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**RESTRICTED**

R.A.F. NARRATIVE

(Second Draft)

AIRCREW TRAINING

1934-1942

AIR HISTORICAL BRANCH (i)

AIR MINISTRY

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PART I.

PRELIMINARY.

1. Chronology.
2. Introductory Survey.
3. Commentary.

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1. CHRONOLOGY

The major landmarks are marked \*.

In general, the growth of the various training theatres is described only by the number of S.F.T.S's at work. Other types of school came into existence in step with the S.F.T.S's, but details of them have, as a rule, been excluded.

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1934

1934

- April \* A.D.G.B. asked for more training to be given to twin engined bomber pilots: existing school instruction was seriously inadequate for them.
- July \* Expansion Scheme A, which planned an increase from 74 to 114 squadrons to be completed by April, 1939.
- October \* Reorganisation of pilot training proposed by Air Commodore Tedder. Civil schools to undertake elementary training and so enable service schools (Flying Training Schools) to give fuller instruction during a ten-months course.
- November One F.T.S. reopened, making 5 F.T.S.'s in all (one in Egypt).

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APPENDICES (In separate volume)

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1935

- January \* Formation of a single navigation school by amalgamating the existing navigation and air pilotage schools proposed by Air Commodore Tedder. Long range bomber and maritime pilots to be trained in navigation at the new school.
- February \* Reorganisation of pilot training: Air Commodore Tedder's proposals (October 1934) modified by shortening the F.T.S. course to nine months and the total period to one year.
- April Number of pupils at F.T.S.'s increased by 25% (from 80 to 96) because too few schools were open to produce enough pilots for Expansion Scheme A.
- May \* Expansion Scheme C, which planned an increase to 162 squadrons, or 1512 first line aircraft, to be completed by April, 1937.
- A new F.T.S. opened, making 6 in all (one in Egypt).
- June \* Reorganisation of pilot training: the new sequence of ab initio instruction at Civil schools followed by service training at F.T.S.'s introduced. The F.T.S. course of 9 months duration was, however, to be reduced temporarily to 6 months "during the period of rapid expansion".
- \* Formation of a single navigation school: the proposals were revised to omit navigation training for long range bomber pilots, since school facilities and instructors for the numbers required by Expansion Scheme C could not be afforded in the time allowed by that scheme.
- July \* Formation of a special school to train long range bomber pilots in T.E. flying, navigation and night flying agreed to be impracticable because facilities and instructors could not be afforded for the numbers involved in the time allowed by Expansion Scheme C.
- Ab initio training of regular pilots began at four civil schools which had previously trained reservists.
- September Use at F.T.S.'s of specially designed T.E. trainers proposed by Air Commodore Tedder.
- October First "reorganised" F.T.S. course, i.e., one which followed ab initio instruction at a civil school, begun. The course was divided into two parts, flying (I.T.S.) and military flying (A.T.S.), and the training of pilots specialised according to their future employment.
- November A new F.T.S. opened, making 7 in all (one in Egypt).

1936

- January
- \* School of Air Navigation formed to train maritime (G.R.) pilots, squadron navigation officers, and navigation specialists.
  - \* Air Observers School formed to train observers in armament subjects only. (Observers were being introduced to replace air gunners, who were trained in squadrons.)
- Two new F.T.S's opened, making 9 in all (one in Egypt). Number of civil schools giving ab initio training had now increased to 13.
- February
- \* Expansion Scheme F, which planned an increase to 1736 first line aircraft to be completed by April, 1937 except for part of the bomber strength, which was to be completed by April, 1939.
- A new F.T.S. opened, making 10 in all (one in Egypt).
- March
- \* Reserves: a long-term scheme for the spare-time training of pilot reserves (the Volunteer Reserve) was agreed, and also a short-term scheme for full-time training of pilot reserves by one year's instruction in the regular (civil school and F.T.S.) sequence. The short-term scheme was planned to start at the end of 1936.
- A new F.T.S. opened, making 11 in all (one in Egypt). This was the full planned provision for Schemes C and F.
- April
- \* Crewing: it was laid down that aircraft would, in general, carry one pilot and an observer. Maritime aircraft would carry one pilot and a navigator (who might be a pilot or, eventually, a suitably trained observer).
- May
- \* Training Overseas: establishment of F.T.S's overseas advocated because congestion in the United Kingdom would increase with expansion and Britain was growing vulnerable to attack.
- Training Command formed from Inland Area.
- June
- Reorganisation of pilot training completed, and all F.T.S's working on I.T.S.- A.T.S. basis. Pilot output about 1,500 per year.
- Night flying training became a regular subject at F.T.S's.
- August
- Training Overseas: unofficial conversations about the establishment of a F.T.S. in Canada.
- November
- T.E. trainer aircraft introduced at some F.T.S's, one third of each course being trained on them. The aircraft were not specially designed trainers, but a maritime (G.R.) service type, the Anson.
- December
- No.17 Group formed to control specialised maritime training units.

1937

January - June

1937

January

A new armament training camp opened, making 4 in all.

February

\* Crewing: the general crewing of aircraft was revised from one pilot and an observer to two pilots and no observer, though some bombers continued with one pilot and an observer. As a result, increased numbers of pilots were wanted and the possibility of lengthening the F.T.S. course to 9 months after the first stage (ending in March 1937) of Expansion Scheme F disappeared.

\* Reserves: the increased pilot output required by this change in crewing made it difficult to find room at F.T.S's for the full-time "one-year" reservist, and the scheme practically disappeared.

The number of "s.n" qualified pilots in bomber squadrons was increased.

A new armament training camp opened, making 5 in all.

April

\* Since the S. of A.N. could not handle the whole number of pilots to whom "s.n" training was to be given, the training of pilots to the roughly equivalent civil 2nd Class Navigator standard was begun at a civil school.

Reserves: Treasury approval given for the flying (aerodrome centre) side of the Volunteer Reserve. V.R. training was done partly at town centres (ground instruction) and partly at aerodrome centres.

The system of training air gunners in squadrons was acknowledged to be unsatisfactory. It could not, however, be replaced by school training because the output required (900 per year) appeared formidable.

Training Command recommended that the Command should be divided into two, one part dealing with flying training. No action was taken.

May

\* Training Overseas: the proposal of establishing a F.T.S. in Canada "regarded as dead".

\* Observers: one month's elementary navigation training added to the two months armament training already given at the Air Observers School, because the navigating of bomber aircraft crewed with one pilot and an observer made it necessary to have navigation-trained observers.

A new armament training camp opened, making 6 in all.

Centralised (squadron) maintenance introduced at F.T.S's.

June

Reserves: the first V.R. aerodrome centres began work.

Experimental course in astro-navigation held at the S. of A.N.

July

Navigation training of pilots extended to a second civil school.

/September

September

A new armament training camp opened, making 7 in all.

November

Astro-navigation approved as a service method and astro. training begun in bomber squadrons.

December

Observers: ruling given that observers must be fully trained (i.e. by a 3 months course) in navigation because a lower standard did not fit them to navigate the long range aircraft in which they were carried. Also ruled that some observers must be recruited by direct entry from civil life, since the numbers required by Scheme F could not otherwise be obtained.

Training Overseas: project of putting a F.T.S. in India (which had been under review for some months) abandoned.

The Superintendent of Reserve's H.Q., which controlled civil schools and V.R. aerodrome centres, was renamed No.26 Group.

1938  
January - May

1938

- January 18 V.R. aerodrome centres in operation, and service types of aircraft (Hart and Audax) beginning to be used for V.R. training.
- Link Trainers coming into use at F.T.S's.
- February Bomber Command drew attention to the backwardness of armament training and the poor efficiency of air gunners.
- The Armament Group was renamed No.25.
- Central Examination Board set up.
- March Reserves: the training of observers and wireless operators in the Volunteer Reserve was approved.
- April \* A dangerous shortage of regular and reserve air crew was shown to exist.
- \* Eight additional Flying Training Schools were required for the further expansion (Scheme L) being planned, but only four could be opened without seriously dislocating the first line by the number of instructors to be found.
- \* Training Overseas: It was proposed that three of the additional F.T.S's required should be Canadian schools, run by Canada, and training R.A.F. pupils.
- Navigation: it had been decided that all pilots should be trained to "s.n" standard, and more navigation training capacity was required. The training of maritime pilots was transferred to a newly formed School of G.R. from the S. of A.N. in order to make more room there, and the use of six civil schools as well was planned. The shortage of crews, however, made it more urgent to train observers, and so four of the civil schools were to be put on observer instead of pilot training. As a result, only bomber pilots were to be trained to "s.n" standard. Half the pilots of long range aircraft were also to be trained in astro. navigation
- The first specially designed S.E. trainer, the Don, proved unsatisfactory.
- Armament Training Camps renamed Armament Training Stations.
- May \* Expansion Scheme L, which planned an increase to 2387 first line aircraft to be completed by April 1940.
- \* Crewing: the general crewing of bomber and maritime aircraft was revised to include an observer as well as two pilots. As a result, the number of observers required increased sharply.
- \* Training Overseas: Canada was asked unofficially to train for the R.A.F. in Canadian schools. The request was refused by the Canadian Government.
- A new armament training station opened, making 8 in all.

/June

1938  
June - September.

1938

June

Reorganisation of pilot training: the sequence introduced in 1935, i.e. ab initio training at civil schools followed by the F.T.S. course, was deemed successful and confirmed as the permanent system.

\* Operational training: Flying Training Schools were found to turn pilots out at too low a standard to enable them to handle the newer types of first line aircraft satisfactorily. A good deal of additional instruction therefore had to be done by squadrons, and it was considered that an additional "interim" stage of training was required, particularly for bomber pilots.

Observers: the full training of observers in navigation was begun at a temporary school improvised by using two first line squadrons.

Reserves: it was decided to increase the number of V.R. aerodrome centres from 22 to 58.

Training Overseas: after pressure in the Canadian parliament, the Canadian Government stated that R.A.F. pilots might be trained in Canadian schools.

The first specially designed T.E. trainer, the Oxford, introduced at F.T.S.'s

July

Observers: introduction of direct entry recruiting. Rate of intake planned as 480 per year.

August

Observers: full training in navigation started at two civil schools.

September

\* Crewing: all flying crews established full time for flying duties. Non-pilot air crew had previously been employed part time on flying and part time on ground trades. There were not enough men in the ground trades, however, to enable all air crew to be released for full time flying duties.

War training: lack of training aircraft would have prevented any but the most modest increase in the size of the training organisation to meet war requirements had war broken out. Only nine of the eleven F.T.S.'s could have been brought up to their planned war-time size, and only five undersized schools for other air crew opened.

Two more civil schools began the navigation training of observers, making 4 in all. Two other civil navigation schools were training pilots.

1938  
November - December.

1938

November

\* Operational training: it was decided to start Group Pools for giving "interim" training after pilots left the F.T.S's and also for giving advanced training to Volunteer Reservists. In war-time Group Pools were planned to combine interim training with the holding of casualty replacements. Inability to find aircraft or staff for them, however, would prevent their provision for a considerable time.

\* Training Overseas: It was decided to establish further Flying Training Schools abroad. It had become clear that Canada would not undertake any early or large scale training of R.A.F. pupils.

One armament training station was converted to a school for the armament training of observers, making the total of armament training stations 7. The temporary navigation training school for observers was closed.

29 V.R. aerodrome centres were in operation.

December

Observers: rate of direct entry recruiting increased to 1920 per year to provide the numbers required by revised crewing (May 1938).

A new F.T.S. opened, making 12 in all (one in Egypt).

An additional Group, No.21, formed to control F.T.S's.

1939  
January - May

1939

January

Operational training: one Group Pool, to serve the fighter squadrons of No.11 Group, opened.

The first specially designed S.E. trainer, the Harvard, introduced at F.T.S's.

Two more civil schools began the navigation training of observers, making 6 in all. Two other civil schools training pilots.

February

Bomber Command pressed for more F.T.S. training in bad weather flying, but it was found impossible for lack of time during the course and lack of wireless at the schools.

Observers: the recruiting of direct entry observers proved smaller than the requirements, and training plans had to be curtailed.

Crewing: a scheme for the progressive training of air crew, first as wireless operator air gunners, and later as observers, was introduced.

Specialisation of pilot training at F.T.S's standardised in two forms - Group I (S.E.) and Group II (T.E.).

Reserve Command, which replaced No.26 Group, was formed to control civil schools and V.R. aerodrome centres.

March

Operational training: a non-mobilisable bomber squadron began to give "interim", or Group Pool, training to bomber pilots.

Bomber Command urged that air gunnery training should be done at schools and its standard raised considerably.

A new F.T.S. opened, making 13 in all (one in Egypt).

April

Proposed that Flying Personnel Reception Depots should be opened in war-time to hold recruits until the flying schools had room to absorb them.

Training Overseas: Canada agreed to train 50 R.A.F. pilots per year (beginning in September, 1939) in Canadian schools.

A new F.T.S. opened, making 14 in all (one in Egypt). Two more armament training stations converted to schools for the armament training of observers, reducing the number of armament training stations to 5.

Two more non-mobilisable bomber squadrons began interim training, making 3 in all.

32 V.R. aerodrome centres were in operation.

May

Navigation: observers were made responsible for the navigation of aircraft, and it was planned to shorten the navigation course given to bomber pilots from 10 weeks to 6 in August 1939. Observers were to be trained in astro. navigation.

Reserves: a continuous-service period of training for V.R. observers and air gunners, starting in September, 1939, was planned.

1939  
May - September

1939

May  
(contd.)

Training Overseas: it was decided to start a F.T.S. in Kenya.

A new F.T.S. opened, making 15 in all (one in Egypt).

Two F.T.S's were training for the F.A.A. leaving 13 whose output went to the R.A.F.

The number of civil schools giving ab initio training to regular pupils was now 19.

June

Expansion of pilot training: it was decided to increase the size of F.T.S's by 25% (from 96 to 120 pupils per school) in September 1939, because a shortage of pilots was foreseen. The expansion was however contingent on enough trainer aircraft being available.

A new armament training station was opened, making 6 in all.

Six more non-mobilisable bomber squadrons began interim training, making 9 in all.

July

\* Training Overseas: Southern Rhodesia, which had formed and trained its own air unit, offered to go on with pilot training, and suggested setting up a Flying Training School in Southern Rhodesia.

Decision to pursue a proposal that a Flying Training School might be established in France.

Armament: the control and co-ordination of armament development and armament training was considered unsatisfactory; and a suggestion made that an Armament Directorate should be set up.

August

Operational training: the amount of interim training required by bomber pilots defined as a (peace-time) course of 14 weeks, with 62-80 hours flying.

Armament: it was decided to start school training for air gunners and establish a Central Gunnery School to raise the standard of gunnery. Making these changes, however, was likely to be delayed by lack of aircraft.

Decision that Flying Personnel Reception Depots should be established.

46 V.R. aerodrome centres were in operation.

September.

\* Changes to war-time training. All F.T.S's (renamed S.F.T.S's) shortened courses from 6 months to 16 weeks, and increased in size to 120 pupils, followed by a further gradual increase to 160. Cranwell was converted to a S.F.T.S., making 16 in all (one in Iraq). All except 19 of the civil schools doing ab initio pilot training and V.R. centres were closed. Armament training stations (including those training observers) were converted to schools for observers and air gunners, and renamed Air Observer Schools: four of the armament training stations were closed, and the number of Air Observer Schools was thus 7; their work was restricted by shortage of aircraft and equipment. Navigation courses for bomber pilots generally came to an end. The navigation training of observers at civil schools

1939

September  
(Contd.)

was continued and there were 10 of these schools, named Air Observer Navigation Schools, at work.

\* Target for war-time expansion. The annual output from training required when the first line had been increased to its war-time maximum was estimated at 20,000 pilots and crews per year. This output was recognised to be too big for the United Kingdom unaided by the Dominions.

\* Dominion-reinforcement. It was proposed that the training of Canadians, Australians, and New Zealanders for Dominion Air Force reinforcement of the R.A.F. should be rationalised and concentrated in Canada.

Operational training. The number of squadrons giving interim training for bombers was increased to 15. They were organised as 9 Group Pools, and put under the control of a specialist Group. The war-time length of course for bombers was fixed at 6 weeks (55 - 60 hours flying).

Training Overseas: the French Government agreed to the establishment of a R.A.F. school in France.

Flying Personnel Reception Depots were started and renamed Initial Training Wings. 3 were in operation, under the control of a specialist Group.

The S.F.T.S. in Egypt moved to Iraq.

October

\* Dominion training: the Riverdale Mission from U.K. began discussions with Canada, Australia, and New Zealand in Ottawa.

Operational training: Group Pool capacity was reviewed and found too small to give full training either to the S.F.T.S. output or to the estimated requirement for casualty replacement.

Observers: the amount of navigation training to be given was increased, but the A.O.N.S's found difficulty in giving it because of war-time restrictions.

Armament: the suggestion of an Armament Command to improve co-ordination and control was made.

One S.F.T.S. closed, making 15 in all (one in Iraq).

A second fighter Group Pool, to serve No.12 Group, was opened. Both fighter Groups Pools were limited by lack of newer types of aircraft, and fighter squadrons largely did their own operational training.

1939

November

# Dominion training: Australia and New Zealand decided to do most of their training at home, and their delegations left Ottawa.

# Navigation: the standard of training, at the S. of A.N. and at civil schools, was reviewed and found unsatisfactory, mainly because of war-time restrictions. The teaching of astro. navigation was virtually impossible.

Operational training: a Coastal Command Pool was opened for maritime pilots.

Armament: the Central Gunnery School was opened, but confined to the training of Gunnery Leaders.

Training Overseas. A training area in France was allotted to the R.A.F. It was agreed that three S.F.T.S's should be established in Southern Rhodesia.

Air Observer Schools renamed Bombing and Gunnery Schools.

Air gunner courses lengthened from 4 to 6 weeks.

December

# Dominion training: negotiations with Canada concluded and Ottawa Agreement signed. Canada to train Canadians, a proportion of Australians and New Zealanders, and a token number of R.A.F. pupils. Australia to train Australians. New Zealand to train New Zealanders. The United Kingdom to provide practically all the aircraft. The whole arrangement was named the Empire Air Training Scheme. It was to be built up to its full size by mid-1942, and was then to consist of 25 S.F.T.S's (16 in Canada, 7 in Australia, 2 in New Zealand) with other schools, and be capable of producing 11,000 pilots and 17,000 other air crew per year. United Kingdom Air Liaison Mission set up in Ottawa.

# Training Overseas: South Africa planned to expand training for the S.A.A.F., and offered part of the future enlarged South African school capacity for training R.A.F. pupils.

# Operational training: it was decided that Group Pools should bring their pupils fully up to operational standard, that they should be renamed Operational Training Units, and that the number of aircraft devoted to operational training should be increased.

Lengthening of courses: S.F.T.S. courses were lengthened to 20 weeks, E.F.T.S. (i.e. civil schools on ab initio pilot training) to 10, A.O.N.S. from 12 to 16, and B & G.S. (observers' armament) from 6 to 8.

Specialisation of schools: Training Command proposed that S.F.T.S's should specialise entirely on either Group I or Group II (i.e. S.E. or T.E.) training in order that the armament training visit to a B. & G.S. might be dropped and increased attention given to night and instrument flying.

1940  
January - April

1940

January

Dominion training: Empire Air Training Scheme Committee set up in the Air Ministry.

Navigation: Bomber Command asked for all bomber pilots to be given navigation training because observers were not capable of navigating accurately enough.

Synthetic training: a Crew Training School was set up by No. 5 Group.

Civilian instructors at E.F.T.S's and A.O.N.S's were mobilised.

Armament training visits by S.F.T.S. Group II pupils came to an end.

February

Crewing: the ~~scheme~~ for progressive training of air crew (February 1939) was dropped.

Operational tour: it was suggested that a scheme for the regular relief of war-weary air crew should be introduced, but no general rule was made.

Fighter Group Pools renamed O.T.U's but not increased in aircraft strength.

Night flying at S.F.T.S's restricted by lack of relief landing grounds.

The I.T.W's (total now 4) were crowded with men waiting for entry to flying training.

March

# Trainer aircraft: it was forecast that the supply of trainers would be inadequate in 1941 and 1942 for the planned expansion of R.A.F. and Dominion training.

Navigation: it was decided by a conference that all bomber pilots should be trained in navigation.

The Coastal Pool was renamed an O.T.U., but was drastically restricted by airfield unserviceability.

E.F.T.S. capacity was increased, to relieve crowding at I.T.Ws, and advanced elementary training begun.

The B. & G. Schools were severely handicapped by lack of aircraft.

Synthetic training: Committee for Simulation of Air Training on the Ground formed.

April

# Empire Air Training Scheme: preliminary ground instruction of the first recruits started in Canada, Australia, and New Zealand on 29th April.

Navigation: the conference decision of March 1940 was reversed. Observers were to remain responsible for navigation, and the standard of their training was to be raised.

Shortening of courses: S.F.T.S. courses were reduced to 16 weeks, E.F.T.S. to 18, A.O.N.S. to 12, and B. & G.S. to 6 (observers) and 4 (air gunners).

1940  
April - June

1940

April  
(Contd.)

Bomber Group Pools were renamed O.T.U's, and their strength of aircraft began to increase. There were 8 Bomber O.T.U's.

Synthetic training: the Committee for Simulation of Air Training on the Ground was renamed the Synthetic Training Committee.

May

- \* A shortage of fighter pilots appeared.
- \* An embargo was put on the sending of aircraft and instructors out of the United Kingdom.
- \* Empire Air Training Scheme: flying training began in Canada, Australia, and New Zealand. The scheme's progress in Canada received Canadian criticism for slowness, and an accelerated plan for Canada was drawn up. The accelerated plan could not, however, be put into practice because of the embargo on sending the necessary aircraft from the United Kingdom.
- \* Training Overseas. Flying training began in Southern Rhodesia. The Brooke-Popham Mission from U.K. began discussions in South Africa.
- \* Operational training. It was decided that the Fighter O.T.U's should forthwith be made capable of dealing with the whole flow of replacements to Fighter Command, which was still relying almost wholly on operational training by squadrons. The existing Bomber O.T.U. organisation was found to be inadequate for first line requirements, and it was decided to form two more O.T.U's, making 10 Bomber O.T.U's in all, and bring all Bomber O.T.U's to full strength in aircraft.

Training and Reserve Commands were merged and redivided into Flying Training and Technical Training Commands. The specialisation of flying instructors on S.E. or T.E. aircraft was introduced: the flying instructor (C.F.S.) course lasted 5 weeks.

I.T.W's began to take direct entries from civil life (they had previously handled reservists).

June

- \* Shortening of courses and specialisation of schools. To obtain a greater output of pilots S.F.T.S. courses were shortened to 12 weeks for Group I and 14 weeks for Group II, and the specialisation of schools on Group I or Group II training (which facilitated the shortening of courses) begun. (the First Revise of pilot training).
- \* Operational training. It was decided that O.T.U's should, as a general rule, be in the United Kingdom in order to reinforce the first line if required. To increase the output of fighter pilots a third Fighter O.T.U. was opened and the course reduced from 4 weeks to 2. The Fighter O.T.U's were still limited by having few first line types of aircraft.
- \* Training overseas: the "Van-Brookham" agreement for the joint development of training in South Africa was signed.

Empire Air Training Scheme: the manufacture of T.E. and crew trainers (Ansons) in Canada was planned because of the embargo on export from the United Kingdom.

1940  
June - August.

1940

June  
(Contd.)

Production in Canada, however, could not be effective for at least a year.

United States: the United Kingdom made an unofficial approach on the possibility of training R.A.F. pupils in the U.S.A., but was told that it "would be better" to train in Canada.

The navigation course at A.O.N.S.'s (for observers) was lengthened to 15 weeks (80 hours flying). The air gunners' course at B. & G.S's was temporarily shortened from 4 to 3 weeks because large numbers were waiting for training and the schools' facilities were limited.

July

- \* Air Member for Training created.
- \* Empire Air Training Scheme. S.F.T.S. training under the scheme began in Canada, Australia, and New Zealand. The embargo on export of aircraft from the United Kingdom was lifted, and the Canadian accelerated plan put in hand.
- \* Training overseas. The first Rhodesian S.F.T.S. began training. It was agreed that 14 R.A.F. schools (including 8 S.F.T.S.'s) should be accommodated in Canada, and that 3 R.A.F. navigation schools should be accommodated in South Africa.

Operational training: the Coastal O.T.U. course was shortened to 2-3 weeks in order to provide an adequate flow of crews. The course had previously been 6 weeks, nominally, but in fact the O.T.U. had been chiefly engaged on converting pilots to new types.

Instructors: the specialised training of E.F.T.S. instructors, by a 4 week course, began, and a (Supplementary) Flying Instructors School was opened for the work. Some E.F.T.S. instructors had previously been trained at the E.F.T.S.'s.

One B. & G.S. was closed, making the total 6.

The number of A.O.N.S.'s, by closing and amalgamation, had now been reduced to 6.

The I.T.W. course, because of the demand for men for pilot training, was temporarily shortened from 8 weeks to 6.

August

- \* Increase of pilot output. Group II S.F.T.S. courses were shortened to the same duration as Group I (12 weeks), Bomber and Coastal O.T.U. courses being correspondingly lengthened by 2 weeks to deal with the instruction displaced from S.F.T.S.'s. (The Second Revise of pilot training). As an experiment, work at some S.F.T.S.'s was intensified by handling 25% more pupils with no increase of instructors or aircraft.
- \* Operational training. The heavy demand for fighter pilots was too much for the three Fighter O.T.U.'s although their aircraft strength was increased, and the Stabilisation Scheme of using first line squadrons for training was introduced.

1940

1940  
August - September

August  
(Contd.)

19½ squadrons were employed on operational training to supplement the O.T.U's. The Fighter O.T.U's were re-organised so that each trained on only one type of aircraft.

It was suggested that O.T.U's be formed in the Middle East.

\* Training overseas. One S.F.T.S. (training for the F.A.A.) began to be transferred from the United Kingdom to Canada, making the number of S.F.T.S's in the U.K. 13 (one training for the F.A.A.). Elementary training under the joint "Van-Brookham" scheme began in South Africa.

\* United States. A scheme for training R.A.F. pupils in United States civil schools was worked out in Washington, but was held up because of its dollar cost and lack of trainer aircraft.

\* Instructors. Large numbers of pilots were required for duty as instructors, and the full numbers could not be met from experienced men without serious dislocation of the first line. It was decided that half the flying instructors required should be drawn from pilots who had just completed their S.F.T.S. training.

A statistical and forecasting staff (T.P.) for planning training was established.

September

\* Increase of pilot output. All S.F.T.S. courses, both Group I and Group II, were shortened to 10 weeks, the S.F.T.S. flying time being reduced to 72 hours. All O.T.U. courses were (when pilots who had been given this shorter S.F.T.S. training reached them) to be lengthened by two weeks to deal with the instruction displaced. The military flying (A.T.S.) part of S.F.T.S. training disappeared. (The Third Revise of pilot training). Intensification of work at R.A.F. S.F.T.S's by overbearing 25% of pupils, thus making the pupil population 200 instead of 160, became general. The specialisation of R.A.F. S.F.T.S's on either Group I or Group II training was completed.

Experiments were begun in training pupils, after their ab initio instruction at E.F.T.S's, on operational types of aircraft at Bomber O.T.U's instead of on trainer types at S.F.T.S's.

Training overseas. One navigation school and one S. of G.R. began to move from the United Kingdom to South Africa. One navigation school began to move from the United Kingdom to Canada. Reinforcements of R.A.F. staff and instructors for one S.F.T.S. reached South Africa.

Trainer aircraft. It was decided to use a type (the Botha) which had been found unsuitable for operational work as an armament trainer. (It was later decided to use it also as a navigation trainer).

A second school for training flying instructors was opened. It was at first called No.2 F.I.S., and later renamed No. 2 C.F.S.

1940

October - November

1940

October

Operational training. Bomber O.T.U. courses were lengthened, because of the Second Revise, to 8 weeks. It was decided to defer the establishment of O.T.U.'s in the Middle East because all the aircraft there were needed for the first line.

Empire Air Training Scheme. Canada agreed to introduce a Third Revise course of 72 days at S.F.T.S.'s, but kept the size of schools unchanged at 160 pupils for lack of aircraft.

Training overseas. A British Air Liaison Mission was sent to South Africa. The S.F.T.S. course in Southern Rhodesia was shortened to 14 weeks and the size of schools increased to 200 pupils.

A slight increase in the amount of night flying instruction at U.K. S.F.T.S.'s resulted from the introduction of hooded flares. Experiments were made with synthetic (sodium) day-night flying.

A second S.F.T.S. began to move from the United Kingdom to Canada, leaving 12 (one training for the F.A.A.) in the United Kingdom.

A second navigation school began to move from the United Kingdom to South Africa.

The second Rhodesian S.F.T.S. began training. A second Coastal O.T.U. was opened. A second (S) F.I.S. for elementary flying instructors was opened.

University Air Squadrons were restarted.

November

# Trainer aircraft. Serious difficulty was being caused to the expansion of training by severe shortage of trainers. Bombing reduced the production of T.E. trainers.

Operational training. Bomber O.T.U. course lengthened to 10 weeks (85-90 hours) as a consequence of the Third Revise, although Bomber Command considered more than 8 weeks unnecessary. Fighter O.T.U. course lengthened to 4 weeks. The Middle East Reserve Pool became a nucleus for future O.T.U. development.

# Canada. The Canadian Government offered to expand the training organisation in the Dominion beyond what was already planned. All the first output of Canadian E.A.T.S. pilots had to be "ploughed back" as instructors for the scheme's later schools.

United States. Refresher training of American citizens who volunteered to serve in the Eagle squadron began at three civil schools.

1940  
December

1940

December

# Empire Air Training Scheme. In Canada 8 S.F.T.S's were open (the accelerated programme), though they were restricted by lack of aircraft and hampered by shortage of spares. In Australia 2 S.F.T.S's were working on 16-week courses with 200 pupils each (Australia also had a third S.F.T.S. training pilots for home defence). In New Zealand 3 S.F.T.S's (equivalent to two of standard size) were working on 12-week courses, and New Zealand's share in the Empire Air Training Scheme was at its full planned size.

Operational training. Fighter O.T.U. course lengthened to 6 weeks as a consequence of the Third Revise. A night fighter O.T.U. was opened, making 4 Fighter O.T.U's (one night) in all. A Specialist Group was formed to control Fighter O.T.U's.

Instructors. It was decided to train air crew (observers and air gunners) as amament instructors. The bulk of the men trained as instructors had just finished their own school training.

One S. of G.R. began to move from the United Kingdom to Canada.

The first "Van-Brookhan" S.F.T.S. in South Africa was at work.

A third Coastal O.T.U. was opened.

8 I.T.W.'s and 2 Reception Centres were open in the United Kingdom.

The withdrawal of experienced pilots from Bomber Command for training as instructors was stopped.

1941  
January - March

1941

January

\* Operational training. The Bomber O.T.U's were found to be incapable of producing enough crews for the expansion of the bomber first line planned during 1941.

Instructors. It was evident that most pilots were reluctant to exchange operational work for instructing.

Instrument flying. The instruction given at S.F.T.S's was inadequate for operational work.

Canada. A new R.A.F. S.F.T.S. started work, making the number of R.A.F. S.F.T.S's in Canada 3 (one training for the F.A.A.).

South Africa. It was agreed that the R.A.F. S.F.T.S. planned for Kenya should be established in South Africa.

A new Fighter O.T.U. was opened, making 5 (one night) in all.

The number of University Air Squadrons was increased.

February

\* Operational training. The Fighter O.T.U's were still incapable of producing pilots in the numbers required, and training in squadrons had to continue.

Trainer aircraft. Experiments were begun in using Hurricanes in place of trainers for part of the S.F.T.S. (S.E.) course. The results of using operational bomber types in place of trainers (September 1940) were not considered successful.

Observers. An experiment in combining the armament and navigation training of observers at one school was begun.

Airfields. S.F.T.S. training in the United Kingdom was seriously handicapped by weather and its effect on grass airfields. Operational airfields were used temporarily.

A Personnel Reception Centre for air crew trained overseas was established.

The Air Training Corps was formed.

March

\* United States. The U.S. Army agreed to release trainer aircraft (which would be supplied under Lend-Lease) for use in civil schools training R.A.F. pupils, and the scheme for Six All-Through schools (August 1940) began to go ahead. Proposals were made for setting up R.A.F. S.F.T.S's in the U.S.A., in addition to the civil schools. The training of R.A.F. observers in the U.S.A. began.

Operational training. The length of the Bomber O.T.U. course was agreed at 8 weeks (55-60 hours flying).

Instructors. The "operational tour", after which air crew were relieved from first line work, was introduced, but the flow of men relieved was almost entirely absorbed by operational training.

One new R.A.F. S.F.T.S. started work in Canada, making the total of R.A.F. S.F.T.S's there 4 (one training for the F.A.A.). Two new Bomber O.T.U's opened, making 12 in all.

Instrument flying. It was decided that S.B.A. training should be part of every pilot's basic (i.e. school) instruction.

1941

March  
(Contd.)

Three new Fighter O.T.U's opened, making 8 in all (one night).

The Flying Boat Training Squadron was converted into a Coastal O.T.U., making 4 in all, but its work was limited by lack of aircraft.

Two O.T.U. nuclei were formed in the Middle East, making 3 in all.

April

\* United States. The "Arnold Scheme" of training R.A.F. pupils in U.S. Army schools was offered and accepted.

\* Operational training. The Bomber O.T.U. course at Wellington and Whitley units was shortened to 6 weeks in order to increase the output of bomber crews.

One new Bomber O.T.U. opened, making 12 in all.

13 E.A.T.S. S.F.T.S's were now open in Canada.

A new R.A.F. B. & G.S. was started in Canada.

The U.K. capacity for training flying instructors was increased.

A Navigation Synthetic Training Development Unit was established.

May

\* Canada. It was agreed that R.A.F. and E.A.T.S. schools in Canada should work on the same basis and be interchangeable. 6 more R.A.F. S.F.T.S's, in addition to the 14 schools agreed in July 1940, were to be established in Canada.

\* United States. The "Towers Scheme" of training R.A.F. pupils in U.S. Navy Schools was offered and accepted.

Increase of pilot output. A method of more intensive working at S.F.T.S's, by means of a shift system, was proposed.

Instructors. Courses at the C.F.S. were started to train flying instructors for O.T.U's.

The third S.F.T.S. in Southern Rhodesia opened.

Two new Bomber O.T.U's opened, making 15 in all (of which one was training for the Middle East).

A new night fighter O.T.U. opened, making 9 Fighter O.T.U's in all (two night).

The use of Hurricanes at S.E. S.F.T.S's in U.K. was extended.

No.4 S.F.T.S. became operational to quell a revolt in Iraq.

June.

\* Increase of pilot output. Work at United Kingdom S.F.T.S's was intensified by increasing the number of pupils at T.E. schools to 240 and starting a shift system experiment with 288 pupils, at one T.E. school.

\* United States. Training of R.A.F. pupils began at the six civil schools (B.F.T.S's) and in U.S. Army schools (Arnold Scheme).

\* South Africa. A revised agreement for joint training was signed which fused the "Van-Brookham" and R.A.F. schools into a single organisation.

1941  
June - July

1941

June.  
(Contd.)

Operational training. An O.T.U. was formed in Canada to train on Hudsons, but was handicapped by unsuitable staff and lack of facilities, and the instruction given was unsatisfactory for a considerable time.

Reports on air crew trained overseas. It was found difficult to give satisfactory replies to requests from Canada and South Africa for reports on air crew trained in these theatres.

Preliminary training. An Air Crew Reception Centre was formed in the United Kingdom to accept and classify recruits for air crew training.

Two B. & G. Schools in the U.K. were converted to combined armament and navigation training of observers, and renamed Air Observers Schools, making 3 A.O.S's in all.

The U.K. air gunner course was temporarily shortened from 4 to 3 weeks.

One R.A.F. E.F.T.S. and a second R.A.F. navigation school started in Canada.

3 E.A.T.S. S.F.T.S's and 1 S.F.T.S. for home defence were at work in Australia.

A fourth S.F.T.S. opened in Southern Rhodesia.

The ex-Kenya S.F.T.S. started in South Africa, making 3 S.F.T.S.'s in the Union, but all were handicapped by shortage of aircraft: South African schools were working on 16-week courses and had a nominal full size of 160 pupils.

A new Coastal O.T. opened, making 5 in all.

July

\* Operational training. A new Coastal O.T.U. opened, making 6 in all, but the output of maritime crews was too small for the first line requirements, and the O.T.U's were limited by shortage of aircraft. The crewing of medium range G.R. aircraft (Hudsons) was therefore changed from two pilots to one pilot and an observer, with a consequent increase in the number of G.R.-trained observers required. A Middle East O.T.U. was established in Kenya, and incorporated a small South African O.T.U. which had grown up there.

United States. A request was made for the setting up of O.T.U's in the U.S.A.

Gunnery Schools. As B. & G. Schools in the U.K. were converted to the exclusive training of observers it became necessary to provide for the training of air gunners by starting specialised Air Gunner Schools. Two B. & G. Schools were converted to A.G.S's, and four new Schools opened, making 6 A.G.S's in all.

A new Fighter O.T.U. opened, making 10 in all (two night).

A new R.A.F. E.F.T.S. opened in Canada, making 2 in all.

One U.K. B. & G. School converted to an A.O.S., making 4 A.O.S's in all.

Two U.K. A.O.N.S's closed as their training was taken over by A.O.S's, leaving 3 A.O.N.S's in the U.K.

August - October

1941

August

- \* Standard of training. A progressively mounting accident rate, as pilots were called on to handle more complicated aircraft at the successive stages of the training sequence, was observed. The causes were taken to be inexperienced instructors and too short courses. Longer courses and a general raising of standards became matters of urgency.
- \* United States. The first R.A.F. pupils at U.S. Army schools (Arnold Scheme) showed an alarmingly heavy failure (elimination) rate in the early stages of their instruction, and directed attention to the selection of pupils for training as pilots.
- \* Operational training. It was noticed that Bomber O.T.U's were not completing their training in the scheduled period of 6 weeks, and that they were consequently becoming overcrowded.

S.B.A. It was decided to increase the amount of S.B.A. training by starting a number of new B.A.T. Flights. The B.A. School was enlarged, and began intensive work. S.B.A. training was begun at the C.F.S.

Trainer aircraft. The use of Hurricanes at S.E. S.F.T.S's began to die out because of high wastage and maintenance difficulties.

A new night fighter O.T.U. opened, making 11 Fighter O.T.U's in all (three night).  
A third R.A.F. navigation school opened in Canada.  
One U.K. A.O.N.S. closed, leaving 2 A.O.N.S's in the U.K.  
An A.O.S. opened in Southern Rhodesia.  
An Air Crew Dispatch Centre was formed in the U.K. to handle men going overseas for training.

September

- \* Longer courses. The United Kingdom S.F.T.S. course was lengthened to 12 weeks (85 hours flying) with winter equivalent periods of 14-16-18 weeks.
  - \* Operational training. Bomber Command's firstline began to lose effectiveness because the crews coming forward from O.T.U's were only part trained.
- Canada. The last (i.e. 16th) S.F.T.S. in the E.A.T.S. programme was opened. Two more new R.A.F. S.F.T.S's were opened, making the total of R.A.F. S.F.T.S's in Canada 6 (one training for the F.A.A.).
- Penrhos experiment. The training of wireless operator air gunners in gunnery and air W/T operating at an A.O.S. was begun experimentally.

