing to the recent decision to increase the heavy bomber effort in Bomber Command, with the resulting increased wastage of aircraft, the rate of squadron expansion to which the Air Ministry had been working was retarded by 22 squadrons by the end of 1944. The Air Staff were anxious to increase the current target force by 15 transport squadrons to be formed during the latter part of 1944. The requirement of ground personnel planned to meet the expansion of Bomber Command in the last half of 1944 was therefore to be considerably reduced owing to the setback in Bomber Command expansion, and this saving made it possible to meet the increase in transport squadrons. The Royal Air Force would therefore derive only a small advantage in 1944 from the additional manpower which would accrue from reducing the training organization below the requirements of the 490 squadron force. The reduction in the training organization on the basis of 490 squadrons, being designed to continue progressively to September 1945, was calculated to give sufficient manpower to meet the requirements during 1945 and the A.M.S.O. did not anticipate that a further reduction in the training organization would increase the theoretically small surplus which was expected to result. Fundamentally, what the Air Ministry felt was needed then (April 1944) was more insurance. Existing plans on the 490 squadron basis insured the Air Force against a too rapid run down up to October 1945 in the event of the continuation of the German war but not thereafter. In any case as aircrew took 12 to 18 months to train, the personnel for the 530 squadron front line strength in October 1945 were already in, or were shortly to enter, the training machine. The task which the Air Ministry had to accomplish was to reduce the training organization so that by October 1945 the output was sufficient for 490 squadrons only. The C.A.S., in summing up the opinion of the Air Council, said that the retention of training capacity planned for October 1945, far from being an insurance was, in fact, essential if the 360 squadron figure was to be held and not weakened further.<sup>1</sup> All that the Air Ministry asked was that no further reductions should be demanded at this time as, if events proved more favourable, reduction could take place very rapidly.

#### **The Dominion and Allied Contribution to the Japanese War**

The part which the Dominions were to play in the front line commitment against Japan had not, (by April 1944), taken clear shape, but in the draft target force produced by the A.M.S.O.<sup>2</sup> they figured largely, and the Air Council agreed that the Dominions should be asked about their intentions

<sup>1</sup> A.C. Con. 4(44).

<sup>2</sup> A.C. 17(44).

in this matter.<sup>1</sup> There was no doubt that serious issues were involved affecting the distribution of effort between the various parts of the Commonwealth and therefore the extent of the continuing burden to be borne by the people of Great Britain. There was a possibility that the Dominions might like to take a larger share than that suggested for them in the A.M.S.O.'s above mentioned target force, in which case the Air Ministry would have been only too pleased to encourage them to contribute as much as they could.

It was assumed generally that Allied Air Forces would be repatriated at the end of the German war and they did not appear in the target force for Japan except for a few French and Dutch squadrons, and Czech medium transport squadrons for Europe and lines of communication. At the same time there was the possibility that the Air Ministry might have to continue to provide the repatriated Air Forces with aircraft and with training facilities. This was an embarrassing situation at the time because the Air Ministry were reluctant to tell the Allied Air Forces of the assumptions regarding the end of the war with Germany and consequently, while reducing the Royal Air Force training organization, the Air Ministry were still providing Allied Air Forces with training backing on the basis of an indefinite continuance of the German war. Training backing for 44 Allied squadrons was being provided whereas only eleven Allied squadrons figured in the 395 Squadron force. This matter became the subject of scrutiny and was later to result in the reduction in Allied training.

#### **The Surplus of Aircrew Personnel**

A further and subsidiary reason for keeping the training organization up to standard was the problem of handling the large supplies of tour-expired aircrew that would be available for service on garrison duties in occupied territory and on lines of communication. Until the autumn of 1943 the input into the training organization had been on the basis that crews did one operational tour only. After an Air Staff review of wastage rates, the input was planned on the basis that nobody in Bomber Command did a second operational tour but that 50 per cent. in Fighter Command and 33 $\frac{1}{3}$  per cent. in other commands did a second tour. This change of policy was one of the few margins left to reduce the aircrew surplus and to save manpower. Actually, by early 1944 there had been an over-consumption of crews in Bomber Command owing to the very rapid tour expiry rate. This built up large numbers which the training organization would have to handle, together with the numbers of returning prisoners of war.

By early 1944 the combined effect of the mounting Allied air superiority, the immense output from the training organization and the large numbers completing their operational tours, had caused an embarrassing situation for the Air Ministry.<sup>2</sup> There were more pilot/navigator/bomb aimer volunteers on the deferred service list than could be absorbed, while at the same time there was an accumulation of trainees throughout the training organization. There was also the difficulty of finding employment for tour-expired aircrews. The most recent statement of aircrew requirements, which took account, amongst other things, of the decision to reduce the size of the

<sup>1</sup> A.C. 23(44).

<sup>2</sup> A.C. 15(44) and A.M. File S.99180.

training organization, had shown that it would not be possible to absorb all the candidates awaiting call-up for P.N.B. duties within a reasonable space of time. Indeed it was stated that unless some measures of diversion were adopted, it would not be possible to resume P.N.B. intakes until September 1944, when the January 1943 recruits would be recalled after 20 months' deferment. This position could not be accepted, particularly at a time when there were difficulties in filling vacancies for training in the non-P.N.B. aircrew categories.

#### **Revised Classification Procedure for Aircrew Trainees**

Since August 1943, the final selection of candidates for a particular aircrew category had been deferred until the recruits had been recalled and had completed their initial course of ground training. It was then decided that in order to meet the situation, the same rule should be applied to all candidates entered before that date and not finally classified as P.N.B., whether they were still on deferred service or under training. Of those personnel who were then at the grading stage and not yet notified of their final classification, approximately one third were to be classified in non-P.N.B. categories. Of those candidates undertaking a Pre-Aircrew Training course or on the deferred service list who had been provisionally selected as P.N.B., approximately half had to be re-classified to the non-P.N.B. category in order to meet the requirements of the service. In this way it was hoped to absorb by the end of 1944 all P.N.B. candidates who had been on the deferred list for nine months or more, as well as those then on the deferred list. Candidates were to be given the option of declining classification on the new basis and those who declined were to be released for service in the Army or Navy. The decision to re-classify was not to be applied to cadets who were taking the University Short Course or to members of the University Air Squadrons. All these were to be classified as P.N.B. It was stated that the P.N.B. candidates who were diverted to a non-P.N.B. role would receive pay at the P.N.B. rates on successful completion of the I.T.W. course until they had completed training and qualified for sergeants rates in their own category. Steps were taken to ensure that this decision was conveyed to all cadets in as sympathetic a manner as possible. In addition, special instructions were issued to officers commanding the units concerned and a statement was also handed to every cadet personally.<sup>1</sup> The position was admittedly most unsatisfactory from the individual point of view, but the war situation had caused a revision of requirements for the various aircrew categories. As a result, the recall of recruits for P.N.B. training had to be virtually suspended. Under the altered circumstances, the total period of deferment might well have exceeded twelve months, and even extended to as long as eighteen months. Apart from the feelings of individuals, it would certainly not have been in the national interest that the most suitable type of young man should have no opportunity of service at a time when there were so many claims on the available supply of manpower. It was therefore necessary to introduce a new system of classification to aircrew categories which enabled candidates to be recalled for training much sooner than was previously the case.

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<sup>1</sup> S. of S. Folder, A.H.B. 1D/7/1(a).

Training for the other categories (air gunners, wireless operators and flight engineers) was proceeding, and in order to ensure that the best possible use was made of the high quality material available, more extensive tests were introduced for making final selections to specific aircrew categories. As it was not possible to give all these tests on interview at the aviation candidates selection boards it was arranged that final selection be deferred until recruits had been recalled and had completed an initial course of ground training during which the tests were taken. Recruits enlisted after 19 August 1943 were advised of this procedure at the selection boards, and it was then applied retrospectively to all aircrew volunteers who had enlisted before that date. The new procedure was that, during the first stage of ground training, candidates underwent tests to assess their suitability for each aircrew category. The results were taken into consideration together with individual preferences and the needs of the Service, for the appropriate classifications. Retention in the limited P.N.B. category, as opposed to re-allocation to one of the other categories therefore depended on the relative performance of the volunteer in the tests. There is no doubt that this new procedure, which was rendered necessary by events, was a blow to an extremely keen and qualified section of the community. Nevertheless it is interesting to note that only three per cent. of the I.T.W. population at that time (April 1944), who had entered as prospective P.N.B. trainees, declined to take the chance of becoming non-P.N.B. on re-classification, and some of them were not free agents as they had been released from industry specifically for P.N.B. employment.<sup>1</sup>

#### **Employment of Surplus Aircrew on Ground Duties**

The other aspect of the surplus aircrew problem was that concerning the large number who had completed their operational tour but for whom no non-operational flying employment could be found between tours. It was necessary to take special measures for their classification and employment since, while instructional and other non-operational employment was normally available for all pilots and for nearly all navigators, a much smaller number of instructional posts were available for the other aircrew categories, particularly air gunners.<sup>2</sup> Hitherto such personnel had in the main been held supernumerary on the strength of commands, but the numbers had reached such proportions as to cause embarrassment to the commands. It was therefore clearly desirable both for general manpower reasons and also from the point of view of the individual to ensure that all such personnel were properly employed. The first step was to set up a unit, similar to the Combined Re-selection Centre at Eastchurch at which all aircrew personnel, returning from overseas or coming off operations and not immediately absorbed in vacancies in their own Commands, could be tested and classified for other employment. It was considered by the A.M.P. that it should be possible to find employment, in posts requiring aircrew experience, for all officers and for a large proportion of the other ranks. There was, however, a residue of airmen for whom employment would not be available, and it was proposed that such personnel should be employed

<sup>1</sup> A.C. Con. 4(44).