One U.K. B. & G. School converted to an A.O.S., and one new A.O.S. opened, making 6 A.O.S's in all.  
A specialised I.T.W. for "straight" air gunners opened.

October

- \* Longer courses. S.F.T.S. courses in Canada were lengthened to 12 weeks, and E.A.T.S. schools enlarged to 200 pupils.

1941  
October - December.

1941

October  
(Contd.)

- \* Operational training. The planned expansion of the bomber first line could not be made because aircraft production was below what had been forecast. To reduce the flow of crews, which was overflowing the existing squadrons, Bomber O.T.U. courses were lengthened to 8 weeks.

A new R.A.F. S.F.T.S. opened in Canada, making 7 R.A.F. S.F.T.S's in Canada (one training for the F.A.A.). Another O.T.U. nucleus was formed in the Middle East, making 1 O.T.U. and 3 O.T.U. nuclei there. An Elementary Air Observers School opened in the U.K. An Air Crew Disposal Wing opened in the U.K. to deal with remustering and special training.

November

- \* Advanced Flying Units. Three United Kingdom S.F.T.S's began to change into Advanced Flying Units, giving short refresher and acclimatisation courses to pilots from schools overseas.
- \* Grading. The testing and grading of pupils, so that only the most promising were sent for training overseas, was begun at a few E.F.T.S's in the United Kingdom.

One U.K. A.O.N.S. was converted to an A.O.S., making 7 A.O.S's and leaving 1 A.O.N.S. in the U.K. A third (S)F.T.S. opened for training elementary flying instructors.

December

- \* The New Deal. Bomber Command urged that the bomber first line's operational efficiency depended on a general raising of training standards. The Air Ministry decided to lengthen the period of pilot training so that there would be 216-290 hours flying before the O.T.U. stage, and 300-350 hours flying before pilots reached the first line, and to make corresponding increases in the training of other air crew. The lengthening would be done gradually.
- \* Empire Central Flying School. Various practices of instruction had grown up in different training theatres because there was no common authoritative instructional doctrine. The setting up of an E.C.F.S. was proposed, as part of the New Deal, in order to produce a standard technique of instruction.
- \* Canada. The Empire Air Training Scheme in Canada (58 schools in all) was brought to its full planned size. A new R.A.F. S.F.T.S. was opened, bringing the number of R.A.F. S.F.T.S's in Canada up to 8 (one training for the F.A.A.).
- \* Australia. 7 E.A.T.S. S.F.T.S's were in operation and the Empire Air Training Scheme in Australia had practically reached its full size. (One more Australian S.F.T.S. was training for home defence). The flow of pupils from Australia for training in Canada and Southern Rhodesia was stopped because of the outbreak of war in the Pacific.
- \* South Africa. 5 S.F.T.S's were open, but their work was severely limited by shortage of aircraft.

1941  
December

1941.

December  
(contd.)

\* Longer courses. Courses at the B.F.T.S's in the United States were lengthened from 20 to 28 weeks, and the schools enlarged from 200 to 240 pupils. The A.O.S. course for observers was lengthened temporarily from 18 to 24 weeks (130 hours flying).

Advanced Flying Units. Two more A.F.U's began work, making 5 units, now called (P) A.F.U's, dealing with pilots. One U.K. A.O.S. was converted into an (O) A.F.U. to handle observers.

A second O.T.U. was opened in Canada, but was temporarily inoperative because of the Pacific war.

15 I.T.W's were open in the U.K.

The P.R.C. in the U.K. had to be expanded rapidly because of large numbers of air crew arriving from schools overseas.

1942  
January - March.

1942.

January

\* Operational training. It was found that, with the length of the Bomber O.T.U. course at 8 weeks, there were too few Bomber O.T.U's to back the first line, and that the planned allowance for Bomber O.T.U. expansion was less than the requirement. A planned, standardised, organisation was introduced in Fighter O.T.U's, and the Fighter O.T.U. course lengthened from 6 to 9 weeks.

Longer courses. The S.F.T.S. course in Canada was lengthened to 16 weeks.

An Empire Air Crew Training Conference was held in London.

Three more (P)A.F.U's were started, making 8 in all, and one more (O)A.F.U., making 2 in all. One new R.A.F. E.F.T.S. opened in Canada, making 3 R.A.F. E.F.T.S's there. A F.I.S. was formed to train (P)A.F.U. instructors, and all units training flying instructors were renamed F.I.S's. It was urged that air gunners should be trained in the maintenance of their weapons.

February

\* Operational training. Because the output from Bomber O.T.U's, existing or planned, was too small for first line requirements, the crewing of bomber aircraft was changed generally from two pilots to one, thus enabling a greater number of crews to be turned out. The O.T.U. output of maritime crews was also too small for first line requirements, and the crewing of maritime aircraft was changed so that each home-based crew had only one O.T.U.-trained pilot.

One R.A.F. S.F.T.S. opened in Canada, making 9 R.A.F. S.F.T.S's there (one training for the F.A.A.) One R.A.F. E.F.T.S. opened in Canada, making 4 R.A.F. E.F.T.S's there. One new Bomber O.T.U. opened, making 16 in all (two training for the Middle East).

March

Australia. The number of E.A.T.S. S.F.T.S's was reduced to 5 (of increased size) in order to provide airfields for operational work. The flow of pupils from Australia for training in Canada was resumed.

South Africa. 6 S.F.T.S's were open. This was only one S.F.T.S. of below the full planned organisation, but the effective size was considerably less because the schools were limited by lack of aircraft.

Operational training. It was agreed that a joint British-American O.T.U. should be started in the Bahamas.

Advanced Flying Units. Signals refresher training for wireless operators trained overseas began at (O)A.F.U's.

Instructors. The training of ground instructors in the technique of teaching was begun.

1942  
March.

1942

March  
(Contd.)

Instructors. The training of ground instructors in the technique of teaching was begun.

Liaison. It was decided to issue a monthly Air Crew Training Bulletin to keep overseas training theatres more fully informed.

A new Bomber O.T.U. was opened, making 17 in all (two training for the Middle East).

10 (P)A.F.U's and 2 (O)A.F.U's were in operation, with 1 S.F.T.S. and 5 A.O.S's in the United Kingdom.

A third O.T.U. opened in Canada.

Two new R.A.F. E.F.T.S's opened in Canada, making 6 R.A.F. E.F.T.S's there.

A Fighter Wing, for training Pilot Gunnery Instructors, was started at the Central Gunnery School.

Specialised I.T.W. training for "straight" air gunners was extended to include instruction in maintenance.

A training unit for staff pilots at (O) A.F.U's was started.

PART II

NARRATIVE

4. Before Expansion.
5. 1934 - March, 1938.
6. April, 1938 - August, 1939.
7. September, 1939 - April, 1940.
8. May, 1940 - March, 1942.

2: INTRODUCTORY SURVEY

(a) - The Expansion of Air Crew Training.  
(1934-1942)

In 1934 the R.A.F. trained some 300 new pilots. By the end of 1941 the Empire's annual rate of output was 22,000. In the same seven years the number of non-pilot air crew trained rose from none in 1934 to 18,000 in 1941. By 1942 the training organisation had grown from the small beginnings of 1934 almost to its full war-time size.

Training expansion went on steadily throughout the whole period. So far as the R.A.F. was concerned, it was not markedly slower in the pre-war years of preparation than it was after the war began. Between 1934 and 1939 there was a sevenfold increase in the yearly production of pilots. Between 1939 and 1942 the R.A.F. increase was sixfold, but in these years R.A.F. training was reinforced by Dominion training of Dominion Air Force pilots for service in conjunction with the R.A.F. - a reinforcement which by the end of 1941 was contributing about half the annual output of 22,000.

In seven years the total number of air crew trained - pilots and non-pilots - rose from 300 to over 40,000 per year. Yet even this impressive multiplication of output does not represent all the training expansion that took place. While it was going on the technical development of aircraft was making great strides. In 1934 the Fury, Gauntlet, Hart, and Virginia were first line aircraft. By 1942 the Spitfire, Hurricane, Beaufighter, Wellington, Halifax, Liberator, and Hudson were in service. Controls became more complex, speeds higher, range and endurance greater, and navigation a much more difficult and important matter. Whereas in 1934 it was unusual for an aircraft to carry more than one man in addition to the pilot, by 1942 crews of four, five, six, or seven were common. Technical development made it essential for all air crew to be trained to higher standards and for large crews to be trained in working together as a team.

Pilot Training

In the first years of expansion the problem of providing air crew  
/was little

was little more than the problem of training pilots. All the comparatively small number of observers then required could be turned out by one school (which was started in 1936) while other non-pilot crew were trained in squadrons.

Between 1934 and 1936, while Air Commodore Tedder was Director of Training, pilot training was thoroughly overhauled. The principle that pilots should leave schools completely prepared and ready for operational work was accepted, and a new flying training sequence planned. For several reasons, however, the new sequence was not put into practice as it was planned, and pilots consequently went from schools to squadrons at less than first line standard.

One reason was that financial restraint - in order to run the R.A.F. economically - kept the total period of pilot training down to a year even though a year was not long enough to teach all that a fully operational pilot needed to know. Another reason was that expansion was regarded as a short term matter rather than as the first step towards a much larger air force, and opening more than the bare minimum of schools was therefore considered extravagant and unwise since increased output might be wanted only for one or two years: on this ground the total period of pilot training was cut down to nine months in order to turn out a large number of pilots from a small number of schools. A third reason was that the expansion to be achieved in 1936 and 1937 was so large as to require, if full training were given to all the new pilots, a great many instructors and training aircraft - so many as to be formidably out of proportion to the small nucleus from which expansion began.

The Flying Training School course was the chief element in the pilot-training sequence, and when the total period of a pilot's training was limited to a year and then cut down to nine months it was the Flying Training School course which suffered. Its proper duration for producing fully prepared pilots was assessed at ten months, but it was fixed late in 1935 at six. For a time nine months was regarded as an unattained ideal, but early in 1937 bomber crews were revised to include

/two pilots

two pilots instead of one, and the consequent demand for more pilots made nine months unattainable as well as unattained. The standard peace time duration of the Flying Training School course then crystallised at six months.

The possibility of training bomber and maritime pilots to a higher standard by means of a specialised three months' course in navigation and night flying was discussed, but the idea had to be abandoned, except for maritime pilots, because of the reasons which compelled curtailment of the Flying Training School course.

The main purpose behind Air Commodore Tedder's overhaul of pilot training - turning men out from the training organisation at first line standard - was thus defeated. Nevertheless, some important changes were made. The Flying Training School course was preceded by a course of ab initio instruction on light aircraft at civil schools, and was thus enabled to concentrate on the flying and military use of more advanced aircraft (the practice had previously been to carry out the whole sequence of instruction at one school). Practical armament exercises were included in the Flying Training School course, with a one-month visit to an armament practice camp. Training on twin-engined aircraft was introduced, and monoplane advanced trainers with the chief characteristics of the new operational types designed. Night flying became a standardised subject of school instruction, and increasing attention was paid to instrument flying. Specialisation - i.e. teaching pupils the subject most appropriate to their future employment - was introduced, partly because of the shortness of the course. The whole pilot training sequence, civil school, Flying Training School, and some disciplinary training, lasted about nine months and included 150 hours' flying.

The changes came into effect from the end of 1935 onwards. Ab initio instruction was taken over by civil schools in the second half of 1935. Night instruction was begun in 1936. Twin-engined trainers came into use at the end of 1936. Instrument instruction began to be reinforced by the use of Link Trainers in 1937. Single-engined

/monoplane

monoplane trainers began to be used in 1939.

Even though the revised sequence of training was too short to turn pilots out fit for immediate operational work, it was held to be successful, and considerably better than the training given before 1936. The training was certainly excellent and successful as far as it went, but it did not go far enough to fit the output for first line work, and its shortcomings in this respect increased as technical development changed the types with which squadrons were armed. School aircraft had no wireless, and considerations of safety therefore prevented night and instrument flying going beyond the elementary stages. Delay in equipping schools with the new advanced trainers meant that many pilots went to squadrons with no knowledge of the characteristics of modern aircraft.

At the outbreak of war the Flying Training School course was almost halved in duration, and the number of pupils at each school increased, to obtain a greater output, but there was at first no change in what was taught. As 1939 and 1940 went on, however, it became increasingly evident that schools were turning out pilots seriously below the standard needed for operational work and that (particularly in the summer of 1940) they were producing far fewer pilots than active and intensive warfare required.

The urgent need was for more pilots, and since the number of schools could not be increased rapidly, the length of pilot training courses had to be cut down further. Practical armament training disappeared from the school syllabus during 1940, and by a general pruning the Flying Training School course was reduced to 10 weeks by the autumn. Each school specialised on either single engine or twin engine training, the intensity of work was increased, and the number of pupils per school raised. These steps raised the pilot output very considerably and averted the danger of a shortage, but they also put the standard of output even more below what was needed for operational work. School training was dealing only with the essentials of pure flying, and had dropped almost all military training. The civil schools and Flying

Training Schools together gave the average pupil only 120 hours' flying.

The concentration of schools on producing maximum pilot output by giving barely essential training went on through 1941. They were again enlarged, and their working further intensified. Monoplane advanced trainers came into general use, and experiments were made in using operational aircraft in schools - though with no net advantage to efficiency.

Meanwhile the number of schools increased steadily, and by the end of 1941 the supply of pilots overtook the demand. It became possible to reverse the process, which had been going on since 1935, of cutting down what was taught at schools. The "New Deal", at the beginning of 1942, lengthened school training and extended the syllabus, paying particular attention to night and instrument flying, so that pilots did not leave school until they had done over 200 hours' flying.

#### Schools and Aircraft

The number of Flying Training Schools rose from four in 1934 to eleven in 1936. This was the least number which, even with courses cut down to six months, could man the expanding first line. In 1938 further expansion became necessary as a more immediate preparation for war, and additional schools had to be opened. More schools, however, needed more instructors, and providing instructors meant taking experienced men from squadrons and so weakening the first line. Only four new schools could be started instead of the eight that were wanted.

When war broke out, fifteen Flying Training Schools were in operation, plus the civil schools which fed them with pupils. This number remained effectively unaltered throughout 1940, and it was not until 1941 that new schools training R.A.F. pupils, and Dominion schools training Dominion pupils, began to widen the sources from which the R.A.F. drew its pilots. Development was then rapid, and by the end of 1941 more than 50 Flying Training Schools, or their equivalents in instructional capacity, were at work.

Before the war the number of schools was kept down for the sake of economy and to avoid calling on the first line to supply a number of  
/instructors.

instructors. At the same time no preparation of buildings and airfields, and no provision of aircraft, was made for war-time expansion. When war broke out more schools were planned, but time was needed to build them and train their staffs, while equipping them with trainer aircraft presented constant difficulty until well into 1942. There were not enough trainers in existence, and too little of the aircraft production programme was devoted to training types, to allow all the schools to work at full size and with full efficiency. Thus no productive increase in the number of schools was possible earlier than 1941, and the expanding training organisation was beset in 1940 and 1941 with difficulties through shortage of aircraft.

#### Technical Development

As long-range, high-speed, monoplanes come into service the work to be done during flight became increasingly complex. The size of crews increased, and each member of the crew required more thorough and specialised training. The pilot's controls became more elaborate. Accurate navigation became an urgent problem. Turrets and radar required new proficiencies in the men who had to handle them. The greater all-weather day and night capabilities of aircraft called for much higher standards of night and instrument flying.

Practically none of the increased training requirements which these technical developments called into existence were met by schools during the years of expansion. Cockpit and flying complexity needed monoplane advanced trainers for efficient instruction, but the supply of these aircraft was slow and scanty. Only rudimentary instruction in night and instrument flying could be given for lack of facilities and time. Navigation was the subject of long and confusing uncertainty. Turrets could not be taught because instructional turrets were very scarce. Over all was the limitation of short courses and lack of time, which effectively restricted what pilots could be taught at schools to very much what they had been taught before expansion began in 1934. Even when advanced trainers and new equipment became general in schools, during 1940 and 1941, the pressure of time grew greater, and school

training could still not pay proper attention to the requirements of technical development. It gave basic flying instruction successfully and efficiently, but could not widen its scope to include newer requirements until the pressure for maximum output in the minimum time was relaxed and the New Deal became possible.

#### Operational Training

When the Flying Training School course was fixed in 1935 at a duration of six months, it fell to squadrons to complete the training process by bringing pilots up to operational standard. This reliance on squadrons for making up the shortcomings of school training as a complete preparation for first line work kept them busily and profitably employed in peace time, but impaired their immediate efficiency and readiness for war and obscured the amount of training given after men left school.

As technical development raised the standard needed for operational fitness, while schools were able to reflect little or nothing of the increased requirements in the instruction they gave, a growing burden of additional instruction fell on squadrons. In addition, the increasing size of crews made it necessary for them to attend to crew training.

The amount of this "operational" training required was greatest in bomber squadrons, which had to give instruction in navigation, crew work, night flying, and instrument flying. By the middle of 1938 it was evident that an "interim" stage of instruction between the school and the squadron was needed, at least for bomber pilots. At the time, however, practically no aircraft or instructors could be diverted to interim training. Group Pools were devised at the end of 1938 to give interim training in peace and war and to serve as casualty replacement reservoirs in war, but only one Group Pool - for fighters - could be brought into existence before September 1939. Some non-mobilisable bomber squadrons were employed on interim training during the summer of 1939, but almost all operational training still fell to the squadrons.

After the outbreak of war it gradually became clear that squadrons

/could

could not go on dealing with the operational training of their casualty replacements and at the same time carry out their first line duties. Operational Training Units, to deal with the gap between school training and operational fitness, had to be set up. Bomber Command was the first to be backed by them, the pre-war non-mobilisable squadrons being converted into training units during the first six months of the war. Coastal and Fighter Commands relied largely on squadron training until the end of 1940, and were not fully backed by O.T.U's until 1941.

The chief difficulty about operational training was that its development directly depleted the first line. Instructors and aircraft employed in Operational Training Units would otherwise have been available for squadrons, since the instructors had to be of operational standard and the aircraft of operational types. The diversion of effort was considerable: a large amount of operational training was needed because of the standard at which pilots left the schools, and this amount increased as the schools' syllabus was pruned in 1940 to obtain greater output in shorter time. A formidable operational training organisation was required to handle the whole flow of pilots to the first line.

At first efforts were made to keep the operational training organisation as small as possible by reducing the amount of training to a minimum, but experience in 1940 and 1941 showed that there were difficulties and dangers in being economical over O.T.U's.

Up to the Battle of Britain, Fighter Command required almost all the available Spitfires and Hurricanes for first line work, and the fighter O.T.U. organisation was very slender. During the battle the fighter O.T.U's were overwhelmed by the demand for casualty replacements, and about a third of the first line squadrons had to be turned into training units incapable of sustained operational effort. In Bomber and Coastal Commands restricting the amount of operational training was found to cause a reduction of operational efficiency through the dilution of squadrons with under-trained crews.

For some time the amount of effort which had to be put into operational training was magnified by the requirement of two pilots for  
/practically

practically every bomber and maritime crew, and first line expansion was made very difficult because of the number of aircraft and experienced men absorbed by O.T.U's. In fact, Bomber Command could hardly expand at all during 1941 for this reason coupled with a failure to build bombers as fast as had been forecast. A change to one-pilot crewing was made in the middle of 1941 for smaller maritime aircraft, and early in 1942 for larger maritime and bomber aircraft, and the problem of providing adequate operational training was greatly reduced as a result.

Early in 1942 the New Deal relieved O.T.U's of the burden of a good deal of comparatively elementary instruction - night flying, instrument flying, etc. - which had fallen to them partly because it had been squeezed out of school courses by pressure of time and partly because O.T.U's were better equipped to deal with it. This relief, plus the reduction in the number of pilots to be trained brought about by one-pilot crewing, made it possible for efficient operational training to be given without excessive diversion of effort from the first line to O.T.U's.

#### Crews

The technical development of aircraft brought a need for larger and more specialised crews, and the first problems of crew policy arose from navigation. Until long-range aircraft came into general use, navigation was usually a matter for the pilot, who worked out his courses while he was at the controls. In the newer types of aircraft which came into service from 1936 onwards, however, navigation had to be a matter of chartboard work: the pilot could no longer deal with it while he flew the aircraft.

In some types of aircraft this set no real problem. It was possible to carry two pilots, and two pilots were advisable because the aircraft's long endurance meant that fatigue had to be reckoned with. If ~~two~~ pilots were carried, one could deal with the chart-board work while the other flew the aircraft. Early in 1937 crews were revised generally to include two pilots (they had previously been based on one pilot and an observer).

There were some types of aircraft, however, which set the same problems of long range and chart-board navigation, but which could not carry more than one pilot, and for these aircraft it was necessary to train the observer in navigation (observers were previously qualified only in bombing and gunnery). The necessity for training observers in navigation did not, however, seem very important at first since the aircraft concerned were ultimately to be replaced by two-pilot types.

The six-month Flying Training School course was too short to produce pilots trained in chart-board navigation, and the suggestion of a special three-months' course in night flying and navigation had been found impracticable for bomber pilots. Squadron training had to be relied on to give pilots the necessary knowledge, but it was found unsatisfactory, and courses were held in 1937, 1938, and 1939 to train an increasing proportion of bomber pilots in navigation. The necessary training resources could not be spared by the R.A.F., and so the courses were held, with varying efficiency and success, at civil schools. Maritime pilots, however, were given a satisfactory navigation and reconnaissance training at a service school from 1936 onwards.

The navigation training of observers gained importance when it was realised in 1937 that for the next few years the readiness for war of one-pilot bombers depended on it. Courses were begun, but they were at first too rudimentary to be satisfactory, and in 1938 an observer's training was extended to include full instruction in chart-board work. Lack of service facilities, however, compelled the teaching to be largely entrusted to civil schools, and the results were variable.

In 1938 and 1939 crew and navigation training were again revised because the amount of effort being put into training pilots in chart-board navigation seemed too much to face in time of war. The number of pilots per crew remained, in general, at two, but an observer was added and made responsible for the navigation. This change caused a great increase in the number of observers required, and compelled the employment of full-time, direct-entry, observers.

Up to 1938 practically all non-pilot air crew, whether observers,

/wireless

wireless operators, or air gunners, were part-time on flying duties. They were drawn from ground tradesmen, and worked at their trades when not required for flying. The system was economical in peace time, but made it impossible to provide the full number of crews in war without seriously disrupting maintenance work. Moreover, men who were busy on their trades did not reach full efficiency in their flying duties. Full-time employment of observers as such was introduced in 1938, and of other air crew in 1939, but direct entry recruiting for these duties was disappointing, and there were few efficient full-time non-tradesmen air crew at the outbreak of war. Up to September 1939 all air crew other than pilots and observers were trained in squadrons, the instruction given being mostly gunnery.

After the outbreak of war the training of pilots in chart-board navigation was dropped, except for maritime pilots. The training of observers went on unchanged, with their navigation instruction given by civil schools. School training of air gunners was begun, amusement training stations being used for the purpose. During the first two years of war none of the non-pilot air crew training was particularly satisfactory. Navigation training was hampered by war-time conditions, as well as lack of equipment: gunnery training suffered from shortage of suitable aircraft and equipment: and in neither case were the instructors well suited to the work they had to do. As a result, a good deal of non-pilot teaching had to be done by O.T.U's in addition to pilot training.

Navigation training was frequently criticised, and it was even proposed in 1940 to change the basis of crewing by making pilots responsible for navigation once more. No change in crews was made, but navigation training was largely transferred overseas in 1940 and 1941, and was shifted from civil to service schools in 1941.

Gunnery training was also criticised, and an attempt made to

/raise

raise its standard by setting up a Central Gunnery School in 1939. The attempt had little immediate effect on schools' work, and improvement waited on aircraft, equipment, and longer periods of training.

### Training Overseas

Up to the outbreak of war training expansion was confined to the United Kingdom. It was fully realised, from 1936 onwards, that Britain had serious disadvantages as a training area, but repeated attempts to set up schools overseas bore little or no fruit.

The drawbacks of the United Kingdom for training were congestion and vulnerability to attack. Canada was free from both, and had the additional advantages of a good strategic position and nearness to the vast industrial resources of the United States. It was the first overseas training area to be investigated, in 1936, but the Canadian Government had no liking whatever for the idea of R.A.F. training in the Dominion. The effect on Canada's freedom to remain neutral in the event of war, the fact that a school would be a foreign military force on Canadian territory, and Canadian dislike of being tied in any way to Imperial Defence combined to make the scheme unacceptable to the Dominion. It made no difference whether the proposal was for a United Kingdom school training R.A.F. pupils, or a Dominion school training Dominion pupils for service with the R.A.F. Repeated approaches were made until in 1939, after some further pressure, the Canadian Government reluctantly agreed to train a handful of R.A.F. pupils from the United Kingdom in Canadian schools.

A great many other locations for R.A.F. schools were reviewed between 1936 and 1939, but almost all were turned down either on strategic grounds or because of practical difficulties. By September 1939 a great deal of time and thought had been devoted to overseas training, but the only results were the planning of a school in Kenya and some discussions about schools in France.

Training R.A.F. pupils overseas was only one aspect of the matter. Training Dominion pupils for service with the R.A.F. was the other.

/Australia

Australia and New Zealand were out of the picture for R.A.F. schools because of their remoteness, but they contributed "trained cadets" for service with the R.A.F., and shortly before the outbreak of war New Zealand undertook to make a substantial contribution of trained men. Southern Rhodesia formed and trained an air unit for war-time service with the R.A.F., and in the summer of 1939 discussed the possibility of setting up a training organisation for the R.A.F. In general, however, the pre-war Dominion Air Forces were small and mainly concerned with civil work: there was little training or first line in the Empire except for those members of Dominion Air Forces who served with the R.A.F.

After the outbreak of war overseas training began to expand. Canada, Australia, and New Zealand set out to develop Air Forces for service with the R.A.F. and it was decided in September 1939 to make the training of Canadians, Australians, and New Zealanders for those Air Forces a common enterprise. Canada was lukewarm about the scheme, and it was not until December 1939 that the details were settled.

The building of airfields and schools, and the creation of training organisations in the Dominions, then started. Training on an appreciable scale did not begin until late in 1940, and except from New Zealand there was no large output until well into 1941.

Canadian progress was considered slow in the Dominion, and the Canadian Government received some awkward criticism in the early summer of 1940. A marked and successful speeding up in the opening of schools followed, and the Canadian attitude towards training changed until pride in achievement and confident eagerness to undertake more training gave rise to difficulty late in 1940 and in 1941 because of Canada's jealousy of training being done elsewhere and anxiety to have control of as much training as possible.

Southern Rhodesia's pre-war suggestion of setting up a training organisation ripened in the autumn of 1939 into a scheme for starting schools in the Colony to train for the R.A.F. These schools came into operation during 1940 and 1941, were largely staffed by the R.A.F., and mainly handled R.A.F. pupils.

South Africa decided, towards the end of 1939, to expand the South African Air Force for the defence of the Union and for service in Africa generally, and offered a share of the expanding training organisation to the United Kingdom for training R.A.F. pupils. The details were discussed by a mission which visited South Africa in May 1940, and a plan of training development was agreed. Development went on, slowly and with difficulties, mainly because of the supply of aircraft and equipment, through 1940 and 1941.

In all these schemes for setting up schools overseas it fell to the United Kingdom to supply most of the aircraft and equipment. The other essentials - airfields, buildings, instructors, and staff - were provided chiefly by the Dominions, except where R.A.F. pupils were being trained. Training aircraft were not available during 1940 and 1941 in the numbers which the growth of overseas training required - especially when that growth was accelerated as a result of the intense demand for pilots in 1940. The result was difficulty and delay in the opening of schools, especially in South Africa (where expansion was from the first recognised as particularly subject to the availability of aircraft). The difficulties caused by shortage of aircraft were increased everywhere by trouble over the supply of spares.

In the summer of 1940 the imminence of the German threat to Britain dislocated some forms of training, and a few schools were transferred bodily from the United Kingdom to Canada and South Africa. Plans were made to transfer more to Canada, but in 1941 new R.A.F. schools were started there without their counterparts in Britain being closed. At the end of 1941 a considerable number of United Kingdom schools were closed, and more R.A.F. schools opened in Canada. In this way the training of R.A.F. pupils was largely moved from the United Kingdom to R.A.F. schools, with R.A.F. staff, overseas.

The large number of R.A.F. and Dominion schools being opened in 1940 and 1941 made heavy demands for trainer aircraft, and their supply became the governing factor in training expansion. Help was

sought from the United States, and suggestions were put forward in May 1940 that British pupils might be trained in the U.S.A. America, however, had no large number of trainer aircraft available in 1940, and it was not until the middle of 1941 that facilities could be provided for training R.A.F. pupils. Six civil operated schools were then set up to work under contract on training British pilots, while at much the same time American Army and Navy schools began to accept considerable numbers of R.A.F. pupils.

The pre-war schemes for starting schools in Kenya and France came to nothing. The Kenya school was opened in South Africa during 1941, because Kenya was too near East African operations to be suitable for a school. The French schools, after work had been started on airfields near the Loire, vanished with the German conquest of France.

While school training was, to a large extent, moved overseas from the United Kingdom operational training remained in the operational area. O.T.U's were a reserve of first line aircraft and skilled men on which it might be necessary to call in emergency. Moreover, operational training needed for efficiency not so much the favourable and undisturbed flying conditions of the overseas training theatres as the more arduous conditions under which first line work had to be done. The great majority of O.T.U's were therefore set up in the United Kingdom, with a few in the Middle East, though many of the Middle East reinforcements were drawn from United Kingdom O.T.U's. A few O.T.U's were started in Canada and the United States to train on types of aircraft built in North America: there were advantages in training near the source of supply and spares and in producing crews who could help in ferrying aircraft to the operational area.

#### Instructors and Staff

The expansion of training in 1940 and 1941 made very large demands for instructors and staff. Operational training, as well as school training, had to be manned. In the two years between the beginning of 1940 and the beginning of 1942 the number of Flying Training Schools went up from 12 to 52 and the number of O.T.U's from 8 to 35. The

number of other schools went up in the same proportion, and some additional, new, types of training unit were formed. Training establishments generally increased in size.

All instructors and staff, except for schools in the United States and those feeding the Dominion Air Forces, had to be found by the R.A.F. There were not enough experienced men to meet this call without unduly weakening the first line, and so a considerable number of R.A.F. instructors had to be provided by "ploughing back" newly trained men into the schools. The same lack of experienced men applied with even greater force to the Dominion Air Forces because of their smallness before the war. Consequently, a good deal of teaching in 1940 and 1941, both in the United Kingdom and overseas, was of necessity done by men who were far less experienced than was desirable. In addition, men given the duty of instructing were not well prepared for the work. Only flying instructors were trained to teach their subject, and even in their case the training was somewhat out of date: no standardised, authoritative, technique of flying instruction on monoplane trainers had yet been produced. Other instructors were equipped only with their own experience and some refreshing of their technical knowledge.

Instructing was not a popular duty. Men disliked being taken from the first line for it, and the operational Commands resisted more than a bare minimum of withdrawal from squadrons for teaching.

As a result of this combination of inexperienced, ill-prepared, and largely reluctant instructors with shortened courses and urgent pressure for output the standard of training declined during 1940 and 1941, and a progressively mounting accident rate - with more crashes as men came to handle more difficult aircraft before their skill matched the aircraft's requirements - appeared in the summer of 1941. The New Deal, with its longer courses and more thorough training, was the counter to this dangerous waste of aircraft and effort.

#### Reserves.

Some of the difficulties which became acutely apparent during 1940 and 1941 were caused by lack of reserves. Lack of a reserve of training  
/aircraft

aircraft restricted the speed with which schools could be brought into operation, restricted the expansion of those which were at work, and compelled the shortening and reduction of courses. Lack of a reserve of trained and experienced men meant that the schools' instructional staff had to be heavily diluted with raw instructors.

The fact that an increase in reserves might eventually be more useful than an increase in the peace-time line had been pointed out as early as 1935, but no effective expansion of reserves came about. A scheme for giving thorough and continuous training to a reserve of pilots, by passing them through the regular Flying Training School course, was suggested but was utterly out of the question because the schools, for the sake of economy, were fully loaded in order to expand the first line at the lowest cost.

A "spare time" system of training reserves had therefore to be devised, and the nature of this system was dictated by two factors. First, there was in 1935 and 1936 strong feeling against the "militarism" of any acknowledged preparation for war, and second, the Auxiliary Air Force was violently opposed to any idea of grafting an enlarged reserve on to its organisation. As a result, the Volunteer Reserve was formed as a "democratic" organisation largely for young men who were interested in flying as a sport, with the military aspect and military discipline in the background. Training was done partly at town centres for ground instruction and partly at flying schools near large towns, and the organisation was almost wholly civilian. Its progress and development were slow, lack of aircraft and equipment being the chief causes, and not until the lack of reserves became seriously alarming in 1938 was there any large expansion of the Volunteer Reserve.

Up to the outbreak of war the Volunteer Reserve consisted mainly of pilots who had been trained to fly elementary types of aircraft. Some provision of advanced and service aircraft was made in 1938 and 1939, and the scheme was extended to non-pilot air crew, but the number of fully trained reserves available in September 1939 was small. The Volunteer Reserve, in fact, chiefly provided a number of part-trained men whose

instruction had to be completed in service schools during the first months of war.

Few other reservists were available. Most of the fully-trained men who passed out of the R.A.F. to the reserve were absorbed into pre-war expansion, either in the civil schools which trained pilots, observers, and Volunteer Reservists, or into the aircraft industry. Virtually no reserve of experienced men existed to reinforce the body of instructors.

### General

There was a marked increase in the amount of instruction given on the ground, before flying began, during 1940 and 1941. One reason was a desire to avoid the public criticism which would follow if eager volunteers were kept waiting for long periods in civil life before the flying schools had room for them. Another was the discovery that many recruits needed a good deal of preliminary general education before they were fit to take the usual courses. A third was the shortage of trainer aircraft, which made it essential to use flying time only for teaching which could not possibly be done otherwise than in the air. Another result of the shortage of aircraft and flying time was the invention and production of a large number of "synthetic" devices for simulating air training on the ground.

As the bulk of school training came to be done overseas, new units had to be formed for receiving and refreshing trained men when they arrived in the United Kingdom. Voyages and waiting periods were unavoidably lengthy, and it became very clear in 1941 that men lost flying practice, forgot much of what they had been taught, and grew generally rusty before they reached the operational area. Reception depots for administrative sorting of the men, and flying refresher units, were established at much the same time that the New Deal was introduced, and the refresher units made a further increase in the pre-O.T.U. flying experience of air crew.

School training overseas raised another difficulty - disposing satisfactorily and efficiently of men who failed their courses.

/Travelling

Travelling was the problem, since the man concerned had frequently to be moved to another training theatre before his training in some other category could begin. The solution was to send overseas only those men whom a flying test showed to have reasonable promise of success, and grading of pupils for this purpose began in a small way in October 1941.

Until the shortage of pilots began to appear disturbing in the summer of 1940 there was no general, co-ordinated, control of all training matters. Operational training grew out of the formidable mass of instruction which short school courses and the progress of technical development laid on squadrons, and it remained for some time separate from school training, which was the specific concern of the Directorate of Training up to June 1940. A member of the Air Council was then created to take charge of all the various aspects of the training organisation and co-ordinate United Kingdom and overseas instruction.

It was found in 1941 that lack of central guidance on methods of instruction, coupled with the training of large numbers of inexperienced men as instructors, was producing local variations of technique which were unsuited, in some cases, as a basis for operational training. An Empire Central Flying School, for developing and disseminating a sound and authoritative common doctrine among the various training theatres backing the R.A.F., was therefore established early in 1942.

The seven years of air crew training expansion between 1934 and 1942 brought about increases in both the numbers produced and in the thoroughness with which each man was taught. The R.A.F.'s output of 300 air crew in 1934 swelled to a R.A.F. and Dominion output of over 40,000. A pilot's pre-squadron flying experience rose from 150 hours in 1934 to 350-400 in 1942. The quantitative expansion came first, and lack of reserves made it necessary to sacrifice quality to quantity in 1940 and 1941, but quantitative expansion and a solution to the problems of operational training made possible a great qualitative expansion at the beginning of 1942.

(b) Air Crew Training in the Empire.

Overseas training was no novelty when it came under review in 1936. In one way or another, and practically without a break, some R.A.F. pilots had been trained outside the United Kingdom since 1918. The idea of doing more training overseas was simple: it would provide the R.A.F. with pilots without exposing schools to the risk of dislocation in war through attacks on Britain. Putting the idea into practice, however, proved complex and difficult.

Three main lines emerged in the development of training overseas. One was the "bedding out" of complete R.A.F. schools, training R.A.F. pupils, in other countries. The second was contracting with schools in other countries, run either by the government concerned or by private enterprise, for the teaching of R.A.F. pupils to R.A.F. requirements. The third was arranging with other countries that they would supply men, fully trained to R.A.F. requirements, who would serve in or in conjunction with the R.A.F.

Each line of development set its own problems. Bedding a school out, i.e., transferring it to another country, involved establishing a British military force in the country concerned: questions of sovereignty and control arose, as well as the possibility that the school might be an embarrassment in time of war. Contracting for training to be done in another country's schools avoided difficulties of sovereignty and control, but raised questions of the compatibility of such training with neutrality in war. Arranging for the supply of trained men raised questions of how the cost of training should be divided and how the men should be commanded while they were serving with the R.A.F.

There was no hard and fast demarcation between these main lines in the actual development of overseas training. Some schools run by other countries were largely staffed by the R.A.F. Others, although mainly concerned with the supply of fully trained men from their home country, also trained on a contract or "agency" basis. In practice there was  
/considerable

considerable overlapping and merging, but in principle and negotiation the three lines remained distinct.

In 1936, however, the main lines and their problems were embryonic. No training was done overseas on a contract basis. There was one "bedded out" R.A.F. school, No.4 F.T.S., which had been working in Egypt since 1921, and a proposal that another F.T.S. should be set up in Cyprus. There was an arrangement by which Australia trained a certain number of pilots in Australia and then sent them as "trained cadets" for service with the R.A.F. A similar arrangement was agreed in principle with Canada, but had not been put into effect.

#### Attempts at Overseas Development 1936 - 1939.

When Air Commodore Welsh urged in 1936 that as much training as possible should be done outside the United Kingdom Air Commodore Tedder suggested that Canada would be an excellent training area, and Group Captain Leckie set out its advantages. Its strategic position was good, it was near the industrial resources of the United States, and Canadians were air-minded and well disposed towards the R.A.F.

The idea of training was then put unofficially to the Canadian Government, without any detailed proposal of the way in which it might be done. The Canadian Government did not respond, and further approaches made it clear by the middle of 1937 that the idea of training, in any form, was unacceptable to Canada. Objections to foreign military establishments in the Dominion, to any commitment which might affect Canada's liberty to remain neutral in war, and to participation in Imperial Defence were the reasons.

The possibilities of training in India, Palestine, Kenya, South Africa, and Egypt were next examined, but they were all ruled out either on strategic grounds (as Cyprus had been) or for political reasons, and no negotiations were started.