<sup>2</sup> A.C. 15(44).

on the duties of their trade. Those who had no trade were to receive instruction in one. At the same time all remained liable for further aircrew employment and wherever possible were kept in flying practice. They continued to receive the pay of their aircrew category.

It was realised that this policy would not be received with enthusiasm by the personnel concerned but there was no alternative form of employment. It was anticipated, however, that there might be certain opportunities, particularly after the second operational tour, of reducing the numbers such as by returning Dominion personnel to their respective countries and by releasing professional men to civil life. This was the policy whose implementation was the logical result of the success of the air war.

### **The Continued Surplus of Aircrew Personnel**

The evident and growing surplus of aircrew, and the swollen deferred service list, at a time when the manpower situation was steadily getting worse, brought the Royal Air Force under the severest pressure to abandon the margins of insurance in planning which they had hitherto maintained. This was not mere conservatism but was based on the knowledge of how hard it had been to create the training organization necessary to support expansion plans and how unwieldy that type of organization had necessarily become in order to ensure the correct standard of training. Measures once taken to disperse hard won training assets could not speedily be revoked, and such was the size of the first line, that wastage which could not be replaced would soon bring about a drastic first line reduction. By the beginning of May, therefore, the stage had been reached in which the Air Council were being pressed strongly to lower their target to 395 squadrons (in spite of their reluctance to abandon their 490 squadron basis) and in which the part to be played by the Dominions assumed larger proportions.<sup>1</sup> In particular, the part which the Canadians were to play in the front line came under discussion as the manpower stringency tempted the Air Council to consider asking the Canadians to use personnel saved by the reduction in the training organization to swell their front line contribution. These considerations resulted in a request to the Canadian authorities to man with ground personnel forthwith an additional 10 squadrons and such other squadrons or units as they might find applicable. This was to raise the number of Canadian squadrons to 54 in all.

At the end of June 1944, the Secretary of State had drawn the attention of the Air Council to the monthly stock report which showed that surplus aircrew personnel over the whole of the Royal Air Force as at 30 June 1944 was 10,800. He was concerned at this figure and pressed the Air Staff to depart from the existing 490 squadron level and plan for the 395 squadron force. It transpired that Royal Air Force expansion might in any event be restricted to the size which would be reached at the end of 1944. Already the programme provided for a fall to 290 squadrons in the second half of 1946 if the war with Germany still continued, and the C.A.S. recommended that any further immediate cut in the training organization should be deferred till the end of September until a clearer view of the prospects of the end of the war with Germany could be taken. At this stage, aircrew categories requiring only short-term training were still being taken in, but

<sup>1</sup> A.C. Con. 5(44).

none of the men recently called up were starting long-term aircrew training. This was the only source of economy that was now open to those who planned training; it was obvious that it was not enough in the face of the existing surplus of aircrew, the generous establishment of crews in the commands and the lower wastage rates being experienced.

A plan for disposing of surplus personnel was initiated. By August 1944 it was becoming evident that with the reduced rates of wastage in the fighting in Normandy, the replacements required were half of those calculated. The squadrons were congested with aircrews and Flying Training Command was still more congested with pools of aircrew at different stages of training. The Commander-in-Chief, Flying Training Command, was concerned at the seriousness of the situation in his Command. No blame was attributable to the training organization for this evident over-production of aircrew, which was due entirely to measures of insurance that had been taken, and happily proved unnecessary. Nevertheless, something had to be done to cut down the production of aircrew and the whole question of overseas training came under scrutiny.

#### **Revised Training Plan**

In consequence of these considerations the A.M.T. put forward important suggestions for reducing the flow of aircrew. In his minute, the A.M.T. said that the production of the new training plan entailed some two months work, and as the current E.A.T.S. Agreement expired on 31 March 1945, the Air Ministry must be prepared by October 1944 to enter into negotiations with the Dominions for the signing of a new agreement.<sup>1</sup> As it was not possible to provide exact data on which to base a new plan, he considered it necessary for plans to proceed on the basis of assumptions which should be as realistic as possible. The current training plan was based on the hypothesis that the German war would continue until the end of September 1945 and that thereafter deployment to a theoretical 490 squadron force would take place. In working out this training plan, the agreed Air Staff replacement rates were used throughout and allowance was made for absorption of all surpluses both in squadrons and in the training organization. Training courses were also kept to a minimum so as to economise in manpower, since it was appreciated that if the actual Japanese war force were smaller, then the same training capacity, operating at an inevitably reduced tempo would still produce sufficient numbers to match the smaller force. The A.M.T. proposed that, in preparing the new training plan, the following assumptions should be made:—

- (a) The German war would be finished by the end of September 1945.
- (b) The Royal Air Force would continue to expand up to the end of December 1944, but not thereafter unless a favourable wastage rate allowed.<sup>2</sup>
- (c) The force existing at the end of September 1945 would be reduced over the ensuing six months.
- (d) Replacement rates for the European war would remain as then planned, with agreed allowances for personnel undergoing second operational tours.

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<sup>1</sup> A.M.T. L.M./3023, 11 Aug. 1944.

<sup>2</sup> War Cabinet (100) Con. 3 Aug. 1944.

- (e) Replacement rates for the active theatre of the Japanese war would be at revised rates to be agreed by the Air Staff.
- (f) Replacement rates on European police work would be based on 30 per cent. of the crew establishment per squadron per annum (i.e. a squadron with 28 crew establishment would require 8/9 crews per annum as replacement).
- (g) No margins were to be allowed for contingencies other than those which might arise should operational wastage fall below current rates.
- (h) On the conclusion of the German war stage, allowance was to be made for one-third of the known air crew prisoners of war becoming available for employment during the Japanese war stage, after an interval of nine months for recuperation and refresher training.

The training organization thus to be planned would be based on minimum lengths of courses which would be acceptable in emergency only. Thus, a reduction in the target force would allow the Air Ministry to extend courses to the length which was acceptable on a long-term policy. The personnel already under training, allowing for recategorisations, were thought to be sufficient to meet requirements of squadrons up to September 1945. The revised plan showed to what extent it would be necessary to resume intakes to meet the requirements of the war after this date. The calculations would also show surpluses which would exist at each stage of training quarter were the German war to end before the end of September 1945. Although the intention was to reduce training as rapidly as possible it was necessary to retain some margin in the event of the prolongation of the German war.

#### **The Growth of the Transport Commitment : Its Effect on Bomber Expansion**

Although the main policy trend at this time was controlled by the manpower situation it is important to note the developments in Allied strategy which necessitated the growth of air transport and the consequent extension of transport and glider training. At the Allied meeting in Cairo in December 1943 it had been agreed that priority should go to the preparations for the invasion of Europe and the Mediterranean operations.<sup>1</sup> Plans for the future fell into two main categories, referred to as Stages 1 and 2 which covered the German and Far Eastern wars respectively. The plans were naturally governed by the widely differing needs of each theatre and necessitated two distinct programmes. The issue was complicated by the need to maintain the air effort against Germany on types of aircraft and under conditions very different to those required in the Far East. As the campaign in Burma progressed it was evident that supply by air was essential to success. Therefore the demand for transport aircraft and crews grew steadily. At the start of the 1944 campaign the transport squadrons under the control of the Supreme Commander were five British and five American, comprising 144 aircraft. By the end of March a shortage of trained aircrew for transport work was revealed owing to the need to convert them to the special technique of the theatre. When planning was undertaken for an all-out offensive during the dry season of 1944-45 it entailed a greatly increased training commitment.

<sup>1</sup> C.A.S. Archives, C.C.S. 423/C., 5 Dec. 1943.

At the end of June 1944 the Secretary of State enquired as to the possibility of going ahead with the formation of bomber squadrons in advance of the planned programme without affecting the transport expansion.<sup>1</sup> The A.M.T.'s Department stated in reply that the basic training organization would produce sufficient crews to man the heavy bomber force irrespective of the casualty rate.<sup>2</sup> This was because, in the case of these types, the limiting factor to expansion was aircraft production, while crew output was in phase with planning. Thus, given favourable casualty trends, crews and aircraft which had been provisioned to meet the anticipated heavy wastage were now available for expansion. In addition, the basic training organization was in a position to produce sufficient crews for 15 additional transport squadrons. On the other hand, the limiting factor both to the expansion of Bomber Command ahead of programme and the formation of additional transport squadrons was the supply of ground personnel. On paper it did not seem possible to have both bomber and transport expansion although some of the additional transport squadrons might be provided, while still expanding Bomber Command to the limit of aircraft availability. It was in any case not possible, in the opinion of A.M.T.'s Department, to curtail training capacity any further since the reductions which had already taken place only left sufficient capacity to meet Japanese war requirements. This statement was based on the generally agreed assumption that, once the German war was over, the training tempo would decline, so that the organization normally required to support the '490 Squadron' Force would then only support the '395 Squadron' Force. On the aircraft side, Bomber Command expansion had been running fairly well to forecast, the latest aiming at some 85 heavy squadrons by the end of 1944. The increase in bomber expansion did not allow the formation of transport squadrons at the expected rate, since the intensity of the bomber effort had been greatly increased. It is, however, interesting to note how the shortage of ground crews was now dominating all development.

#### **Continued Manpower Problems: Reduction in the Size of the Deferred Service List<sup>3</sup>**

In June 1944 the Prime Minister asked Sir John Anderson to reconvene the Ministerial Committee to consider the allocation of manpower for the second half of 1944.<sup>4</sup> The situation by July was that two separate decisions had to be made. The first was to meet the immediate shortage of Army personnel in July and August 1944, and the second was to put forward demands which would be in accord with plans drawn up for the end of the German war and the start of the Japanese war deployment. The original manpower demand for 1944 had been based on the indefinite continuation of the German war and had amounted to 142,000 personnel. It was then calculated that if the above demand were reduced to 80,000 expansion could continue until the autumn of 1945. By this time the training organization would have been reduced to a level adequate to support front line expansion

<sup>1</sup> S. of S./A.M.T. Target Force 'J' Folder, 23 June 1944.

<sup>2</sup> A.M.T./S. of S. (T.P.), 1 July 1944.

<sup>3</sup> Although manpower is of necessity closely allied to training, detailed discussion of the problem has been avoided in this narrative so as not to obscure the main issue. Refer A.H.B. Monograph, *Manning*.

<sup>4</sup> M.721/4, 15 June 1944.

and wastage equal to the requirements of the Japanese war. There were therefore three main factors to be considered :—<sup>1</sup>

- (a) The assumption that the war against Germany would end in September 1945.
- (b) The March expansion programme.
- (c) The continued reduction of the training organization planned in December 1943.

After these questions had been examined by the A.M.T. in consultation with the Air Staff and A.M.P. it was apparent that they related mainly to reductions in O.T.U. and H.C.U. capacity, lower squadron replacement rates after practical experience of 'Overlord' and the possible transfer of surpluses of partly trained pupils from one category to meet requirements in another. The effect of these changes was not expected to be felt until early 1945 in the case of operational squadrons, and a few months later for the training organization generally. The Air Ministry welcomed this short term point of view. They were relieved of the necessity of considering long term policy, in particular the maintenance of the training organization after September 1945, at a level considerably higher than that required to support 490 squadrons for the Japanese War. It also offered a breathing space for the difficult questions of training policy under examination by the A.M.T. The immediate consideration was the proposed increase of 22,000 in the Army intakes during July and August, partly at the expense of the Royal Air Force. The problem was the method of obtaining the personnel for the Army. There was the alternative of either transferring to the Army men already serving in the Air Force or of sending A.T.C. cadets who had been training with a view to entry in the Air Force. Both alternatives were unacceptable and undoubtedly would have political and domestic repercussions.

While the Cabinet Manpower Committee were examining the basis of short term recommendations in which figured a further reduction of 10,000 in R.A.F. manpower, the Minister of Labour showed his concern at the size of the deferred service list. By June 1944 there were 34,000 men on the deferred list, and the Ministry of Labour suggested that 10,000 could be released to the Army.<sup>2</sup> The Air Ministry recognised that at the time they could not resist the claims of the Army and they would have to give up some of the specially selected personnel on the deferred list, about half of whom were A.T.C. cadets. They realised the consequence of the transfer of such keen personnel, trained in their own time and with the help of voluntary instructors of public bodies, who had worked hard in the belief that, in fitting young men for aircrew, they were performing an urgent public service.

At the beginning of July 1944 an analysis of the deferred list was completed. It disclosed that of a total of 34,000 men, some 19,000 were not immediately available for recall because they were specially deferred, under age, or for some other reason. It was estimated, however, that 30,000 of the 34,000 would be ready for recall by the end of December 1944. The Air Ministry was prepared to have 30,000 tested and classified with the intention of keeping 20,000 most suitable for aircrew duties and making available to the Ministry of Labour the balance of 10,000. This testing was possible

<sup>1</sup> W.M. (43) 164th Conclusions.

<sup>2</sup> M. P. (44) 2nd and 3rd Meetings, 26/28 June 1944.

at a uniform rate over six months. These measures meant that there would be available a three months supply of aircrew material. There was some objection to the Air Ministry proposals as it had been hoped to call up 10,000 men for the Army from the deferred list within two months, whereas under the Air Ministry scheme not more than 3,000 appeared likely to be available. It was pointed out that it was an essential point of the plan that the men on the deferred list should be put through certain tests to which they would not normally have been subjected until after their call up. This process inevitably took some time, but everything possible was done to expedite matters and to release 6,000 during July and August and the remainder during September and October.

### **Re-allocation of Aircrew Personnel**

The cumulative effects of the shortfall of aircraft (particularly heavy bombers and American types), the low number of casualties incurred in North Africa, Sicily and Normandy—and the efficiency of the training organization—had resulted in a substantial surplus of aircrew. This was coupled with the general manpower shortage whose effects have been elsewhere described and these factors, together with the confusion which inevitably followed contemplation of the end of the German war and the start of Stage II against Japan, made up a situation as complicated as any which had faced the Air Ministry.<sup>1</sup> The immediate task which confronted the Air Ministry was how to deal with the problem created by existing and prospective surpluses of aircrew and how to relieve existing deficiencies in ground trades. The aircrew surpluses existed at personnel reception centres and personnel despatch centres and also among trained aircrew in operational commands and at holding and allocation units such as the Aircrew Allocation Centre, Brackla.<sup>2</sup>

During the preceding few months, a series of measures had been undertaken to employ surplus aircrew personnel, trained and under training, temporarily on ground duties. Thus, surplus personnel under training were being employed as M.T. drivers and despatch riders, on clerical and other duties at R.A.F. units and, at the request of other Government Departments, on transport, first aid building repairs and agricultural work. Similarly a certain proportion of aircrew personnel passing through Brackla were posted temporarily to ground duties in their trades or to trade training. Extensions of courses had also been introduced in all training theatres. These measures were but palliatives, however, and real progress in solving the problem awaited decisions on such matters as the Second Stage Target Force in terms of crews and ground establishments by theatres, together with a programme for the contribution of the air forces to the Second Stage Target. Following these, a revised programme was also required for the contraction of the training organization. The aircrew training programme which was then being worked out by the training department did not take account of the further cut of 200,000 personnel which had just been proposed by the Prime Minister. There was also the necessity for planning the post war training organization; all this in face of the demobilisation scheme which was based, not on unit requirements, but on age and length of service. It was obvious

<sup>1</sup> S. of S. Folder, A.H.B. ID/7/1(b).

<sup>2</sup> A. C. 42(44).

that this would affect efficiency to a marked degree and that some compensating increase in the numbers of the ground organization would be required to allow for the drop in efficiency. A further consideration was the question of 'unscrambling' the very substantial Dominion element from the Royal Air Force units. The return of the Dominions personnel to their countries would result in more vacancies for surplus Royal Air Force aircrew personnel, but this was a complicated business to arrange without serious loss of efficiency. This question was tied up with high policy and the wishes of the Dominions concerned.