By the beginning of 1938 the project of training overseas seemed to have reached an an impasse, but in April the planning of further R.A.F. expansion and a closer prospect of war gave renewed impetus to

/the search

the search for training capacity outside the United Kingdom. Another approach to Canada was made in May 1938 with a proposal that Canadian schools should be set up to train R.A.F. pupils. The Canadian Government again rejected the idea of training, but the rejection became known in Canada, and was challenged in the Canadian Parliament and press. The Canadian Government then modified its attitude by stating that R.A.F. pupils might be trained in Canadian establishments under Canadian control. Negotiations were begun in the summer of 1938, but it soon became evident that there was no likelihood of any early or large-scale arrangement being made.

Another review of possible overseas training theatres was therefore undertaken towards the end of 1938. India and Egypt were again ruled out by a combination of political and practical, as well as strategic, difficulties. So was Iraq. Kenya was more promising, and it was decided in May 1939 to establish a R.A.F. Flying Training School there. The setting up of a school in France was proposed at about the same time, and negotiations with the French Government made good progress. These were developments in training overseas by "bedding out".

Meanwhile it had been agreed with Canada, in April 1939, that Canadian schools would train 50 R.A.F. pupils per year, starting in September 1939. This was a small beginning in training overseas by contract.

The most notable pre-war increase of overseas training, however, occurred in the supply of trained men for service with the R.A.F. Early in 1939 New Zealand undertook to send 220 trained New Zealand pilots per year in peace, and to increase the number to 650 pilots and 700 other air crew in war.

#### The Empire Air Forces

The Dominion Air Forces were small before 1939. In fact, they were bare nuclei from which military forces might be created if the necessity arose, and were employed mainly on non-military government work such as surveying and photography. Although there was some growth during the pre-war years of R.A.F. expansion they were still small in

numbers and in first line strength at the outbreak of war.

South Africa embarked in 1937 on the creation of a Citizen Air Force for the defence of the Union, but the scheme never really got beyond the elementary stages of pilot training.

Southern Rhodesia started in 1936 to form an Air Unit which would, if necessary, be available for service anywhere with the R.A.F. The Unit was trained by the summer of 1939, and Southern Rhodesia then expressed a wish to go on with training, suggesting that a Flying Training School might be set up in the Colony.

After the outbreak of war Canada, Australia, and New Zealand, who were sending expeditionary forces to operational areas, had to face the problem of training first line air forces to serve with the R.A.F. At the same time the planned war-time expansion of the R.A.F. called for more air crew than the United Kingdom was capable of training without Dominion help. Joint enlargement of the R.A.F. first line by the supply of trained Dominion air crew was the solution, and in September 1939 Mr. Bruce (High Commissioner for Australia) suggested that the training of air crew from Canada, Australia, and New Zealand should be made a common enterprise, with all advanced training concentrated in Canada.

The suggestion was accepted in principle, and discussions began in Ottawa in October. Canada, however, was only lukewarm, taking the attitude that "the war was not Canada's in the same sense that it was Britain's" and that the proposed training plan was one "for which the British Government must be largely responsible". Difficulties arose over the cost of the scheme, Canada urging that the United Kingdom's contribution should be greater and Canada's less. Australia and New Zealand decided that it would be both cheaper and quicker for them to do advanced as well as elementary training at home, and their delegations left Ottawa. The common enterprise of advanced training in Canada then dwindled to a scheme by which Canada would train Canadians, a small number of Australians, a rather larger proportion of New Zealanders, and a token number of R.A.F. pupils.

Negotiations with Canada dragged on, the principal points of contention being the size of Canada's financial contribution and her insistence that trained Canadian air crew supplied under the scheme should be organised as Canadian Air Force squadrons working under Canadian command in conjunction with the R.A.F., in spite of the fact that Canada could not complete these squadrons by supplying ground staff for them. Canada also insisted on complete control of the schools in Canada, an idea that the "common enterprise" might be run by the R.A.F. being dropped early in the discussions.

Eventually a modified scheme, providing for linked training organisations in Canada, Australia, and New Zealand, was brought into existence by the signature of the Riverdale Agreement in the middle of December 1939. The date for completion of the organisation was set at mid-1942, and they were planned to provide (when at full size) enough Dominion-trained Dominion men to supply just over half the expanded first line's total air crew needs.

The Canadian, Australian, and New Zealand training organisations were together named the Empire Air Training Scheme, which was thus primarily an arrangement for the three Dominions to supply men, fully trained to R.A.F. requirements in Dominion schools, for service in the first line. The scheme also included contracts for Canadian schools to undertake some training for Australia, New Zealand, and the United Kingdom, and provided that first line service should be in Dominion Air Force squadrons as much as possible. The United Kingdom contributed most of the aircraft and equipment required by the three training organisations, as well as a few key men to help in starting them: for the rest, they were purely Dominion enterprises.

South Africa was not a party to these discussions and arrangements. The Union did not propose to participate generally in the war, but to confine itself to the defence of South Africa, so that no question of training South Africans for service with the R.A.F. first line arose. In December 1939, however, the Union planned to expand the South African Air Force and its training organisation, and offered the United

/Kingdom

Kingdom a share in the enlarged training organisation to be created. The offer was accepted, but it was clear that the expansion of South African training would depend on the supply of trainer aircraft, which was already heavily committed to equipping R.A.F. schools and the Empire Air Training Scheme.

The expansion of South African training, and the United Kingdom's share in it, was discussed by a mission which visited the Union in May 1940. It was found that virtually a complete new school organisation would have to be set up to train to R.A.F. standards, and that a strong reinforcement of R.A.F. instructors and staff would be needed to start it. An agreement for building up South African training on these lines and for teaching R.A.F. pupils on a contract or "agency" basis was signed in June 1940.

Southern Rhodesia renewed her suggestion of setting up a school in the Colony shortly after the outbreak of war, and it was agreed in the autumn of 1939 that a number of schools should be established. Southern Rhodesia's small population made it impossible for the Colony to provide more than a fraction of the pupils, instructors, and staff needed, so that the schools had to be manned and supplied with pupils almost entirely by the R.A.F. They thus became virtually "bedded out" R.A.F. schools.

Overseas Expansion of R.A.F. Schools.

Until the summer of 1940 plans for setting up R.A.F. schools outside the United Kingdom provided only for Flying Training Schools in Kenya and France. Arrangements were made with the French Government during the winter of 1939-40 for starting five R.A.F. schools in the Loire area, but the prospect of these schools disappeared completely with the German conquest of France in June 1940. The school in Kenya became less and less practicable after Italy's entry into the war and the start of operations in East Africa.

Training in the United Kingdom, particularly navigation training, was hampered and made inefficient after September 1939 by restrictions on flying, restricted training areas, and inability to use wireless freely. The fall of France added considerably to these difficulties by

/accentuating

accentuating the vulnerability of training aircraft and airfields and the risk involved in lighting airfields for night flying practice. The advisability of transferring training outside the United Kingdom came to the fore. Canada decided at the end of May to help if United Kingdom schools had to move, and the United Kingdom was told unofficially of her readiness to accommodate R.A.F. schools. In July Canada and South Africa were asked to receive schools from the United Kingdom, and it was agreed that fourteen R.A.F. schools should be transferred to Canada and three to South Africa.

Seven schools moved overseas from the United Kingdom as going concerns during the autumn of 1940 - four to Canada and three to South Africa. The loss of output involved in transplanting schools at work, the shortage of trainer aircraft, and the inadvisability of reducing the number of experienced pilots and aircraft in Britain however led to a decision that new R.A.F. schools should be formed overseas while existing schools stayed in the United Kingdom. The remaining ten Canadian locations earmarked for R.A.F. training were then occupied, at intervals during 1941, by new schools sent out from the United Kingdom.

More R.A.F. schools were needed, and the question of where they should be set up was considered late in 1940. Canada was anxious to have them, while Southern Rhodesia had much to commend it as a location, but it was hoped to put some at least of the schools in the United States because the availability of trainer aircraft was a very important factor at this time and because the advantages of close co-operation with America were manifest. Other arrangements for training in the United States were, however, made during the spring of 1941, and in May it was agreed that the new R.A.F. schools should be started in Canada.

#### Canada

Public opinion in Canada became critical of the Empire Air Training Scheme's slow progress in May 1940, and an accelerated programme was drawn up. The accelerated programme was for a time completely hamstrung by an embargo which the United Kingdom put on the export of

/aircraft

aircraft at the end of May. In July Canada made the supply of aircraft for the accelerated scheme a condition of accepting the transfer of schools from Britain, and the accelerated scheme then went ahead. To guard against further criticism the Canadian Government insisted on an acknowledgment that transfer was possible only because excellent progress had been made in preparing airfields and schools for the Empire Air Training Scheme.

Canada's attitude towards training was by now completely changed. She became thoroughly conscious of her commitments and determined to make them a conspicuous success. The Canadian Government pressed to be entrusted with more training, and was confident of Canada's ability to carry it out. It was sensitive to the possibility that putting training elsewhere than in Canada might be considered a slight on Canadian efficiency, and was anxious that no unfavourable comparisons might be drawn between Canadian schools and the transferred R.A.F. schools (which had rather more aircraft and handled more pupils). By the middle of 1941 it was decided to put more R.A.F. training in Canada and unify all schools in Canada under Canadian control.

#### Empire Training

Ground instruction under the Empire Air Training scheme began on the same day, 29th April 1940, in Canada, Australia and New Zealand. Flying training began four weeks later, on 27th May. No preliminary ground instruction was at first given in Southern Rhodesia, and flying training under the new joint scheme began on 8th August 1940.

New Zealand had to deal only with pilot training, and made a good start by virtue of her pre-war preparations for supplying trained men: her share of the Empire Air Training Scheme was complete and in operation by the end of 1940. Canada and Australia had larger and more complex organisations to set up: their parts of the scheme were at full size by the end of 1941. All Southern Rhodesia's schools were at work by the middle of 1941. South Africa made slower progress: comparatively few trainer aircraft could be provided for her at first, and it was not until well into 1942 that the South African organisation reached its full

/size.

size. The school originally planned for Kenya was transferred to the Union, and in June 1941 the R.A.F. transferred schools and the South African schools were fused into a single joint organisation. R.A.F. schools in Canada came into operation gradually and at intervals during 1940, 1941, and 1942.

In all the Empire training theatres a very considerable programme of building and airfield construction had to be carried out before schools could start work. This programme was particularly formidable in Canada because of the large number of Empire Air Training Scheme and R.A.F. schools to be set up there, but a valuable nucleus of constructional experience as well as of airfields was provided by the work done on the Trans-Canada Airway since 1936.

In Canada, Australia, New Zealand, and South Africa the training of instructors and ground staff was an essential preliminary to the expansion of the school organisation. This was no light or easy matter, since the small pre-war size of the Dominion Air Forces meant that they had few experienced men, while the R.A.F. could spare only a bare minimum of key men to help. As a result, the Dominions had at first to work with a high proportion of newly-trained and inexperienced instructors.

In every Empire training theatre, shortage of aircraft and lack of spares caused serious difficulty while the school organisations were expanding. Shipping losses were an additional trouble, particularly in the case of South Africa.

The rapidity and magnitude of Empire training development, in spite of these severe difficulties of building, staffing, and supply, was most impressive. In two years from the first formulation of plans in the autumn of 1939 44 Service Flying Training and 92 other flying schools were brought into existence in the various Empire training theatres. Eighteen months after flying training first began in May 1940 the Empire schools were producing trained air crew at the rate of 40,000 men per year.

(c) R.A.F. Training in the United States.

The possibility of arranging for R.A.F. pupils to be trained in the United States was mentioned from time to time after the outbreak of war, but no steps were taken until a conversation in May 1940 gave reason to hope that the U.S. Government might look favourably on the idea.

It was then asked unofficially whether R.A.F. pilots might be given non-military training in American schools. The U.S. Government replied that its schools could not take British pupils because more training than the schools could handle was required for America's own forces. A suggestion that the U.S. Government might allow civil schools to be set up for the purpose of training R.A.F. pupils was met with the answer that it would be better for those pupils to be trained in Canada, where American aircraft and American instructors could be used. Canadian training was in fact reinforced by a number of American instructors during the summer of 1940, but no considerable supply of American aircraft was obtained.

In August 1940 the question of R.A.F. training in the United States was reopened. It was received with a cordial desire to help Britain, and a scheme was worked out for setting up civil schools which would train British pilots under contract. Awkward questions of neutrality and official sanction were to be avoided by making the scheme a civilian commercial venture of selling non-military training to the United Kingdom, but there were other difficulties in the way of putting it into effect at once. The dollar cost to Britain of establishing and running the schools would be heavy, while America had no trainer aircraft available for the schools to use. The advantages of buying training in the United States were, however, considerable and manifest: there would be the great general benefit of close co-operation with America, and the immediate particular benefit of not having to find aircraft, airfields, instructors, and staff for the schools. It was decided to go ahead in spite of the cost, but the scheme eventually held up because aircraft could not be found for it earlier than the middle of 1941.

The civil schools project then lay dormant until after the Lease

/Lend

Lend Act had been passed, the United States undertook in March 1941 to find the necessary aircraft. A great deal more of the cost was borne by America under Lease-Lend, and arrangements for building six British Flying Training Schools were put in hand at once. Training began in June 1941, the six new schools coming into operation in July and August (instruction was at first given, temporarily, in other schools).

During the winter of 1940-1941, while the civil schools scheme was dormant, two other, small-scale, developments of training in America took place. Refresher courses at American civil schools were arranged for American citizens volunteering for the Eagle squadron, and a contract for the navigation training of R.A.F. pupils was made with the Pan-American Airways school at Miami.

In March 1941, shortly after a start had been made on the civil schools scheme, the idea of opening R.A.F. Flying Training Schools in the United States was advanced in London. More R.A.F. schools were wanted, and Canada was anxious to have them, but locating the schools in America was attractive. The plan was put to the United States, and was answered by an offer to train R.A.F. pupils in American Army Air Force Schools. This offer was made by General Arnold in April 1941, and the training of British pupils in American Army Schools, which began in June 1941, came to be known as the "Arnold Scheme". A similar offer to train R.A.F. pupils in American Navy Schools, known as the "Towers Scheme", was made and accepted in May 1941.

Training under the Arnold Scheme was different from that given in the British Flying Training Schools. The civil schools worked to R.A.F. requirements, whereas the Arnold Schools gave the American Army course, with some modifications, under American Army discipline. The Towers Scheme course again differed, and was directed towards specialised training for flying boat and aircraft carrier work.

The development of R.A.F. training in the United States was notable for the speed with which it came into existence after the various schemes were agreed and put in hand. Whereas other training theatres

had to build up their organisations gradually, America had "ready-made" resources in instructors, man-power, and equipment. The civil schools scheme was settled in March 1941, and the Arnold Scheme in April. In June both schemes came into full operation, and from the outset dealt with pupils at the rate of some 5,000 per year.

3. COMMENTARY - THE PROBLEMS OF TRAINING EXPANSION.<sup>¶</sup>

The R.A.F. was planned in 1919 to have as its primary function the capacity to expand without drastic alteration. "The present need 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, will be capable of producing whatever time may show to be necessary in future." (Lord Trenchard's Memorandum on the Permanent Organisation of the Royal Air Force, 1919).

In this framework Lord Trenchard considered training of extreme importance. The capacity to expand depends on three main elements - an operational pattern on which to model the enlarged first line, a pursuit of technical development to equip it efficiently, and a study of the training needed to man it - and Lord Trenchard described training as "that on which the whole future of the Royal Air Force depends."

(a) The Course of Events.

During the next fifteen years training, though it occupied a great deal of the R.A.F.'s time, passed more and more into the background. The process of instruction became a settled, regular, familiar routine: there was no great technical development calling for re-assessment and revaluation; military aircraft in 1934 were much the same as they had been in 1918.

Pressure for economy kept expenditure on schools to the bare minimum. Though a few essential nuclei of teaching were opened in the 1920's, by 1930 there was nothing to spare for more than the indispensable ancillaries to a small number of squadrons. Training became less a primary activity for schools and more a secondary activity for squadrons.

That squadrons should undertake a large share of training was an inevitable result of economy. They existed, they had aircraft and

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<sup>¶</sup> This analysis of development between 1934 and 1942 is the narrator's interpretation of events, and has no other authority.

experienced men, and training was an obvious way of keeping them usefully occupied. Employing squadrons on training, however, had its disadvantages. They were never particularly efficient because they always had a considerable proportion of learners, teaching was done not by specialist instructors but by the experienced men on whom first line efficiency depended, and since training was not the squadrons' raison d'etre it was sometimes treated with the lack of seriousness that often goes with a minor role.

The prestige of R.A.F. training was high, and the R.A.F. was well aware of the fact. The C.F.S. kept flying instruction at an admirable and polished standard. Training was excellent - but only within narrow limits. It was almost solely a matter of producing pilots, it was concerned with short-range flying, and it was largely pre-occupied with piloting ability. It had, in fact, become static and stereotyped in the form prescribed by the lessons of the last war, and its weakness lay in the great reputation of this stereotyped process. There was a constant temptation to take it for granted that the established order of training was fully adequate to any demands that might be made on it, and to assume that the training element in the framework of expansion would inevitably be capable of producing whatever time might show to be necessary.

#### Expansion

When expansion began in 1934 A/C. Tedder pointed out that the established order of school training not only failed itself to produce operational competence but left so much to be done by squadrons that they could attain passable military efficiency only after an uphill struggle. Indeed, some squadrons with more complicated roles never really succeeded in the struggle. He then proposed to raise the standard of school instruction so that pilots would be turned out operationally competent, and thus enable squadrons to concentrate on their first line functions.

After some hesitation and argument, the principle of school training up to operational standard was agreed in 1935. Though agreed, however, it was not carried into practice. School training up to operational

standard involved lengthening the period of instruction as well as revising the syllabus, but economy and immediate expediency compelled the time taken for training a pilot to be cut down. The reduction of time roughly offset the improvement in syllabus, and schools continued to turn pilots out at much the same established order standard.

Apart from economy of cost, which was still a major consideration, the main obstacle in the way of raising the school standard was difficulty in providing instructors. Expansion required a larger flow of pilots, and to give them longer courses would need a very considerable increase in the number of schools. The existing R.A.F. could not supply the instructors for all these schools without seriously depleting the first line, and it was preferred to keep school training virtually unchanged rather than weaken the first line temporarily.

The same logistic problem - providing instructors and staff for new schools - turned up time after time in the working out of expansion. In 1935 and 1936 it prevented the opening of specialised schools to deal with the training consequences of technical development. In 1937 and 1938 it forced the teaching of navigation largely outside the service and into civil schools. In 1938 and 1939 it kept down the number of new pilot training schools that could be opened. After the outbreak of war it had a powerful retarding influence on the general development of training, and particularly on operational training. The number of experienced men was never large enough to provide both the backbone for squadrons and an adequate staff of instructors.

The number of instructors available and the amount of training desirable together fixed the maximum rate at which expansion could go on efficiently, but at every stage of expansion the actual rate set was well in excess of this maximum efficient rate. More instructors could not be found and so the standard of training had to suffer. In 1935 the existing size of the R.A.F. (which governed the number of instructors), the postulated rate of expansion, and school training up to operational standard were incompatible. Some relief was given by entrusting the earliest stage of flying training to civil schools, but even so the

amount of school training found practicable was only about half the full requirement. The remainder of the burden fell inevitably on squadrons.

The dominance which practicability and economy exercised over training in 1934-1936 is noteworthy. There seems to have been a conviction that the established order was really capable of producing what was needed, and that improvements, though perhaps desirable in themselves, could safely be subordinated to other considerations. The attitude is exemplified by a comment which Mr. W.L. Scott made on an estimate of how long it would take to train pilots in war time -

"The balance between putting untrained men into the air and putting squadrons out of action by failing to fill their establishments will have to be struck by the Air Council..... I suppose however we all of us feel that the chance is a small one that such lengthy periods as are here assumed will be practicable."

It seems remarkable that thorough training - obviously a first essential in expansion - should have been subordinated to immediate expediency and a fractional economy in cost, or that an expert assessment of how much instruction was necessary should have been dismissed as impracticable. Yet the number of schools was kept down, and the fewest possible instructors taken from the first line, so that expansion would show the greatest number of squadrons, in the shortest time, for the money being spent on it.

Though the expanding first line was little weakened by the withdrawal of experienced men for instructing, it was weakened nevertheless by dilution with half-trained, inexperienced, pilots who needed more instruction. The same result happened over and over again as expansion went on. Half-trained pilots, half-trained navigators, half-trained air gunners offset whatever gain in squadron efficiency was made by keeping potential instructors out of training units. In every case a certain quota of training had to be given before a man reached operational standard - and if schools gave only a part of the necessary instruction squadrons had to deal with the rest before they were fit for first line duty.

/Technical

### Technical Development

Keeping school training to an unchanged "established order" standard of output made no allowance for the effects of technical development. Yet new types of aircraft were coming into service which demanded more knowledge from pilots and required non-pilot aircrew to have greater skill and take more responsibility.

The need for specialised training units to deal with these corollaries of technical development was obvious and acknowledged, but it was found impracticable to provide the specialised instruction except in one case - navigation for maritime pilots, where the difficulties were well recognised and comparisons might be made with the Navy. Bomber pilots, whose navigation problems were rapidly becoming quite as difficult, could have no specialised course.

Squadron training in navigation, as well as in handling the new types, was at first relied on for bomber pilots. It proved unsatisfactory in spite of the fact that more pilots were trained, as squadron navigation officers, to give it. School courses were then begun, but it was impracticable for the R.A.F. to provide instructors and staff, and so the courses were mainly entrusted to civil schools without much knowledge of service requirements. As a result of this belated and unsettled arrangement of training, navigational efficiency was attained so slowly that it was a serious defect at the time of the Munich crisis in 1938.

Crew training was consistently left as much as possible to squadrons, in spite of the fact that training air gunners in squadrons had been found so unsatisfactory that it was decided in 1934 to replace squadron-trained air gunners by school-trained observers. Requirements changed, however, observers had to deal more and more with navigation, and air gunners continued to be trained in squadrons.

Much time was spent on the question of training observers to navigate. There was considerable reluctance to entrust so responsible a duty to anyone but a pilot, and for a time the need for navigation-trained observers was staved off by deciding that pilots should navigate and

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that more pilots should be trained. Reliance on pilots for navigation broke down, however, partly because the pilot of a long-range one-pilot aircraft could not both fly and navigate it, and partly because training all pilots to the necessary navigational standard was a formidable matter. Navigation gradually passed into the hands of observers, and they began to be trained in navigation. At first a short period of elementary instruction was added to their armament course, most of the training being left to squadrons. Then, after a dangerous shortage of trained crews had been realised in the spring of 1938, full navigation courses were started. Once again it was impracticable to provide instructors and staff for service schools, and the courses had to be given by civil schools.

It was also impracticable to provide schools for air gunners, although from time to time the need was acknowledged and the inefficiency of squadron training agreed. As a result, Bomber Command found in July 1939 that its air gunners were "not fit to cross the line".

#### Training in Squadrons

The slow and exiguous extension of the established order meant that squadrons had to cope not only with the instruction that fell to them because the scope of school training was limited but also with new demands on pilots and the rapidly evolving requirement of crews. At the same time expansion necessarily meant that each squadron had a higher proportion of inexperienced men, while the growing imminence of war left less time in which to work up to operational readiness.

In 1938 it was recognised that an "interim stage" of pilot training would have to be provided to take some of the load off squadrons - a stage that would do something to bridge the gap between school training and operational fitness. It was impracticable, however, to set up the necessary training units. Only by "rolling up" a number of bomber squadrons in 1939 was any interim training begun.

#### War-time Problems - Operational Training.

At the outbreak of war in 1939 the R.A.F. was relying on a training system which remained unchanged in scope since the early 1920's, except

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for a patchwork of enforced additions and extensions - civil schools handling navigation, a few rolled-up bomber squadrons on interim training, and some specialised courses. For the rest, training was almost entirely a matter of producing pilots, with 150 hours' flying experience, on a syllabus which had changed little in twenty years. Training, in fact, had remained almost stationary while the operational pattern and the technical design of aircraft had developed greatly, and most of the difficulties of 1940 and 1941 followed inevitably from this lopsided shape of the pre-war framework of expansion.

The mismatching of school training to operational needs set a major problem. It was realised - though rather slowly - that squadrons could not in war-time combine more than the final polish of instruction with their operational work, and that all the training they had done in peace would consequently have to be transferred to training units. The amount of instruction involved was formidable, and the size of organisation needed to cope with it was not accepted without doubt and argument.

There was reluctance to divert all that was needed from the first line - instruction and aircraft for operational training could be found only at the expense of squadron expansion - and also, perhaps, some reluctance to acknowledge how seriously inadequate the established order of school training was. During the months of "phoney war" there was no direct proof that the need for operational training was urgent, and the full measure of the problem was not really taken until the summer of 1940.

Efforts were then made to keep operational training to a minimum, but every attempt to avoid a full and properly organised system failed. Fighter Command had virtually no operational training organisation before the Battle of Britain, in order to keep the largest possible first line waiting in readiness, but as soon as the battle was joined and the German effort committed the disengaged squadrons had to be converted into training units. Bomber Command and Coastal Command found that economy on operational training crippled the first line, either by starving it of

replacement crews or by diluting it with half-trained men.

During 1941 the standard to which training had to be carried before aircrew were fit for the first line was at last realistically gauged, and the need for all this training to be given in specialised units fully established. It was then realised that for bomber and maritime aircraft equilibrium in the division of resources between training and operations could be reached, with existing crews, only if the first line remained almost static. The necessary standard of training, existing crews, and first line expansion were in fact incompatible. Hard experience had shown that training could not safely be cut down, and so the crews of bomber and maritime aircraft had to be revised.

#### War-time Problems - Output of Pilots.

The problem of operational training arose from the mismatching of schools to first line requirements in their standard of instruction. The second major problem came from mismatching in the number of men trained. From time to time before the war it had been pointed out that a much larger training organisation would be needed in war, but it had always been impracticable to create the reserve of instructors, staff and aircraft which would enable such an organisation to come quickly into operation. As a result, no considerable increase of school training was possible until some 12-18 months after the outbreak of war.

During the "phoney war" the small output from schools gave no trouble, but it became an extremely serious matter as soon as active operations began. In the summer of 1940 the demand for pilots outstripped the schools' capacity. The course of training - already so short as to leave the large gap which had to be bridged by operational training - had to be curtailed in order to force considerably larger numbers out of the schools, while the effort required from both instructors and aircraft had to be intensified ruthlessly.

It was intended to make up for the reduction in school training by increasing the amount given at the operational training stage, but this made the operational training problem still more formidable. Operational training was kept to the minimum, and the total amount of training -

/at school

at school and operational stages together - sank dangerously low. Curtailment of training certainly produced pilots during 1941 in the required numbers, but the standard at which they were turned out became disturbingly inadequate for first line work.

War-time Problems - Aircraft, Instructors and General.

Shortage of trainer aircraft was the dominant limitation in expansion of both operational and school training in 1940 and 1941. The production of trainers had been based on a conservative "established order" of training, and could not be quickly readjusted as the logic of events compelled a more realistic assessment of the scope of instruction to be made. Operational types of aircraft - at the direct expense of the first line - were used at the operational training stage to make good the shortcomings caused by lack of trainers and school training, but none the less the development of the training system was consistently hampered and retarded by lack of trainers.

Finding instructors, though a constant difficulty, was never a dominant limitation except as part of the general problem of providing for operational training at the expense of the first line. It was not possible to reconcile the provision of experienced men as instructors for all the expansion of school training with first line expansion and first line efficiency, and so inexperienced newly-trained air crew were "ploughed back" to teach in schools. There were misgivings about the effect on the standard of instruction; the proportion of instructors ploughed back was high; and the effects of shortening school courses were certainly increased: but there was no disastrous collapse in the quality of output.

There was a marked distaste for the duty of instructing. The impression of training created by its treatment for so long as a stereotyped, limited, thankless, routine matter for schools or a side activity for squadrons could not be dispelled quickly by the Air Council's reasoned, if belated, explanations of its vital importance - especially as those explanations were not backed up by any concrete recognition in the form of pay, privileges, or awards. Aircrew were generally reluctant to be selected as instructors, and their preparation for teaching

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did little to increase their liking for the work or their efficiency in doing it. Flying instructors were given a special, if somewhat out-of-date, course, but other instructors were for practical purposes given no training in how to teach their subjects.

Until the summer of 1940 the established order of pilot training in how to teach their subjects.

Until the summer of 1940 the established order of pilot training and service schools was the concern of Training Command; civil schools dealing with the additions made during expansion were controlled by Reserve Command; and operational training was handled by the operational Commands. The whole process of aircrew training, in fact, came under five different Commands and two departments of the Air Ministry. It was then co-ordinated and rationalised to a large extent, and training - "that on which the whole future of the Royal Air Force depends" - was for the first time directly represented on the Air Council.

The extension of training overseas - by R.A.F. and Empire schools - was modelled on the established order of training in existence at the outbreak of war. In most cases courses were shortened or work intensified because of the urgent demand for pilots, and the increasing flow of men trained overseas in 1941 therefore increased the problem of operational training. Empire schools were of necessity staffed very largely by inexperienced instructors because Canada, Australia, and New Zealand had comparatively few experienced men and the United Kingdom could spare practically none, but nevertheless the standard of teaching was remarkably good.

Variations of instructional technique between different training theatres began to grow up, and it became necessary to co-ordinate and modernise the training of flying instructors by starting an Empire Central Flying School.

#### The New Deal.

By the end of 1941 it was clear that aircrew had to be fully trained to operational standard before they went to the first line, that the established order conception of school training was far below what was

needed, and that operational training would cripple first line expansion unless it was minimised by improved school training and the revision of crews.

The New Deal was then drawn up as a realistic plan for giving adequate training to all aircrew. Roughly, it doubled the instruction provided by the pre-war established order, or achieved by the 1940-1941 combination of shortened school courses and restricted operational training. This was an enormous advance on any previous standard of training, but even so it was little, if any, higher than operational fitness had required since at least 1938, and provided very much the same length and kind of instruction that A/C Tedder had proposed in 1934.

(b) Training and the Framework of Expansion.

Training had a good many difficulties and failures during the pre-war and war-time years of expansion, and all of them came more or less directly from the original relegation of training to a subordinate "poor relation" place in the framework of expansion.

In 1935 A/C. Tedder stated the need for reassessing the process of instruction and giving it a larger place in the planning of expansion with a logical clarity that was completely justified by events. There seems, however, to have been a conviction that the established order, which enjoyed a high reputation, was adequate for what was wanted, and it was left to all intents and purposes unchanged. There seems also to have been an undue readiness to accept the impracticability of making any large expansion of training on a vicious circle argument that instructors and aircraft could not be spared from squadrons for training, and that therefore either the amount of training or the output from schools would have to be strictly limited - a futile argument that led to overloading squadrons with training and so making them still more unable to spare experienced men for instructing. Impracticability may have been an effective reinforcement for considerations of economy or of swelling the number of squadrons by any possible means, but it was an unsound justification for whittling down one of the essential elements  
/of expansion.

of expansion. However, the impracticability of any material school expansion, though bemoaned, was consistently accepted until after the outbreak of war, and the vicious circle of inability to find instructors and facilities was not broken.

The results of underrating the magnitude of training became painfully apparent. Squadrons' peace-time efficiency and readiness for war suffered badly. A large, rather unexpected, operational training organisation had to be set up in war. There was doubt and incredulity about the amount of instruction really needed to produce operational fitness. Whereas less than 10% of the total effort had gone to training units under the established order in peace, some 25% had to go to them in war, and the necessary instructors and aircraft could not be provided unless the first line was cut down. The training organisation came to consist of a large number of separate stages, each created as the need for it became inescapable. Except where the C.F.S. influenced the established order of pilot training, the technique of instruction was poor.

When the fundamental need for thorough training was fully realised the leeway could not be made up quickly. Resources for more training could not be stamped out of the ground. The detailed organisation of new training units had to be worked out by experiment and the lessons of experience. Time was needed.

The major problems of training during pre-war and war expansion thus seem to have been due to two errors of judgment - assuming that the established order of instruction would be mainly adequate to the increasing demands on it, and accepting the impracticability of finding men and material for new schools. In the first it was apparently forgotten that the Red Queen's Law - "it takes all the running you can do to stay in the same place" - applies with particular force to any achievement which has as high a reputation as R.A.F. training. In the second, the essential constructive principle that "difficulties can be overcome at once: impossibilities take a little longer" was not applied.

Both suggest, not so much that the "extreme importance of training"

/was neglected,

was neglected, but that the kind of training which should have extreme importance was wrongly conceived. The concept was not of a developing, questing and experimenting system of instruction which would serve, side by side with technical development, the evolving operational pattern, but of a static, proved, element which could largely be taken for granted.

### The Concept of Training.

Readiness to expand - or the peace time "framework of expansion" - seems to be much more a matter of the accepted concept of training than of the particular system in current use. Realistic and unequivocal assessment of the amount of instruction needed to bring up a recruit from the very start of his training to the full standard of operational fitness required when he enters the first line, a clear picture of the best method and technique of teaching him, and a thorough realisation that giving all this instruction, in one way or another, is inevitable, would together make up a concept of training which could be translated into any practical form - any current system - which might be appropriate to the needs of the moment. Such a concept of training would essentially be constantly and closely linked with technical development and changes in the operational pattern, and would evolve through experiment and research as new equipment or new requirements had to be matched with trained men. Research schools, working with "guinea-pig" courses of typical recruits, would perhaps be necessary to devise and assess ways of tackling new problems or improvements in existing methods.

In its concrete form, the concept of training would be expressed as the optimum length of course, syllabus of instruction, organisation of schools, teaching technique, instructor-training requirements, and schedule of instructional equipment and devices which would produce full operational fitness for the current operational pattern and newest technical development. Ways of assessing pupils' progress and the output standard would be important corollaries.

Once the concept of training had been formulated, it would be a fact - a statement of the quantity and quality of instruction needed

/to produce

to produce an efficient first line. It would not be an immutable fact - indeed, any suggestion that the concept was static or needed no improvement would be a danger sign - but it would not be a matter for debate and discussion. It would remain the accepted basis for planning until development necessitated a revised concept.

What would be a matter for debate and discussion would be how the concept of training should be worked out in practice. In peace part of the process of instruction and part of the research might be in the hands of squadrons, with the rest entrusted to schools. In war, or during preparation for war, almost all the training process would probably pass to schools. The precise way in which the work was divided would, however, be of comparatively minor importance if there were always an accurate and up-to-date scale by which to gauge what proportion of the total effort was really going into training and how successful that effort was proving.

The most important matter would be to ensure that the concept of training remained "live" and in constant harmony with other elements in the framework of expansion - that a revaluation of instruction accompanied every new technical or operational development. Providing instructors and resources to carry out this live concept of instruction would clearly be, not a matter of doubtful practicability, but, an obvious first essential.

Lord Trenchard's estimate of training as "that on which the whole future of the Royal Air Force depends" might well be matched by Sir Arthur Tedder's "expansion of service squadrons must be based on a reasoned training expansion programme. If we attempt, as we did in the last (1914-1918) war, to make our training expansion fit a hypothetical squadron expansion, we shall again fall between two stools and secure neither the squadrons we want nor the training which is requisite."

#### 4. BEFORE EXPANSION

In the years before 1935 the Royal Air Force, though it was largely occupied with training, had only a bare minimum of schools. Pilots were taught to fly, ab initio, at schools, but the schools were ~~expected~~ to do little more than lay sound foundations for the training in applied military flying given later in squadrons. The few non-pilot aircrew were selected from serving airmen and taught entirely in squadrons.

A comfortable axiom that Britain "was **not** likely to be involved in a major war within ten years" meant that there was no set date by which squadrons had to be fully ready for war, and no urgent time limit within which individual pilots must reach an operational standard of proficiency.

The more training done in squadrons the less was the cost of the Air Force: if operational units did the work of schools there was no need to pay for schools as well as a "first line". Moreover, the squadrons were kept usefully and profitably employed.

The price of this economy was paid in unreadiness and time: unreadiness because each squadron had pilots at various stages of military competence, and time because it had to deal with the training both of its pilots as individuals (without the specialised equipment of a school) and of itself as a fighting unit. Another aspect of the economy of squadron training was that experienced men were both teachers of young pilots and mainstays in war.

The amount of individual training added to the Flying Training School's foundation varied according to the type of squadron. Fighters and short range day bombers, for instance, needed considerably less than flying boats or night bombers. Flying boat pilots had to learn the

/handling

handling of their type of chart-board aircraft, navigation, and the captaincy of a crew; night bomber pilots had to have much the same knowledge; while pilots of short-range day aircraft had no need for twin-engine flying, night flying, or long distance navigation.

The individual training done by a squadron had to be dealt with, to a large extent at least, before the squadron's corporate training as a fighting unit could begin. A squadron's year was therefore divided into an Individual Training Period of the winter months and a Collective Training Period of the summer. Pilots came forward from the Flying Training Schools mainly at the beginning of the Individual Training Period, so that they could be brought up to the standard necessary for them to take a profitable part in collective training.

325263/34 The need for individual training pressed most hardly on night bomber squadrons. Special arrangements existed, in "training squadrons" adapted to the work, for teaching flying boat and torpedo bomber pilots, but night bomber pilots had to be given their individual training in the service squadrons. A/M Brooke-Popham (C.-in-C., A.D.G.B.) was uneasy in April 1934 because night bomber squadrons had to devote a quarter of all their work to flying training; in consequence, their service training was circumscribed and their efficiency below the minimum of war readiness.

The individual proficiency achieved by pilots under this system was high, but slowly attained: it was a year or more after leaving the Flying Training School before a man became a fully competent military pilot. The corporate efficiency of squadrons was correspondingly low: each was diluted with pilots who were still learning the fundamentals of their work, and the dilution of squadrons at home was increased by the posting of a proportion of

/pilots,

pilots, shortly after they had been trained, to squadrons overseas.

Flying Training Schools taught pupils ab initio on a ten months' course: flying was done entirely on single engine aircraft, twin engine training at schools having been abandoned in 1931 because so heavy an aircraft as the Vimy, if used immediately after elementary instruction on an Avro, often produced pilots who were not sound on aircraft with light, accurate, and even controls. Pilot navigation (or air pilotage) was taught; armament instruction was theoretical; and ground training was concerned with basic all-round knowledge.

Further navigation training (except for flying boat pilots) was given in squadrons by pilots who had taken a course at the School of Air Pilotage at Andover. Practical armament training was also a matter for squadrons: annual visits were made to the Armament Training Camps for practical experience. Conversion to the squadron's type of aircraft, and the teaching of night flying, were also matters for the squadron: each flight of a twin engine squadron was supposed to have a flying instructor trained at the Central Flying School.

About three hundred new pilots were taught to fly each year. The Flying Training Schools were No. 3 at Grantham, No. 5 at Sealand, and No. 4 at Abu Sueir in Egypt: No. 2 at Digby was closed in December 1933. There was also the Training Base at Leuchars, which taught officers from the Navy and Army, and dealt with the special requirements of carrier-borne aircraft. Each school turned out some eighty pilots a year.

Grantham, Sealand, and the Central Flying School at Wittering, which was concerned with the technique of flying instruction and the training of instructors, were

/under

under No.23 Group at Grantham. Abu Sueir was controlled by Middle East Command, and Leuchars by Coastal Area. The Armament Training Camps (No.1, Catfoss, No.2, North Coates Fitties, and No.3, Sutton Bridge) and the Air Armament School at Eastchurch were under the Armament Group, which was formed at Eastchurch in February 1934 to provide a central authority on questions of armament and armament training.