The main lines of policy which were decided were as follows:—

- (a) All personnel still undergoing initial, elementary or service flying training, who were surplus to aircrew requirements, would be diverted to ground employment after they had been classified at the end of their particular course. They were to be given the option of volunteering for combatant duties with the other services; but would not, if this could be avoided, be transferred to the other services against their will. In any case R.A.F. requirements were to be met before personnel were released to other Services.
- (b) It was the aim that personnel who completed S.F.T.S. or equivalent training should complete the remaining stages of their training and that they should be employed on operational or other flying duties, provided they could be passed forward to such duties in a reasonable space of time. Any surplus in personnel reception centres which could not be passed forward in a reasonable time would be considered for disposal.
- (c) Dominion and Allied personnel were to be withdrawn as rapidly as possible from R.A.F. units under arrangements to be agreed with the Dominion authorities.
- (d) Aircrew personnel surplus to their own category were to be re-trained as necessary in other aircrew categories where there might be deficiencies or where it was desired to improve the standard by the employment of a higher grade of personnel.
- (e) A certain number of qualified personnel were to be transferred to the Fleet Air Arm to meet new requirements for flying duties, and others were to be employed as glider pilots.<sup>1</sup>
- (f) It was the aim, so far as possible, to employ any G.D. officers who could be made available, particularly any who had been selected for permanent commissions, in those administrative posts, then filled by A. and S.D. officers, in which General Duties experience was desirable.
- (g) To the extent to which the above measures did not dispose of the surplus, aircrew who had completed one operational tour were to be employed on ground duties, being re-trained in ground trades as necessary.

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<sup>1</sup> Details of the training and employment of the R.A.F. glider pilots are given in the A.H.B. monograph, *Airborne Forces*.

It was an over-riding principle throughout that personnel would not be held in pools for an unreasonably long period. This entailed the continuance of intakes of aircrew for training at a level sufficient at least to meet the requirements of the post-war air force. This was welcomed by the training authorities as it was most desirable to keep the training organization in being and to maintain the enthusiasm of the A.T.C. and other volunteers for aircrew duties. In summarising the situation, the Air Member for Personnel reported to the Air Council that, although it might be possible from the short term aspect to take steps to find temporary employment of aircrew personnel on ground duties, he needed far more guidance than he possessed as to the size and distribution of the Second Stage Target Force, before he could make material progress in any re-allocation of manpower which involved re-training. From his point of view he was naturally anxious that the output of the training organization should be reduced as soon as was possible to conform to Second Stage requirements, since the longer that the output continued at a higher rate, the more difficult it was to absorb and re-train the surpluses on ground duties, and the greater the risk of disciplinary and other trouble. The difficulty in giving guidance on the Stage II and post-war needs was in the main due to the indefinite nature of the manpower allocation. Most plans at this time awaited Cabinet decisions on the release scheme for the Services.

By the autumn of 1944, the growing surplus of aircrew over requirements had been checked by the various measures described, but it still remained far in excess of requirements. Thus, to meet the Stage II force which had now been scaled down from 490 to 390 squadrons it was stated that, whereas the requirement was for 23,425, the actual stock position, exclusive of the Dominions, was 62,241 at the end of August 1944 and 56,460 at the end of the following month, in addition to a total of 23,000 on deferred service. By early December 1944, the A.M.T. had given an approximate estimate of the aircrew surplus as 25,000, a figure which subsequent investigations proved to be substantially correct. There was however, some reluctance on the part of his staff to give an unqualified figure because the surplus figure at any given date was fortuitous, so many changes were taking place in training that deductions could not be drawn from it without a detailed assessment of the factors involved. However, it was stated that a comparison of the total population of aircrew under basic training on 31 October 1944, with the population theoretically required at that date to maintain the German war until 30 June 1945 and the Japanese war (on the latest target force) thereafter, showed a surplus of some 25,000 aircrew under training in the pre-O.T.U. stage. The *ab initio* intakes to the Royal Air Force required for the Japanese War Stage amounted to some 1,750 aircrew per month, so that if there were no further intakes for the period November 1944 to June 1945 inclusive, 14,000 of this surplus would theoretically be absorbed, leaving a residual surplus of 11,000 aircrew in basic training who could be disposed of.<sup>1</sup>

The figures of the surplus thus revealed must not be viewed in isolation, lest wrong deductions should be made. Had expected casualties been actually suffered, or the German war continued throughout the summer of 1945 and the Japanese war not ended so abruptly then these surpluses might

<sup>1</sup> S. of S. Folder, A.H.B. ID/7/1(b).

easily have been turned speedily into deficiencies. Another aspect was that the cessation of wastage and the emptying of the training pipeline in themselves would in any case have produced a large latent reserve. The only criticism which can be levelled must be, not that surpluses existed, for they were inevitable, but that the logically unanswerable and vital factor of the morale of the waiting thousands was not sufficiently taken into account. So far as the Air Ministry were concerned, the most adequate measures were undoubtedly taken in theory to keep the waiting aircrew profitably employed. In fact this was not so. It may be that more energetic and vital leaders were needed. It may be that insufficient use was made of the potential of unemployed or mis-employed retired service officers. Whatever the reason, the populations of the various holding units led an aimless existence.

### **Stage II : Training Requirements for the 390 Squadron Force**

In September 1944 the War Cabinet had forecast the end of the German war as 31 December 1944.<sup>1</sup> The effect of this was that aircraft production would be reduced as from 1 January 1945 to the level required for a 390 Squadron Force. The decision also left open the way for a further reduction once the revised requirements and results of the negotiations for American aid for Stage II were known. The immediate outcome of the first step was that, if the German war continued after December 1944, there was likely to be a slow decline in the strength of operational squadrons from December 1944 to March 1945, and after March there would be a serious falling off in strength. The Air Staff view that some insurance should be allowed to delay this quick run-down in strength after March 1945 was represented to the War Cabinet, who decided against the proposal : the Air Ministry were thus committed to the 390 Squadron basis as from 1 January 1945. It was likely moreover that the final requirements for aircraft for Stage II would be even less than those needed for the 390 Squadron Force. Although the War Cabinet would not permit any insurance against the likelihood of the German War continuing into 1945 they agreed to production plans which would allow aircraft to become available to maintain Royal Air Force striking power unimpaired until March 1945. The Air Council therefore decided that aircrew training be regulated according to the aircraft available in the first six months of 1945 and thus meet the requirements of the 390 Squadron Force for the Japanese war.<sup>2</sup>

During 1944 the flying training organization had been progressively reduced and by December 1944 was in the concluding stages of contraction to the level required for Stage II. The technical training organization, which had been curtailed in order to enable the maximum front-line expansion to be reached, had to be increased in order to make provision :—

- (a) To meet the particular requirements of Stage II.
- (b) To replace overseas tour-expired men.
- (c) For the introduction of the leave scheme.
- (d) For the release of men in the high priority classes.
- (e) To produce a sufficient number of tradesmen fit for overseas service.

<sup>1</sup> W.M. (44) 124th Con.

<sup>2</sup> A.C. Con. 10(44).

In short the Royal Air Force had to prepare urgently for a rapid and efficient deployment against Japan as soon as the war in Europe was over. The total intake into the training organization which was required on this account was 50,000 men who had to be fit for overseas service and in a late release category. This number was difficult to attain because the Royal Air Force, in order to free the maximum amount for more active duties, accepted in the ground trades a high proportion of older men and those of lower medical grades. Therefore, allowing for releases at the end of Stage I, it was impossible to find men of sufficient medical standard to meet the training of 50,000. The best estimate that could be made was 35,000 plus 9,000 surplus aircrew of which 4,000 would be available during the first half of 1945.

#### **Reduction to a 327 Squadron Force : Further Training Reductions**

At the beginning of 1945 the Ministry of Aircraft Production issued a revised production programme as a further attempt to release more labour for reconstruction purposes.<sup>1</sup> The previous programme of October 1944 was based on the assumption that the war in Europe would not continue beyond 30 June 1945 and that the Royal Air Force would then be reduced to 390 squadrons for Stage II. However the new force was to be further reduced to 327 squadrons. The difference between the two programmes was not very great in respect of the total number of aircraft to be delivered but represented a considerable increase in the amount of labour which could be released. As a result of this decision aircrew outputs from basic training were, in theory, reduced to the level required to maintain the 327 squadron force after 1 July 1945. This might have resulted in a deficiency if the German war had continued after that date, but in actual fact the position was not serious provided the Air Ministry did not consent to removing the planned basic training capacity from Canada. This they were being pressed to do by the Treasury as the Empire Training Scheme agreement was due to terminate at the end of March 1945, and after that date all training carried out in Canada had to be paid for in dollars. Although it would have been possible to substitute an equivalent training scheme elsewhere such arrangements would involve a gap in outputs and increase manpower requirements.

In addition to the Canadian Schools it was hoped to retain part of the Royal Air Force training organization in Southern Rhodesia. Elsewhere, however, the output from the overseas basic training organization was rapidly falling off. Australia and New Zealand were concentrating on supplying the needs of their own Air Forces in the Pacific theatre and the despatch of pupils to Canada had ceased in October 1944. Trainees in Canada were returning to Australia and New Zealand on completion of training apart from a few needed to replace wastage in the 'Article XV' Squadrons with the Royal Air Force. In South Africa arrangements were made to disband all schools training Royal Air Force pupils.<sup>2</sup>

The effect of the reorganization on the training schools was that the A.F.U.s were planned to close progressively from 1 January 1945 onwards and the H.C.U.s and O.T.U.s were to reduce their intakes to the Stage II level from 1 March 1945. The Air Ministry were anxious about this run-down of training and would have preferred to plan on the basis of the German

<sup>1</sup> A.C. 1(45).

<sup>2</sup> A.C. Con. 11(44).

war ending by September instead of June, so that if it did continue that long there would be a margin of aircrew output to match the aircraft production programme. The position was that crews were available on the scale required up to the end of September without affecting the Stage II crew position provided that there was no increase in wastage rates. The situation therefore in January 1945 was that, on the one hand, the Air Ministry wished to retain sufficient of the training organization to guarantee the Air Forces against a sharp run-down in strength if the German war continued after June 1945. Whilst on the other hand, under pressure of the Cabinet in favour of reconstruction, decisions had been taken which involved the inevitable run-down of the training organization, based on the firm assumption that the European war would be over by June 1945. Nevertheless although the aircrew position was satisfactory there was still anxiety regarding the high rate of wastage in Bomber Command. This was due not to losses but to the increased effort which meant that the crews were completing their operational tours in a shorter time. From the training viewpoint it made no difference whether replacement was necessary for casualties or for tour expiry, and the surplus gained as casualties decreased was offset by the greater turnover due to tour expiry. For this reason it was decided to review the length of operational tours.<sup>1</sup>

#### **Examination of Length of Operational Tours**

The Commander-in-Chief Bomber Command had already made recommendations for lengthening tours of bomber crews. The Air Council however were cautious in their approach to the problem in that they did not wish to break faith with crews who were actually on operations.<sup>2</sup> At the same time the low rate of losses and wastage were causing an extraordinary increase in the tour expiry rate which had been based on the normal wastage hitherto encountered. It was proposed therefore with great support from the commands, including 2nd T.A.F., to increase the bomber tour from 30 to 36 sorties.

The situation in Bomber Command was paradoxical in that training had been cut and aircrew put into reserve and yet it was necessary to lengthen the operational tours. Measures were therefore taken to extend the tour on a 'points' system which differentiated between the easy targets in countries outside Germany and the more dangerous ones in that country. There had been some delay on the part of Bomber Command in issuing the necessary scheme, and there had been repercussions from Canada. The Canadian Government refused to lengthen the operational tour of Royal Canadian Air Force personnel serving in Bomber Command. They regarded the proposition as inconvenient and politically embarrassing in that they did not consider that the Canadian public would understand the necessity for this step in view of the general aircrew surpluses existing at the time. This refusal was understandable since the Canadian people were a long way from the battle and a General Election was imminent. The C.-in-C. Bomber Command was in a difficult position. In a letter dated 12 March he suggested that the repercussions were not realised, pointing out that there were 1,757 Royal

<sup>1</sup> A.C. Con. 1(45).

<sup>2</sup> A.C. Con. 3(45).

Canadian Air Force personnel in non-Royal Canadian Air Force squadrons alone, and to have given the Canadians special treatment would have resulted in curtailment of operations. The position was a difficult one and had arisen because of the intense effort of the spring of 1945. The situation was eased by the Air Council decision to revert to the 30 sortie tour by the end of April 1945.<sup>1</sup>

#### **Postponement of Training reduction**

It was very difficult to reach a compromise on the question of insurance margins in the event of prolongation of the German war as the whole of the arrangements for the build-up and reorganization of the Air Forces for Stage II hinged on men being released from the training organization. If the run down of the training organization were delayed the Air Ministry would have had to retain the men to take the full period of 88 weeks training for a new batch. Against this, the basic intake matched requirements for the Japanese war and was, in fact, lower than the previous standard. It was, therefore, agreed that a decision on the question of proceeding with the planned reduction of the training organization should be postponed for four weeks.<sup>2</sup> At the beginning of February the run down of the training organization was still held up pending calculations as to the crew position in the event of various assumptions, based on the unpredictable factor of wastage. The same uncertainty about the end of the war in Europe continued to perplex the Air Ministry.<sup>3</sup> The position was particularly complicated because, owing to the decline in man-power, the plans for Stage II were dependent on the liquidation of the organization for Stage I. There were two sources from which personnel could be found, i.e. the training organization and the front line. From the political aspect the Royal Air Force were being urged to reduce training and yet maintain the front line for as long as possible. However the Air Ministry, conscious of the complete dependence of the front line on training were inclined to preserve training at the expense of operational effort. The consequence was that, whilst trying to keep both organizations going, the 5 per cent. margin of deficiency had been exceeded and so the disbandment of front line squadrons began in the middle of March 1945.

A further illustration of the reason why the Air Ministry wished to retain their training organization is provided by the events in South-East Asia. By January 1945 the situation in central Burma urgently demanded more aircraft, primarily for transport purposes: and future plans also envisaged large scale airborne operations which created a new commitment for 1,800 glider pilots.<sup>4</sup> Thus simultaneously with the general decline in air potential there were still certain aspects which required full development up to the end of the war. The effects on other phases of the air organization were therefore acutely felt because the first line was already fully extended on all fronts.

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<sup>1</sup> A.C. Con. 4(45).

<sup>2</sup> A.C. Con. 1(45).

<sup>3</sup> A.C. Con. 5(45).

<sup>4</sup> A.H.B. Monograph *Airborne Forces* Chapter II, A.P. 3231.

### **Final Assumptions as to the End of the War**

As a result of the Yalta conference in February 1945 the probable date of the end of the war was estimated to be between June and December 1945.<sup>1</sup> This new date led to the need to maintain the training establishments instead of reducing them, diverting personnel to man new basic training units and to support such organizations as Transport Command and Air Command South East Asia. The problem thus became whether to reduce operational effort or training and, after consideration, the Air Staff decided to reduce first line strengths and increase the effort before interfering with the training. Nevertheless by the beginning of April 1945 detailed reductions were being worked out in the A.M.T.'s Department.<sup>2</sup> Instructions were issued to Bomber Command for the immediate closing of three and a half O.T.U.s and one H.C.U. As the output from basic training had been geared to the Stage II force for some time, intakes into A.F.U.s had in any case commenced reduction in April, with the consequent progressive reduction of O.T.U.s and H.C.U.s thereafter. The main result, as far as the Forces were concerned, of the Prime Minister's new assumption that the war would end by 30 June 1945 was that it would make little difference to their intakes during the first half of 1945, but would result in earlier and greater releases of manpower during the second half of the year.

By the middle of April the date for the war end had again been advanced by the Prime Minister and at a Cabinet meeting he stated that plans should be made on the assumption that the war in Europe would end by 31 May 1945.<sup>3</sup> The Air Ministry therefore set about the task of reducing the air forces to the Stage II level. So far as the training organization was concerned the requirements for crew replacement depended more on the length of tour than on operational wastage. It was decided that during Stage II the Air Ministry should revert to the system of a 12 to 18 months tour for everybody, making allowance for those cases where personnel had nearly completed their tour when the change of system was put into effect. Another question also arose as to whether the existing ruling should be continued whereby everyone in training units was to complete their course of training even if their services were not required in the capacity for which they had been trained. A reversal of this ruling would cause a considerable redundancy of personnel; nevertheless the Air Council decided that the reversal would have to be made in order to effect every possible saving of personnel in training.

### **The War Ends**

Following the cessation of hostilities in Europe planning for the Japanese war continued on the basis of it lasting a further 18 months. The main difficulty to be overcome was that caused by the previous decision to make provision against the German war continuing to the end of 1945. The effect of this decision was to retard both the reduction of flying training and the retraining programme for Stage II. In addition the Royal Air Force was required to transfer 20,000 men to the Army to meet their requirements for Stage II. However by the end of May the flying training organization had been reduced to the level required to provide aircrew for Stage II squadrons only.

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<sup>1</sup> A.C. 8(45).