Both No.23 Group and the Armament Group were under Inland Area, but on technical and training matters these Groups worked direct with the Directorate of Training at the Air Ministry. This directorate was in the Air Member for Personnel's department, training being treated as a specialised aspect of manning the Air Force. The directorate's branches dealt with flying training, navigation, armament, and the technical ground trades.

Training done in squadrons was the concern of the Directorate of Staff Duties, in the Chief of the Air Staff's department, since squadrons' training was intimately bound up with the operational fitness of the Air Force.

In general, the types of aircraft in service use made comparatively light demands on pilots; no squadrons were armed with monoplanes; elaborate cockpit drills were still in the future; there was little service need for instrument and bad weather flying; night flying and long distance navigation were needed only by five bomber squadrons and twenty-four flying boats. The quality of recruits presented few problems: the numbers required were small, and pilots could be chosen with care either from civil life or from serving airmen. Specialist matters such as armament and navigation were regarded as particular aspects of a pilot's general equipment, and the specialist officers concerned with them were junior and only advisory to the main trend of policy on both operational requirements and training.

5. 1934 - March 1938

A five-year programme for expanding the R.A.F. to 69 squadrons, with 52 allotted to Home Defence, was approved in 1923. For various reasons, however, this programme was put off from year to year for the following ten years, until at the end of 1933 there were only 42 Home Defence squadrons (29 regular and 13 special reserve and auxiliary) out of a total of 74.

Expansion began with a Defence Requirements Committee plan in February 1934 to provide 40 additional squadrons, and bring the Home Defence Force up to 52 squadrons, by 1940.

Expansion Scheme A followed. It was approved in July 1934, and also planned to add 40 squadrons: but Home Defence was now to have a total of 75 squadrons, and the programme to be completed by April 1939.

In March 1935 Sir John Simon and Mr. Eden visited Germany and brought back a clearer picture of German intentions. Expansion Scheme C, which planned a considerably larger and quicker increase, was approved in May. Its target was a Metropolitan Air Force of 123 squadrons, and a total first-line strength of 1512 aircraft, by April 1937.

The international outlook grew darker: Italy made war on Abyssinia: German troops occupied the Rhineland. Expansion Scheme F was approved in February 1936.

Scheme F made little alteration to the planned number of squadrons, but put the first line target up to 1736 by raising the number of aircraft per squadron. It increased the proportion of heavy bombers, and provided more reserves. The planned increase of bomber weight (by rearming with larger aircraft as well as putting up the number of squadrons) was however largely deferred until

1937 and 1938 because it seemed unlikely that the necessary aircraft could be built earlier: up to April 1937 Scheme F was substantially the same as Scheme C. Its full development was to be finished by April 1939.

The general conception of all these schemes was that the first line strength should grow by the prescribed date, and then remain stabilised. A short-term spurt in the output of pilots would man the first line as it grew, while the long term training requirement would be the smaller flow needed to maintain an increased but stabilised first line. Extra schools, or special measures, could cope with the transient "expansion period".

But though the first line strength grew and was manned, it never became stabilised. Larger and larger expansion schemes were continually being worked out: some were approved; some came near approval, and others remained embryonic: but a new and larger plan was always in operation long before its predecessor was complete.

Another enemy to stabilisation was the increasing urgency of readiness for war. At first the aim of making a deterrent show of force without unduly heavy expenditure and the desire to avoid dislocation of normal trade gave expansion something of a shop window character. By 1937, however, the Spanish Civil War had begun, and German preparations became more disturbing. In March 1938 German troops marched into Austria. Fighting efficiency, with the prospect of war in a measurably short time, became more important than a mere show of force: reserves of men and material and plans for replacing casualties were given greater attention in the later expansion schemes such as J and K, which were under consideration at the end of 1937 and beginning of 1938.

A third enemy to stabilisation was technical development. A great change in the speed and complexity of service types

/was going

was going on: the endurance of practically all aircraft except fighters was increasing: operation at night and in bad weather was becoming essential: and power-operated turrets were coming into use. With technical development came changes in crewing: duties had to be allocated to various members of the crew and reallocated in the light of experience: training had to be developed and extended to match the developments in equipment.

This lack of stabilisation pressed hardly on squadrons. The time available to them for training and "working up" grew shorter as war readiness became a more imminent necessity. Their dilution with new pilots fresh from school became greater as the first line expanded more rapidly. Their technical problems increased as they were rearmed with more complex types. The pressure was greatest perhaps on bomber squadrons, where the problems set by endurance and crewing were considerable, and where expansion and rearming were scheduled late in the programme.

#### Logistics

At the outset, training expansion was almost wholly dominated by the small size of nucleus R.A.F. in existence up to 1934. All the essentials for training a larger first line - instructors, airfields, and aircraft - had to come from existing resources. Time was needed to build new schools, construct new trainer aircraft, and produce new men with the experience necessary for satisfactory teaching: and it would not be until two or three years after the start of expansion that the training organisation provided from the nucleus could be materially reinforced.

The nucleus R.A.F. had rather less than a thousand pilots - some experienced, some inexperienced - available to provide additional instructors. Expansion Scheme A called for 1000 extra pilots (over and above the normal

flow of replacements) to be trained in the four years 1935 - 1939. Scheme C demanded over 2000 extra pilots in rather under two years (1935 - 1937). Scheme F, as it developed during 1936 and 1937, required over 4000 extra pilots in the four years 1935 - 1939. Translated into terms of flying instructors, these figures meant that if the sequence and length of a pilot's training were left unchanged about 10% of the experienced pilots in the nucleus would have to be withdrawn from the first line for teaching to meet Scheme A's requirements, and that over 40% would have to be withdrawn for Scheme C (or, later, for Scheme F). So large a withdrawal would inevitably leave squadrons with a very slender backbone of experienced men, and the effects would obviously be serious not only on their readiness for war but also on their ability to handle the very considerable amount of post-school training which they had to do.

Scheme C's formidable call for instructors could be reduced to manageable proportions in only two ways - using service instructors for the bare minimum of instruction, and keeping the number of pilots trained down to the least figure which would man the expanded first line. By these means the withdrawals for teaching were kept down to under 20% of the nucleus of experienced men, but the consequences were unfortunate and inconvenient in the later years of expansion (1937 - 1938). Limited school training, plus the effects of technical development, made it advisable or necessary to provide additional instruction - for instance, in navigation or at Group Pools. Keeping down the numbers trained, <sup>(1)</sup> however, made it as impossible  
/in 1937

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(1) Anxiety to keep down numbers had some curious results, especially where new technical requirements were concerned. Courses on newer subjects of instruction e.g. navigation - could not be arranged until the posts which their output was to fill had been established. The post, however, could not be established until there were the trained men to justify the establishment. Keeping down numbers was, of course, powerfully reinforced by considerations of financial prudence.

in 1937 - 1938 as it had been in 1935 - 1936 to find the required instructors without weakening or rolling up the first line. The result was a continued inability to have as many service training units as were required on grounds of efficient instruction, with the consequence that either civil schools had to be used or the impossibility of giving some forms of instruction by organised courses accepted.

The provision of trainer aircraft was a similar and parallel limiting factor. If the amount of instruction and the number of pupils had not both been kept down Scheme C would have needed more aircraft as trainers in schools than the nucleus R.A.F. had possessed for all purposes. The aircraft industry was hard pressed to turn out all the operational aircraft required for first line expansion and rearmament, and had little margin for building trainers or developing the new instructional types being made necessary by technical development. Training expansion had therefore to be done with as few aircraft as possible - and those few had to be mainly established, if somewhat old-fashioned, types such as the Hart and its variants.

One further, and wider, consideration influenced the logistics of training expansion. It was not certain how far R.A.F. expansion would have to be taken before its purpose - deterring Germany and providing an adequate reply to the German Air Force - was achieved. Each successive expansion scheme set a target, in numbers and time, which it was thought or hoped would achieve the purpose, and so each scheme was regarded as a short term matter of intensive preparation which could be followed by a period of "sorting out" and polishing after the purpose had been achieved. Not until expansion had been in hand for some two or three years did it become reasonably clear that no settled post-expansion period of consolidation and

working up was to be expected, but that the constant succession of ever-larger expansion schemes was in fact preparation for war.

#### The Reorganisation of Flying Training

Training came under review when expansion began in 1934. The review had two main aspects: producing more pilots to man the new squadrons in peace, and devising a system to turn out a flow of well trained replacements and reinforcements in war. The first was a matter of multiplying schools: but the second affected the whole structure of flying training. The system which existed in 1934 could not meet the fundamental war-time requirement that pilots should leave school fit to take their place in a fighting front line.

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In July 1934 Air Marshal Sir John Higgins (Chairman, of Armstrong Whitworth Aircraft Ltd. and A.V.Roe & Co.Ltd.) put to Air Marshal Bowhill (Air Member for Personnel) a suggestion that Air Service Training (a company with which he was associated) should undertake preliminary training and preselection of pilots before they entered service Flying Training Schools. A similar suggestion had been investigated and turned down about ten years before, and the first reaction to Sir John Higgins' proposal was unfavourable: training at civil schools (for Air Service Training could not be a single chosen instrument) might not satisfy service requirements, any corollary shortening of the F.T.S. course would be undesirable because F.T.S. training was already below squadrons' requirements, and it was likely that the use of civil schools would mean extra cost.

In October, 1934, however, Air Commodore Tedder (Director of Training) brought the possibility of using civil schools into his review of the peace and war training

/systems,

systems, and incorporated their use in proposals for a complete reorientation of the training system.

This reorientation<sup>(1)</sup> arose from two axiomatic and fundamental considerations: first, that the war system of training should deliver pilots fit to take their places without delay in squadrons, and second, that there should be no radical difference between the peace and war systems of training because any such difference would cause dislocation and confusion on the outbreak of war. It proposed that a course of about ten weeks' duration at a civil school, similar to that given to Class AA reservists, should precede the F.T.S. course, and deal with the elementary stages of learning to fly: that the F.T.S. course itself should remain unchanged in length, but have its scope enlarged to include comprehensive training in applied military flying: and that a month's visit to an Armament Training Camp should come towards the end of the F.T.S. course.

In this form the scheme seemed to have administrative disadvantages. It increased the total period of training before a pilot reached a squadron, and so not only reduced the length of his service career in the squadron but also meant that slightly more pilots would have to be trained. It increased the total expense of training a pilot both by adding the civil course and by making the F.T.S. course more elaborate.

Moreover, the policy of giving advanced training at the F.T.S. instead of in the squadron was by no means accepted: as shortly before as February 1934 the Air Council had rejected it because of the consequent reduction in a pilot's squadron service.

These disadvantages were discussed by Mr. W.L. Scott (S.7) and Air Commodore Tedder, and the scheme modified.

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(1) Appendix 1 - Paper dated 31st October, 1934, by A/C. Tedder on Training Organisation.

The civil school course was reduced to two months and the F.T.S. course curtailed to two terms of 4½ months each, i.e. to nine months in all, and the total training period kept down to a year. This removed the objection of shorter service in squadrons and, to a large extent, that of greater expense: but Air Commodore Tedder felt that it was cutting things rather fine and that the time would be barely enough to deal properly with advanced training, and in particular with night flying. The need for greater war readiness, and the compression of the training period to a year, removed the objections to a policy of giving more advanced training at schools.

The reorganisation of flying training, in this revised form, was approved early in 1935, chiefly on the grounds that it would increase the efficiency of squadrons and broaden the training resources available in war. It was introduced by A.M.O. A135/35, which said the reorganisation was intended:-

June 1935

A.M.O. A135/35

"by accelerating the elementary stage of flying and ground instruction, to carry service training to a materially higher standard than can at present be attained, without however increasing the total length of training and consequently reducing the period of service given by short service officers and airmen pilots in squadrons. The extended syllabus is designed to eliminate a considerable part of the individual training at present given to a pilot in his first year in a squadron and thus to render him fit to take his part in flight training immediately on posting to a squadron."

Expansion: Schemes A, C and F.

Scheme A called for five Flying Training Schools. (1)  
The Training Base at Leuchars which was renamed No.1 F.T.S. and went on unchanged with its specialised work, made a sixth.

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In January 1935 the number of pilots required was found

/to have

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(1) No.2 was reopened at Digby in November, 1934 and No.6 opened at Netheravon in May, 1935.

to have been underestimated. Since it would have been difficult to open an extra school at short notice because instructors and aircraft could not be provided quickly, it was decided to increase the number of pupils per course from 40 to 48 at all schools except Sealand (where bad weather and congestion made an increase inadvisable). Larger courses began in April 1935 at Grantham, in May at Digby and Netheravon, and in July at Abu Sueir.

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Scheme C required eleven Flying Training Schools, and five new schools were opened between November 1935 and March 1936. (1) These five schools started off on the reorganised system, but with an important alteration. The demand for pilots was large, and A.M.O. A135/35, in introducing the new system, had stated that its advantages in giving a materially higher standard of training could "only in part be achieved during the present period of rapid expansion when, owing to the need for an accelerated outflow of pupils, the period of the flying training school course is temporarily reduced to six months."

The older schools changed over to the new system as they were re-equipped with aircraft. (2) Sealand began in October 1935: Digby, Grantham, Abu Sueir and Netheravon in the first

half of

(1) No. 11 F.T.S. opened at Wittering in November 1935, the Central Flying School having moved from Wittering to Upavon in August. In January 1936 No. 7 F.T.S. opened at Peterborough and No. 8 at Montrose; No. 10 opened at Ternhill in February and No. 9 opened at Thornaby in March.

(2) Under the old system rather more than half a Flying Training School's aircraft had been elementary trainers (Tutor), the rest being service types (Hart and Fury). Under the new system pupils came forward fit to begin flying service types, and schools were accordingly equipped with the Hart, Audax and Fury, only three Tutors being kept at each school for instrument flying. The total establishment of an F.T.S. was 65 aircraft.

half of 1936: Leuchars remained on unreorganised ab initio training.

By the middle of 1936 ten schools were working to the reorganised course, "temporarily" curtailed to six months. Nine were dealing with 48 pupils per course, and Sealand was dealing with 40. The output of pilots became just over 1,500 per year, compared with 300 per year before expansion began.

Scheme F required the same number of Flying Training Schools as Scheme C, but required them longer. Scheme C had planned to reach stabilisation in 1937, when three schools needed only for the "expansion period" would close and the F.T.S. course be lengthened to nine months. Scheme F would not reach stabilisation under 1939, and the three schools would have to continue until then to train the pilots needed by its larger first line.

The ten Flying Training Schools working to the reorganised syllabus drew their pupils from thirteen civil schools,<sup>(1)</sup> which began work in the latter half of 1935 and early in 1936, their output being arranged to feed the intake requirements of Flying Training Schools as they started on the new system. The civil schools were affiliated to F.T.S.'s for the purposes of liaison and continuity in the instruction of pupils.

The number of Armament Training Camps required went up with successive expansion schemes. A called for seven,

/C for nine,

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- (1) Filton (Bristol Aircraft Ltd.)  
Hamble (Air Service Training)  
Hatfield (de Havilland Ltd.)  
Brough (Blackburn Ltd.)  
Sywell (Brooklands Aviation Ltd.)  
Woodley (Phillips and Powis)  
Harworth (Flying Training Ltd.)  
Desford (Reid and Sigrist)  
Perth (Airwork Ltd.)  
Prestwick (Scottish Flying College)  
Ansty (Air Service Training)  
Yatesbury (Bristol Aircraft Ltd.)  
White Waltham (de Havilland Ltd.)

C for nine, and F for eleven, but in each case the full number was not needed until late in the programme,<sup>(1)</sup> since the additional squadrons had to be formed before they could have any need of armament training.

Twin Engine Training.

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In April 1934 Air Marshal Brooke-Popham asked for some special provision to be made for training night bomber pilots. To raise the efficiency of these squadrons, he said, it was essential to relieve them of the burden of preliminary training in twin engine and night flying, which could "only be regarded as basic flying training" so far as they were concerned.

He pointed out that the requirements of night bombers were comparable with those of flying boats, for which it had been found necessary to set up a special training unit, and suggested four ways of providing the necessary training:

- (i) by putting a service squadron exclusively on training.
- (ii) by re-creating<sup>(2)</sup> an advanced training school to specialise in night and twin engine flying
- (iii) by creating a special ab initio school
- (iv) by creating training nuclei which could expand in war either to schools or to service squadrons.

In discussing the general question of twin engine training, Air Marshal Brooke-Popham said:-

"The introduction of the twin engined "day-night" bomber is a fact, and the twin engined fighter is becoming more of a probability. Both twin engine and night-flying training will, therefore, in the near future, have to be considered in a far wider aspect than merely the requirements of the five regular night bomber squadrons, and proper measures decided upon to ensure the required training."

/His conclusion

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(1) No. 4 A.T.C. was opened at West Freugh in January 1937, No.5 at Penrhos in February, No.6 at Woodsford (later renamed Warmwell) in May, and No.8 at Evanton in September 1937.

(2) Advanced training had been done at Digby in 1933.

His conclusion was, "it is inevitable that night flying and multi-engine flying must ultimately be in the curriculum of the Flying Training Schools".

The night bomber problem was held in abeyance for nearly a year, and nothing was done, while the reorganisation of flying training was being formulated and decided. When the new system of training was introduced, however, it went only a little way towards meeting the difficulties. It included some night flying<sup>1</sup> and navigation, but no T.E. flying, at the F.T.S.: schools were to be equipped only with S.E. aircraft. Moreover, compression of the F.T.S. course from nine months to six meant that the night flying could only be local and the navigation elementary. The first pilots trained on the reorganised syllabus would not reach squadrons until well on in 1936.

In June 1935 Air Commodore Tedder examined (2) the whole problem and came to the conclusion that training on T.E. aircraft at Flying Training Schools would be useful only if suitable light T.E. trainers could be produced, and if the F.T.S. course were of the length originally designed (i.e. nine months). He analysed the requirements which went under the omnibus heading of "twin engine training" into conversion to T.E. aircraft, flying experience by day and by night, and advanced navigation, and pointed out that the last two depended very largely on having enough time devoted to them.

So far as Flying Training Schools were concerned in the immediate future, twin engine training was ruled out by lack of suitable aircraft, and thorough training in navigation and night flying were ruled out by lack of time. The only

/other way

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(1) Night flying was introduced in the ab initio training of pilots (on Moths or Tutors) in 1935, and it was found that pupils with only some 20-25 hours flying were capable of profiting from the instruction.

(2) Appendix 2 - Paper dated 20th June 1935 by A/C Tedder.

June 1935

other way of providing twin engine training outside squadrons was a special T.E. School which could either deal merely with conversion T.E. flying, in which case three weeks would be long enough, or take three months and tackle the problem fully. He dismissed the short course as not having enough value to justify a special school, and considered that a three months' course could not be managed with the numbers and dates set by the expansion programme (i.e. Scheme C).

No special T.E. training would therefore be possible "during the expansion period", and squadrons would have to go on giving basic preliminary training. This was agreed by Air Chief Marshal Ellington (C.A.S.) in July 1935. The ultimate solution was to be a special T.E.B. school, but this was left to a more distant future when the pressure of expansion would be over.

Thus no progress had been made in relieving the night bomber squadrons of their burden, except to the very limited extent that the reorganised but curtailed F.T.S. course would begin to turn out better trained pilots in 1936. It had been made clear, though, that the full problem of "twin engine training" was primarily one of flying experience and navigation.

Two months later Air Commodore Tedder turned to the only improvement possible under the existing conditions, and proposed<sup>(1)</sup> to ease the transition from school to squadron by giving advanced training on T.E. aircraft at the F.T.S. There was no intention of relieving squadrons of any major burden: the training given at Flying Training Schools would remain substantially the same as with S.E. aircraft: only conversion to T.E. flying, which was recognised as a comparatively small part of the whole problem, would be taken off the squadrons' shoulders.

/The difficulty

September  
1935.

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(1) Appendix 3 - Memorandum on T.E. Training Aircraft dated 23rd September, 1935.

The difficulty was aircraft. Obsolete T.E. aircraft like the Virginia were quite unsuitable for training: there was a wide variety of multi-engined Service types: and it would be highly uneconomical to give each school specimens of every type. What was needed was a T.E. trainer which, in general characteristics, was reasonably representative of the various twin engined service aircraft. There was no need for this aircraft to be itself a Service type; it could be a specialised trainer, developed possibly from an existing civil type. The important requirement was speed in production.

The possibility of adapting the Airspeed Envoy was investigated, but in December Air Marshal Newall (A.M.S.O.) took the view that providing T.E. trainers at Flying Training Schools was not in accordance with Air Chief Marshal Ellington's ruling (in July) that twin engine training should be done in squadrons. Air Marshal Bowhill thought that the ruling referred to providing extra training, and not to modifying F.T.S. training to bring it more in line with Service requirements.

The question was referred to the C.A.S. Air Chief Marshal Ellington did not disagree with the proposal to use T.E. aircraft at Flying Training Schools, but considered the proposal to use a modified Envoy thoroughly unsound. Not only would it take a long time to make the modifications and start production<sup>(1)</sup> but "if it is our aim to get at once a training aircraft which will enable pilots to be taught to fly twin engine machines, we should take an existing machine as it stands with the single modification of dual control. To attempt to graft on to this the means of teaching navigation, bombing and aerial gunnery, which do not necessarily

/require

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(1) It had needed 27 months to produce 100 Ansons after the modifications to the civil type had been agreed.

325263/34

December  
1935.

require a twin engine aircraft, is to my mind completely wrong. If Flying Training Schools require aircraft for such purposes, they should be supplied with service types which will not involve the introduction of a new type into the Service".

The drawback of using a simple "pure flying" trainer was pointed out by Air Marshal Bowhill. Economy and the best use of time made it advisable for practice in T.E. flying to be combined with other training - navigation, cloud flying, night flying and so on - so that a trainer with service equipment was required. The question then resolved itself into whether Ansons or modified Envoys could be produced earlier in the number needed. Air Marshal Newall investigated and found that Ansons could be made more quickly. Air Chief Marshal Ellington approved their use at F.T.S's.

Air Marshal Bowhill at once asked for the decision to be reconsidered. The Anson was not as good a training aircraft as the Envoy: it had no flaps, and modifying it with flaps would largely nullify its advantage of earlier production: its performance was inferior and it was not so suitable for training in blind, cloud and night flying.

Further investigation confirmed the opinion that Envoys could not be produced quickly enough, and Air Marshal Bowhill then suggested that Ansons should be used only until Envoys were turned out, and that Envoys should be ordered as replacements for Ansons.

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Twin engine training at Flying Training Schools was eventually introduced late in 1936 "in order to meet the growing demand for twin engine pilots and to relieve Service squadrons of the responsibility for providing twin engine conversion training."

One third of the pupils of each course, (those destined  
/for Heavy

for Heavy Bomber, General Reconnaissance, and Flying Boat squadrons) were to be trained on T.E. aircraft. It was laid down:-

"In the first instance it is essential to provide all pupils, irrespective of what types they are to fly later, with single engine training. Pilots destined for twin engine aircraft will therefore be required to fly single engine aircraft during the first six weeks of their term at the Flying Training School, when it is hoped that they will complete 25 hours dual and solo flying. Thereafter, their training in the first and second terms will be carried out on twin engine aircraft."

The first schools to be equipped with Ansons<sup>(1)</sup> were No. 3, Grantham and No.6, Netheravon, in November 1936. No.9, Thornaby, was equipped in December.

These Ansons had no flaps; the Central Flying School reported in May 1936 that the unflapped Anson had been tested and appeared to be acceptable for use at Flying Training Schools. Work was going on, however, on modifying the Anson with flaps.

#### Flying Training Schools

Before 1934 night flying was one of the Cinderellas of training. It was neglected by the Central Flying School and the Flying Training Schools: its teaching was left to squadrons, and there was no co-ordinated system or common doctrine laid down in the C.F.S. training of instructors.

The problem of improving night training was considered<sup>(2)</sup> and discussed, and in August 1935 it was laid down as a policy that:-

- (i) Flying is an art in itself, which can be either taught or practised under conditions of daylight, cloud or darkness. The application of this art is taught or practised as Service training in the form of day bombing, night reconnaissance, the use of clouds for cover, etc., etc. It is clear that night flying falls, as regards

/instruction,

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(1) The establishment was 16 Ansons, 12 S.E. aircraft being withdrawn, and the total aircraft at these schools became 69 (47 I.E. and 22 I.R.).

(2) See note on page 88.

instruction, under the category of the art of flying under conditions of darkness and should, therefore, be taught as part of the instruction in flying and not as Service training.

- (ii) Night flying instruction should be given, as is day and instrument flying, during the Flying Training School course. The application of night flying to Service training, e.g. night navigation and reconnaissance, if taught at the Schools, should occur during the second term.
- (iii) The Central Flying School, as the establishment responsible for formulating the methods of flying training, should issue the "patter" for night flying instruction.

There was considerable delay, however, in providing night flying equipment for Flying Training Schools, and it was not until the middle of 1936 that they began night flying training. The aim was limited: it was recognised that the time available during the course would not permit enough practice to produce experienced night flying pilots, and so the purpose of F.T.S. night training was defined as "ensuring that every Service pilot had flown at night, keeping instructors in night flying practice, and destroying the theory that night flying required some special technique and skill". The syllabus aim was six hours' flying at night, all on circuits and landings except for one out and back flight of 20 miles.

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When the reorganised system of training was introduced Flying Training Schools were divided into the Flying Training (renamed Intermediate Training in 1937) and Advanced Training Squadrons. Pupils spent one term of 13 weeks (15 in winter) and did about 50 hours' flying, in each. A new course was accepted every three months when the previous course passed from the I.T. to the A.T. Squadron.

The aim of the first term was to bring pupils up to a standard when "handling the aircraft was a means to an end rather than an end in itself", which meant that "the pupil must be able to fly accurately and to reach his objective under any weather conditions". Navigation

/training'

training covered map reading and elementary D.R. (both as pilot and as observer) with wind finding by the reciprocal course method; it was practised on two or three 200-mile triangular cross country flights with a given wind. Instrument flying was taught by ground instruction in the functions of the instruments and frequent short practices, when occasion served, under the hood: in addition, the navigation exercises were partly done under the hood. It was not, however, entirely practicable to carry out this syllabus: some Harts had no hoods for the front seat, and no hoods were available for Ansons.

The pupil's term in the Advanced Training Squadron was largely devoted to armament training: ground instruction and exercises with the cine camera gun and over the camera obscura were done at the Flying Training School, and the work culminated in the month's attachment to an Armament Training Camp. There was a certain degree of specialisation in the work of the second term: pupils were taught only the aspects of bombing and gunnery required in the squadrons for which they were destined, squadrons being classified into three groups:-

- I Fighters
- II Medium Bomber, Light Bomber, Torpedo Bomber and Army Co-operation.
- III Heavy Bomber, Flying Boat and General Reconnaissance.

Broadly, the controlling factor in the training was whether the aircraft had one pilot and fixed guns or two pilots and free guns. Pilots for Groups I and II (plus some G.R. pilots) were trained in fixed gunnery: those for Group III were trained in free gunnery, both as pilots and gunners. Training for bombing, both as pilot and bomb aimer, was given to Groups II and III only. This specialisation was acknowledged to be undesirable, but was "made inevitable by the number of pupils and the limited facilities available".

/In addition

In addition, the F.T.S. course covered photography, reconnaissance and formation flying, and included height tests of 30 minutes at 15,000 feet.

S.34816

In November 1936 No.23 Group asked for the duration of the F.T.S. course to be increased to nine months, and the pupil population at each school reduced to 80 (i.e. two courses of 40). It was difficult to complete the syllabus in all respects; pupils had insufficient time to digest their instruction; and a "cramming" course did not produce the best or most permanent results.

"Pressure of expansion", however, was still as powerful a factor as it had been in 1935; the need for two pilots in large aircraft was on the horizon; and though the ideal of longer courses and fewer pupils was accepted no date could be set for its achievement. The duration remained at six months, and the size of courses at 48.

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A further difficulty came with the introduction of T.E. training. The policy of requiring pupils to fly Harts during their first six weeks at F.T.S. meant that the first term tended to degenerate into a conversion course to two service types, with navigation, instrument, and night flying receiving less attention. In November 1936 No.23 Group proposed that T.E. pupils should be trained throughout on Ansons, but the proposal was turned down and the policy of starting on S.E. aircraft reaffirmed by the Air Ministry.

The proposal was put forward again in July 1937, aggravation of the already difficult problem of getting all pupils off solo at night being given as the chief reason. The scheme was tried experimentally, found successful, and approved by the Air Ministry in November 1937. Four more Ansons were allotted to the schools concerned (Nos. 6, 9 and 10) and four Harts withdrawn.

Throughout this period Flying Training Schools were

/working

working under heavy pressure, which was due in a considerable degree to their organisation. Maintenance was done in the flights, and instructors had to deal with maintenance, administration and ground instruction as well as flying instruction. In fact, everyone did a bit of everything. Flying Training Schools worked satisfactorily, in spite of this faulty organisation, only because the organisation was extravagant.

S.38529

It was clear that this system, which was working with difficulty in peace, would break down under war-time pressure; and in June 1936 Air Commodore Tedder wrote a paper on the subject. He compared the flight system of maintenance with civil operating, and found the Service system uneconomical, though direct comparison was not possible.

"Service economics in war and civil economics in peace are very much akin, because the object is in each case to ensure efficient working with the strictest regard to economy, while preserving the ability to expand".

Air Commodore Tedder applied these principles to a Flying Training School, and deduced that there should be a functional organisation by which technical maintenance was delegated in its entirety to one group containing all the technical maintenance personnel, under an officer in charge of maintenance: in war there would be need for strict economy in these men because of competition between industry and the Services. Similarly, there should be an administrative organisation, to relieve the instructional staff and maintenance personnel of all administrative work. The Flying Training School should thus have three distinct divisions:- an office, a garage and a school.

The flight system of maintenance ended in May 1937, when maintenance was centralised for each squadron (i.e. Intermediate and Advanced) under a squadron Engineer Officer.

/During 1937

During 1937 some of the stations used by Flying Training Schools were required for operational units as expansion developed. No.9 F.T.S. moved from Thornaby to Hullavington in July, No.3 F.T.S. from Grantham to South Carney in August, and No.2 F.T.S. from Digby to Brize Norton in September.

The preliminary civil school course dealt with the basic principles of flying, and included the use of instruments. Its duration was eight weeks (10 weeks in winter) and pupils' flying time was 50 hours (25 dual: 25 solo).

#### Navigation Training

Up to 1935 long distance navigation was required only by flying boat and night bomber squadrons, and to a lesser degree by torpedo bomber squadrons and coast defence units. In all cases navigation was the pilot's concern.

Flying boat pilots were given navigation training as part of the 29-week Flying Boat Course at Calshot. Torpedo bomber and coast defence pilots were trained in their units at Donibristle and Gosport by navigation specialists. Night bomber pilots were trained in squadrons by Air Pilotage officers (renamed "squadron navigation officers" in 1935) who had passed a 13-week course at the Air Pilotage School, Andover. Specialist "N" officers were trained by a 7 months' course at Calshot.

The importance of accurate navigation over the sea had been made clear by exercises with the Navy: but even though special training was given to flying boat pilots it was doubtful whether their standard was satisfactory.

There was no doubt, however, about the night bomber squadrons: their standard was unsatisfactory.

At an early stage of expansion it was planned to form four "Coast Reconnaissance" squadrons equipped with land-planes, and Air Commodore Tedder pointed out in January

S.34945

1935 that these squadrons could hardly be expected to be reasonably efficient unless the pilots were given adequate training in navigation and reconnaissance. He then put forward a scheme for amalgamating the Air Pilotage School at Andover with the Navigation School at Calshot and giving navigation courses to flying boat, coast reconnaissance, T.E. bomber, torpedo bomber, and coast defence pilots at the combined school. This would involve taking away the navigation part of the Flying Boat Pilots' course (which was roughly equivalent to the 13-week Air Pilotage course) and leaving that course with only the training in flying and handling flying boats. To provide air training at the amalgamated school he proposed to use the first of the Coast Reconnaissance squadrons, and so avoid having to produce extra aircraft.

Air Vice Marshal Courtney (D.C.A.S.) agreed with the proposals, which he said sought to give a fairly considerable proportion of the force an advanced course of training in navigation, and went on:-

June 1935

"I am being driven inevitably to the general conclusion that we must eventually aim at a system of training which will provide all flying personnel in the force with a standard of navigational ability not less than that at present possessed by our flying boat pilots. The increasing speeds and ranges of aircraft, the probability that bombing squadrons will in war have to fly long distances over the sea to their objectives, the likelihood that squadrons will have to fly for long periods either in or above the clouds, and the tendency towards a more general adoption of night flying, all seem to emphasise the need for more thorough navigational training.....We are rapidly leaving behind us the days when, by depending on local knowledge, by sticking to railways or rivers, or by following tracks ploughed across the desert, we could solve our difficulties without going to the trouble and expense of proper navigational training."

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In June 1935, however, the pressure of Scheme C caused Air Commodore Tedder to revise his proposals by leaving out any provision for T.E. bomber pilots: the requirements of time and numbers which made it impossible to give these pilots special T.E. training made it equally impossible to

/give them

give them additional navigational training (which would in fact have been a major element in the "special T.E. training"), and the immediate problem of navigation training for bomber pilots remained unsolved. In the more distant future there seemed little likelihood that they could be trained at the same school as maritime pilots; there would be too many of them.

The proposal was now that a combined School of Air Navigation and Reconnaissance should be formed at Manston, with the first of the new G.P. (Coast Reconnaissance) squadrons to give the air training. Its functions would be:-

- (i) courses in navigation, reconnaissance, and ship recognition for pilots operating over the sea,
- (ii) courses for squadron navigation officers,
- (iii) specialist "N" courses.

On this proposal Mr. W.L. Scott made the pertinent observation that it could not be considered a long term policy. He pointed out that the old system of giving purely flying training at schools and service training in squadrons had been replaced by a policy of giving some service training in Flying Training Schools, and that it would therefore be necessary to consider in due course how far that service training should be specialised for different types of squadrons, and in particular how far navigation training should be carried. "It will perhaps appear of dubious wisdom to accept three navigation standards, namely one to be reached in the 12 months ab initio course (i.e. F.T.S.), one slightly higher for Flying Boat, G.P. and Bomber Squadrons, and one much higher for N Specialists".

Air Commodore Tedder's proposal was approved, and the School of Air Navigation was formed at Manston on 6th January 1936. No. 48 (General Reconnaissance) squadron, equipped with Ansons, provided aircraft, pilots, and wireless services.

The Navigation and Reconnaissance (N.R., later called G.R.) course for pilots operating over the sea was to last 16 weeks, and consist of the 13-week navigation course plus training in reconnaissance and ship recognition: there were to be six courses, each of 25 pupils, per year. The squadron navigator (s.n.) course was to be of 13 weeks' duration: there were to be three courses each of 12 pupils per year. The specialist N course was to be of 7 months' duration, with eight pupils. In addition, there were to be occasional two-week courses for officers needing refresher training.

S.47629      •

The net outcome of this reorganisation and all the discussions leading up to it was small. Maritime pilots would in future have a thorough course in navigation, but for the rest of the service matters remained very much where they had been since 1918. How unsatisfactory this was likely to prove was shown by a paper-written in August 1936 by Flight Lieutenant D.J. Waghorn on "Navigation in the R.A.F.". In it he pointed out that the technical development of aircraft, by increasing speed and range, had increased the difficulties of navigation so that it was doubtful if the average R.A.F. officer would be capable of making the best use of the new types of aircraft.

Future operational work by bombers, he said, was likely to be at or above 18,000 feet, and at speeds of about 200 m.p.h. Dead reckoning was likely to produce serious and cumulative errors at long ranges (meteorological forecasts for 18,000 feet at a distance of say 500 miles were not likely to be completely reliable): directional wireless was not as accurate as had been thought, while its range was doubtful and wireless silence a possible necessity in-war.

Flight Lieutenant Waghorn also pointed out that the

/R.A.F.

R.A.F. had very little experience of long distance flying, save by following well defined routes and so making little call on true navigational ability, and that specialist navigators ("N") had only academic knowledge, and no practical experience, of astronomical navigation. He urged that experimntal long distance flying should be undertaken, to form a basis for instruction and enable navigators generally to be given long-distance experience, and that astronomical navigation should be developed.

This paper passed through the hands of Air Commodore Garrod, the acting A.O.C. No.23 Group, who endorsed the need for experimental long-distance flights, study of modern navigational methods, and long training flights to give experience. He added the necessity for including cloud and above-cloud flying at Flying Training Schools, which would mean equipping the schools with wireless and homing facilities.

The paper then brought some urgent and emphatic comments from Group Captain Harris, who observed that it was essential to simplify the means of navigation until all pilots were accurate navigators: producing expert navigators could be done as it was done then, but it took a long time, and a few laboriously trained experts were no answer to war requirements. Moreover, experts tended to surround their art with clap-trap, whereas navigaion should be made a simple and practical matter.

Group Captain Harris said that navigation was probably -the most important aspect of service operational efficiency, but the general attitude towards it was deplorable and the standard of efficiency lamentable. It had for a long time been the Cinderella activity of the R.A.F.: senior officers had had neither knowledge of it nor interest in it, and the junior officers who had in the past been responsible at the Air Ministry for navigation equipment and /methods

November  
1936

methods had not carried enough guns to get vital requirements properly co-ordinated and put across. The same, he added, was true of armament.

The chief reason for this lack of interest and drive in navigation Group Captain Harris put down to the fact that with short range aircraft "pilotage and Bradshaw" had been considered substitutes for navigation. The efficient operation of an Air Striking Force depended on accurate navigation to pilotage range, pilotage to the target, and bombing accuracy, the problems of the return flight being much easier.

The lack of interest and drive still persisted, however, and the development of navigation remained slow, half-hearted, and hesitant.

#### Bomber Pilots

S.40289  
The future crewing of aircraft was laid down by Air Chief Marshal Ellington in April 1936. Bomber and two-seater fighter aircraft were to have a crew of one pilot and an observer (plus wireless operators and air gunners where they were needed) and G.R. aircraft one pilot and a navigator (who would be a pilot, at least until 1939, when it might be possible to produce an observer competent to do the work).

This one-pilot crewing of bombers at once brought up another aspect of the navigation problem. The pilot would be the only trained navigator in the aircraft (however inadequate his training might be in bomber squadrons) and Air Commodore Sholto Douglas (D.S.D.) pointed out in June 1936 that he could not both fly the aircraft and navigate it over the distances which newer types (i.e. Blenheim, Whitley, Hampden, Battle, Wellesley) made possible.

The need for some more specialised attention to navigation than could be given in the pilot's spare time (even with an automatic pilot) was increased by the

prospect of operating at night and in bad weather. The possibility of having a navigation-trained observer was mentioned, but not pursued.

June 1936

Group Captain Harris (D.D.Plans) emphasised that every aircraft with an endurance of more than three hours should have two pilots because of the strain (which was far more mental tension than the physical effort of actual flying) in war time. Moreover, crew morale needed a second pilot capable of bringing the aircraft back if anything happened to the first pilot, and first pilots could be trained only by apprenticing them for a time as second pilots. Group Captain Harris considered that navigation should remain the first pilot's responsibility, and not be palmed off on second pilots or observers. He protested against taking navigation less seriously over the land than over the sea; with the coming of cloud and night flying for all bombers, their navigation problems would be far more complicated and far more likely to lead to disaster than those of aircraft operating over the sea.