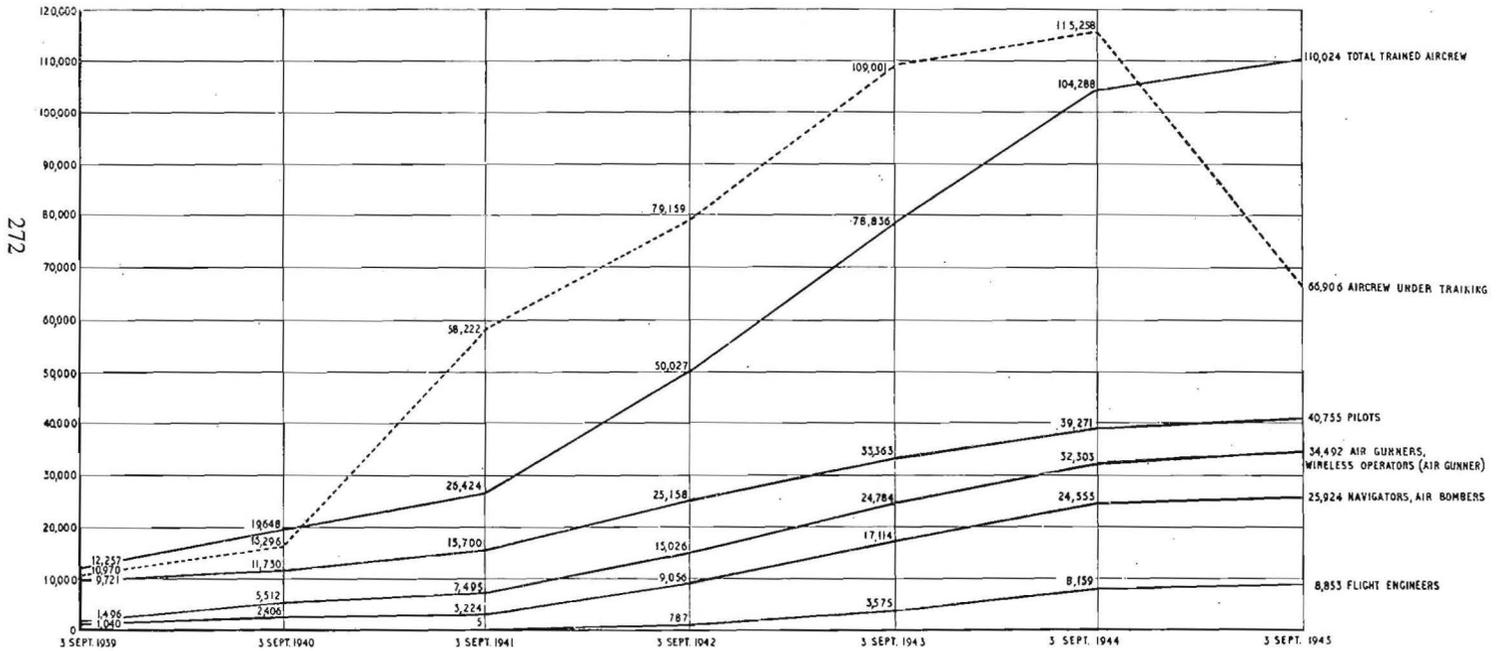
<sup>2</sup> A.C. 13(45).

<sup>3</sup> W.P. (45) 250.

The whole situation was altered by the fall of the atom bomb leading to the collapse of Japan, and on the 27 August 1945 the Air Council decided that training be planned on a basis of 169 squadrons. Although the wars were over the problems facing the training organization were not. There still remained the task of reducing the force available by more than 50 per cent. whilst maintaining a balanced and well trained force capable of meeting all the demands of the post-war period.

## STRENGTH OF AIRCREW SERVING UNDER THE OPERATIONAL CONTROL OF THE R.A.F.

1. THE STRENGTHS OF TRAINED AIRCREW RELATE TO AIRCREW ON OPERATIONAL DUTY OR HOLDING STAFF APPOINTMENTS BUT DO NOT INCLUDE DOMINIANS PERSONNEL SERVING IN HOME DEFENCE UNITS IN THE PACIFIC AREA.
2. THE STRENGTHS OF PERSONNEL UNDER TRAINING INCLUDE QUALIFIED AIRCREW UNDERGOING POST-GRADUATE TRAINING (AT FLYING INSTRUCTORS SCHOOLS, OPERATIONAL TRAINING UNITS ETC.) BUT EXCLUDE PUPILS UNDER SUCH TRAINING IN SCHOOLS IN THE DOMINIANS.



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APPENDIX No.1

APPENDIX No. 2  
 OUTPUT OF QUALIFIED AIRCREW\*  
 3 SEPTEMBER 1939—2 SEPTEMBER 1940

Country of Graduation	Pilots	Observers and Navigators	Air Bombers	Wireless Operators (Air Gunner)	Air Gunners	Flight Engineers	Total
United Kingdom ... ..	2,992	771	—	3,286	781	—	7,830
Canada ... ..	171	—	—	—	—	—	171
Australia ... ..	116	17	—	—	10	—	143
New Zealand ... ..	509	165	—	—	208	—	882
South Africa ... ..	—	—	—	—	—	—	—
Southern Rhodesia ... ..	15	—	—	—	9	—	24
India ... ..	36	20	—	4	—	—	60
Middle East ... ..	155	—	—	—	6	—	161
U.S.A. ... ..	—	—	—	—	—	—	—
Total Overseas ... ..	1,002	202	—	4	233	—	1,441
Total Home and Overseas ... ..	3,994	973	—	3,290	1,014	—	9,271

*Note:—\** These figures refer to the number of personnel that qualified for the award of the appropriate aircrew brevet. That is, they successfully completed the Service Flying Training School (or its equivalent) course.

OUTPUT OF QUALIFIED AIRCREW  
3 SEPTEMBER 1940—2 SEPTEMBER 1941

Country of Graduation	Pilots	Observers and Navigators	Air Bombers	Wireless Operators (Air Gunner)	Air Gunners	Flight Engineers	Total
United Kingdom ... ..	6,792	2,158	—	6,122	2,198	154	17,424
Canada ... ..	5,473	1,422	—	2,171	209	—	9,275
Australia ... ..	618	400	—	545	116	—	1,679
274 New Zealand ... ..	1,174	—	—	—	—	—	1,174
South Africa ... ..	—	220	—	37	189	—	446
Southern Rhodesia ... ..	856	—	—	—	—	—	856
India ... ..	118	21	—	10	4	—	153
Middle East ... ..	118	38	—	—	46	—	202
U.S.A. ... ..	352	20	—	—	—	—	372
Total Overseas ... ..	8,709	2,121	—	2,763	564	—	14,157
Total Home and Overseas ... ..	15,501	4,279	—	8,885	2,762	154	31,581

OUTPUT OF QUALIFIED AIRCREW  
3 SEPTEMBER 1941—2 SEPTEMBER 1942

Country of Graduation	Pilots	Observers and Navigators	Air Bombers	Wireless Operators (Air Gunner)	Air Gunners	Flight Engineers	Total
United Kingdom ... ..	4,006	3,113	—	7,009	3,179	563	17,870
Canada ... ..	12,693	6,145	77	4,800	1,828	—	25,543
Australia ... ..	2,349	1,035	—	1,747	191	—	5,322
New Zealand ... ..	1,334	—	—	—	—	—	1,334
South Africa ... ..	1,377	1,924	—	475	21	—	3,797
Southern Rhodesia ... ..	1,799	210	—	—	356	—	2,365
India ... ..	247	49	—	11	1	—	308
Middle East ... ..	—	—	—	—	—	—	—
U.S.A. ... ..	4,505	1,695	—	606	—	—	6,806
Total Overseas ... ..	24,304	11,058	77	7,639	2,397	—	45,475
Total Home and Overseas ... ..	28,310	14,171	77	14,648	5,576	563	63,345

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OUTPUT OF QUALIFIED AIRCREW  
3 SEPTEMBER 1942—2 SEPTEMBER 1943

Country of Graduation	Pilots	Observers and Navigators	Air Bombers	Wireless Operators (Air Gunner)	Air Gunners	Flight Engineers	Total
United Kingdom ... ..	512	2,633	599	6,518	7,580	6,022	23,864
Canada ... ..	15,855	7,745	5,545	3,522	3,816	—	36,863
Australia ... ..	3,890	1,956	—	2,472	1,139	—	9,457
New Zealand ... ..	1,144	—	—	—	—	—	1,144
South Africa ... ..	1,876	3,161	748	529	372	—	6,686
Southern Rhodesia ... ..	1,920	229	—	—	399	—	2,548
India ... ..	170	24	—	38	5	14	251
Middle East ... ..	—	—	—	—	—	—	—
U.S.A. ... ..	4,362	—	—	56	—	—	4,418
Total Overseas ... ..	29,217	13,115	6,293	6,617	5,731	14	60,987
Total Home and Overseas ... ..	29,729	15,748	6,892	13,135	13,311	6,036	84,851

OUTPUT OF QUALIFIED AIRCREW  
3 SEPTEMBER 1943—2 SEPTEMBER 1944

Country of Graduation	Pilots	Observers and Navigators	Air Bombers	Wireless Operators (Air Gunner)	Air Gunners	Flight Engineers	Total
United Kingdom ... ..	402	555	47	3,092	10,004	6,705	20,805
Canada ... ..	13,386	10,714	7,333	4,526	6,837	207	43,003
Australia ... ..	2,821	1,014	—	1,512	901	175	6,423
277 New Zealand ... ..	1,178	—	—	—	—	—	1,178
South Africa ... ..	2,651	3,479	1,009	555	251	—	7,945
Southern Rhodesia ... ..	1,752	244	—	—	454	—	2,450
India ... ..	232	—	—	68	4	—	304
Middle East ... ..	—	—	—	—	913	—	613
U.S.A. ... ..	2,442	—	—	—	—	—	2,342
Total Overseas ... ..	24,462	15,451	8,342	6,661	9,060	382	64,358
Total Home and Overseas ... ..	24,864	16,006	8,389	9,753	19,064	7,087	85,163

OUTPUT OF QUALIFIED AIRCREW  
3 SEPTEMBER 1944—2 SEPTEMBER 1945

Country of Graduation	Pilots	Observers and Navigators	Air Bombers	Wireless Operators (Air Gunner)	Air Gunners	Flight Engineers	Total
United Kingdom ... ..	598	643	83	1,169	4,503	4,441	11,437
Canada ... ..	6,691	5,833	2,718	3,477	3,010	1,706	23,435
Australia ... ..	1,204	1,507	159	882	929	194	4,875
278 New Zealand ... ..	779	—	—	—	—	—	779
South Africa ... ..	2,446	3,458	703	313	234	79	7,233
Southern Rhodesia ... ..	1,388	95	—	—	381	—	1,864
India ... ..	153	—	—	54	3	—	210
Middle East ... ..	—	—	—	—	496	—	496
U.S.A. ... ..	2,012	—	—	—	—	—	2,012
Total Overseas ... ..	14,673	10,893	3,580	4,726	5,053	1,979	40,904
Total Home and Overseas ... ..	15,271	11,536	3,663	5,895	9,556	6,420	52,341

APPENDIX No. 3

ANALYSIS, BY AIR FORCES, OF THE TOTAL OUTPUT OF QUALIFIED AIRCREW

Location of Output	Nationality	Pilots	Observers and Navigators	Air Bombers	Wireless Operators (Air Gunner)	Air Gunners	Flight Engineers	Total
United Kingdom ...	R.A.F. ...	15,287	9,869	728	27,190	28,243	17,885	99,202
	R.I.A.F. ...	15	4	1	6	2	—	28
	<i>Total</i> ...	15,302	9,873	729	27,196	28,245	17,885	99,230
Canada ...	R.A.F. ...	22,068	15,778	7,581	755	2,096	—	48,278
	R.C.A.F. ...	25,918	12,855	6,659	12,744	12,917	1,913	73,006
	R.A.A.F. ...	4,045	1,643	799	2,875	244	—	9,606
	R.N.Z.A.F. ...	2,220	1,583	634	2,122	443	—	7,002
	R.I.A.F. ...	18	—	—	—	—	—	18
	<i>Total</i> ...	54,269	31,859	15,673	18,496	15,700	1,913	137,910
Australia ...	R.A.A.F. ...	10,998	5,929	159	7,158	3,286	369	27,899
New Zealand ...	R.N.Z.A.F.	6,118	165	—	—	208	—	6,491
South Africa ...	R.A.F. ...	4,227	10,170	2,404	—	445	—	17,246
	S.A.A.F. ...	4,123	2,072	56	1,909	622	79	8,861
	<i>Total</i> ...	8,350	12,242	2,460	1,909	1,067	79	26,107
Southern Rhodesia ...	R.A.F. ...	7,216	717	—	—	1,591	—	9,524
	R.A.A.F. ...	514	61	—	—	8	—	583
	<i>Total</i> ...	7,730	778	—	—	1,599	—	10,107
India ...	R.A.F. ...	165	21	—	—	—	14	200
	R.I.A.F. ...	791	93	—	185	17	—	1,086
	<i>Total</i> ...	956	114	—	185	17	14	1,286
Middle East ...	R.A.F. ...	273	38	—	—	1,116	—	1,472
U.S.A. ...	R.A.F. ...	13,673	1,715	—	662	—	—	16,050
<i>Grand Total</i> ...	R.A.F. ...	62,909	38,308	10,713	28,607	33,536	17,899	191,972
	R.C.A.F. ...	25,918	12,855	6,659	12,744	12,917	1,913	73,006
	R.A.A.F. ...	15,557	7,633	958	10,033	3,538	369	38,088
	R.N.Z.A.F. ...	8,338	1,748	634	2,122	651	—	13,493
	S.A.A.F. ...	4,123	2,072	56	1,909	622	79	8,861
	R.I.A.F. ...	824	97	1	191	19	—	1,132
	<i>Total</i> ...	117,669	62,713	19,021	55,606	51,283	20,260	326,552

Explanatory Notes:

1. The figures for R.A.F. personnel include the following approximate numbers of foreign aircrew personnel trained for Allied Air Forces serving with the R.A.F.:-

Belgian ...	550	} (The majority trained in Canada)
Czechoslovakian ...	950	
Danish ...	25	
Dutch ...	575	
French ...	2,000	
Greek ...	50	(Trained in S. Africa and S. Rhodesia)
Polish ...	4,400	(The majority trained in the U.K.)
Yugoslavian ...	200	(Trained in S. Africa and S. Rhodesia)
	<u>8,750</u>	

2 The figures for R.A.F. personnel trained in Canada include 3,792 Fleet Air Arm personnel.

3. The figures for U.S.A. include 598 American volunteers who were trained in the Refresher Schools in U.S.A. and served in the R.A.F.

4. The figures for Wireless Operators (Air Gunner) trained in the United Kingdom include 2,109 who were awarded their wireless operator brevets in the United Kingdom and subsequently received gunnery training in the Middle East.

APPENDIX No. 4  
FLYING TRAINING SCHOOLS IN OPERATION ON 3 SEPTEMBER 1939

	United Kingdom	Middle East
Elementary Flying Training Schools ... ..	19	—
Service Flying Training Schools ... ..	15	1
Bombing and Gunnery Schools ... ..	7	—
Air Observer Navigation Schools ... ..	10	—
Operational Training Units ... ..	2	—
Wireless Schools ... ..	3	—
TOTAL ... ..	56	1

*Note.*—Schools training flying instructors and staff pilots are not included.

FLYING TRAINING SCHOOLS IN OPERATION ON 3 SEPTEMBER 1940

	United Kingdom	Canada	Australia	New Zealand	S. Africa	S. Rhodesia	Middle East	Total
Initial Training Wings ... ..	5	2	2	1	1	1	—	12
Elementary Flying Training Schools ... ..	17	8	6	3	2	2	—	38
Service Flying Training Schools ... ..	12	2	1	2	1	1	1	20
Bombing and Gunnery Schools ... ..	7	1	—	—	—	—	—	8
Air Observer Navigation and Bombing and Gunnery Schools	—	—	—	—	1	—	—	1
282 Air Observer Navigation Schools ... ..	5	—	—	—	—	—	—	5
Air Observer Schools ... ..	—	3	1	—	—	—	—	4
Operational Training Units ... ..	17	—	—	—	—	—	—	17
Wireless Schools ... ..	3	2	—	—	—	—	—	5
Wireless Operator (Air Gunner) Schools ... ..	—	—	1	—	—	—	—	1
General Reconnaissance Schools ... ..	1	—	—	—	—	—	—	1
Technical Training Schools ... ..	—	1	—	—	—	—	—	1
TOTAL ... ..	67	19	11	6	5	4	1	113

FLYING TRAINING SCHOOLS IN OPERATION ON 3 SEPTEMBER 1941

	United Kingdom	Canada	Australia	New Zealand	South Africa	Southern Rhodesia	Middle East	U.S.A.	India	TOTAL
Initial Training Wings ... ..	15	5	5	1	1	1	—	—	1	29
Elementary Flying Training Schools	8	24	10	4	5	4	—	—	2	67
Service Flying Training Schools ...	12	22	5	3	2	4	1	—	1	50
Bombing and Gunnery Schools ...	1	7	2	—	—	—	—	—	—	10
Air Observer Navigator and Bombing and Gunnery Schools ... ..	—	—	—	—	5	1	—	—	—	6
Air Observer Navigation Schools ...	1	—	—	—	—	—	—	—	—	1
Air Observer Schools (and A.N.S.s)	6	11	4	—	—	—	—	—	—	21
283 Air Gunners Schools ... ..	5	—	—	—	—	—	—	—	—	5
Wireless Operator (Air Gunner) Schools ... ..	—	—	2	—	—	—	—	—	—	2
Wireless Schools (and Signals Schools)	3	4	—	—	—	—	—	—	—	7
Operational Training Units ...	39	—	—	—	—	—	—	—	—	39
Technical Training Schools ...	—	1	—	—	—	—	—	—	—	1
Ground Reconnaissance Schools ...	—	—	—	—	1	—	—	—	—	1
British Flying Training Schools ...	—	—	—	—	—	—	—	6	—	6
“ Arnold ” Schools ... ..	—	—	—	—	—	—	—	11	—	11
“ Towers ” Schools ... ..	—	—	—	—	—	—	—	4	—	4
Pan American Airways School ...	—	—	—	—	—	—	—	1	—	1
TOTAL ... ..	100	74	28	8	14	10	1	22	4	261