S.40289

February  
1937

It was clear that provision must be made for navigation in addition to piloting, and that trained men must be provided for it. The crewing of aircraft was revised early in 1937: wherever possible bombers were given two pilots (Harrows, Whitleys, Wellingtons, Hampdens, Heyfords, Hendons, Hendons and the P.13/36 and B.12/36), and so were G.R. aircraft. But in some bombers (Blenheims, Wellesley, Battle) it was impossible to carry two pilots, though the range and endurance of these aircraft made some special provision for navigation necessary. Squadron training was to be relied on to develop the necessary navigational skill, and each bomber squadron was to have three "s.n." qualified pilots.

These decisions of course increased the pilot output required from Flying Training Schools and the amount of "s.n." training needed, but no more schools were opened.

/The six-month

The six-month F.T.S. course was retained. It had been intended to bring in the originally planned nine months duration of F.T.S. course during 1937, but the increased demand for output made it necessary to keep on with the curtailed course. The School of Air Navigation's "s.n." training capacity was increased, 10-week courses of 22 pupils taking the place of 13-week courses of 12.

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This increased rate of training at Manston was, however, not enough. It would be 1939 before all the "s.n." posts were filled, and so Air Commodore Leckie (D. of T.) suggested in January, 1937 that selected pilots should be trained at civil navigation schools for Second Class Navigators' licenses. (1)

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This proposal was at first closely linked with the aim of giving short service officers better equipment for their later career in civil life. The plan was, however, eventually approved on the ground that more "s.n." officers were urgently needed. It was possible to find pupils at once because delay in forming new squadrons meant that there was a temporary surplus of pilots for whom no aircraft were yet available.

Navigation training at civil schools was thus begun as a **temporary expedient for reducing the deficiency** of "s.n." officers until Manston could turn out the numbers needed, and for taking advantage of a temporary surplus of pilots. Only 70 pupils were to be trained during the summer of 1937.

The first course (47 pilots) began at the Imperial School of Air Navigation, Notting Hill, London in April, and the second (20 pilots) at Air Service Training, Hamble,

/in July

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(1) The Air University (i.e. Hamble) navigation course had been taken at their own expense by some keen pilots, who had obtained Second Class Navigators licences. This led to the temporary acceptance, by A.M.O. AL/36, of this licence as an alternative qualification for squadron navigation officers.

in July. The courses lasted three months, included no practical work or flying, and were recognised to be inferior to the Manston course. The pupils were selected from those who had been in squadrons some 12-18 months after leaving F.T.S.

In the meantime the question of giving all bomber pilots a course in navigation had again been under consideration. No decision had been taken by September 1937, but it was agreed to continue courses at the Imperial School of Air Navigation (40 pupils) and Air Service Training (30 pupils) in anticipation of the introduction of navigation training for all pilots. The intention was for civil school training to be a temporary stop gap until more Service schools could be arranged, and another batch of 70 pupils was sent to the two civil schools for training in January 1938.

#### Observers

Up to 1934 Air Gunners were the only non-pilot members of air crew. They were selected by squadrons from their airmen, wireless operators being chosen when they were required, and were trained in the squadrons. Some were trained in bombing as well as gunnery, and a few were employed full time as air gunners. Navigation, of course, was the pilot's responsibility.

This system of squadron selection and training was found increasingly inadequate and unsatisfactory: there was considerable variation not only in the qualifications of air gunners, but also in their standard of proficiency. It was therefore decided in 1934 to replace them by a new class of school-trained aircrew, Air Observers. The change-over was to be made gradually, old style air gunners being replaced by observers as their period of service came to an end.

A.M.O.  
A196/34

/Observers were

Observers were to be drawn from airmen serving in the skilled "apprenticeship" trades, and were to be trained by a basic course in bombing and gunnery. An Air Observers School to give this training was opened at North Coates<sup>(1)</sup> in January 1936. The output of this school was 200 per year; the course lasted two months; and after being trained the observers were to be employed part time on air crew work and part time on their basic trades. The course was not expected to turn out fully trained observers: squadron training to fit them for work in the type of aircraft concerned was to follow the basic course.

The general crewing of one pilot and an observer laid down in April 1936 was estimated to require 1264 observers for manning Scheme F's first line. North Coates, however, could produce only 580 before April 1939. Even if some 500-600 "old style" air gunners who had been trained in bombing were also employed on observer duties, there would still be a deficiency at the target date for Scheme F.

At this stage observer requirements became linked with navigation requirements. It was essential to provide someone other than the pilot flying the aircraft to attend to navigation, and there were two possible solutions. One was to train the observer in navigation, and the other was to carry a second pilot.

Group Captain Oxland (D.D.O.R.) and Air Commodore Sholto Douglas pointed out in June 1936 that one-pilot crewing had as its inevitable corollary the necessity for producing an "Observer I", fully trained in navigation as well as in bombing and gunnery, but that no steps had been taken to select or train such men.

Group Captain Harris argued strongly for the two-pilot solution, since navigation was the most important duty in bombers and responsibility for it must rest on the  
/captain

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(1) North Coates had previously been an Ammunition Training Camp: its place as No.2 A.T.C. was taken by Aldergrove.

captain (i.e. first pilot), and because of pilot fatigue and pilot casualty considerations.

Air Commodore Tedder pointed out that the only navigation training then being given to observers was given in squadrons, and that whether their squadron training was continued or whether they were school trained it would be some considerable time before the "present so-called observers" could attain anything like the navigational skill required.

The two pilot solution was generally accepted, and early in 1937 observers were replaced by second pilots in the crews of all aircraft which could carry two pilots. This reduced the number of observers required and so the prospective deficiency in 1939, but it left a navigation problem for aircraft such as the Battle, Blenheim, and Wellesley which could not carry two pilots. These aircraft, however, were ultimately to be replaced by larger types carrying two pilots, so that in the long run the observer problem would disappear.

In the meantime Battles, Blenheims, and Wellesleys needed observers who knew something about navigation. The course at North Coates was extended in May 1937 from two to three months, and navigation training "similar to that given a pilot at the Flying Training School" was added to the syllabus. This was recognised to be only a basic preparation for squadron training and the following points were made clear to Commands when the North Coates course was extended:-

"The air observer has not been, and cannot for the present be trained up to a complete operational standard at the Air Observers School. This can only be achieved in the squadron to which he is posted, as a member of a crew. It is considered that a period of six months advanced training in a unit will be necessary before the required standard can be reached, except in those cases when the observer has had considerable previous experience as an air gunner.

/The necessity

February  
1937

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The necessity for the thorough training of air observers should be brought to the notice of the units concerned.

With the additional navigation courses already arranged, it is anticipated that there will be a "s.n." navigator in every flight in Bomber Command. This will materially reduce instructional difficulties. A further scheme for the training of all pilots up to "s.n." standard is also under consideration".

The capacity of North Coates was increased so that in spite of the longer course the output of observers remained at 200 per year. This was still insufficient to meet the requirements of Scheme F by 1939, even when the number of observers had been reduced by the revised crewing, but the prospect did not cause much concern: there was likely to be a surplus of pilots, who could act as observers until 1940, when North Coates would have trained enough men.

The increasing proportion of large aircraft, with the revised crewing laid down early in 1937, began to make heavy demands for other classes of aircrew. Two wireless operators were to be carried in the larger aircraft, and one in other types where long range or night work was required. The rest of the crews were to be "straight" air gunners (who were in fact largely drawn from tradesmen): a few specialist air gunners (chiefly wireless operator mechanics and fitters) were wanted for flying boats.

This called for an output of some 900 air gunners per year, and although it was suggested that unit training was not satisfactory a change in the system was not considered possible. To ease the provision of wireless operators Sir Edward Ellington ruled that only one of the two in the crew of larger aircraft should be on the squadron establishment. The second was to be found in peace (when he was needed) from the station establishment, and in war from the reserve.

Bomber Command's Requirements.

The reorganisation of flying training, the rearrangement  
/of navigation

April  
1937

S.40289

of navigation training, and the development of observers barely touched the fringe of the "twin engine bomber" problem. Specialised courses had been considered in 1935, but nothing had come of them because of the need to get pilots into squadrons by the dates set by expansion. In 1937 the main burden of training still rested on squadrons.

Squadrons' training, however, was seriously handicapped by lack of appropriate and necessary equipment, and by lack of navigation-trained observers, as Air Chief Marshal Steel pointed out in September 1937.<sup>(1)</sup> Blind flying and night flying were difficult to carry out in squadrons at this time, and the standard at which pilots came forward from Flying Training Schools was not called in question.

The handicaps under which Bomber Command was trying to attain readiness for war were also the subject of a letter<sup>(2)</sup> from Air Chief Marshal Ludlow Howitt in November 1937. This stressed the need for enabling bombers to operate and train in all weathers, and for providing a thoroughly trained full-time observer.

The Air Staff was in full agreement with Bomber Command. Operational training was gravely jeopardised by lack of adequately trained observers in Wellesleys, Battles and Blenheims: old style air gunners were not capable of meeting the navigation demands made by these aircraft, and observers needed very considerable additional training in squadrons.

519517/36

November  
1937

Air Commodore Sholto Douglas (D.S.D.) said:-

"We have created an Air Force of long range and high offensive potential. If we are to use this potential in war and give full scope to its training in peace, a highly skilled full time air observer is just as much an essential as is any other member of the crew, not excluding the pilot".

/Part-time

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- (1) Appendix 4 - Letter from Bomber Command to the Air Ministry dated 1st September 1937.
  - (2) Appendix 5 - Letter from Bomber Command to Air Ministry dated 10th November 1937.

Part-time observers did not come fresh to their aircrew duties, and did not have time for the further training and study they needed.

The part-time observer problem was not, however, a simple question of operational requirements. "Economy modified perhaps by considerations of airmen's careers", as Air Chief Marshal Ludlow Hewitt expressed it, also came into the matter, which had been under consideration and discussion since the summer of 1936. Part-time observers were also part-time tradesmen, and they could not be released for full time aircrew duty until there were enough skilled tradesmen to replace them on maintenance work. The part-time system of providing observers was an inducement for recruiting the right type of man into the skilled trades from which observers were chosen. Full-time observers recruited direct from civil life would have to be given rapid promotion if the same type of man as came forward for pilot duties were to be recruited, and this rapid promotion would compare badly with the slower promotion in the trades from which service entry observers were chosen. If observers were to be highly trained in navigation there would be little difference, in the type of man recruited or the instruction needed, between observers and pilots: it might therefore be simpler to go the whole hog and provide pilots. There would be difficulties over the increased cost of personnel involved in making observers full time.

S.41243

October  
1937.

These objections were put forward by Air Marshal Mitchell (A.M.P.) who also argued that navigation requirements were to be met by giving adequate training to pilots, and that the need for observers was therefore purely temporary since the aircraft concerned were to be replaced in a few years by larger types carrying two pilots.

There was considerable divergence of opinion between

/Air Marshal

Air Marshal Mitchell, who wanted to go slowly in providing full-time and highly trained observers, and the Air Staff, whose view was expressed by Air Vice Marshal Peirse (D.C.A.S.) in November 1937:-

"I consider that from the operational point of view the whole-time air observer is a necessity. The types of aircraft now coming into the Service take a heavy load considerable distances at high speed. The delivery of that bomb load at the target depends as much on accurate navigation and bomb aiming as on piloting, and the air observer is, depending on the type, partly or wholly responsible for these duties. To expect a really high standard of efficiency in those duties from an air observer who spends part of his time on technical ground duties is to expect too much.

One of A.M.P.'s arguments against the whole time air observer is the increase in the personnel vote which such a policy would entail. I submit that this cannot be accepted as a serious reason. We have created an Air Force of long range and high offensive potential. The crew must not be of a lower standard than the aircraft otherwise our ends will be defeated. But there seems to be a danger of this so long as our potential is governed by personnel policy.

D. of T. has recently increased the standard of training of air observers: in particular navigation is being given increased attention. These improvements in training, when they have had time to take effect, should go some way towards removing some of the difficulties to which Bomber Command refer. They are not a remedy".

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The Air Staff view prevailed, and in December 1937 Air Chief Marshal Newall ruled<sup>(1)</sup> that all observers were to be trained up to the same navigation standard as pilots, that the shortage of observers must be made good earlier than 1940, and that direct entry observers must be recruited because the numbers needed could not be drawn from serving airmen without seriously depleting the skilled ground trades.

The principle of full time employment on observer duties was accepted, but it was to be applied only to direct entry observers until such time as more tradesmen  
/were available

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(1) Appendix 6 - Minute from C.A.S. to A.M.P. dated 13th December 1937.

were available to release part-time observers from their maintenance work. Half the entry to observer training was to be drawn from the Service, and half by direct entry from civil life.

These rulings required a higher navigation standard and a longer course for observers, as well as a larger output from training. The increased commitment was beyond the capacity of North Coates, and so it was planned to give the navigation part of the syllabus (12 weeks) at civil schools and the amament part (8 weeks) at Service schools.

Astronomical navigation, from 1935 onwards, was gradually developed for general Service use. Development involved the consideration of almanacs, the provision of sextants, and the equipment of aircraft with an astro station, and instruction could not begin until this was done. The aim was to produce a "rule of thumb" system which did not depend on any knowledge of the underlying theory.

An experimental astronomical navigation course was held at the School of Air Navigation in the early summer of 1937. The duration of this course was three weeks; the pupils were "s.n." trained officers; and the object of the experiment was to find out whether they could be taught enough, in the time, to make efficient practical use of astro.

S.47629 After the experimental course it was agreed, at a conference in July 1937, that with the progressive simplification of astro which would come about when an air almanac, full altitude azimuth tables, and an averaging sextant were available (they were being produced) a four weeks' course would be satisfactory. It was also agreed that astronomical navigation had advantages at distances of more than 300 miles, and that bombers with a greater radius of action than this, as well as G.R. aircraft, should use it.

/The intention

S.47629

The intention was that pilots whose duties would call for astronomical navigation should be trained before joining their squadrons, but the courses could not start for another year - that is, not before the middle of 1938. In November 1937 the decision to make astro navigation a standard service method was approved by the C.A.S.

In October 1937 training in astro. navigation was begun in bomber squadrons. Squadrons with a trained astronomical navigator were to be issued with one set (to be increased later to three) of equipment and publications, and were to start training their pilots.

#### Reserves

The development of schools in 1935, 1936 and 1937 was planned only to man the peace-time first line. Readiness for war was another matter: casualties and war time expansion would call for reserves and a War Training Organisation. The War Training Organisation would turn out the greatly increased war-time flow of trained men needed for reinforcement and expansion, but it would take time to get into its stride. Reserves would be needed to cover both reinforcement and expansion in the interim period.

S.35435

Before expansion began, the reserve of pilots was made up of officers and airmen who had left the R.A.F. on expiry of their period of service, plus a few civil pilots. This reserve was kept in practice by annual refresher courses, mainly on elementary types of aircraft, at civil schools. It was small, since it was mainly limited by the numbers which could be drawn from those who had made up the R.A.F. in the years before expansion began, and it would manifestly be inadequate for the expanded first line being planned. Its maximum size was estimated in 1935 at 2,307 active pilots, 574 pilots not in training, and 268 auxiliary pilots, to which might be added a possible 1,300 /civil pilots.

civil pilots.

This was far too small to meet the demands for casualty replacement and first line expansion which would come in war. Air Commodore Tedder said it was evident that the only way of solving the problem was to make drastic alterations, both in the numbers of the reserve and in its standard of training. Air Commodore Welsh (Director of Organisation) observed that beyond a certain point increase of reserves might well be more profitable than increase of first line strength.

At the end of 1935 it was calculated on the basis of Scheme F that an entry of 800 per year from civil life to the reserve was needed to build up enough pilots by 1939 (some 8,700) for replacing first-line wastage. This figure, however, would not be enough to allow any first line expansion in the first year of war (even assuming reinforcements from the Dominions) or provide instructors for an enlarged training organisation.

S.35435

In February 1936 Mr. W.L.Scott wrote a paper<sup>(1)</sup> on Direct Entry Reserves. The requirement from civil life was an annual entry of 800 pilots, about 300 observers, and about 200 non-flying (engineers, signals, accounts, stores and possibly medical) personnel, and all these should be men of the public and secondary school type since the duties called for the degree of intelligence that was roughly indicated by the capacity to get a scholarship to a secondary school.

The problem was to attract this type of volunteer in large enough numbers, and a number of conditions for success were postulated. The demands on volunteers' time must be modest (i.e. evenings, week-ends, and one continuous fortnight each year); the training centres must be conveniently accessible, there must be financial inducement and social

/attractiveness

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(1) Appendix 7 - Paper on Direct Entry Reserves by Mr. W.L. Scott dated 20th February, 1936.

attractiveness, employers' co-operation and good publicity must be secured.

From this basis the paper went on to outline a scheme of aerodrome centres (the existing thirteen regular and reserve civil schools with some additions) and town centres.

The flying clubs were considered as possible aerodrome centres, but were not looked on with much favour: their social life was not wholly appreciated, they were weak in training facilities, and they had too many non-flying activities. It was thought best to rely on the aircraft industry for aerodrome centres: the R.A.F. had its hands far too full with regular expansion.

The Auxiliary Air Force, which might have appeared a natural nucleus round which to build a reserve training organisation, was reluctant to sacrifice its exclusive character to serve wider interests. Its standard of expenditure and social rigidity were incompatible with a democratic reserve. In fact its opposition to a suggestion from Air Marshal Bowhill that it should form a reserve of accountant and stores officers (who might have been thought socially acceptable) was so violent that the suggestion was hastily dropped.

The projected direct entry reserve came to be visualised as a collection of young men drawn from the middle class in its widest sense, and with no suggestion in its organisation of "a predetermined social hierarchy."

The social and political setting of the time had considerable influence on discussions about this reserve and on the scheme which ultimately emerged. There was strong popular feeling against any "caste" or "old school tie" distribution of commissions and against the privilege and exclusiveness typified by the attitude of the Auxiliary Air Force. There was also strong feeling against the "militarism" of any

/organised

organised and acknowledged preparation for war.

The second influence was clearly shown in some proposals<sup>(1)</sup> made by Air Commodore Chamier of the Air League of the British Empire in March 1936. These urged the advantages of a "Citizen Air Force" without military commitments, dependent on young men's eagerness to learn to fly cheaply, run by a private company, and paid for at so much a head by the Air Ministry. The excellent publicity to be expected for such a scheme was stressed and so was the advantage of keeping everything on a civilian basis in order to recruit those who objected to "anything with a military flavour". But the prospect of relying for the R.A.F.'s pilot reserves on a possible patriotic urge at the outbreak of war from a private company's collection of unmilitary pupils was too uncertain, and the plan was turned down.

Air Commodore Tedder disliked much of the scheme put forward by Mr. Scott. The number of aerodromes centres needed to build an adequate reserve would call for more instructors than could be found. The avoidance of a "predetermined social hierarchy", and reliance for officers on the evolution of leaders from the mass of the reserve seemed to him unsound. He stressed three essentials in organising a reserve:- first, as high a standard of training as possible, so that the reservist could take his place in a service squadron with the minimum of delay; second, a close connection between the reserve and the regular service; and third, a reserve organised as a second line of defence.<sup>(2)</sup>

/There was

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(1) Appendix 8 - Paper on National Aviation Training by Air Commodore Chamier.

(2) Appendix 9 - Paper on R.A.F. Reserve by Air Commodore Tedder.

There was considerable discussion, in the course of which Air Vice Marshal Freeman (A.M.R.D.) remarked that he could see some advantage in a citizen air force because "most peace-time pacifists become war-time patriots - it requires less courage". The discussion made clear that the suggested new direct entry reserve would be a long-term project needing some four years to reach service efficiency, that full service efficiency could probably be reached only by attaching reservists to squadrons, and that the question of "democratic" or "social hierarchy" commissions in the reserve was really a matter of choosing between the public school boys who might be lost by democratic entry and the secondary school boys who might be lost by "special hierarchy" commissions.

Air Chief Marshal Ellington brought the reserve problem down to earth by saying that immediate casualty replacements wanted fully trained men, that the direct entry scheme being discussed would be of more use after 1939 than before, and that some direct entry reservists would have to be given complete military training in the meantime. Squadrons were too busy with the work of expansion, and so Flying Training Schools would have to be used, even if it meant opening more of them. He also added the pertinent remark that embryo military pilots - not anti-military civil flyers - were needed.

In the end it was accepted that an adequate reserve of pilots could not be created before 1939, and that a direct entry reserve of pilots who had been given full regular training at Flying Training Schools was essential. These "one-year reservists" were to pass back to civil life from the F.T.S., and their training was to begin as soon as the Flying Training Schools had room to spare.

The direct entry scheme, in very much the form that

/Mr. Scott

Mr. Scott had outlined it, was also to be put in force, and Lord Swinton (S. of S.) laid down the following conditions:-

S.37628.

- (i) Every man must be under a liability to serve in emergency,
- (ii) The Air Ministry must have control over the reserve and responsibility for it,
- (iii) The focal points were to be town headquarters and a civil flying school connected with the town headquarters,
- (iv) The general spirit of the town headquarters was to be similar to that of the Artists Rifles,
- (v) There was to be common entry in one rank - airmen pilot,
- (vi) Officer requirements were to be filled by a combination of selection and competition after the age of 21.

The commissioning problem was thus dealt with by compromise, and an obligation of war service imposed. A letter to Air Commodore Chamier explained that the town centres were to be organised "on the basis of good fellowship..... rather than on that of military discipline" in order to avoid "forfeiting the adhesion of these young men who look on flying primarily as a sport".

All that remained was a name for the new reserve. A variety of suggestions appeared - put forward in many cases because of their publicity value. Air Chief Marshal Ellington disposed of all "Civic" and "Citizen" titles by saying that what was wanted was a military reserve, and dealt with those which included "Air Force" by observing that a collection of half-trained pilots would not be an air force but a means of supplying wastage in the R.A.F. Only "R.A.F. Volunteer Reserve" remained as a possible title.

S.37628

The Volunteer Reserve was to be organised under the Superintendent of Reserve. The town centres were to be managed by retired or reserve officers on the Superintendent of Reserve's staff, assisted by local advisory committees. The aerodrome centres were to be run by competent firms

drawn from the whole range of the aircraft industry, beginning with the thirteen schools already engaged on regular and reserve training. Service training was to be given ultimately, after about two years' week-end work, by attachment to service squadrons. Though the scheme included observers, no observer training could be done until the pilots were skilled enough to give them flying practice, and so the Volunteer Reserve was at first confined to pilots.

Ground instruction was to be given at the town centres, and it was expected that each Volunteer Reservist would do some 60 hours flying a year (i.e. 28 at week-ends, 12 on summer evenings, and 20 during the fortnight annual training period).

S.37628

One difficulty in getting the scheme going was lack of instructors. Although good pay (£600 - £750 p.a.) was being offered, the existing thirteen civil schools on regular and reserve training were short of 15 flying instructors, while 15 of the instructors already employed by them were not really up to standard. Widespread training at many centres, and sporadic week-end work, would mean uneconomical use of instructors, and, as Air Commodore Tedder observed:-

"Flying instructors cannot readily be produced in unnumbers: not only is a large amount of experience required before a pilot can become an efficient instructor but he must also have the ability and temperament to instruct. The standard of flying throughout the Service, which is perhaps the one respect in which we are definitely ahead of other nations, has only been attained by strict insistence on a high standard of efficiency on the part of all flying instructors. It is of the utmost importance that we maintain that standard".

No early or large increase in the number of flying instructors could be expected.

Another difficulty was that the V.R. scheme dealt only with the elementary training of a large number of direct entrants. There was nothing to prevent other reservists

/deteriorating

deteriorating in skill. The short service officer or airman pilot who had left the service, and the proposed one-year reservist, would have only a little flying on elementary types provided for them. Since the squadrons were too busy to deal with these reservists, Air Commodore Tedder recommended that some special provision should be made. But although the need for service training was agreed, no facilities for it could be spared from regular work.

The country was carefully analysed for its Volunteer Reserve recruiting potential. The distribution of the existing reserve, the proportion of the middle class, and the political complexion of areas were all taken into account.

The scheme, however, was slow in starting. Financial approval for the flying side was not given until April 1937, and the first V.R. aerodrome centres were not opened until the summer of that year. (1)

By the beginning of 1938 eighteen V.R. centres were either open or scheduled.

A.M.O. A205/36

The one-year reserve plan was introduced, but came to nothing. When the scheme was conceived in March 1936 it was intended that Flying Training Schools should begin to work on the nine-months F.T.S. course between October 1936 and January 1937. To provide the one-year reservists two Flying Training Schools were to start the long course in November, training equal numbers of regular and reserve pilots, while the other F.T.S.'s remained on the short course until June 1937.

/This promised to

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(1) In June, July and August 1937, ten centres were attached to the civil regular and reserve schools at Filton, Sywell, Harworth, Hamble, Desford, Prestwick, Hatfield, Ansty, Brough and White Waltham, and two more opened at Shoreham (Brooklands Aviation, Ltd.) and Redhill (British Air Transport). In October 1937 an aerodrome centre was attached to Woodley and two opened at Gatwick. (Airports Ltd.) and Gravesend (Airports Ltd.). In December one was attached to Perth, and in January 1938 one was opened at Rochester (Short Bros.) Another was scheduled for Castle Bromwich. Of the original thirteen "regular and reserve" schools only Yatesbury, because of its distance from any sizeable centre of population, was without a V.R. aerodrome centre.

This promised to produce more pilots than Scheme F required, and it seemed likely that not only could all Schools go on to the long course, but that 170 one-year reservists could be produced every year even if some F.T.S.'s were closed.

This prospect was based on the one-pilot crewing of April 1936, and disappeared when the two pilot crewing for heavy bombers was introduced early in 1937. With the disappearance of surplus F.T.S. capacity and the necessity for continuing with the short course the possibility of training one-year reservists without opening new F.T.S.'s disappeared as well.

#### The War Training Organisation

The second part of readiness for war, so far as training was concerned, was the planning of an efficient War Training Organisation which could come quickly into operation when it was needed, and this was one of the first aspects of expansion to be tackled.

S.36677

Air Marshal Bowhill insisted that the War Training Organisation must be a "meccano" system, with schools organised as standard functional units, so that their number and proportions could be varied to suit changing requirements of output.

S.34816

To this general plan Air Commodore Tedder added the important requirement that the output must be good enough to take its place in a service squadron with the least possible delay. He then proposed a War Training

October  
1934.

Organisation in three main stages:-

- (i) Ground Training Schools, each dealing with 300 pupils, and giving basic training on a course of 1-3 months duration.
- (ii) Flying Training Schools, each dealing with 120 pupils and instructing on elementary and single engined service aircraft. The course was to be of 11-17 weeks duration.

/(iii)

- (iii) Applied Flying Training Schools, each dealing with 90 pilots and 90 air gunners, to teach military flying on single or twin-engined aircraft (as appropriate). The duration of the course was to be four months.

The ground training schools were to allocate recruits to pilot or air gunner duties, and select officers and N.C.O.'s as well as give basic instruction.

This war training plan was the basis on which peacetime pilot training was reorganised in 1935, and the War Training Organisation was kept in abeyance until the new system of flying training had been decided. In October 1935 it was recast, but with shorter course durations since it had been suggested that Air Commodore Tedder's original proposals were unrealistically long for war conditions, into a scheme for:-

S.36677  
S.34759

October  
1935.

- (i) Ground Training Schools, with 300 pupils and a 4-weeks course.
- (ii) Flying Training Schools (i.e. the war form of the civil schools), with 100 pupils and an 8-week course (50 hours flying).
- (iii) Advanced Flying Training Schools, dealing with:-
  - (a) training on service types (both single - and twin-engined) with 80 pupils and an 8 weeks course (50 hours flying).
  - (b) training in war flying, with 74 pilots and 60 air gunners, on an 8 weeks course (40 hours flying). Single or twin-engined types were to be used, as appropriate, and night flying was to be included for twin-engine pilots.

This main structure of training had a number of ancillaries. A Central Flying School, a Navigation School, and an Air Armament School were provided for training instructors. Observers Schools were also included. The scheme was, however, essentially a pilot-training one.

Some additions were made in July 1936. A Marine Aircraft School was to train in G.R. and deal with flying

boat and shipborne aircraft training, and the School of Army Co-operation was included. In October 1936 the training of air gunners was shifted from the Advanced Flying Training School to the Observers School.

The capacity of schools was arranged to fit, on a "meccano" principle, the anticipated wastage at the previous stage. These wastages were estimated at nil for the Ground Training School, 20% for the Flying Training School,  $7\frac{1}{2}\%$  for (a) and 5% for (b) of the Advanced Flying Training School, and  $16\frac{1}{3}\%$  for the Observers School. Air Gunner wastage during training was put at 10%.

The first line of Scheme F was estimated, early in 1937, to need the war-time backing of 22 Flying Training Schools and 22 elementary schools. These (and the other schools in the War Training Organisation) would need 3,961 aircraft (including 1,292 single engined intermediate trainers, 329 twin-engined intermediate trainers, 722 twin-engined armament trainers, and 260 target towers) over and above the aircraft used for regular peace-time training.

Up to this time the C.A.S. had given no approval for making provision for any War Training Organisation other than a general agreement in February 1935 to one school to three squadrons, the schools being on aerodromes left free by squadrons going overseas. He gave general approval for the Scheme F War Training Organisation in January 1937, but no immediate action was expected: providing aircraft and aerodromes for training after the hypothetical outbreak of a war ranked after providing first-line aircraft and reserves, with which the hands of industry were already more than full.

A revised War Training Organisation was issued in April 1937. The pilot-training schools were renamed

/Elementary

Elementary and Service Flying Training Schools. The Armament Training Camps were to be changed in wartime into Air Observer Schools (of which Scheme F's force would need 13). The Coastal Command training units controlled by No. 17 Group were to come under Training Command in war (this change of control was subsequently dropped).

S.43067

At the end of 1937 there were no reserves of aircraft or equipment for the War Training Organisation, which was therefore - as it had been all the time since 1934 - only a paper scheme incapable of being put into operation if the need for it should arise. Expansion was, however, coming to be regarded less as a deterrent factor in diplomacy and more as a realistic preparation for war, and a practical organisation which could start work without delay was becoming a necessity.

Air Vice Marshal Portal (Director of Organisation) suggested in December 1937 that the War Training Organisation should be phased to the stage which expansion would have reached at various dates. The full requirements of the scheme were so large that the cost of laying down the necessary reserves of aircraft and equipment might be more than could be faced: it would be better to provide only as much as the actual size of the first line needed.

Group Captain Leckie (Director of Training) urged, however, that the size of War Training Organisation should not be reduced because the first-line strength at any particular time had not yet reached the full expansion planned. He pointed out that on the outbreak of war the Air Staff would certainly demand the completion of expansion, and that the War Training Organisation would therefore have to produce men for expansion as well as for the replacement of casualties. As things were, the most that could be done on the outbreak of war was to put the reduced duration of

S.43067

courses laid down by the War Training Organisation into operation. This would increase the output of pilots by no more than 33<sup>1</sup>/<sub>3</sub>% over the peace time figure, and the output would fall short of the war-time wastage of the Metropolitan Air Force even at its 1937 strength by 1,200 pilots, a year, and would be 5,400 per year below the war wastage of the full Scheme F force. To make the War Training Organisation a practical, instead of a theoretical matter, aerodromes were needed as well as reserves of aircraft and equipment.

S.43067

December  
1937

Air Marshal Bowhill and Air Vice Marshal Welsh (A.M.S.O.) agreed, however, that the essential requirements for the War Training Organisation were not available, and were unlikely to be available for a long time to come. The only possibility was to keep the plans for war-time training in line with such aircraft and equipment as could be provided, and so have a sequence of interim, but feasible, schemes instead of a large but unrealisable one.

The War Training Organisation thus became in effect an ad hoc plan, phased not with the requirements of first line strength but with such training reserves of aircraft and equipment as could be made available.

The expansion schemes drafted and considered during 1937 and 1938 reflected the growing need for realistic war readiness by planning schools and aerodromes for the War Training Organisation. Scheme J, in October 1937, aimed at providing 6 Ground Training Schools, 6 Flying Training Schools (i.e. six more than the peace time number) and 54 relief landing grounds. Scheme K in January 1938, added two more Flying Training Schools and four more relief landing grounds. But these were more pious aspirations than practical plans: Air Vice Marshal Portal remarked:-

"Aircraft can, of course, be bought and stored if the money is available, but the acquisition of sites for schools and the provision of the necessary reserve of personnel to man schools may well prove problems beyond our capabilities".

/Higher Organisation

Higher Organisation.

The Flying Training Schools formed in 1935 and 1936 came under the control of No.23 Group. The civil flying schools were supervised by the Superintendent of Reserve, who had been responsible for the reserve training done by them before the reorganised system was introduced, and who had "Inspector of Civil Training Schools" added to his title in 1935: his headquarters were at Hendon.

The School of Air Navigation was directly under Inland Area when it was first formed, but was transferred to No.23 Group in July 1936. No.1 F.T.S., Leuchars, was also transferred to No.23 Group in July 1936.

Expansion made necessary a functional reorganisation of Commands, and as part of this reorganisation Inland Area became Training Command on 5th May 1936. It moved from Stanmore to Market Drayton on 10th July 1936.

All flying, technical, and ground training schools, as well as miscellaneous units such as storage and packing depots, came under Training Command. The Command, however, was concerned only with technical, equipment, medical, works and other administrative aspects; and on these it was the sole link between units and the Air Ministry. Training and personnel matters were the concern of Training Command's Groups, which dealt direct with the Air Ministry on them. The Groups were thus by-passed on administrative matters, and the Command on training and personnel questions: Maintenance Liaison Officers were established at Groups and Personnel and Training Liaison Officers at Training Command.

Training Command in 1936 consisted of No.23 Group, No.24 Group (which dealt with technical and ground training and with the School of Photography) at Halton, and the Armament Group. In addition, it contained Cranwell, which was raised to Group status in July 1936, and the Superintendent of Reserve's H.Q.

No.22 Group, which dealt with Army Co-operation and controlled the School of Army Co-operation, was transferred from Inland Area to A.D.G.B. in February 1936 (and later to Fighter Command).

The only training units outside these Groups were the Flying Boat Training Squadron at Calshot, the Torpedo and Coastal Defence Training Squadron at Gosport, and the School of Naval Co-operation at Lee-on-Solent. These were controlled directly Coastal Command until December 1936, when No.17 Group in that Command was formed at Lee-on-Solent to deal with them.

S.41012

The plans for the War Training Organisation circulated in April 1937 evoked from Air Marshal Burnett (A.O.C.-in-C., Training Command) a strong recommendation that Training Command should be split functionally into two Commands, one dealing with flying training and the other with ground training, because of the unwieldy increase of commitments which would happen in war time. No action was taken, possibly because the essentials of the War Training Organisation were non-existent, and the prospect of an unwieldy Command correspondingly remote.

In December 1937 the Superintendent of Reserve's Headquarters were renamed No.26(T) Group. The amount of training done at civil schools (for which the Superintendent of Reserve was responsible) had grown, and was to increase further.

In February 1938 Training Command became completely responsible for all its Groups (i.e. for training as well as administration), and an Air Officer Administrative was established. The Armament Group was renamed No.25 Group, and a Central Examination Board set up at Grantham to set and mark examination papers and test the practical examinations at civil and Service Flying Training Schools, and to  
/deal with

deal with examinations in Service subjects at the R.A.F. College.

Training Overseas.

In May 1936 Air Commodore Welsh was forced to the conclusion that the United Kingdom would be very congested after Scheme F had been completed. He therefore suggested that units which were not necessary in the United Kingdom for strategical reasons should be established overseas.

In particular, he wanted Flying Training Schools to be located abroad. The schools planned as the long-term permanent provision for Scheme C were in the United Kingdom, but he urged that the extra long-term schools which would be needed for Scheme F should be outside the country.

At this time Cyprus was being considered as a site for a Flying Training School, but its strategical situation was too bad and its weather too good. Air Commodore Tedder thought Egypt unsuitable for the same reason: consistent fine weather meant that little navigation or bad weather training could be done. He suggested Canada, and the suggestion was backed up by a paper from Group Captain Leckie (Superintendent of Reserve), who knew Canada and its flying conditions well.

Training had been done in Canada in 1917-1918, and had been entirely successful; Canada was well disposed towards the R.A.F. from close association in the last war and Canadians were very suitable for recruiting as pilots. Canada was more accessible than Abu Sueir; the U.S.A. was a virtual guarantee of Canada's security; and Canada could be supplied from the U.S.A. should communications become difficult.

At this stage no special consideration was given to the source from which pupils would be drawn, though it was assumed that some recruiting at least would be done for the

/R.A.F.

S.38427

S.38427

May 1936.

R.A.F. in Canada. It was also contemplated that the schools would be R.A.F. organisations training for the R.A.F.

A warning of political difficulties was given by Air Commodore Sholto Douglas. Canada was an attractive suggestion, but Canadians might feel that the existence of a British Flying Training School in Canada would be inconsistent with the Dominion's liberty to remain neutral in war. This warning was confirmed by Air Vice Marshal Peirse, who thought it undesirable for political reasons to contemplate setting up R.A.F. schools in the Dominions.

A number of alternative suggestions were put forward. Air Vice Marshal Peirse proposed arrangements with the Dominion Governments to train given numbers of pilots per year, the training being done in Dominion Air Force schools staffed partly by Dominion and partly by R.A.F. personnel, and considered it practicable to set up schools which would be nominally Dominion but virtually British. He also suggested locations in India (Bangalore), Rhodesia, or Kenya. Air Commodore Sholto Douglas had already advanced Northern Ireland as a possibility.

Air Marshal Newall then asked for the C.A.S.'s approval in principle to the establishment of a school in Northern Ireland, since the immediate problem was home defence. He was in favour of the Canadian project, and liked the idea of India, although the financial complications there would be formidable.

Three distinct conceptions were in fact contained in these various suggestions. One was the plan of locating overseas, as 4 F.T.S. was located at Abu Sueir, R.A.F. schools training R.A.F. recruits. The second was a scheme for the Dominion training of Dominion recruits for service with the R.A.F., and the third was a plan for "nominally Dominion but virtually British" schools training to R.A.F. requirements.

requirements. These conceptions were not clearly distinguished in 1936, but they had considerable significance later.

In June 1936 Air Chief Marshal Ellington agreed in principle to establishing a school in Northern Ireland, but foresaw difficulties over the site and the climate. He endorsed a suggestion, which Lord Trenchard had just made, that Caithness would be a good location. He expected no insuperable difficulties over location in India, and found the Canadian proposal attractive, though he expected political obstacles to the establishment of schools in the Dominions. Finally, he put the Air Staff order of preference as:-

1. Caithness
2. Northern Ireland
3. Canada
4. India
5. New Zealand
6. Australia
7. South Africa

Northern Ireland was turned down at once. Air Marshal Bowhill considered the prevalence of low cloud too serious a difficulty. He also thought the same reason, together with the extreme variation in hours of daylight, very unfavourable to the suggestion of Caithness. (1)

Air Commodore Welsh took stock of the F.T.S. position in July. Of the nine schools which would remain after Scheme F expansion had been completed only one, No.8 F.T.S. at Montrose, still needed a permanent location. Although Caithness might provide the solution, he still felt it would be wise to place some schools abroad to relieve congestion. He also pointed out that in war the R.A.F. would probably have to go abroad for some of its training, and suggested that the Canadian proposal should be pursued.