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FLYING TRAINING SCHOOLS IN OPERATION ON 3 SEPTEMBER 1942

	United Kingdom	Canada	Australia	New Zealand	South Africa	Southern Rhodesia	Middle East	U.S.A.	India	TOTAL
Initial Training Wings ... ..	15	7	5	1	1	1	—	—	1	31
Elementary Flying Training Schools	17	19	6	3	7	4	—	—	2	58
Service Flying Training Schools ...	2	26	5	2	7	4	—	—	1	47
Bombing and Gunnery Schools ...	—	10	3	—	—	—	—	—	—	13
Air Observer Navigation and Bombing and Gunnery Schools ... ..	—	—	—	—	7	1	—	—	—	8
Air Observer Schools (and A.N.S.s)	—	13	4	—	—	—	—	—	—	17
General Reconnaissance and Air Navigation Schools ... ..	—	—	—	—	—	—	—	—	1	1
General Reconnaissance Schools ...	—	1	—	—	1	—	—	—	—	2
Air Gunners Schools ... ..	8	—	—	—	—	—	—	—	1	9
Advanced Flying Units (Pilot) ...	8	—	—	—	—	—	—	—	—	8
Advanced Flying Units (Observer)...	8	—	—	—	—	—	—	—	—	8
Wireless Schools (and Signals Schools)	3	4	—	—	—	—	—	—	—	7
Wireless Operator (Air Gunner) Schools ... ..	—	—	3	—	—	—	—	—	—	3
Operational Training Units ... ..	49	6	—	—	—	—	5	—	2	62
Heavy Conversion Units ... ..	4	—	—	—	—	—	—	—	—	4
Technical Training Schools ... ..	1	1	—	—	—	—	—	—	—	2
British Flying Training Schools ...	—	—	—	—	—	—	—	6	—	6
" Arnold " Schools ... ..	—	—	—	—	—	—	—	11	—	11
" Towers " Schools ... ..	—	—	—	—	—	—	—	5	—	5
Pan American Airways School ...	—	—	—	—	—	—	—	1	—	1
<b>TOTAL ... ..</b>	<b>115</b>	<b>87</b>	<b>26</b>	<b>6</b>	<b>23</b>	<b>10</b>	<b>5</b>	<b>23</b>	<b>8</b>	<b>303</b>

FLYING TRAINING SCHOOLS IN OPERATION ON 3 SEPTEMBER 1943

	United Kingdom	Canada	Australia	New Zealand	South Africa	Southern Rhodesia	Middle East	U.S.A.	Bahamas	India	TOTAL
Initial Training Wings ...	23	7	5	1	1	1	—	—	—	1	39
Elementary Flying Training Schools ...	17	21	6	3	7	4	—	—	—	2	60
Service Flying Training Schools ...	2	29	5	2	7	4	—	—	—	1	50
Bombing and Gunnery Schools ...	—	11	3	—	—	—	—	—	—	—	14
Air Observer Navigation and Bombing and Gunnery Schools ...	—	—	—	—	7	1	—	—	—	—	8
General Reconnaissance and Air Navigation Schools ...	—	—	—	—	—	—	—	—	—	1	1
General Reconnaissance Schools ...	—	1	—	—	1	—	—	—	—	—	2
Air Observers Schools (and A.N.S.s) ...	—	11	4	—	—	—	—	—	—	1	16
Air Gunners Schools ...	10	—	—	—	—	—	—	—	—	—	10
Wireless Schools (and Signals Schools) ...	7	3	—	—	—	—	—	—	—	—	10
Wireless Operator (Air Gunner) Schools ...	—	—	3	—	—	—	—	—	—	—	3
Advanced Flying Units (Pilot) ...	10	—	—	—	—	—	—	—	—	—	10
Advanced Flying Units (Observer) ...	9	—	—	—	—	—	—	—	—	—	9
Operational Training Units ...	57	7	—	—	2	—	6	—	1	2	75
Heavy Conversion Units	17	—	—	—	—	—	—	—	—	1	18
Technical Training Schools ...	1	2	—	—	—	—	—	—	—	—	3
British Flying Training Schools ...	—	—	—	—	—	—	—	5	—	—	5
TOTAL ...	153	92	26	6	25	10	6	5	1	9	333

FLYING TRAINING SCHOOLS IN OPERATION ON 3 SEPTEMBER 1944

	United Kingdom	Canada	Australia	New Zealand	South Africa	Southern Rhodesia	Middle East	U.S.A.	Bahamas	India	TOTAL
Initial Training Wings ...	6	4	4	1	1	1	—	—	—	1	18
Elementary Flying Training Schools ...	16	9	5	3	6	4	—	—	—	2	45
Service Flying Training Schools ...	2	23	5	2	6	4	—	—	—	1	43
Bombing and Gunnery Schools ...	—	11	1	—	—	—	—	—	—	—	12
Air Observer Navigation and Bombing and Gunnery Schools ...	—	—	—	—	7	1	—	—	—	—	8
Air Observer Schools ...	—	11	3	—	—	—	—	—	—	—	14
Air Gunners Schools ...	7	—	—	—	—	—	1	—	—	1	9
Air Gunners Initial Training Schools ...	—	—	—	—	—	—	1	—	—	—	1
Advanced Flying Units (Observer) ...	9	—	—	—	—	—	—	—	—	—	9
Advanced Flying Units (Pilot) ...	11	—	—	—	—	—	—	—	—	—	11
General Reconnaissance Schools ...	—	1	—	—	1	—	—	—	—	—	2
General Reconnaissance and Air Navigation School ...	—	—	—	—	—	—	—	—	—	1	1
Wireless Schools (and Signals Schools) ...	7	3	—	—	—	—	—	—	—	—	10
Wireless Operator (Air Gunner) Schools ...	—	—	2	—	—	—	—	—	—	—	2
Technical Training Schools ...	1	2	—	—	—	—	—	—	—	—	3
Operational Training Units ...	49	7	—	—	2	—	9	—	1	1	69
Heavy Conversion Units	19	—	—	—	—	—	1	—	—	3	23
British Flying Training Schools ...	—	—	—	—	—	—	—	4	—	—	4
<b>TOTAL ...</b>	<b>127</b>	<b>71</b>	<b>20</b>	<b>6</b>	<b>23</b>	<b>10</b>	<b>12</b>	<b>4</b>	<b>1</b>	<b>10</b>	<b>284</b>

FLYING TRAINING SCHOOLS IN OPERATION ON 8 MAY 1945

	United Kingdom	Canada	Australia	New Zealand	South Africa	Southern Rhodesia	Middle East	U.S.A.	Bahamas	India	TOTAL
Initial Training Wings ...	5	1	2	1	1	1	—	—	—	1	12
Elementary Flying Training Schools ...	14	3	2	3	2	3	—	—	—	2	29
Service Flying Training Schools ...	2	6	2	2	2	4	—	—	—	1	19
Bombing and Gunnery Schools ...	—	2	2	—	—	—	—	—	—	—	4
Air Observer Navigation and Bombing and Gunnery Schools ...	—	—	—	—	2	1	—	—	—	—	3
Air Observer Schools (and A.N.S.) ...	—	1	1	—	—	—	—	—	—	—	2
Air Gunners Schools ...	6	—	—	—	—	—	1	—	—	1	8
Air Gunners Initial Training Schools ...	—	—	—	—	—	—	1	—	—	—	1
General Reconnaissance Schools ...	—	—	—	—	1	—	—	—	—	—	1
General Reconnaissance and Air Navigation Schools ...	—	—	—	—	—	—	—	—	—	1	1
Advanced Flying Units (Observer) ...	7	—	—	—	—	—	—	—	—	—	7
Advanced Flying Units (Pilot) ...	9	—	—	—	—	—	—	—	—	—	9
Wireless Schools (and Signals Schools) ...	7	1	—	—	—	—	—	—	—	—	8
Wireless Operator (Air Gunner) Schools ...	—	—	1	—	—	—	—	—	—	—	1
Schools of Technical Training ...	1	—	—	—	—	—	—	—	—	—	1
Operational Training Units ...	43	6	—	—	2	—	9	—	1	1	62
Heavy Conversion Units	15	—	—	—	—	—	1	—	—	2	18
British Flying Training Schools ...	—	—	—	—	—	—	—	4	—	—	4
TOTAL ...	109	20	10	6	10	9	12	4	1	9	190

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