/ There was,

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(1) Caithness was, however, surveyed, and in due course Kinloss and Lossiemouth became Flying Training Schools.

There was, however, no overwhelming urgency about the pursuit. Eleven R.A.F. Flying Training Schools were at work, and though five of them were occupying aerodromes earmarked for operational purposes, all but one of the five were scheduled to move to a non-operational station in the next year or two.

Canada had been asked in 1934 to join in the "trained cadet" scheme which was working successfully with Australia. This was a scheme by which Australian pilots, trained in Australia, were given short-service commissions in the R.A.F., and returned to the Reserve of the R.A.A.F. at the expiry of these commissions. Canada had accepted the scheme in principle in June 1935.

The suggestion of a Flying Training School in Canada was discussed between Mr. Ian Mackenzie (Canadian Minister of National Defence) and Air Commodore Tedder in August 1936. Air Commodore Tedder left the details as fluid as possible, so that they could be put forward in the way most likely to be acceptable to the Canadian Government, and Mr. Mackenzie undertook to take the question up. There was, however, strong feeling in Canada against being tied to any form of Imperial Defence organisation.

No answer came from Canada, and in February, 1937, Lord Swinton (S. of S.) asked Mr. Malcolm MacDonald (S. of S. for Dominions) for help in getting some reply about both the F.T.S. proposal and the "trained cadet" scheme, from which trained pilots should have arrived in December 1936.

Still Canada gave no answer, and in June the attitude of the Canadian Delegation at the Imperial Conference satisfied Lord Swinton that no useful purpose could be served by taking the question up again. He then informed the Air Council that the proposal to set up a Flying Training School in Canada could be regarded as dead.

June  
1937

S.38427

/Air Vice

Air Vice Marshal Welsh moved on to the next location in order of priority. India was investigated.

Air Vice Marshal Peck (A.O.C.India) considered, in August 1937, that the establishment of a Flying Training School in India would have many advantages, but he was concerned lest its establishment should appear to be Imperial acceptance of financial responsibility for Indian defence. The dilemma was that if India bore the cost of defence, defence was limited by the slowness and inefficiency of Indian administration, whereas any attempt to obtain greater efficiency would mean Imperial acceptance of the expense. The policy was to encourage India to improve and modernise her own defences, rather than rely on Imperial help, and Air Vice Marshal Peck felt that the F.T.S. proposal might cut across this.

Air Vice Marshal Portal summed the position up in September 1937: establishing a school in India would involve extra cost and political difficulties, and would in any case be a slow business. Air Vice Marshal Welsh agreed that the idea of an F.T.S. in India should probably be dropped, but still clung firmly to the advisability of putting a school outside the United Kingdom, and proposed Palestine, Kenya, or South Africa.

The Indian proposal flickered into life again. In October Air Vice Marshal Peirse was in favour of it because there were signs of a change in Imperial relations with India over defence: in November Air Vice Marshal Peck reported favourably on the possibility of Bangalore and the probable attitude of the Government of India. But the flicker died away, and by the end of 1937 the India scheme was shelved.

Air Vice Marshal Peirse had not looked kindly on the proposals of Palestine, Kenya, and South Africa. Strategic vulnerability and political difficulty were the reasons, and these schemes, too, were shelved.

SUMMARY

The first three years of expansion were marked by a good deal of clear thinking about the scope and purpose of training. The important principle that instruction given at schools should fit a man to take his place in flight training immediately on posting to a squadron - i.e., that squadrons should not be expected to do individual training - was established in 1935 by the reorganisation of flying training.

The necessity for accurate navigation was recognised. "Pilotage and Bradshaw" were acknowledged to be out of date, and by 1936 the need for pilots to be competent navigators over long distances and under difficult conditions had been plainly stated.

The "T.E. bomber" problem was defined in 1935 as a question of navigation plus experience, with "experience" covering night and bad weather flying.

Specialised advanced trainer aircraft combining the requirements for pure and applied flying training, were agreed to be necessary, and S.E. and T.E. trainers, having the chief "common factor" characteristics of the operational types for which they were the preparation, were specified in 1936.

The essentials of an efficient reserve were analysed as a high standard of training and close connection with the regular service. The size of reserve needed for replacing casualties and for expanding the training organisation in war was assessed, and a workable War Training Organisation laid out. Though it may seem deceptively like a truism, A/C Welsh's remark that beyond a certain point increase of reserves might well be more profitable than increase of first line strength had far-reaching implications.

S.32963

The arguments for doing training outside the United Kingdom were made plain, and the advantages of Canada

/appreciated.

appreciated. The disadvantages of areas with consistently fine weather were also realised.

All those basic requirements were clearly seen, clearly stated, and generally accepted. But the clarity with which they were defined was matched by the ineffectiveness with which they were put into practice. Minor obstacles and short term considerations continually modified, hamstrung, or postponed the application of far reaching principles.

The reorganisation of flying training was planned to turn out pilots who would need little or no individual instruction in squadrons, and to bring pupils up to this standard a total period of 13-14 months at school was considered necessary. Yet the period was cut down first to a year in order to avoid any material increase of cost, and then to nine months in order to meet Scheme C's demand for pilots before April 1937.

S.34816  
The first cut was in essence a refusal to face the fact that more thorough training needs longer time and consequently involves greater expense. The Treasury was never asked to sanction the expense of a longer training period in order to produce better trained pilots: the Air Ministry's letter requesting financial approval said in one paragraph, "with the development of air warfare... the time available within the total period of a year (has become) insufficient to give the basic training required", but went on after describing the proposed reorganisation to the somewhat contradictory statement, "time will be available, still within an average total period of a year, to give much more satisfactory training".

The second cut amounted to treating expansion as a temporary matter of urgency. The aim was to get pilots into squadrons by April 1937 without the trouble, expense, and dislocation of opening schools for a short time only.

/It showed

It showed that expansion was being geared not to the time needed for producing fully trained men but to the date set either by the manufacture of aircraft or by the need for first line strength as a diplomatic deterrent. A/C Tedder had urged a different policy, saying in 1934:-

S.32963

"In my opinion expansion of Service Squadrons must be based on a reasoned training expansion programme. If we attempt, as we did in the last war, to make our training expansion fit a hypothetical squadron expansion, we shall again fall between two stools and secure neither the squadrons we want nor the training which is requisite."

As a matter of training cutting the duration of courses was robbing Peter to pay Paul. What was left untaught in schools because of lack of time inevitably became a matter for individual training in squadrons. Squadrons, however, were less well equipped than schools for basic instruction, and were hampered by such corollaries of expansion as rearming, dilution with inexperienced men, and shortage of equipment.

As a matter of readiness for war the cut in pilot-training time was a definite handicap. Full individual proficiency was reached more slowly in squadrons than at schools, and collective training was hampered not only by the need for individual teaching but also by the existence of surplus pilots turned out by accelerated production from the schools.

The effects of curtailing the F.T.S. course were most marked in T.E. bomber and G.R. squadrons, for which pilots needed a considerable amount of training in navigation, night flying and bad weather flying.

The obvious solution was adopted only for G.R. pilots, and then only for navigation and reconnaissance.

The argument that expansion was urgent and temporary postponed the project of special instruction for bomber pilots, and their training remained with squadrons.

Rather half-hearted attempts were made to provide squadron  
/navigation

navigation officers for teaching the subject, and some of these "s.n." officers were trained on unsatisfactory courses at civil schools. By the end of 1937 a proportion of bomber pilots were being trained, after they had served in squadrons some little time, by a less efficient equivalent of the navigation course given all maritime pilots after leaving the F.T.S.

Conversion to twins became a matter for the F.T.S. when Ansons were brought into use at schools, but conversion was a comparatively small part of the special training required by bomber and maritime pilots.

Night flying and bad weather flying remained matters primarily for squadron training. They were included in the F.T.S. syllabus, but the six months' course duration did not permit more than an elementary introduction to them.

Crew training also showed initial acceptance of the principle that schools should turn out fully trained men, followed by a drift towards reliance on squadron training.

Observers were introduced in 1934 in order to replace unsatisfactory unit-trained air gunners by efficient school-trained men, and an Air Observers School was set up. But as observers became more and more concerned with navigation, more and more of their training fell once again to squadrons. Air gunners, who reappeared for such gunnery duties as were not done by observers, were squadron trained the whole time.

Nothing was done about the need for adequate and general training in navigation for a variety of short-term reasons. First, pressure of expansion did not allow the time or facilities for teaching any but maritime pilots. Second, the policy that pilots were responsible for navigation, and the two pilot crewing of large aircraft, made it unnecessary to train observers. Third, the awkward case of such aircraft as Blenheims was a passing phase which could be dealt

with by squadron training. Fourth, a number of personnel and financial arguments were advanced against full time and fully trained observers.

Navigation was, in fact, a case of inability to see the wood - the need for someone to be trained to navigate - for the trees. The proportion of long range aircraft increased rapidly, but not until 1938 was any thorough and general training of the men to navigate them begun.

Astronomical navigation, as a service method, was only just emerging from the development stage at the end of 1937. Training in it was not a general possibility because the necessary books and equipment were not yet available.

Armament was in rather better case. The second term of the F.T.S. course was largely devoted to its teaching, and observers were given a practical armament course. But though this school training of pilots and observers was reasonably satisfactory, the unit training of air gunners was not.

Little increase was made in the reserve. The only possible way of providing more pilots quickly - the "one year reservist" scheme for training at Flying Training Schools - was killed when an unchanged number of schools had to produce two pilots instead of one for each large aircraft. This increased demand for pilots also killed the possibility of extending the F.T.S. course in 1937 to its originally-intended nine-months' duration.

The Volunteer Reserve, after it emerged from the curious combination of anti-military opinion and social considerations discussed in 1936, made slow progress. At the end of 1937 it consisted of only 1,200 pilots in various elementary stages of training.

The War Training Organisation existed on paper, but there was virtually nothing with which to put it into

/practice.

practice. At the end of 1937 there could have been no difference, except in the length of courses, between the peace and war training organisations.

Training overseas had not developed at all, in spite of A/V/M. Welsh's pertinacious urging and exploration. Canada was unwilling to become associated with any form of Imperial Defence, while various political and strategic reasons were accepted against other possible locations.

The practical results of the clear thinking about training done in the first three years of expansion can thus be summed up quite briefly. The structure of pilot training had been broadened and given greater war readiness by bringing in civil schools. The F.T.S. course had been made more efficient, and pilots' armament training properly catered for, by the reorganisation of flying training. Reasonable navigation and reconnaissance training had been provided for G.R. pilots only. Specialised advanced trainers for pilot training had been designed and ordered.

For the rest, there had been a great deal of discussion, "pressure of expansion", and temporary stop-gaps, but the main principles had not been put into effect.

6. April 1938 - August 1939

In March 1938 Germany annexed Austria. Expansion  
May 1938. Scheme L, prepared as a matter of urgency, was approved in  
May.

1937 -1938 Scheme L was essentially an accelerated version of  
Schemes J and K, which had been under consideration during  
the winter, and were intended to match the growing size of  
the German Air Force. They (Schemes J and K) aimed at  
providing a Metropolitan Air Force of 2,387 first line air-  
craft, with increased strength overseas, by the middle of  
1941. The Air Staff wanted to reach this first line strength  
more than a year sooner, by April 1940, but the middle of  
1941 was the earliest that could be achieved under peace  
time conditions of industry and recruiting.

In Scheme L the principle of "no interference with civil  
industry" was dropped, and the date of completion brought  
forward to April 1940. Only a slight first-line increase  
over Scheme F was planned by April 1939, but there was to  
be a great growth of bomber strength during the following  
year. The Metropolitan bomber force (40 medium and 28  
heavy squadrons at April 1939) was to become 26 medium  
and 47 heavy squadrons by April 1940, while 33-1/3% increases  
in the I.E. aircraft per squadron were to bring its first  
line strength up from 990 to 1,350.

In September 1938 the Munich crisis emphasised the  
urgency of complete readiness for war, and led to expansion  
Scheme M, which planned to provide more fighters and have  
all bombers of the largest type.

March 1939 In March 1939 Germany seized Czecho-Slovakia. Scheme  
M was approved, and compulsory military service (the "militia")  
introduced. The militia, however, came too late to affect  
the problems of aircrew recruiting and training before  
war broke out on September 3rd.

Throughout Schemes J, K, L, and M there was a steadily mounting insistence on complete manning of the peace first line and provision of personnel reserves. The requirements of trained men rose sharply, and out of proportion to the increase in first line strength, since there was to be a great expansion in large aircraft which needed more pilots, more crews and more maintenance staff.

#### Scheme L

Scheme L set a formidable personnel and training problem. In April 1938 Group Captain Slessor (D.D.Plans), Group Captain Linnell (D.D.W.O.) and Group Captain Bottonley (Bomber Command) made a realistic assessment of true first line strength instead of the "facade peace first line".

A.H.B. V/  
5/10.

Bomber Command was likely to have a serious and growing deficiency of trained crews as Scheme L developed. To provide enough Flying Training Schools to turn out the pilots needed for Scheme L's expansion would mean depleting the first line by drawing the necessary instructors and other personnel from it. To provide crew training would mean further depletion of the first line. It was therefore impossible to have the Scheme F force fit for war in 1939 and at the same time create the Scheme L force by 1940.

Trained reserve crews were non-existent, and there was no advanced training organisation for the Volunteer Reserve. The reserves which should be behind the Scheme L force in 1940 could not possibly be trained by then.

Lack of reserves, in fact, would limit the effective operational strength of Bomber Command. Whether its nominal first line was 990 in April 1939, 1,200 in October 1939, or 1,350 in April 1940, it was doubtful whether more than 500 bombers could be operated: the rest of the nominal strength would have to be used as reserves, and would limit the time for which the first line could sustain operations to something between 7 and 19 weeks. The prospect for Fighter

/Command

Command was similar, but set a simpler problem since crew training was not involved. Group Captain Slessor summed up the position by saying, "The principal point that emerges is the absolutely vital need for drastic action in respect of regular crew and reserve training".

The way in which reserve requirements mounted because of the increasing number of large aircraft can be seen from a comparison of the estimated wastages during the first year of war strength of Schemes J, K, and L:-

A.H.B.  
V/5/9

Scheme F	8,291 pilots	10,939 other air crew
Schemes J, K, and L	15,661 pilots	21,584 other air crew

To sustain the first line of Scheme L in war it was estimated that a monthly output of 1,800 aircraft, 1,135 pilots, and 1,466 other air crew would be needed. In June 1938 Group Captain Slessor suggested that the scale of operational effort and wastage on which these calculations were based should be reviewed to make sure that planning was being done on a sound basis.

S.32963

A committee was set up under Air Vice Marshal Sholto Douglas, and among the conclusions which he embodied in a memorandum dated 28th June were:-

If a full War Training Organisation of 33 E.F.T.S.'s, 33 S.F.T.S.'s, 25 A.O.S.'s, and 7 Navigation Schools came into operation without delay, a reserve of 8,760 pilots, 3,131 observers, 1,490 air gunners, and 6,980 wireless operators would be required. The War Training Organisation would be called on to produce 1,100 pilots, 500 observers, 400 air gunners, and 900 wireless operators per month, and would need 7,055 additional aircraft (including 2,178 T.E. types) during the first four months of war to bring it into operation.

These figures were for Scheme L at the strength it was planned to reach in April 1940 (slightly higher figures were also worked out for April 1941), and were accepted by Air Chief Marshal Newall as a basis for calculation. The regular training requirement for manning the expanding first line in peace was mounting as sharply as those war-time requirements of reserves and war training.

Since 1935 the annual output of pilots from the schools had been about 1,500; to provide the pilots for Scheme L by April 1940 a rate of 2,500 was needed in 1939. To turn out 1,000 extra pilots in a year needed eight more Flying Training Schools and sixteen more civil schools, but of the eight F.T.S.'s only three would be a permanent peace-time requirement: the other five were wanted only for a one-year spurt in 1939.

At first the observer training problem was simplified by Scheme L: the increasing proportion of large aircraft carrying two pilots meant that fewer observers would be needed. But in May 1938 it was decided to include an observer in the crew of every bomber and G.R. aircraft, and the number of observers required by April 1940 went up suddenly from some 700 to over 2,000. Only 300 - 400 had been trained by the early summer of 1938, and the training rate, which had been 200 per year in 1937, had to increase to 2,000 per year in 1939. Moreover, all future observers had to be given the long training in navigation required by Air Chief Marshal Newall's ruling of December 1937.

#### Flying Training Schools.

Eight more F.T.S.'s, over and above the eleven already at work, were needed to provide the pilots for Scheme L by the date set, April 1940. To man these eight schools some 300 officers and 4,000 airmen were required and practically all would have to be drawn from squadrons in the first line.

Squadrons were already considerably diluted with inexperienced men, and to take away a large number of experienced pilots and skilled maintenance staff for employment in Flying Training Schools was likely to wreck their efficiency. Air Vice Marshal Sholto Douglas wrote, "as a result of intensive efforts during the past two years the squadrons are just beginning to attain some sort of standard of operational

/efficiency.

efficiency. I feel that we should do everything in our power to maintain and improve that standard". Air Vice Marshal Peirse was "seriously concerned about the effect on first line squadrons".

The comparatively small nucleus of experienced pilots was in fact wanted for three distinct purposes: as the backbone of squadrons' war readiness, for training new pilots as squadrons worked up, and as instructors in schools. The nucleus was not enough to serve all three purposes fully, and so the number of extra Flying Training Schools to be opened was cut down to four. A suggestion by Air Commodore Leckie that some pilots straight from F.T.S. should be trained and employed as instructors was not considered likely to make a substantial reduction in the number of experienced men wanted. The suggestion was acted on, however, with the result that an appreciable, though not catastrophic, lowering of the standard of F.T.S. instruction was observed.

Four Flying Training Schools instead of eight would cause a deficiency of 720 pilots in April 1940. It had, however, been planned to offset the shortage of reserves to some extent by providing spare pilots in squadrons, and the deficiency of 720 only meant that these spare pilots would be lacking in April 1940. The deficiency would be overtaken in the following September. The reduction to four

/additional

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additional schools<sup>(1)</sup> was approved in April 1938.

S.34816 The length of course remained unchanged at six months: the mounting demand for pilots and inability to open more than the minimum of additional schools made the originally-planned nine months duration more remote than ever. The "reorganised" system was, however, generally considered to be successful, to have raised the standard at which pilots left schools; and to have relieved squadrons of responsibility for much individual training: and it was confirmed as the permanent system of pilot training in June 1938.

S.46938 Nevertheless, it was necessary for Air Chief Marshal Newall to write in May 1938:-

"(i) There is no doubt that the standard of training attained by pilots when they join Service units is higher now than it has ever been before, but at the same time there has been a great increase in the complexity of the modern bomber aircraft and also in the responsibility of the captain of the aircraft having regard to the size of the crew and the cost of the aircraft. The improvement in the standard of training although very considerable has not kept pace with the increased demands on the fully trained pilot. There is therefore a gap which we must fill between the time the pilot leaves his F.T.S. and the time when

/he is fit

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(1) No.12 F.T.S. opened at Grantham in December 1938, No.13 at Gullane in March 1939, No.14 at Kinloss in April 1939, and No.15 at Lossiemouth in May 1939. Gullane was renamed Drem in June.

To feed these four new F.T.S.'s with pupils six additional civil schools were employed on regular pilot training:-

No.15	E. & R.	F.T.S.	Redhill
No.19	"	"	Gatwick
No.20	"	"	Rochester
No.22	"	"	Cambridge
No.23	"	"	Gravesend
No.30	"	"	Derby

No.11 F.T.S. moved from Wittering to Shawbury in May 1938, and No.6 from Netheravon to Little Rissington in August 1938.

No.1 F.T.S. changed from ab initio training to the reorganised system of Intermediate and Advanced Training Squadrons, and began to draw its pupils from elementary civil schools, in May 1938. Its output continued to go to the Fleet Air Arm, and it moved from Leuchars to Netheravon in August 1938.

In May 1939 No. 7 F.T.S., Peterborough also began to train for the Fleet Air Arm, its T.E. aircraft being replaced by S.E. during the summer of that year.

he is fit to assume the responsibilities of captain of an aircraft. In addition there is the consideration that during the period immediately following the arrival of a pilot at a service unit, he is in what we have called "the accident-prone zone", and it is therefore desirable that he should be trained on to flying the big expensive types by an interim stage rather than by flying them immediately after leaving the F.T.S.

In my opinion there should be an interim stage after leaving the F.T.S. when a pilot should concentrate on getting in air hours. He would not go up with a full crew and would fly the lighter types of modern aircraft. The ideal is to give him air hours on an aircraft with all modern characteristics, such as retractable undercarriage, V.P. aircrews, etc., but in the meantime we must make do with aircraft which are available. The surplus of pilots in squadrons will allow this training to be given, without appreciably interfering with operational training.

The above applies to Bomber Command only."(1)

The development of modern trainers had been going on, and the Airspeed Envoy had eventually been modified into a T.E. trainer named the Oxford.(2) It had been decided in 1936 to have special S.E., as well as T.E., trainers with modern characteristics, and the D.H.Don was designed as the S.E. trainer. In April 1938, however, the Don proved

/unsatisfactory

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(1) Air Chief Marshal Newall went on:

"(ii) Some time ago, it was decided that even for initial training it was desirable that the aircraft used for this purpose should have, as far as possible, the characteristics of modern service aircraft, i.e. low-wing monoplanes. There is no doubt that the modern low-wing monoplane has certain inherent disadvantages, particularly in regard to spinning, and it seems clear that it is more difficult to recover from a spin in an aircraft of modern characteristics than it used to be in the older biplane types.

I do not consider that it is in any way necessary that at initio training should be carried out on aircraft with modern characteristics; what we require is a simple aircraft, free from vice, easy to maintain, and easy to fly, which will give the pilot confidence in himself and in flying generally and will be easy to extricate from a difficult position should it, for instance, be inadvertently put into a spin.

I have therefore decided that we will abandon our present ideas at the earliest possible date, and revert to an older type such as the Moth, for ab initio training.

The Magister will serve an extremely useful purpose in enabling a pupil to gain air hours when he has left his Flying Training School.

Both these decisions are, I think desirable in order to avoid accidents, particularly under the stress of rapid and extensive expansion."

(2) The Oxford was brought into service of No.3 F.T.S. South Cerney, No.5 F.T.S. Sealand, and No.7 F.T.S. Peterborough in June 1938.

unsatisfactory, and it was necessary to continue with Harts for S.E. training until the N.A.16 (Harvard) could be obtained and the Master produced. (1)

There were differences of night flying policy between Commands, and a standard policy for night lights and night flying was worked out in 1937 and 1938. Flying Training Schools continued to do little more than "ensure that every pilot had flown at night".

The use of Tutors for instrument flying was discontinued in 1937, Harts taking their place. Link Trainers were installed at Flying Training Schools early in 1938. (2)

627393/37

In February 1939 Air Vice Marshal Pattinson (A.O.C. No. 23 Group) pointed out that bad weather training (for which Bomber Command had asked) was virtually impossible at Flying Training Schools. No.F.T.S. aircraft were equipped with wireless, and it was therefore essential that pupils should keep in sight of the ground on cross-country flights: instrument flying could only be practised under the hood. The syllabus required nothing more than hooded flying and Link instruction: at the elementary civil school stage five hours under the hood and some Link training were given, while at the F.T.S. a 10 hours Link Trainer course and as much hooded flying as possible were done.

Air Marshal Burnett (C.-in-C., Training Command) added the argument that there was no time in the F.T.S. course to make the addition of bad weather practice possible. He also considered that no time for it could be found in the pilots'

/navigation

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(1) The first Harvards were used at No. 12 F.T.S. Grantham in January 1939. Masters were not introduced until 1940.

(2) Link Trainers were introduced only because it was difficult to give enough airborne practice in instrument flying. In general, it was considered desirable at this time to give as much instruction as possible in the air.

navigation course,<sup>(1)</sup> and that it could therefore not be done until pilots went to the Group Pools.

The formation of Group Pools for Bomber and Coastal Commands had, however, been postponed, and Air Vice Marshal Sholto Douglas insisted that pilots should be given the best grounding in instrument flying possible at Flying Training Schools. The syllabus requirements nevertheless remained unchanged, and the impossibility of F.T.S. practice in cloud and bad visibility was agreed.

For the same fundamental reason, lack of wireless facilities, the cross country night flying exercise was cancelled in March 1939. Air Marshal Burnett said:-

"When this exercise was introduced it was considered that it could give the young pilot confidence in his ability to fly by night out of sight of the aerodrome lights, and that it would relieve air congestion in the immediate vicinity of the aerodrome.

Experience now indicates that the risk involved in sending pupils on cross country flights by night with no proper navigational facilities or wireless aids, particularly in the multi-engined types where the view to starboard is poor, is such that these flights have to be almost entirely confined to nights when the visibility is sufficiently good to enable a pupil to see his own aerodrome's beacon throughout the flight. It will be appreciated that under such conditions there is little to be gained by this exercise whilst any sudden and unexpected deterioration of weather conditions is likely to result in pupils getting lost with probably serious results."

It was recognised that these shortcomings in night and bad weather training were at variance with the professed intention that F.T.S. training should be carried "to the stage at which the pupil will have completed his individual training and have had some experience of Flight training", but pressure of time and lack of facilities made it inevitable for night cross country and bad weather training to be left to a later stage of a pilot's career.

The training given to Battle pilots came under review

/late in

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(1) See Page 149 .

late in 1938. It was laid down by the Air Ministry that they should be trained on S.E. aircraft, and be given a limited amount of bomb aiming practice on T.E. aircraft: and a suggestion from Training Command that it would be better to teach them on T.E. aircraft so that they got more training in piloting for precision bombing and photography was turned down.

627393/37

In February 1939 it was decided to standardise the training for all S.E. type pupils at Flying Training Schools, and give no special bombing instruction to those destined for S.E. bomber squadrons. This reduced the different types of pilots to be trained to two:- S.E. or Group I, and T.E. or Group II.

In May 1939 the proportion of pupils to be trained as Group II was two-thirds - reflecting the greater number of multi-engined aircraft planned by Schemes L and M - but some schools continued to train only one-third of the intake as Group II because their strength of T.E. trainers had not yet increased. (1)

S.51631

By April 1939 the prospective deficiency of pilots at April 1940 had grown to some 1,200, and a still larger deficiency of 2,000 was promised for 1941. Air Vice Marshal Philip Babington (D. of P.) pointed out that the remedy needed was a violent increase of output in the near future without any general growth of overheads. The difficulty of providing experienced men to staff the schools was still, as it had been a year before, a serious limiting factor.

The only solution possible under these conditions was to put some form of the War Training Organisation into operation. (The War Training Organisation produced a greater rate of output by increasing the number of pupils

/at each

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(1) The establishment for a Flying Training School dealing with two courses of 48 pupils each (two-thirds being Group II) was at this time 64 (26 S.E. and 38 T.E.) aircraft.

at each school, working shorter and more intensive courses, drawing extra instructors from the reserve, and using more aircraft.) The full War Training scheme was not considered practicable in peace time, but the possibilities of either increasing the pupil population or shortening courses were considered. The discussion brought out a number of difficulties: the extra wear and tear of more intensive work would need runways and Relief Landing Grounds, but F.T.S. airfields were grass and the schools had only four R.L.G.'s suitable for the new types of training aircraft against a requirement of 20; and there was the familiar problem of finding enough instructors. The most serious difficulty turned out to be lack of training aircraft. Additional Ansons, Oxfords, and Harvards would not begin to be available until late in 1939, while Masters would be later still.

S.51631  
June 1939  
In the end it was decided to adopt a plan suggested by Air Vice Marshal Pattinson. The size of F.T.S. courses was to be increased from 48 to 60, beginning in September; each school was to be given eleven extra aircraft (5 S.E. and 6 T.E.) with additional maintenance staff and an improved supply of spares; one additional staff pilot was to be provided; and the instructor strength was to be kept up to establishment.

The plan was to apply to all schools except Nos. 1 and 7, and was estimated to produce 468 more pilots per year. Increased intakes at the civil schools began in June, but war broke out before they passed on to the Flying Training Schools.

#### Navigation

The need to give pilots more navigation training than the F.T.S. course included was agreed in 1937. There was to be a separate navigation course following a pilot's F.T.S. training: it was to last ten weeks, and produce

/the "s.n."

the "s.n." standard to which only squadron navigation officers had originally been trained. In addition, half the pilots destined for large long-range aircraft were to have a four weeks' course in astronomical navigation.

The numbers to be dealt with were formidable. Plans were made for giving 1,500 pilots navigation training in 1938 and 1939, and the capacity of the School of Air Navigation was increased by transferring the navigation and reconnaissance training of pilots for G.R. squadrons to a new School of General Reconnaissance at Thorney Island in April 1938.

Even so, Manston could not handle all the training. Six civil schools<sup>(1)</sup> were to be used for the remainder, working to the Manston syllabus and including air exercises in their instruction. The astronomical navigation courses were to be held at Manston.

April-May  
1938.

This scheme was to start in April 1938, when the School of Air Navigation began dealing the larger courses. Two civil schools<sup>(2)</sup> began working to the Manston syllabus in May, and the other four civil schools were to start during the summer. In April, however, the lack of trained observers was seen to be serious, and these four schools were changed to observer training. The rate at which pilots could be trained in navigation was therefore limited to some 900 a year, and only bomber pilots were given the training.

May 1938

In May, a radical change was made in navigation policy. It was thought that training pilots in navigation by means of a 10-week

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(1) Including four which had been approached to do observer training.

(2) Air Service Training, Hamble, and the Imperial School of Air Navigation (which moved to Shoreham and changed its name to Martin's School of Air Navigation).

of a 10-week course would be impracticable in war, and that the most that could be done would be to teach basic D.R. navigation so that pilots could supervise the navigation after some experience as second pilot. Accordingly, a Conference on Training and Establishment of Air Observers in War S.40289 decided that in war time the observer should be responsible for the navigation of aircraft.

This decision meant that a fundamental change of policy, from pilot responsibility for navigation to observer responsibility, would occur at the outbreak of war. It had as a corollary the need for adding observers to peace time crews and training them in peace time: otherwise there would be almost complete reliance on the Volunteer Reserve for observers and navigation in war. Observers were accordingly added to the peace time establishments of all bomber and G.R. aircraft, and the requirement for observer training went up sharply.

Thus by the middle 1938 a very rapid and considerable development had taken place in the policy of providing for navigation. Late in 1937 pilots (except those who went to Manston or the civil schools for "s.n." or equivalent courses) and observers were given only a four weeks training in basic D.R.,<sup>(1)</sup> their further training being left to squadron navigation officers. After May 1938 all pilots and observers were to be trained by 10-week courses up to "s.n." standard, and some pilots were to be trained in astronomical navigation as well. Moreover, all bombers and G.R. aircraft were to carry an observer as well as the pilot or pilots.

In February 1939 W/Cdr. Mackworth (O.R.3) pointed out that this seemed to involve a disproportionately large amount of teaching and flying to ensure that aircraft were

/safely

(1) At the F.T.S. (pilots) or at North Coates (observers).

safely navigated. Three men were being fully trained for every large aircraft, and two for every smaller bomber.

To cut down the amount of training effort thus devoted to navigation he proposed that navigation should become the observer's responsibility in peace as well as war, and that pilots should be given only sufficient training to enable them to get across country or bring the aircraft back in emergency. The observer would be given a 10-week course to "s.n." standard, plus an astronomical navigation course in the case of long range aircraft: the pilot a 6-week course: squadron commanders the 10-week and astronomical navigation courses: and G.R. pilots the School of G.R. course.

S.47667

Air Chief Marshal Ludlow Hewitt objected strongly to the idea of making the observer responsible for navigation, arguing that the captain should be both competent and responsible, and should then delegate navigation to the observer; if the observers were made responsible the pilot would wash his hands of navigation. Air Vice Marshal Sholto Douglas, however, saw no difficulty in the captain being less fully competent than the observer, provided a pilot's basic grounding was good enough to enable him to appreciate the problems of navigation.

The policy of observer responsibility for navigation was introduced in May 1939 (1). It was acknowledged that the previous aim of training all pilots and observers on 10-week courses had never been realised in practice. In future all pilots were to be given basic training, beginning at the F.T.S. and continuing with a 6-week course at a navigation school. Observers were to be trained to the highest standard required, and were therefore to be given the 10-week course (for which 12 weeks were allowed at civil schools)

/and the 4-week

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(1) Appendix 10 - Letter from the Air Ministry to all Commands (except Maintenance Command) dated 22nd May, 1939.

and the 4-week astronomical navigation course if it was needed. Pilots were to be capable of supervising navigation, and of bringing back the aircraft in emergency. Squadron leaders were to have a six weeks' advanced navigation course so that they could give adequate supervision to squadron training.

To ensure that pilots were trained to the required standard the F.T.S. syllabus was to be rewritten so that it and the later six-week course at the navigation school would together cover the same ground as the ten-week course.

It was recognised that the School of Air Navigation gave better training than the civil schools, and that observers ought therefore to be taught "to the highest standard required" at Manston. The capacity of the schools and the numbers concerned, however, made it awkward to put this into practice ; and it was decided to keep pilot training at Manston and observer training at civil schools until the change could be made conveniently.

The F.T.S. syllabus was to be revised at once, and six-week navigation school courses were to start in August 1939. Astronomical navigation courses for observers began in June.

#### Observers.

In December 1937 the plan of training required by Air Chief Marshal Newall's ruling that observers should be trained up to the Manston 10-week standard in navigation was sketched out. Three weeks were to be given to gunnery (with 10 hours flying), three weeks to bombing (12 hours flying), and twelve weeks to navigation: some service subjects, such as D/F, photography, and reconnaissance, were to be included in the navigation course for service entry observers, and to be taught later to direct entry.

/Armament

Armament subjects were to be taught at service schools. Navigation was to be taught at a service school (40 hours flying) to service entry observers, and at civil schools<sup>(1)</sup> (36 hours flying) to the direct entry.

December 1937-  
April, 1938.

719502/37

Little further progress was made, however. Aircraft were not available for increasing the amount of navigation training; no Ansons had been ordered because Air Commodore Leckie had said in September 1937 that none were required for observer training at civil schools, and none could be provided before they were thrown up by the rearming of G.R. squadrons in the autumn of 1938: the possibility of developing a special navigation trainer from the D.H.89A was considered and agreed, but there would inevitably be a long delay before the aircraft could be made. Increased navigation training at North Coates, as well as the civil schools, depended on the supply of aircraft.

The direct entry observer scheme also moved slowly. Air Marshal Mitchell foresaw considerable difficulty over recruiting, especially at a time when an increased intake of pilots was required. Discussions were going on over conditions of service.

Again, more navigation training for pilots meant that the civil schools would be wanted, when aircraft could be supplied, for pilot rather than observer training.

March 1938

In March Air Marshal Mitchell informed Air Vice Marshal Sholto Douglas, who was pressing to have fully trained observers in squadrons as soon as possible, that North Coates might begin training on the longer course in August  
/or September

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(1) Four civil schools were approached to undertake the training:-

Yatesbury	(Bristol Aeroplane Co.)
Desford	(Reid and Sigrist Ltd.)
Hamble	(Air Service Training)
Prestwick	(Scottish Aviation Ltd.)

or September 1938, and that the direct entry scheme might start in January 1939.

In the meantime, observer training went on, at North Coates only, at the unchanged rate of 200 per year and on the unchanged short syllabus. The most that could be done was to inform Commands<sup>(1)</sup> of the intention to improve observer training and of the necessity for squadrons to train up to the higher standard until the school training of observers could be improved.

The aircraft required to get the scheme for better navigation training going amounted to 48 Ansons: the four civil schools needed 6 each, and two service schools together needed 24.

April 1938

A.H.B.  
V/5/10

In April the serious results of a lack of trained crews became fully realised. On 12th April a Conference on the Training of Regular and Reserve Crews, instructed by Lord Swinton that the matter must be treated "exactly as it would be treated in war", decided that more observers must be trained to a higher standard without delay. The prospective deficiency on Scheme L requirements was then 700, before observers had been included in every crew. The four civil schools were to start observer training as soon as possible, with aircraft found from various sources. The direct entry scheme was to be settled, and observers recruited, immediately.

There would be an inevitable delay before the training of direct entry observers could be started, and so the training of service entry observers was stepped up at once. A temporary Air Observer School was provided, by converting a bomber station with two non-mobilisable Heyford squadrons

/and supplying

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(1) Appendix 11 - Letter dated 6th April 1938 from Air Ministry to Bomber, Fighter and Coastal Commands.

and supplying the necessary specialist instructors.<sup>(1)</sup>

The direct entry scheme was introduced<sup>(2)</sup>, and two civil schools<sup>(3)</sup> began training in August. The other two<sup>(4)</sup> began in September. After a 12-week navigation course at these schools, pupils passed on to service schools<sup>(5)</sup> for training in bombing and gunnery. As the civil schools came into operation the temporary Air Observer School stopped navigation training, and closed in November. The total output of observers, direct entry from the civil schools and service entry from North Coates, was planned to be 600 per year.

When observers were included in all crews the prospective deficiency rose to some 2,000 at April 1940. Training facilities had to be increased, and it was decided to double the pupil population at each civil school, bring in two additional civil schools,<sup>(6)</sup> and change Hamble and Shoreham from pilot to observer training. To deal with armament training two more Armament Training Schools were to be equipped with Heyfords and become Air Observers Schools.<sup>(7)</sup> The

/rate of

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(1) Leconfield, with Nos. 97 and 166 squadrons, started the navigation training of service entry pupils on the 12-week syllabus in June 1938: navigation instructors were transferred from North Coates. North Coates stopped navigation work, and concentrated on the armament training of Leconfield's output.

(2) A.M.O. A.253/38.

(3) Prestwick and Desford.

(4) Ansty and Yatesbury.

(5) North Coates or Acklington (which was converted from No. 7 Armament Training Station to No.2 Air Observer School in November 1938).

(6) The two additional civil schools, Perth (Airwork Ltd.) and Sywell (Brooklands Aviation Ltd.), began training, each with 60 pupils, in January 1939.

(7) Aldergrove was changed from No.2 A.T.S. to No.3 A.O.S., and West Freugh from No.4 A.T.S. to No.4 A.O.S., in April 1939. Each was provided with 16 Heyfords and six armament instructors, but the shortage of direct entry recruits meant that these facilities could not be fully employed on observer training.

839898/38

December  
1938.

rate of recruiting direct entry observers was to increase, between December 1938 and February 1939, from 480 to 1920 per year.

Difficulty occurred in recruiting enough direct entry pupils, however, and it was necessary to fill some of the places with service entry observers. Lack of direct entry pupils also made it impossible to start training observers at Hamble and Shoreham in February, as had been intended, and these two schools therefore went on training pilots.

#### Bomber Command

In 1937 Bomber Command had been, in general, so handicapped by its own difficulties as to be comparatively little concerned about the standard at which pilots and observers came forward from schools.

Air Chief Marshal Ludlow Hewitt's Training Report for 1937<sup>(1)</sup> regretted, for instance, that full advantage could not always be taken of the more advanced training, and particularly the night flying training, done at Flying Training Schools. On navigation training he remarked that its vital importance was fully recognised, but that squadrons could do little of "the invaluable advanced practice of flying over the sea" because of lack of life saving equipment. Navigation courses at civil schools were not very satisfactory because they included no practical flying, and training in astronomical navigation (then a squadron matter) was making slow progress because squadrons had to give priority to more elementary instruction.

He laid stress on the handicap of having no satisfactory crew policy, and outlined the possibility of devising a progressive aircrew trade. He emphasised the backwardness of armament training: there was an almost complete lack

/of turrets

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(1) Dated March 1938.

of turrets and guns, and a shortage of range facilities: a large proportion of air gunners were unqualified. The general standard of bombing accuracy could be better: and ground training had been hampered by a shortage of A.M.L. Teachers. (1)

In 1938 there was a better supply of equipment, and Regional Control (2) began to be organised. The handicaps on Bomber Command grew less, its concern with matters of basic training increased, and it began to exert considerable pressure on these matters.

So far as pilot training was concerned, only engine handling and cockpit drill on newer types of aircraft, and the need for sound instruction in bad weather flying, were put forward as questions requiring attention at Flying Training Schools. Night flying and instrument flying, beyond the comparatively elementary standard to which F.T.S. instruction took them, were accepted as matters for individual training in squadrons, but matters to which adequate attention had not been possible because of surplus pilots, shortage of instructors, and lack of flying hours.

The F.T.S. syllabus was revised on engine handling and cockpit drill in March 1939, but adequate instruction depended on the replacement of Harts by Oxfords, Masters, and Harvards in the schools. Bad weather flying, as a matter of practical experience, was ruled out by the lack of wireless facilities at Flying Training Schools.

The handicap on squadron training of lack of flying hours was largely caused by the low serviceability of the new bomber types. To overcome it, squadrons were given in

/1939

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(1) i.e. "synthetic" training devices for

(2) An organisation for giving assistance from the ground to aircraft in difficulties: the precursor of Flying Controls.

1939 two trainer aircraft (Ansons) per flight in addition to their establishment of operational types: (1) the Ansons were to be used for individual training, such as navigation, signals, instrument flying, and landings, for which operational aircraft were not essential.

Surplus pilots, who had for some time hampered Bomber Command's training, existed because bomber expansion came late in the programme. Pilots had been turned out by Flying Training Schools, but aircraft for the new squadrons had not yet come forward. Their effect was to dilute the Command's training effort: the available instructors and facilities had to train, and keep in practice, a larger number of men.

These questions of pilot training were comparatively minor, however. Crew training and its essential preliminary, crew policy, were Air Chief Marshal Ludlow Hewitt's chief concern over personnel and instruction. "One of the chief results of the year's experience (1938) is ..... that the work of the members of the crew of a modern bomber requires a very much higher standard of training and specialisation than has hitherto been contemplated".

The standard of air gunnery needed raising considerably, and "reliance for training on the mutable and uneven local talent in each station, with the inadequate facilities there" was not satisfactory.

Air Chief Marshal Ludlow Hewitt drew attention to the need for action on these matters from time to time during 1938 and 1939, and discussed them fully in his Training Report for 1938<sup>(2)</sup>. In this report he laid considerable

/stress on

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(1) Fighter Command was also to be supplied with trainer aircraft (Battles) for instrument flying and night flying training.

(2) Appendix 12 - Extracts from Bomber Command Annual Training Report 1938.

stress on the importance of teaching more senior officers up-to-date methods, and ascribed a good deal of the "phenomenally slow progress in sound methods of air navigation" to lack of knowledge or interest on the part of senior officers. He considered it essential that "training policy at the Air Ministry should comprehend the instruction of senior officers as well as junior officers", and that it was in fact more important to teach new methods to senior officers than to their juniors.

Crew Policy.

Air Chief Marshal Newall's ruling of December 1937 laid down that all aircraft with a large enough crew should have two men capable of performing every important function, and accepted the principle of the whole time observer.

519517/36

Accepting the principle of whole-time observers, though, did not provide whole-time crews for Bomber Command. Observers could not be whole-time until either maintenance staff were available to take over the observers' ground duties or direct entry recruits had been trained, and in March 1938 Air Marshal Mitchell refused to inform Commands officially of the decision to have whole-time observers. Wireless operators were part-time aircrew, and one of the two for each large aircraft had still to be found when required from the station establishment.

805448/38

In June 1938 Air Vice Marshal Sholto Douglas' Committee on the Expansion of the Operational Commands to Scheme L accepted a proposal from Bomber Command that direct entry whole time air gunners should be provided.

In July, 1938 Air Chief Marshal Ludlow Hewitt expanded the "aircrew trade" policy which he had outlined in his Training Report for 1937 into detailed proposals<sup>(1)</sup> for a

/progressive

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(1) Appendix 13 - Letter from Bomber Command to Air Ministry dated July 1938.

progressive crew trade and systematic training to provide the observers and air gunners needed.

The scheme aimed at training direct entry recruits first as air gunners and then, after a period of service and experience in that capacity, as wireless operators. From wireless operators, by further experience, training and qualification, aircrew tradesmen would become observers. Finally, a proportion might receive further training and advancement as pilots.

Air Vice Marshal Sholto Douglas pointed out that these proposals were a logical extension of the direct entry observer scheme and of the proposal to have direct entry air gunners. The air gunner's work was becoming more complicated, and required a higher standard of skill: moreover, it seemed poor economy to entrust expensive aircraft to half-trained and inefficient air gunners.

Air Vice Marshal Portal considered it essential to have whole time air gunners.

"It seems to me rather ludicrous to train tradesmen in peace for air gunners, use them in war, with the high casualty rate, as air gunners, and lose the whole value of their peace trade training. They will have to be replaced in war by reservists who cannot possibly be so efficient from the trade aspect as the peace time airmen."

The part-time air gunner system, which had been due partly to economy and partly to the fear that air gunners would be idle unless the aircraft was flying, and which had proved a failure from both the tradesman and the air gunner aspects, was abandoned in September 1938, and in all Scheme I establishments flying crews were totally divorced from maintenance.

In October 1938 Air Vice Marshal Portal (A.M.P.) embodied the "aircrew trade" scheme in a memorandum<sup>(1)</sup>

/to an Expansion

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(1) Appendix 14 - E.P.M.156(38) - Memorandum on "Aircraft Crews (other than Pilots)" by A/V/M. Portal dated 29th October 1938.

to an Expansion Progress Meeting. A slight modification was made by ignoring the comparatively small requirement of "straight" air gunners and planning for all air gunners to be wireless operators. All aircrew were to be drawn from boy entrant wireless operators and trained as Wireless Operators (Air): after three years on aircrew duty 25% were to be selected for further training as observers, the remainder continuing as Wireless Operators (Air). Observers were to be on an equal footing with airmen pilots, and the policy was to provide for commissioned observers. Direct entry air observers were to continue only until the new scheme produced "aircrew trade" observers.

The scheme was approved, and introduced early in 1939 by A.M.O. A.17/39, which also laid down the policy of whole-time employment on aircrew duties for all members of aircrew.

#### Group Pools.

In May 1938 Air Chief Marshal Newall called attention to the need for an "interim stage after leaving the F.T.S." (1) In June it was considered by Air Vice Marshal Sholto Douglas' Committee on the Expansion of the Operational Commands. The difficulty was to provide the "lighter types of modern aircraft" necessary.

It was agreed that Oxfords would be suitable, but no Oxfords were immediately available. The best that could be done was to allot two Ansons to each flight of bomber squadrons.

The possibility of using non-mobilisable elements of Bomber Command to give "interim" training was suggested. Shortage of both first line personnel and reserves was compelling a division of the Command into mobilisable and non-mobilisable parts, and Air Vice Marshal Sholto Douglas'

/Committee

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(1) See page 144.

Committee envisaged having mobilisable and non-mobilisable flights in squadrons with the non-mobilisable flight employed on training.

The ultimate organisation for the "interim stage" was agreed to be Group Pools, but the possibility of doing intermediate training in any form depended on the supply of Oxfords or Ansons, and it would be some time, perhaps more than a year, before they were available.

In September 1938 another problem arose. No provision had been planned for any reservoirs of trained pilots and crews from which casualty replacements could be drawn in war, and ad hoc arrangements had to be improvised during the Munich Crisis.

In October Air Vice Marshal Portal devised a combined solution to the intermediate training and casualty replacement problems. He proposed that Advanced Flying Training Centres should be set up, to deal in peace time with the "interim stage" and also with the advanced training of reservists, and to become Group Pools for holding casualty replacements, and keeping them in flying practice, in war.

E.P.M.158(38)

Air Marshal Welsh put these proposals to an Expansion Progress Meeting in November, and they were approved. The scheme was to establish one Advanced Flying Training Centre for each operational Fighter and Bomber Group, and one for Coastal Command, making ten in all. <sup>(1)</sup> Their size and  
/establishment

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(1) Their functions were defined:-

In war,

- (i) To provide each operational Group with a reservoir or "pool" from which replacement crews can be drawn.
- (ii) To train the output of the Flying Training Schools up to an operational standard before it passes to the operational squadrons.

In peace,

- (i) To provide intermediate training and practice to regular pilots after leaving the Flying Training Schools and before passing to operational units.
- (ii) To act as Advanced Training Centres for flying personnel of the R.A.F.V.R. and thus fit them to take their place in operational units as soon after the outbreak of war as they are required.

establishment were calculated on the war requirement of holding casualty replacements for one week of sustained operations: a peace-time basis for calculation - bringing up to war readiness a proportion (54% of pilots and 65% of aircrews) of Scheme L's reserve requirement of 9,000 pilots and 12,000 aircrews for the first six months of war - was rejected as too indefinite.

These ten Group Pools<sup>(1)</sup> were to hold 371 pilots or crews, be equipped with 174 aircraft (of which a proportion would be operational types), and supply casualty replacements for Scheme L's first line of 2,375. They were to vary in size according to the needs of the Groups they backed: No. 12 Group was to have 10 pilots in its pool, while No. 4 Group had 63 crews. Six Bomber pools, three Fighter pools, and one Coastal pool were to feed 73 Bomber, 36 Fighter, and 19 Coastal squadrons.

Ten aerodromes were earmarked for Group Pools, but in most cases they would not be available until late in the working out of Scheme L. It was considered that non-mobilisable squadrons might take their place in the meantime.

In formulating the scheme Air Vice-Marshal Portal pointed out that casualty replacements in war, whether they came from the reserve or from schools, would need additional training in the Group Pools before they could take their places in squadrons.

During October and November 1938 two conferences emphasised that Group Pools were urgently needed, both as a measure of war readiness and for the advanced training of reservists, but only one was started before the outbreak of war. This was No. 11 Group Pool, which opened at Andover in January 1939 with four Demons and a training capacity of 8  
/pilots,

A.H.B.  
V/5/10

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(1) The name "Advanced Flying Training Centre" was soon dropped.

pilots, and moved in June to St. Athan. Its establishment was then 11 Battles and 22 Spitfires or Hurricanes, but its strength was a long way below establishment. From June onwards it dealt solely with the training of V.R. pilots.

S.46938

Organisation  
Memorandum  
223/39.

The ten Group Pools as planned required 120 officers, 2,550 airmen and 350 civilians to staff them, and in March 1939 it was decided that lack of personnel would prevent the opening of more than two before March 1940. The second was to be another Fighter Pool, for No.12 Group, and was to be formed at Aston Down during the summer. It was postponed, however, and had not opened when war broke out.

The intermediate stage which Air Chief Marshal Newall had considered necessary for Bomber Command was thus not provided by Group Pools. It was supplied, as a temporary measure, by the use of non-mobilisable bomber squadrons.<sup>(1)</sup> These squadrons retained a nucleus of their more experienced pilots as instructors, the remainder being posted to mobilising units, and had half their operation types of aircraft replaced by Ansons.

/In August

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(1)No.52	(Battles),	Upwood,	which became a Group Training Squadron on 1st April.
No.63	(Battles),	Upwood,	became a Group Training Squadron on 1st April
*No.75	(Harrows),	Honington,	became a Group Training Squadron on 1st March.
No.104	(Blenheim),	Bassingbourn	became a Group Training Squadron on 1st June.
No.108	(Blenheim),	Bassingbourn	became a Group Training Squadron on 1st June.
No. 7	(Hampden),	Finningley,	became a Group Training Squadron on 1st June
No. 76	(Hampden),	Finningley	became a Group Training Squadron on 1st June
No. 97	(Whitley),	Leconfield,	became a Group Training Squadron on 1st June
No.148	(Wellington)	Honington,	became a Group Training Squadron on 1st June.

\* No.75 Squadron was rearmed with Wellingtons in July.

S.46938

In August 1939 Air Chief Marshal Ludlow Hewitt stated Bomber Command's requirement of Group Training Squadrons. He prefaced the statement by saying, "It is most uneconomical in practice, even in peace time, to make operational squadrons undertake the initial operational training of pilots and crews coming direct from elementary training schools, and it would be quite impossible in war time. It is therefore necessary to consider the extent of the training organisation required to undertake the whole of this initial operational training".

August  
1939

He defined Bomber Command's initial operational training requirements as:-

- "(A) The training of regular pilots and crews coming from training schools to replace wastage
  - (i) in peace
  - (ii) in war
- (B) The operational training of the R.A.F.V.R. in peace.
- (C) The operational training of regular pilots and crews required to meet increasing establishments during periods of expansion.

(A) is a peace and war requirement, (B) is a peace requirement and (C) is a temporary requirement in peace but may also have to be taken into consideration in war to meet war-time expansion".

The syllabus requirement to bring pilots up to operational standard put at 62 hours (24 night) for Whitleys, Wellingtons and Hampdens, and 80 hours (27 night) for Battles and Blenheims. This assumed that pilots would have flown T.E. aircraft before arrival at Group Training Squadrons, and was considered the absolute minimum.

Air Chief Marshal Ludlow Hewitt stressed the necessity for properly regulated courses at regular intervals if Group Training Squadrons were to work efficiently. He put the peace time duration of the course at 14 weeks, and showed that the flying hours available from a Wellington or Whitley squadron with 16 + 8 aircraft would enable 22 pilots

/to be trained

to be trained on each course, while a Battle or Blenheim squadron with 24 + 12 aircraft could handle 27 pilots per course. The training of other members of aircrew was not specifically discussed: it could be carried out in the flying time necessary to train pilots.

From this basis Air Chief Marshal Ludlow Hewitt went on to show that the peace-time training requirement would be rather over one Group Training Squadron for each mobilising operational squadron, or almost eighteen times the figures of October 1938.

This enormous disparity is explained by the fact that the war time requirement of Group Pools was calculated in October 1938 on the assumption that they were to hold only one week's casualty replacements - i.e. that a pilot's length of stay in the pool would average one week - whereas Bomber Command took into account the fact that a pilot would have to stay in the pool long enough to be trained up to operational standard.

#### The Volunteer Reserve.

In April 1938 it was suggested by Air Vice Marshal Sholto Douglas that the shortage of pilots which would be caused if only four new Flying Training Schools were opened might be remedied if V.R. pilots could be induced to join the regular Air Force temporarily during the period of deficiency. Such a scheme would not only provide squadrons with more pilots, but would also be a solution to the urgent and troublesome problem of bringing V.R. pilots up to full operational efficiency.

Service types of aircraft (Hart and Audax) were brought into use at V.R. aerodrome centres in 1937 and 1938, and were being used to train pilots up to a standard corresponding to the intermediate stage at Flying Training Schools. More advanced training was the difficulty: no facilities

/.ere available

S.44537

were available for instruction corresponding to that given by the Flying Training School A.T.S. or by squadrons. This lack of an advanced training organisation for the V.R. was one of the matters to which Group Captain Slessor's committee drew attention in April 1938.

The original plan for the Volunteer Reserve, based on Scheme F, had been to recruit 800 pilots in each of the years 1936, 1937 and 1938, but the scheme was late in starting, and only 1,200 pilots were recruited up to the end of 1937. It had also been intended to establish a non-pilot air crew section, and this was mentioned in the Memorandum on the Air Estimates for 1937-8, but Treasury approval (for the training of 2,500 observers and 3,200 wireless operators) was not obtained until March 1938.

S.44572

Scheme L's requirements from the V.R. were considerably greater than Scheme F's: 7,000 pilots were needed instead of 2,400 and 4,750 wireless operators instead of 3,000. The observer requirements at first dropped from 2,500 to 1,500, and then rose to over 3,000 with the decision to add observers to all crews. In addition, Scheme L required 1,000 air gunners.

May 1938

Against these requirements, the V.R. in the spring of 1938 consisted only of some 1,200 pilots; no observers or wireless operators were under training. Only 22 of Scheme F's planned 33 aerodrome centres were in operation, and few of the 25 town centres had started work. The official procedure for acquiring and conditioning these town centres through the Office of Works was slow and circuitous; the average time needed to get a town centre ready was nine months; and only seventeen of them had even been selected.

This inadequate and halting development of the Volunteer Reserve was outlined by Air Marshal Mitchell in a paper<sup>(1)</sup>

/dated

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(1) E.P.M. 101 (38)

dated June 1938 which proposed to increase the number of aerodrome centres to 58 by using all available and suitable civil airfields, (1) and the number of town centres to 55.

Existing centres were to be expanded to their maximum capacity, and air crew training done at all centres. The scheme was approved, and a Director of Volunteer Reserve Expansion (Air Commodore Pulford) was established in A.M.S.O's department.

The aircraft requirements were 376 elementary trainers (Moths or Magisters), 860 service trainers (Harts), and 480 crew trainers (Oxfords or Ansons). 440 flying instructors, 480 staff (air crew training) pilots, 165 armament instructors, 178 wireless instructors, and 140 navigation instructors were needed. It was far from easy, however, to provide the instructors and aircraft. Equipment and hangar accommodation were also likely to cause delay. In fact, Air Marshal Mitchell said, it would be unduly optimistic to expect that the programme could be completed by April 1940.

By the beginning of November 1938 11 town centres and 29 aerodrome centres were in operation. By April 1939 13 more town centres and 3 more aerodrome centres had started. Eleven more town and 14 more aerodrome centres came into use in the summer of 1939. The pupil capacity of aerodrome centres varied slightly, but each was, on the average, planned to deal with 100 pilots and 100 air crews.

In July 1939 Scheme M required a further expansion to 13,000 pilots and 12,150 other air crew, and the use of 20 more aerodrome centres was projected.

These programmes of town and aerodrome centres planned to give only basic training, and did not touch the problem of advanced training. The large numbers which they

/envisaged

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(1) Including the municipal airfields then being developed.

envisaged were inevitably only a promise for the future:<sup>(1)</sup>  
with week-end and spare time instruction it needed well over  
a year to train a Volunteer Reserve pilot or observer.

In the first half of 1939 some provision was made for more advanced training at the V.R. centres. A few Battles were allotted, and camera guns, turrets, and other instructional equipment were to be supplied.

Reliance was chiefly placed, however, on the Group Pools and non-mobilisable squadrons for Volunteer Reserve advanced training. As a long term plan it was intended that V.R. pilots should be required to do at least a fortnight's annual training period at Group Pool, and as a short term expedient non-mobilisable squadrons were to take the place of Group Pools.

While the Group Pool solution was being devised in October 1938 it was realised that urgent measures were needed to deal with the "dangerous shortage of reserve air crews" and a scheme for inducing Volunteer Reservists to take a six months period of continuous training was proposed.

S.50933.

The inducement was to be a bonus of £50 (there was some discussion whether it would not be wiser to make it £75) for the six months' service. But while there were some 600 V.R. pilots ready for advanced training in March 1939, there were no trained crews to match them, and so only pilots could be given advanced training. In the summer of 1939 small numbers of V.R. pilots were trained for fighters in the solitary Group Pool, and for bombers in the non-mobilisable Group Training Squadrons.

The next question was how to give basic training to

/observers

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(1) In September 1938 there were 545 V.R. pilots who were ready to begin the A.T.S. stage of F.T.S. training (i.e. who had learned to fly Harts) and 1121 who had finished the elementary stage.

observers and wireless operators during their six-months period of continuous service. The difficulty was that they required the same facilities as were used for training regular crews, and that the facilities could ill be spared since Bomber Command were 54% deficient in trained and experienced crews.

930636/39

The number of V.R. air crew concerned was set at 300 observers and 500 wireless operators. It was not practicable to give so much elementary training in non-mobilisable squadrons, and wherever the training was given it would need Ansons and the use of armament facilities. The Ansons could only come from those used for training by Bomber Command, and armament training could be provided only by reducing the operational Commands' use of tow lines and targets.

May 1939

Eventually it was decided to train the continuous service V.R. observers on 12-week navigation courses at civil schools followed by eight weeks armament training at a new A.T.S. (Jurby, which was due to open in September 1939), and eight weeks in a non-mobilisable Bomber Squadron. Wireless operators were to start with eight weeks on gunnery training (at Acklington), and go on to a 16-weeks wireless course at a civil school (Hamble), followed by two weeks at a non-mobilisable squadron. The scheme was to come into operation in September, dealing with 420 observers and 300 wireless operators in 1939-1940. By this time, however, there was no need to attract Volunteer Reservists for continuous service: the Military Training Act would provide "militia" for the R.A.F., and the scheme accordingly became one for the militia training of air crew.

#### The War Training Organisation.

Air Vice Marshal Sholto Douglas' committee estimated that the War Training Organisation required to back the first line force of Scheme L would need to produce monthly

/outputs

outputs of 1,000 pilots (from the eighth month of war), 500 observers (from the sixth month), 900 wireless operators (from the eighth month), and 400 air gunners (from the third month). These numbers would call for 33 Service Flying Training Schools, 25 Air Observer Schools, and 7 Navigation Schools, which would have to come into operation in the first four months of war, and would require a reserve of 7,055 aircraft to start them going, plus a monthly wastage replacement of 408.

S.46305

In September 1938 there were only 818 aircraft (465 elementary trainers and 353 obsolete S.E. Service types) available for expanding the training organisation. They were a miscellaneous collection, drawn from Volunteer Reserve training, Auxiliary Air Force training flights, University Air Squadrons, Cranwell, communications units, and storage. There were just enough to put 9 Elementary and 9 Service Flying Training Schools on war establishment.

No additional aircraft were available for the remaining Flying Training Schools, or for the Armament Training and Air Observer Schools. By putting together all the aircraft already at the Armament and Observer Schools<sup>(1)</sup> three war time Air Observer Schools could be formed, but they would have to work at reduced capacity until more aircraft and personnel became available. By taking Hinds from non-mobilisable squadrons two more Armament Training Schools could be used for training Air Gunners.

S.46305

That was the limit of the War Training Organisation possible in September 1938:- nine Flying Training Schools on a war basis, two on a peace establishment but working to the shorter War Training course, three Air Observer Schools working at less than full size, and two Air Gunner Schools.

/The annual

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(1) In peace time most of the aircraft used at these schools were brought by visiting squadrons, or E.T.S.'s.

The annual output would have been 3,100 pilots, 1,450 observers, and 1,300 air gunners: compared with an annual war-wastage requirement (for the Scheme F force) of over 10,000 pilots and 11,000 air crew.

During 1938 and 1939, therefore, the dominant fact about the War Training Organisation was its complete dependence on what aircraft would be available at the outbreak of war. Every suitable aircraft, whether used for reserve training, navigation training, or kept in store, removed a little of the limitation, but the gulf between the 818 aircraft of September 1938 and the 7,055 needed to put a full War Training Organisation into operation was too formidable for any urgent need to attend to the problems of aerodromes or accommodation.

S.46306

The War Training Organisation was nearly as badly ham-strung by lack of potential instructors as by lack of aircraft. In the autumn of 1938 there were only 132 reservists suitable for instructor work over and above those (172) already employed on teaching at civil schools or for the Volunteer Reserve.

Reservists were urged to take instructor courses, and so were Volunteer Reservists with more than 250 hours flying. The number of potential instructors increased during 1939, but so also did the number immediately employed at civil schools and V.R. centres. In August 1939 there were less than 500 reserve pilots who could be called on for instructor work in the War Training Organisation.

Whatever the limitations on the practical side of the War Training Organisation might be, the theoretical plan for it was slightly revised, and issued as S.D.138(1), in April 1939. It followed the peace training system very closely, except that Amament Training Schools were to change in war to Air Observer Schools and train 90 observers and 30 air gunners each (in addition to dealing with attachments from

Flying Training Schools).

So far as pilot training was concerned, the number of pupils at each Service Flying Training School went up from 96 to 152: the course duration came down to 16 weeks (8 weeks I.T. Squadron and 8 weeks A.T. Squadron): the armament training attachment was reduced to a fortnight: and the flying hours remained unchanged at 100 per pupil. The aircraft establishment went up from 64 to 108 (45 S.E. and 63 T.E.).

The Elementary Flying Training Schools were to have 96 pupils and 54 elementary trainers each. The length of course was to be 8 weeks, and the flying hours 50 per pupil.

Relief landing grounds were to be provided: two for each S.F.T.S. (one suitable for night flying), and one for each E.F.T.S. (1)

From the S.F.T.S., pilots were to go direct to squadrons or Group Pools, except those destined for G.R. Squadrons. G.R. pilots were to leave the F.T.S. after the I.T.S. part of the course, and go to the School of G.R. for a 12 week course which included an armament training attachment. The G.R. School's capacity was to be 78 pupils.

The War Training Organisation also included specialist schools for Flying Boat, Torpedo, and Army Co-operation training, Flying Instructors' Schools, and Air Navigation Schools.

Observer training was to remain almost as in peace time: there was no reduction in the length of the navigation course (12 weeks); the armament course was shortened to 6 weeks: but both navigation and armament were to be taught at the A.O.S. The advanced (astronomical navigation) course at the A.N.S. was to remain at 4 weeks. The A.N.S. also provided for a small output of "navigation officers and

/instructors"

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(1) In fact, there were in 1939 only four Relief Landing Grounds for the 15 Flying Training Schools in the United Kingdom.

instructors" from 12 weeks courses. No navigation courses for pilots were scheduled.

This whole War Training Organisation described itself as designed to train "personnel up to a standard which will ensure that on passing out from the Training Schools they will be qualified to assume their full responsibilities."

As the first, preparatory, stage of air crew training the War Training Organisation planned Initial Training Schools giving a thorough grounding in discipline and elementary instruction in ground subjects. The course was to last one month, and it was intended early in 1939 that two Initial Training Schools, each with 350 pupils, should be formed at the outbreak of war.

S. 51385

In April Brigadier General Critchley, who had done preliminary training for the Canadian Corps in 1917 and the R.F.C. in 1918, approached Sir Kingsley Wood with a scheme for putting 10,000 cadets under training for a period of 2-3 months to get them ready for absorption by pilot, observer or gunnery training schools.

Brigadier General Critchley proposed to do this training at Hastings, St. Leonard's, Bexhill and Cooden Beach, to use billets and public parks, and to employ the staff he had in 1918, many of whom were available.

At first sight the scheme appeared nothing but a lengthier and unnecessary duplication of Initial Training Schools. Air Commodore McClaughry and Air Marshal Portal, however, pointed out that at the outbreak of war Elementary and Service Flying Training Schools would be fully occupied in bringing partly-trained reservists up to standard, and that it would be fourteen weeks after the outbreak of war before the Initial Training Schools could begin to deal with recruits. During this time good and suitable men would try to join the R.A.F., become discouraged by the

/delay

delay, and join other services.

Various possible solutions to this problem of the lag in putting pupils under training at the outbreak of war were discussed. So far as reservists were concerned, they could be sent home to wait until training capacity was available, but this could not be done with war-time volunteers, and priority for war-time entries over peace-time entries was undesirable. Alternatively, both peace-time reservists and war-time entries could be employed on ground duties until their time came for air crew training.

Both alternatives were unsatisfactory. Sending recruits home to wait would have an unfortunate effect and bring public criticism. Employment on ground duties would mean embarrassing numbers, with problems of training and kitting, at the stations to which they were sent.

Estimates of the numbers of air crew trainees concerned varied from 3,000 to 10,000 depending on dates and the inclusion of Volunteer Reservists. Some form of Reception Depot was clearly needed, but neither instructors nor accommodation could be provided by the Service.

It was argued that if Brigadier General Critchley could get the staff, so could the R.A.F., and that accommodation was a matter of requisitioning and billeting. At the end of August it was decided to establish Flying Personnel Reception Depots at holiday camps, universities, and V.R. town centres, where recruits awaiting vacancies could be given preliminary ground instruction. They were to be additional to the Initial Training Schools, and were to be dispensed with when the flow of recruits had reached normality. A special Group in Reserve Command was to be formed to deal with these Flying Personnel Reception Depots.

This was, essentially, Brigadier General Critchley's scheme, which Air Marshal Portal and Air Marshal Welsh had

/throughout

S. 51385

August  
1939

throughout recognised as the best solution, brought under R.A.F. control. Brigadier General Critchley was put in charge of it.

Armament Training.

All through the period of expansion pilots and observers were given school training in armament, but air gunners were not. There had been suggestions in 1936 and 1937 that unit training of air gunners was not satisfactory, but Air Marshal Bowhill said in April 1937 that there seemed no possibility of changing the system because the training requirement of 900 air gunners per year was too large.

A curious sequence of policies about air gunnery had occurred. In 1934 it was decided to replace unit trained air gunners by school trained observers because unit training was unsatisfactory; in 1936 and 1937 the development of aircraft and air crews compelled the observer to concentrate more and more on bombing and navigation, and air gunners were added to crews to deal with gunnery; but the new air gunners were unit trained.

At the same time, rapid technical development in air gunnery was going on. Not only were power operated turrets being developed and introduced on service types, and the Browning replacing the Lewis and Vickers G.O. guns, but higher speeds and changing operational conditions were altering the tactical conception of gunnery.

In his Training Report for 1937 Air Chief Marshal Ludlow Hewitt commented strongly on the backwardness of armament training and the large proportion of unqualified air gunners in Bomber Command. It was acknowledged by the Air Ministry in 1938 that the standard of efficiency of air gunners was poor and that shortage of facilities gave little hope of rapid improvement.

At the beginning of 1939 Air Chief Marshal Ludlow Hewitt

/returned

returned to the shortcomings of gunnery training in his Training Report for 1938. (1) His chief points were that satisfactory training was impossible with existing facilities, that unit training was in any case a poor system, and that a central air gunners' school working to a high standard was very urgently wanted. He stressed the need again in his Readiness for War Report in March, repeated his recommendation for a central gunnery school in May, and wrote in July:-

S.1574

July 1939

"At present, apart from the need for elementary training for air gunners at gunnery schools, we have no instructors and no instructions to guide us in the Service training of air gunners. Consequently, until we have a centre where the whole subject is studied our gunnery instructors remain in relation to the air gunners in the position of "the blind leading the blind". Under these conditions we cannot possibly hope to reach a standard of efficiency which would permit of our crews facing the enemy with any confidence".

Even so, he was doubtful if he had convinced the Air Ministry of the extreme urgency of the problem, and wrote a few days later:-

"As things are at present, the gunners have no real confidence in their ability to use this equipment efficiently in war and captains and crews have, I fear, little confidence in the ability of the gunners to defend them against destruction by enemy aircraft. Under these conditions it is unreasonable to expect these crews to press forward to their objectives in the face of heavy attack by enemy fighters".

The difficulty was the number of Armament Training Stations. (2) Expansion generally, and the large increase of observer training in particular, made heavy demands on armament training facilities. There were 10½ armament /training

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(1) Appendix 12.

(2) Armament Training Camps were renamed "Armament Training Stations" in April 1938. One additional station, No. 7 Acklington, had been opened in May 1938. It was converted to an Air Observers' School in November 1938, and No. 7 A.T.S. was opened again at Porthcawl (later renamed Stormy Down) in June 1939. Pembrey and Jurby were scheduled for armament training, but neither opened before the outbreak of war.

training stations<sup>(1)</sup> in the summer of 1939, of which four were employed on observer training, and 6½ on squadron and F.T.S. attachments. The period of squadron attachments had been cut down from a month to three weeks, and Bomber squadrons had to devote practically all this limited time to gunnery.

For the future, four-week attachments of operational squadrons were estimated to need 6 Armament Training Stations: four week attachments from Flying Training Schools 3¾; observer training three or four; militia training two; and Volunteer Reserve advanced training two. To deal with these commitments alone would need some 17 armament training stations, or four more than would be available in 1940<sup>(2)</sup>. Even though three new armament stations were planned to start work later in 1940, there was no possibility of training air gunners unless some of the existing commitments were cut out.

S.56180

August  
1939

This quart of requirements and pint pot of facilities were discussed at a conference in August 1939. Air Chief Marshal Ludlow Hewitt was insistent on the vital need for improvement in gunnery training, the bombers were not fit to cross the line: he wanted all available facilities put on gunnery training, even at the expense of squadron armament training visits, and would rather be short of observers than of air gunners.

/It was decided

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- (1) North Coates }  
 Acklington }  
 Aldergrove } on observer training in 1939  
 West Freugh }  
 Catfoss }  
 Sutton Bridge }  
 Warmwell } on squadron and F.T.S. attach-  
 Evanton } ments in 1939.  
 Porthcawl }  
 Penrhos }  
 Leuchars (half size) }

Jurby }  
Pembrey } to open late in 1939

(2) Three more armament stations were to open late in 1940.

It was decided to use all the armament training stations for air gunners, observers and F.T.S. attachments. Squadron visits were to be dropped, and there were ultimately to be Air Gunners' Schools and three Air Observer Schools (dealing with militia as well as regular training), with four Armament Stations for F.T.S. visits. To deal with squadron armament practice cine camera guns were to be provided as soon as possible for both Fighter and Bomber Commands, and Bomber Command was to have towing facilities.

In addition, there was to be a special gunnery school (the Central Gunnery School) to deal with the training of instructors and the development of gunnery technique and tactics.

The snag in this plan was that the reorganisation called for 219 more attack aircraft and 90 more target towers, as well as more staff, to equip even the existing stations, and that there would be a delay of at least six months before they could be supplied.

In the meantime, Bomber Command had a strength<sup>(1)</sup> of 622 trained air gunners (366 of whom were wireless operators, and the rest drawn from other trades) against an air gunner establishment of 1,576. 691 more were under training in squadrons.

This conference also decided that in future only wireless operators were to be trained as air gunners in accordance with the new "crew trade" policy.

#### Higher Organisation.

In 1938 and 1939 the amount of training done at civil schools increased rapidly. Pilot training to Scheme L figures meant that more Elementary Flying Training Schools were required: observer training was multiplying the civil

/navigation

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(1) On 17th June 1939.

navigation schools: Volunteer Reserve development called for more V.R. aerodrome centres.

At first, all these civil schools were under No.26 Group which, though nominally under Training Command, was in practice largely controlled direct by the Air Ministry. Training Command was not staffed to deal with No.26 Group, which consequently tended to drift out of control, while No.26 Group itself was not staffed to deal independently with all its administrative work.

Again No.26 Group had far too many units: Air Commodore Pulford was strongly of the opinion that a single Group should not have more than 12 V.R. centres or flying schools.

These facts, and the advisability of setting up a separate command to handle the civil reserve training schools, were discussed in a paper<sup>(1)</sup> by Air Vice Marshal Portal. In November 1938 it was decided to create a Reserve Command of four Groups.<sup>(2)</sup> Readiness for war had considerable influence on this decision, since it seemed that all the war training requirements envisaged under Scheme L would be too much for Training Command to handle alone at the outbreak of war.

The other Groups of Training Command also came under review in 1938. In December No.23 Group was relieved of some of its responsibilities by the conversion of Cranwell (which had held Group status since July 1936) into No. 21 Group, which took over two Flying Training Schools (No. 8 Montrose and No.12 Grantham). No.21 Group continued to control the various units at Cranwell, and was also res-

/possible

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(1) E.P.M.166 (38)

(2) Reserve Command was formed on 1st February 1939 with its Headquarters at Hendon. No. 26 Group was renumbered 30. In April No.50 Group moved from Hendon to 11 Tavistock Place, London, and a new Group, No.51, was formed to relieve No.50 of part of its responsibilities. In August No.50 Group moved from Tavistock Place to Bristol, and No. 51 Group from Tavistock Place to Leeds.

possible for the new Flying Training Schools (No.13 Drem, No. 14 Kinloss and No.15 Lossiemouth) formed in 1939 and for the new E. and W. School formed at Yatesbury in December 1938.

No. 25 Group was growing large, and the question of splitting it was considered. In December 1938 Air Marshal Burnett pointed out that observer training was divided between civil navigation schools in No.26 Group and service observer schools in No.25 Group, and proposed that divided control should be avoided by putting both armament and navigation training under No.25 Group. It was, however, considered impracticable to separate navigation training from the other activities of civil schools working under contract, and so the control of civil navigation schools remained with No.26 Group and Reserve Command. The proposal to split No.25 Group was not pursued.

719502/37

S.54808

The scope and functions of No.25 Group came under critical review in July 1939, when the unsatisfactory character of armament training was being considered. The original intention in creating an Armament Group had been to provide a central authority to deal with the design of equipment and its installation in aircraft, and to give instruction in the use, maintenance, and tactical employment of armament. The Group, however, had no real influence on technical design and embodiment or on the development of tactics, and only very little on the development of training. It had no connection with development except by liaison with Air Ministry and the Experimental Establishment, and it had no link with the operational Commands.

In fact, No.25 Group did no more than advise on maintenance and supervise basic training. New developments, whether in equipment or tactics, were matters with which it had little direct touch. Moreover, there was no organisation at all for co-ordinating armament tactics, which remained entirely in the hands of the operational Commands.

/Air Commodore

July 1939

S. 54808

Air Commodore McClaughry considered that to develop proper fighting efficiency a sweeping reorganisation should be made, and the whole chain of armament organisation reviewed from top to bottom. He recommended the setting up of **proper** co-ordinating and directing authority, and suggested an Armament Directorate at the Air Ministry. As a temporary, stop-gap, measure he proposed that No.25 Group's position be strengthened by putting the Group directly under the Air Ministry, making its liaison with research and development and training. No action was taken on these proposals.

Air Vice Marshal Portal had suggested, in his proposals for forming Reserve Command, that No.17 Group should be transferred from Coastal to Training Command. Air Marshal Burnett had made the same suggestion in his proposals of April 1937 for the splitting of Training Command, but in both cases Coastal Command objected, and it was decided not to make the transfer.

There was little change in the Air Ministry Directorates concerned with training. What was done in the squadrons of operational Commands was the concern of D.S.D. in the C.A.S.'s department, while training in Training and Reserve Commands was controlled by D. of T., in A.M.P.'s department. The branches of the Directorate of Training dealt with pilot training (F.T.), navigation and photography (T.Nav. and T. Nav. Photos.), armament (T.Arm. general training - chiefly in chemical warfare - (T.G.) and technical training of ground staff (T. Tech.).

These two directorates were dealing with closely linked matters. Competing claims on experienced pilots for instructor work appeared when Scheme L's Flying Training Schools were cut down to four. Division of basic training responsibility could be seen over instrument and night

/flying.

flying. Conflicting uses for the same aircraft and facilities were shown when Bomber Command and reserve training both required Ansons and armament stations.

Training Overseas.

During the winter of 1937-8 the possibility of putting a second Flying Training School in Egypt was investigated. A site at Suiz was provisionally selected, but the project was dropped because the Air Staff considered it strategically unsound.

In April 1938 Scheme L required three permanent schools over and above those planned for Scheme F. These three schools had already been located in the United Kingdom, and Air Vice Marshal Portal was therefore of the opinion that there was little point in considering overseas sites except as potential for the War Training Organisation.

April  
1938.

Air Marshal Welsh, however, put forward a paper<sup>(1)</sup> proposing that the three permanent schools should be in Canada. He suggested that they should be established by the Canadian Government, run by the R.C.A.F., and paid for by the United Kingdom. Although their existence in Canada would probably increase the recruiting of Canadians, they would be units to which pupils could be sent from the United Kingdom.

Air Marshal Welsh set out the advantages of the scheme:-

- (i) Congestion in the United Kingdom would be relieved,
- (ii) Canada was a safe area not subject to dislocation in war,
- (iii) Difficulty over taking up more land in the United Kingdom would be avoided,
- (iv) Canadian instructors and maintenance staff would be employed, thus avoiding dislocation of squadrons,
- (v) The intake of Canadian recruits would be increased,

/(vi)

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(1) E.P.M. 67 (38)

- (vi) The Canadian aircraft industry would be encouraged, and United Kingdom factories released to produce operational types,
- (vii) The criticism that Canadian resources were not being used would be met.

The last point was particularly important. There had been pressure in Parliament and approaches from Canadian business interests on it, and it might be politically opportune to raise the question of training again with the Canadian Government.

Air Marshal Welsh's proposals were approved, and the High Commissioner put them to Mr. Mackenzie King during the first U.K. Air Mission's visit to Canada in May 1938. The suggestion was that the schools should be under Canadian (R.C.A.F.) control, train for the R.A.F. and to the R.A.F. syllabus, draw pupils from both Canada and the United Kingdom, and be paid for by the United Kingdom.

S.43124

Mr. Mackenzie King's reaction was unfavourable. He considered the scheme tantamount to establishing a military station in Canada owned, maintained, and operated by the Imperial Government for imperial purposes. It would be a definite military commitment undertaken at the request of the United Kingdom, and would arouse hostility in those (mainly in Quebec and the Middle West) who wanted to keep out of the European vortex. This attitude was confirmed by the Canadian Cabinet, with only one dissentient, and the proposal was dropped.

S.43124

The Canadian Government's virtual rejection of the scheme became known to the Opposition in the Canadian Parliament, probably from a conversation in London between Sir Thomas Inskip and Mr. Drury of the Canadian Car and Foundry Co., and a question was asked by Mr. Meighen (Leader of the Opposition) in June. The Canadian Government claimed that no official request had been made to Canada on the matter. The matter was pressed, and

/Canada's

A.H.B.  
IIIc/3/1

Canada's position was eventually defined by a statement that British pilots could train in Canadian establishments under Canadian control, a distinction being drawn between this and the setting up in Canada of a branch of the British armed forces responsible to Britain.

Since the suggestion put forward in May by the High Commissioner had in fact been that the schools should be under Canadian control, this represented a considerable change of front. (The reason was probably press criticism following the disclosure of the Canadian Government's chilly reception of the British proposals).

In view of the Canadian Government's different attitude Group Captain Robb was sent in July, with the second U.K. Air Mission, to find out whether Canada would train 135 Canadian recruits per year as pilots for service with the R.A.F. (1) He had a further brief, if Canada agreed to train these 135 pilots a year, to explore whether additional training capacity up to a total of 400 pilots per year (i.e. the equivalent of three Flying Training Schools) could be created.

Group Captain Robb was limited by two conditions: first, that the cost of training the 135 pilots should be divided between the United Kingdom and Canada, since their Service would be partly R.A.F. and partly R.C.A.F. Reserve, and second that the pupils should be recruited in Canada.

A.H.B.  
IIIc/3/1

Mr. Mackenzie King took the attitude that this was a United Kingdom scheme for which the United Kingdom should pay, as had been suggested in May. He also said that the offer of training facilities applied only to pupils from the  
/United Kingdom

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(1) It was proposed that these 135 pilots should replace the existing arrangements for Canada to send 15 "trained cadets" and 120 Canadian recruits (selected in Canada for training in United Kingdom schools) every year for service with the R.A.F.

United Kingdom: to recruit and train Canadians would prejudice Canada's freedom to decide on Canadian co-operation in imperial defence.

These two points were serious obstacles, and no progress was made. It seemed that Mr. Mackenzie King would definitely prefer to have no training scheme: and the fact remained that the existence within the R.C.A.F. of schools working for the R.A.F. would be a moral commitment to Canadian participation in any war in which the United Kingdom might be engaged - a moral commitment that would be stronger if the United Kingdom paid for the schools.

Eventually the Canadian Government offered to train 50 United Kingdom pupils a year. They were to have had elementary training at civil schools in the United Kingdom, the cost was to be apportioned after twelve months' experience, and the United Kingdom was to supply 14 instructors. This offer was accepted in April 1939, and the first course of 17 was scheduled to begin in September.

Australia had been sending Australian-trained pilots for service with the R.A.F. under the "trained cadet" scheme since before 1934, and planned to make a further contribution to Imperial defence by developing capacity for aircraft manufacture and sending complete R.A.A.F. squadrons.

The position was different in New Zealand, where there was little possibility of building aircraft. Early in 1939 the New Zealand Government decided that their most effective peace-time contribution would be to train pilots for the R.A.F., and agreed to turn out 220 per year. The small existing school at Wigram was to be expanded to a full Flying Training School by May 1940, and a second F.T.S. was to come into operation in September 1940. Training was to be done on Gordons, Vildebeestes and Oxfords, but it was doubtful if more than one third of the output

/could be

April  
1939

S.51649

S.57870

could be T.E. trained: the Dominion could not well afford to buy more than 36 Oxfords. In war time it was planned to train 650 pilots, 350 observers and 350 air gunners per year for the R.A.F.

Oct. - Nov.  
1938.

After Group Captain Robb's return it was clear, in October 1938, that no early or considerable help over training outside the United Kingdom was to be expected from Canada. Air Marshal Welsh accordingly proposed<sup>(1)</sup> that India, Iraq, Kenya, and other possible locations should again be investigated, and in November the Air Council approved the principle of establishing further Flying Training Schools abroad.

There were considerable strategic difficulties. Group Captain Linnell (D.D.W.O.) disliked backing the Metropolitan Air Force by schools in Egypt or further East: there should be no more Schools east of Gibraltar than were needed to feed the Middle East and Far East.

There were political difficulties as well. Any school in India not under Indian control would present a constitutional obstacle. Bangalore was ruled out because it was in a native state (Mysore). Ambala was suggested by Air Vice Marshal Joubert (A.O.C. India) in January 1939, but was unsuitable because of an inadequate water supply.

Iraq was no better. Any expansion would have to be done within the existing cantonments, and this was hardly feasible at Habbaniyah. At Shaiba the weather and lack of space were difficulties. In fact, there was no hope of a school in Iraq without a lengthy process of negotiation and building.

Egypt was equally unpromising. Abu Sueir could not be  
/expanded,

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(1) E.P.M. 169(38)

expanded, and another station in the canal zone would present awkward problems. By May 1939 it became accepted that congestion in the United Kingdom could be relieved only by training in Canada.

The A.O.C. Middle East had, however, recommended Kenya. The Governor of Kenya, Sir Robert Brooke-Popham, welcomed the proposal, and a site was chosen at Nakuru, ninety miles from Nairobi. The establishment of a Flying Training School there was approved in May 1939.

S.50935

In May Captain Harold Balfour (U.S. of S.) suggested that a Flying Training School should be started in France. The Rheims area, Southern France, and N.W. France were discussed as possible locations, but no conclusion was reached. In July the Air Council decided to pursue the suggestion, with the intention of opening a school in peacetime and continuing it as a school in war. The Foreign Office was consulted, and Sir Kingsley Wood discussed the scheme with M. Guy la Chambre (French Air Minister), who received it favourably. An official request was then made, to which the French Government agreed on 1st September 1939.

S.16171

S.16171

Summary.

By the spring of 1938 expansion was not working out according to plan. Whatever the number of squadrons might be on paper, Group Captain Slessor's analysis showed that the effective first line in April 1939 and for some time later would be no more than half the "apparent peace time facade".

Again, however, much F.T.S. training had been improved compared with its earlier standard, squadrons were still largely occupied with individual training, and an interim stage between the F.T.S. and bomber squadrons had become necessary. Bomber Command had to be divided into mobilisable and non mobilisable elements, and September 1938 found one Bomber Group with 176 aircraft, but only 27 crews, ready for war. (1)

S.47667

The causes were many, varied, and interrelated. Shortage of trained regular and reserve crews were the chief symptoms, but shortage of trained regular crews came partly from reliance on squadrons for a considerable part of pilots: individual training and the greater part of crew training, and partly from lack of a settled crew policy and adequate schools for crew training. Reliance on squadrons for so much training, and lack of crew training arrangements, in turn resulted largely from uncertainty and delay in settling navigation policy.

Something was done about each of these causes. Pilots' basic training was extended to include a 10 weeks' navigation course, and a major reason for the preoccupation of bomber squadrons with individual training removed. Observers'

/basic

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(1) This was quoted by W/Cdr. Mackworth as an instance of the amount of effort required by navigation training: the lack of crews was due to the amount of time and flying needed to bring pilots up to operational standard in navigation.

Observers' basic training was made thorough in both navigation and armament, and another source of a good deal of squadron training removed. Satisfactory crewing was laid down at the end of 1937, and a long-term crew policy worked out at the end of 1938. The Volunteer Reserve was greatly expanded, and its scope increased by making provision for crew training and advanced pilot training. Group Pools were devised to serve the dual purpose of an interim stage for regular pilots after leaving the F.T.S. and of a service training stage for the Volunteer Reserve.

In each case, however, the working out of the plan was hedged about by difficulties and limitations. Navigation courses for pilots, even when G.R. training had been transferred from Manston to a separate new school and two civil navigation schools brought in, could be given only to the output for bomber squadrons. Moreover, this amount of navigation training was considered feasible only in peace: time could not be spared for it in war.

In May 1938 an observer was included in every bomber crew to supply the navigational skill in which war-trained pilots would be lacking. The number of observers to be trained rose sharply: eight civil schools and a temporary service school were brought quickly into operation, but the supply of pupils<sup>(1)</sup> was not enough to fill them.

Early in 1939 it became clear that a large and possibly extravagant amount of effort was being put into navigation training, and so the pilot's peace time training was cut down from 10 weeks to 6 and the observer made responsible for navigating the aircraft.

The quality of observer training at civil schools was not very high. A second service school was ultimately to

/be provided

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(1) Largely from a direct entry scheme which was introduced somewhat belatedly and proved unattractive to the type of man required.

be provided, but there was little prospect of its starting work before 1940.

Group Pools and the interim stage had little more than a paper existence. The decision to establish them was taken in November 1938, but lack of aircraft, staff, and aerodromes made it impossible to start them earlier than 1940. In any case, they were planned to a hypothetical war time size, and their ability to handle the peace time interim stage and V.R. commitments were left to be determined by experience.

A number of non-mobilisable bomber squadrons were used as temporary substitutes for Group Pools from April 1939 onwards, but they dealt mainly with advanced V.R. pilot training and at the outbreak of war were only emerging from the experimental phase.

Expanding the Volunteer Reserve and widening its scope was an inherently lengthy business. Time was needed to organise more town and aerodrome centres: supplying the centres with instructional equipment and advanced types of aircraft could not be done quickly; and instructors were hard to find. Moreover, the V.R. basis of week-end and evening instruction inevitably needed a long time to turn out fully-trained men.

To produce a sizeable and well trained reserve more quickly it was essential for reservists to have a six months' continuous service period of training. A bonus system of inducing them to undertake this continuous training was devised at the beginning of 1939, only to be rendered unnecessary by the introduction of compulsory militia service.

The main problem of accelerated reserve training, however, was that it required the aircraft, staff, and facilities that were also needed for regular training.

Plans for reconciling the two were drawn up very shortly before the outbreak of war, and consequently never put into operation.

All these changes, developments, and expedients arose from the working out of Scheme F. Scheme L affected them only by scaling them up to larger numbers. In the case of F.T.S.-pilot training, however, the full scaling up was not done because experienced men could not be spared from squadrons to staff more than four of the eight F.T.S.'s needed.

There was not much output from these improvements in training. A steady flow of bomber pilots went through the navigation schools, but the output of observers was disappointing because of the difficulty in finding enough pupils. Week-end training of V.R. crews did not have time to make much progress before September 1939, while continuous service training never got under way. Advanced training of V.R. pilots went ahead, but they could do little service training. Group Pools, or their substitutes, barely started.

Some further improvements in basic training were agreed to be desirable, but found impossible. Bad weather and night flying (the remaining major elements of individual training done by squadrons) could not be taught more thoroughly at Flying Training Schools, which lacked the time and wireless facilities to deal properly with them, or at the navigation schools, and so were left in February 1939 as subjects for the non-existent Group Pools to teach. Air gunners, in spite of the admitted inadequacy of unit training, were not taught in schools because there were too few armament training stations to provide school facilities. School training for air gunners was planned only in August 1939, after strong pressure from Bomber Command, at the expense of squadron visits to the armament stations.

/Almost

Almost every aspect of training was to some extent hampered in 1938 and 1939 by shortage of aircraft. Flying Training Schools were equipped with fewer T.E. trainers than the proportion of Group II output required, and had to rely on Hart Variants for S.E. training until the Harvard gradually came into use in 1939. The start of navigation training at civil schools was delayed because Ansons could not be provided. Battles and Ansons for V.R. training were found only with difficulty. Oxfords could not be provided for Group Pools.

Little progress was made in arranging for training overseas, and that little came late. A Flying Training School was sited in Kenya, and the French Government agreed to the establishment of R.A.F. schools in France. New Zealand promised to supply a sizeable number of trained pilots, but Canada showed persistent reluctance to undertake any appreciable training commitment.

A general comparison of R.A.F. and German training was made early in 1939. The German system was believed to provide an ab initio "A" school course of something under 6 months, a "B" school course of 5 months on service types, a "C" school course of 3 months on heavy service types, followed by 4 month specialist school courses on bombers or fighters. Roughly, the German "A" school corresponded to the R.A.F. 10 weeks civil school stage, the "B" and "C" schools to the first  $4\frac{1}{2}$  months of the R.A.F. Flying Training School, and the specialist schools to the last part of the F.T.S. course and to squadron training.

In addition the German system provided specialist blind flying schools, to which there were no R.A.F. equivalents, and Supplementary Schools working full time on reserve training.

The annual output was estimated to be about 2,600

/regular

regular and 1,440 fully trained reserve pilots (for 1938). The corresponding R.A.F. output was 1,600 regular and 165 fully trained V.R. pilots. The German system (which was thought to work to a standard rather than to a period of training) was considered to produce men at least as highly trained as the British.

7. September 1939 - April 1940.

When war began existing schools were converted as far as possible to the planned War Training Organisation. 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 T.E. 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 S.E. trainers were Hart Variants, whose use entailed considerable conversion 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, and a certain lack of instructors. 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 both 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 minimise 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 no interference by enemy action. It was much as if some full-scale peace-time exercise were being carried out against a background of war conditions.

Planning for future expansion was done on the basis of a monthly production of 2,550 aircraft. The ultimate first line force, and the training organisation necessary for building up and maintaining that force, were derived from this figure.

In September the preliminary estimate was that a training organisation of 45 Elementary and 45 Service F.T.S.'s, with corresponding ancillary schools, would be needed. In November a target first-line force was approved, and an ultimate training organisation<sup>1</sup> based on it. This training organisation, however, was not required to reach its full size before 1942. For the immediate present of the first eight months of war no more schools could be opened and no more aircraft provided, so that the output from existing schools at their War Training size and with War Training course lengths was the most that could be done.

/Casualty replacement

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1. Of 60 E.F.T.S.'s, 60 S.F.T.S.'s, 40 A.O.N.S.'s, 27 B. & G.S.'s, 6 A.N.S.'s, 2 Schools of G.R., 3 Flying Instructors' Schools, 3 Schools of Army Co-operation, and 2 Torpedo Training Schools.

Casualty replacement, expansion and training development, during this period all had to be based on the output of some 5,600 pilots<sup>1</sup>, 3,600 observers and 5,400 air gunners per year from the existing schools.

At the outbreak of war Reservists, the Auxiliary Air Force, and the Volunteer Reserve were called up. Many V.R. pilots, and practically all V.R. aircrew, had to be given a considerable course of basic training. In addition, it was found that a fair proportion of A.A.F. pilots also needed courses.

#### Flying Training Schools.

On the outbreak of war all but 19<sup>2</sup> of the civil E. & September 1939. R. Flying Training Schools were closed. Their aircraft were redistributed, and 540, chiefly Harts and Ansons, became available to bring the S.F.T.S.'s up from peace to war establishment. This number was not enough; about 600 were needed to make the change at fifteen schools and some 50 more to convert Cranwell to a S.F.T.S. At first only nine S.F.T.S.'s increased to war establishment. Again, the proportion of T.E. aircraft was not high enough, so that five of the nine schools on war establishment had to produce pilots in the ratio of two S.E. to one T.E., instead of the planned ratio of one S.E. to two T.E. During the autumn of 1939, however, more T.E. aircraft became available, and all schools were then able to train 2/3 of their output as Group II (T.E.).

/The S.F.T.S.

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1. For the R.A.F. In addition, about 600 pilots per year could be trained by Nos.1 and 7 S.F.T.S.'s for the Fleet Air Arm.
  2. Those remaining in operation were:-

Reserve	No.1 Hatfield	No.12 Prestwick
Command	No.2 Filton	No.13 White Waltham
Training	No.3 Hamble	No.14 Elmdon (which moved from Castle Bromwich,
Instructions	No.4 Brough	and with which No.20 Gravesend, was
	No.5 Hanworth	amalgamated).
	No.6 Sywell	No.15 Redhill
	No.7 Desford	No.30 Derby (renumbered 16 in April 1940)
	No.8 Woodley	No.18 Fair Oaks
	No.9 Ansty	No.22 Cambridge
	No.10 Yatesbury	No.24 Belfast (with which No.23 Rochester, was
	No.11 Perth	amalgamated).

S.D.138/1.

The S.F.T.S. course was shortened, as had been planned for war-time training, to 16 weeks, the A.T.S. visit to an armament training station being reduced to two weeks. The syllabus requirement of flying hours remained at 100 per pupil, and the amount of S.F.T.S. navigation instruction was increased in consequence of the decision taken in May to bring all pilots up to "s.n." standard by S.F.T.S. training followed by a 6-week navigation course.

The pupil capacity of S.F.T.S.'s was scheduled to increase from 96 to 152 per school, but the increase came about gradually<sup>1</sup>. Aircraft, instructors (there was a particular shortage of navigation instructors), ground staff, and accommodation were the governing factors.

The E.F.T.S.'s were also scheduled to increase their pupil capacity and shorten their courses, but an increased E.F.T.S. output was not needed for some considerable time. While the S.F.T.S.'s were working to the limit of their facilities and staff to finish the training of Volunteer Reservists who had done elementary, or in some cases intermediate, training before the war, there was no point in E.F.T.S.'s working at full pressure simply to add to the waiting list for admission to S.F.T.S.'s. The E.F.T.S.'s therefore trained on courses of a nominal 10 weeks' duration, but often extended to considerably longer, instead of the 8 weeks planned by the War Training Organisation. Some of them filled in time when there was little call for intakes to S.F.T.S.'s by training Volunteer Reservists as E.F.T.S. instructors by courses of 4 weeks duration (30 hours flying).

/There were

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1. The F.A.A. schools (Nos. 1 and 7) were not brought up to war establishment until the summer of 1940.

There were so many V.R. pilots in the earlier stages of training that a number had to be returned to civil life, after mobilisation, to await calling up when training space became available. At the same time, war entrants were coming in, and their turn to start training had to wait until the accumulation of Volunteer Reservists had passed into the schools. By the beginning of 1940 the Initial Training Wings were crowded, and public feeling began to grow about the waits and delays before flying training began.<sup>1</sup>

The planned output from flying training, about 5,600 pilots per year<sup>2</sup>, was practically double the intake capacity of the Group Pools, and was also far in excess of the demands of wastage and expansion at a time when virtually no fighting was going on. In October Air Commodore Cordingley (Director of Manning<sup>3</sup>) produced figures which showed that with this rate of S.F.T.S. output there would be a slight deficit of pilots at the end of 1939 (i.e. the pre-war deficiencies would not have been quite wiped out), but a surplus of over 1,100 by April 1940 provided the existing low rate of casualties continued<sup>4</sup>. This surplus was likely to be embarrassing, since there was no way of employing the pilots or keeping them in flying practice<sup>5</sup>.

S.58474

/At about

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1. Appendix 15 - Extract from "Sunday Graphic" 25th February, 1940.
  2. The monthly figures, showed the 8-week lag before A.T.S. training of intermediate-trained Volunteer Reservists affected the output, were:-

September 1939	158	January 1940	455
October 1939	149	February 1940	518
November 1939	708	March 1940	468
December 1939	562	April 1940	518
  3. The Directorate of Manning was created in July 1939 to be responsible, inter alia, for calculating personnel requirements for training, courses, etc.
  4. The possible other side of the picture was shown by a parallel set of figures which forecast shortages of 1,700 pilots at the end of 1939 and of 1,475 in April 1940 if sustained operations were in progress.
  5. The figures were worked out on the assumption that the Group Pools would be handling as many pilots as possible, and the surplus forecast was the number for whom there would be no room in Group Pools.

S.2546

At about the same time it appeared that the 16-week S.F.T.S. course was too short for adequate training. Bomber Command, at the beginning of November, criticised the standard of S.F.T.S. output and asked for more attention to instrument flying and night flying<sup>1</sup>. Training Command suggested that more attention could be given to these subjects if the armament station visit were transferred to the Group Pool stage of training, thus saving the time which was usually lost or wasted at the S.F.T.S.'s by making so short a visit.

The prospect of an embarrassing surplus, and similar evidence that school courses were too short, could however also be seen in the case of observers and air gunners. Air Marshal Portal therefore proposed that courses generally should be lengthened by 25%, which would combine an improvement in training with reduction of output<sup>2</sup>.

The fact

1. Practically no night flying instruction was being done by schools at this time, partly because they were interpreting black out to mean an almost total absence of aerodrome lighting, and partly because only a proportion of their aircraft had night flying equipment.
2. At about this time (November 1939) Lt. Col. Smith-Barry (who had invented and made successful the Gosport system of training in 1917 and had thus moulded the general character of R.A.F. pilot training) and Major Heenan (who had been with Lt. Col. Smith-Barry at Gosport) put forward a paper in which some radical changes were proposed in order to improve the output efficiency and qualitative standard achieved by Flying Training Schools.

The changes proposed fell under two main heads:- working aircraft and instructors more intensively to obtain greater output without corresponding absorption of resources in training, and establishing "all-through" schools of considerable size (400 aircraft) to deal with every stage of a pilot's instruction (except operational training) for the sake of efficiency and a higher standard. They were considered in detail by the Air Ministry and Training Command, and met with marked opposition. It was demonstrated at great length that no intensification of the work done by aircraft or instructors was possible, and that no advantages could be expected from all-through training in a large school.

The proposals were turned down, and the matter dropped. It was rather complacently agreed that the existing training system stood in no need of intensification or improvement, and that experiments to those ends were unnecessary. The changes which had taken place since the days of Gosport were stressed repeatedly, as were the unfamiliarity of Lt. Col. Smith-Barry and Major Heenan with recent developments and the assiduity with which training had been constantly improved.

The Smith-Barry proposals, however, were to some extent carried into effect towards the end of 1940, not as a result of the Smith-Barry - Heenan paper, but in consequence of the urgent pressure for pilots which appeared as soon as active operations began.

The fact that the existence or absence of active operations could transform deficiencies into surpluses, or vice versa, so completely and so rapidly meant that little significance could be attached to forecasts of numbers, and that it was consequently not sound to base plans on those forecasts. Air Marshal Portal therefore suggested that the basis for fixing course lengths should be the time necessary to provide really adequate training, it being borne in mind that courses might have to be shortened if output were urgently required or lengthened if the demand were light.

The general lengthening of courses by 25% was agreed, and was introduced in December. Air Marshal Welsh pointed out that if the lengthening were a permanent measure more schools and more effort in training would be needed, with a corresponding reduction in the front line. Air Chief Marshal Newall, however, ruled that the question of more schools did not arise immediately, and that the operational effort would have to be adjusted if necessary.

S.58474

The lengthening of S.F.T.S. courses to 20 weeks and of E.F.T.S. courses to 10 was accompanied by an instruction that the extra time should be devoted to instrument flying and general flying practice at E.F.T.S.'s, and to instrument, night and formation flying at S.F.T.S.'s.

The actual reduction in the output of pilots during the winter of 1939-40 was a great deal more than the 25% increase in course lengths should have caused. The winter was exceptionally severe, and 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 14,000 in February, the effects of the weather being aggravated by serious un-serviceability of grass aerodromes.

S.F.T.S. courses had to be further extended by anything up to ten weeks, their total duration thus becoming

/between 20

S.59175

between 20 and 30 weeks. The actual output of pilots in January, February and March was 550 less than 20-week courses should have produced, and the surplus which had been forecast for April 1940 completely disappeared.

Intakes to flying training were, of course, reduced by the factors which reduced output. By February the I.T.W.'s had some 2,500 recruits, or nearly six months' supply, waiting for vacancies at schools. 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 by putting the S.F.T.S. course duration back to 16 weeks in April.

The E.F.T.S. course was also restored to its originally planned length, i.e. 8 weeks, and as further ways of easing the congestion in I.T.W.'s the total E.F.T.S. pupil capacity<sup>1</sup> was increased by 144 in March, and advanced elementary training was started, also in March, at No.9 E.F.T.S., Ansty and No.10 S.F.T.S., Yatesbury. 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.

Training Command's proposal that pilots' practical armament training should be done at Group Pools rather than at S.F.T.S.'s was pursued irrespective of the general lengthening of courses. It arose from the difficulties under which armament training stations were working as well as from a desire to avoid wasted time during S.F.T.S. courses, and had in its favour the strong argument that Group Pools could do crew training on current operational aircraft with up-to-date armament equipment.

/Bomber

1. The standard E.F.T.S. for war training purposes had 96 pupils. In practice, however, schools varied in size, and were classified as A (96 pupils), B (72 pupils), or C (48 pupils). The increase of 144 pupils in March 1940 was made by converting No.4 E.F.T.S. Brough from C to A, No.5 E.F.T.S. Hanworth from B to A, No.15 E.F.T.S. Redhill from 36 pupils to B, No.8 E.F.T.S. Woodley from 24 pupils to C, and No.18 E.F.T.S. Fair Oaks from 36 pupils to C. No.15 E.F.T.S. Redhill was used to train Polish pilots.

Bomber Command supported the proposal, with the proviso that the time saved should be devoted by S.F.T.S.'s to night and instrument flying. Fighter Command, whose Group Pool training facilities were practically non-existent, objected to it and insisted that fighter pilots must be given practical armament training at S.F.T.S.'s. Fighter Command could not be persuaded to create an adequate Group Pool organisation, and so a further difference between the training given to Group I and Group II pilots had to be introduced<sup>1</sup>.

If the system of training both Groups at each S.F.T.S. were continued there would be the complication of arranging armament visits for only a part of the pupils at every school, and Training Command therefore proposed that schools should specialise on training either one Group or the other. Specialisation of schools had two main advantages: maintenance would be simplified because each school would have a single type of aircraft, and the Group I schools could be chosen so that pupils could do air firing on near-by tow-lines, thus avoiding the need for any armament training visits at all.

S.2546

In December 1949 Training Command proposed that four S.F.T.S.'s should specialise on Group I training, and the remaining eight schools training for the R.A.F. on

/Group II

S.58905

E.T.S.2  
(40)

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1. No. S.E. and T.E. differentiation could be wholly satisfactory, because Group II (T.E.) training did not include the fixed gunner necessary for T.E. fighters and some bombers, while Group I (S.E.) training did not include the bombing needed by S.E. bombers. T.E. fighter pilots were drawn from Group II output until April 1940, but this proved unsatisfactory, and A/V/M. Babington decided that they should in future come from Group I and be converted to T.E. aircraft after leaving the S.F.T.S. Bomber pilots mainly came from Group II, but some Group I pilots also went to bombers, partly because Group I training was suitable for Battles. The proportion of T.E. to S.E. pilots required had risen from 2:1 to 3:1 with the use of T.E. aircraft for fighter and army co-operation work, though this was not necessarily the proportion of bomber to fighter pilots. As first line expansion and re-armament went on the proportion of T.E. pilots required was scheduled to increase until it reached 6.5:1 at the end of 1941.

Group II<sup>1</sup>. The disadvantages of specialising schools were pointed out by Air Marshal Welsh and Air Commodore Donald (D. of O.). Mixed schools could easily change the proportion of Group I and Group II pupils in their output to meet changing requirements: indeed, this flexibility was the reason which had previously been held to justify them. With specialised schools, on the other hand, the proportion of output could be changed only with difficulty: and more schools would therefore be needed to provide margins of trained men and guard against contingencies. In any case, specialised schools were wanted only because Bomber Command and Fighter Command needed different basic training, and this difference in basic training was itself required only because there were immediate shortcomings in Fighter Group Pools. Specialised schools did not seem sound as a measure of long-term planning.

Another disadvantage put forward was that pupils would have to be selected for specialisation on Group I or Group II at the E.F.T.S.'s, but not much weight was attached to it. Training Command were confident that any given batch of pupils could be satisfactorily trained on either syllabus, while Air Marshal Portal considered that longer periods of elementary training at the I.T.W. and

/E.F.T.S.,

1. At this time there were 14 S.F.T.S.'s in the United Kingdom:-

- |                        |                        |
|------------------------|------------------------|
| No.1 Netheravon        | (Harts and Harvards)   |
| No.2 Brize Norton      | (Harvards and Oxfords) |
| No.3 South Cerney      | (Harts and Oxfords)    |
| No.5 Sealand           | (Harts and Oxfords)    |
| No.6 Little Rissington | (Harvards and Ansons)  |
| No.7 Peterborough      | (Harts and Audax)      |
| No.8 Montrose          | (Harts and Oxfords)    |
| No.9 Hullavington      | (Harvards and Ansons)  |
| No.10 Ternhill         | (Harvards and Ansons)  |
| No.11 Shawbury         | (Harts and Oxfords)    |
| No.12 Grantham         | (Harts and Ansons)     |
| No.14 Kinloss          | (Harvards and Oxfords) |
| No.15 Lossiemouth      | (Harvards and Oxfords) |
| Cranwell               | (Harts and Oxfords)    |

Nos.1 and 7 were training for the Fleet Air Arm.

No.13 Drem, was closed on 27th October because the aerodrome was required by Fighter Command, and was dispersed among Nos.8, 14 and 15 S.F.T.S.'s.

No.12 Grantham, was transferred from No.23 Group to No.21 Group on 10th October.

The schools earmarked for Group I training were Sealand, Montrose, Kinloss and Lossiemouth.

E.F.T.S., coupled with the physiological and psychological tests then being developed by the Flying Personnel Research Committee, should enable satisfactory selection to be done.

S.2546

In January 1940, a conference on Specialisation and the Transfer of Armament Training decided to try specialising schools as soon as possible, in order to improve the general standard of training by making more time available at S.F.T.S.'s and enable bomber pilots to have their armament training on operational types of aircraft.

Armament training attachments of Group II pupils to B. & G. Schools stopped at once, and their place was taken by visits from Bomber Command Group Pools. Attachments of Group I pupils from S.F.T.S.'s went on temporarily until tow lines and towing aircraft could be provided at the four Group I schools and the specialisation scheme put into effect. No fundamental change in the S.F.T.S. syllabus was involved. Armament subjects were still to be taught in the Advanced Training Squadron, local bombing ranges used by Group II pupils, and cine camera gun exercises carried out. The essential difference was simply that bomber pilots would not do high level bombing and live firing until they went to Group Pools, and would have more S.F.T.S. training in night and instrument flying.

S.2546

Putting the scheme into effect, however, meant equipping the eight Group II schools completely with Ansons or Oxfords, and this required more T.E. aircraft than were available. It was therefore planned<sup>1</sup> that four of the Group II schools should have Battles<sup>2</sup>, two Oxfords, and two

/Ansons.

1. Hullavington, Shawbury, Grantham and Cranwell were to do Group II training on Battles. Brize Norton and South Cerney were to use Oxfords and Little Rissington and Ternhill, Ansons. Of the Group I schools, Sealand and Montrose were to have Masters, Kinloss and Lossiemouth, Harvards.
2. The Battle was considered a better makeshift Group II trainer than the Hart.

Ansons. Two of the Group I schools were to have Masters<sup>1</sup> and two Harvards.

Even this plan, which Training Command put forward in February 1940, called for more T.E. aircraft than could be provided. Moreover, it had just been decided that no more Ansons or Oxfords could be allotted to Training Command since the whole output was needed to equip new schools overseas. Specialisation of schools could therefore not be started because there were not enough T.E. aircraft to equip even four schools for Group II training, nor yet enough Battles, Ansons, and Oxfords, to equip eight Group II schools, though there were enough Masters and Harvards for the four Group I schools. The overall deficiency of trainer types was being covered by using Hart Variants.

A specialised Group I course began in April at Montrose, and specialised Group II courses at Shawbury and Grantham, but there was no prospect of any further development of the scheme. Kinloss and Lossiemouth were being handed over to Bomber Command<sup>2</sup>, Sealand was soon to be abandoned, and Montrose was probably to be abandoned. This meant that no S.F.T.S. would remain near the sea, and therefore that no S.F.T.S. could have the tow lines needed for Group I air to air firing. The possibility of specialising schools appeared at the end of April to have been killed by events.

Shortage of T.E. aircraft was not the only handicap on S.F.T.S.'s. There was an acute shortage of spares for Ansons, Oxfords, and Harvards, while maintenance work was not satisfactory largely because experienced men had been replaced by newly-trained recruits. The result was a mounting shortage of serviceable aircraft, accentuated by a lack of replacements for Oxfords and Ansons.

/In February

1. Masters began to come into use in the early part of 1940.
2. Kinloss and Lossiemouth were taken over in April at short notice for the use of Bomber Command during the Norwegian campaign. No.14 S.F.T.S. moved to Cranfield, and No.15 to Middle Wallop: their current courses were lengthened by a fortnight to allow for the dislocation of moving.

In February satisfactory lighting and drill for night flying were worked out<sup>1</sup>, but further difficulty arose from the lack of relief landing grounds, and there was consequently little increase in the amount of night flying instruction. Difficulty in training Group II pilots came from the lack of local bombing ranges<sup>2</sup>. The establishment of Link Trainers was raised from 3 to 4 per S.F.T.S. in November 1939, but they could not be provided quickly. Cloud and bad weather flying could still not be practised because the schools had no wireless.

A.72863/40

Up to April 1940 the supply of flying instructors was a hand-to-mouth business. Some E.F.T.S. instructors had been trained at the E.F.T.S.'s themselves, largely from suitable Volunteer Reservists who had not been through a S.F.T.S. course. The C.F.S. had been training other instructors in day and night work on both S.E. and T.E. aircraft: reducing the C.F.S. course from 6 to 4 weeks had been tried, but had proved impracticable with this syllabus.

In April it was decided to introduce Elementary Flying Instructor courses, supervised by C.F.S. instructors. The pupil instructors were to be drawn from S.F.T.S. outputs, and the rate of training was to be about 300 per year on 4 week courses.

It was also decided to increase the output of instructors from the C.F.S. by specialising their training on S.E. or T.E. aircraft and reducing the course to 5 weeks. The output was to be about 500 Instructors per year, 300 T.E. and 200 S.E. The types for specialisation were ~~Oxfords~~ and Masters, though Harvards would also be used while they remained at S.F.T.S.'s.

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- /In the
1. Part of the drill provided that aircraft were to be recalled on a yellow air raid warning.
  2. The first local bombing range, serving South Cerney and Hullavington, was opened on 20th April.

In the autumn of 1939 some difficulty arose over the instructors who had been working at E.F.T.S.'s before the war. The E.F.T.S.'s continued as civilian schools after the outbreak of war, and these instructors went on working as civilians. Additional instructors posted to the E.F.T.S.'s were, however, in the R.A.F. The older instructors, who were all members of the R.A.F.O., or R.A.F.V.R. became dissatisfied at not being in uniform. Civilian instructors had some trouble in controlling uniformed pupils, and a mixture of service and civilian instructors was undesirable. As a result, all instructors<sup>1</sup> were mobilised on 1st January 1940, the C.O.s being seconded to the operating companies so that they could properly attend to the companies' interests.<sup>2</sup>

#### Navigation and Crews.

The outbreak of war found navigation embarking on a fundamental change of policy, from pilot to observer responsibility, and at the same time largely dependent for the competence of observers on the rather unsatisfactory training given by civil schools.

Pilots<sup>3</sup> had been trained in peace time to "s.n." standard, originally by a 10-week course, but later (the change being decided on in May 1939) by a combination of more instruction at the F.T.S. with a subsequent 6-week navigation course which produced the same "s.n." standard. Only the F.T.S. part of this latter scheme had come into operation by the outbreak of war.

/The war-time

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1. Including those at the civilian operated Air Observer Navigation Schools.
  2. At the same time the C.O.s of civil schools were relieved of actual flying duties, chief flying instructors (C.F.I.'s) being appointed and made subordinate to the C.O.
  3. The policy was for all pilots to receive this training, but in practice only bomber pilots were given it.

The war-time policy was for pilots not to be given navigation courses as part of their basic training because of the time and effort involved. Accordingly the 6-week courses were dropped, and war-trained pilots received only the recently-increased navigation instruction given at S.F.T.S.'s. This S.F.T.S. instruction, however, was not satisfactorily carried out. There was a shortage of instructors which persisted until the early part of 1940; the instructors were a scratch collection with no particular competence or training; S.F.T.S.'s had few aircraft suitable for navigation training and no wireless facilities to enable them to fly long distances or by night; and the areas available for cross country flying were restricted. As a result, war-trained pilots went forward to Group Pools with little more than an elementary theoretical knowledge of chart-board navigation.

S.47667

Observers before the war had mostly been trained at civil schools. Their instruction was recognised to be somewhat defective, but it had been considered better to accept the defects than to open service schools for the abnormally large number of observers to be trained in 1939 and 1940. A second service navigation school at Chivenor had been planned, but it was not due to come into operation until late 1940, when the number of observer pupils would have dropped to a more modest figures.

The war-time policy for observer training was that Armament Training Stations should change into Air Observer Schools and teach both armament and navigation. This, however, was flatly impossible in September 1939. The Armament Training Stations were too small to hold the increased pupil population which twelve weeks' navigation training in addition to the armament course would involve; there were not enough aircraft to provide the navigation

/flying;

flying; and the necessary staff pilots and maintenance crews could not be found.

Observer training at civil schools had therefore to go on after the outbreak of war. In fact, it had to be increased: reserves of trained observers were non-existent, since there had not been time to give Volunteer Reservists more than elementary ground training and a little flying; deficiencies had to be made up and casualty replacements provided; and some of the pre-war tradesmen observers were badly needed in their ground trades.

The extra schools which had been intended for continuous service or militia pupils were brought in, and by the end of September 1939 there were ten civil schools<sup>1</sup>, soon named Air Observer Navigation Schools, with a total output capacity of some 4,200 observers per year. No question of the adequacy of this number arose: it was comfortably in excess of the armament training capacity, which was the limiting factor.

September 1939

The course given at the A.O.N.S.'s lasted 12 weeks and called for 36 hours flying, some of it at night. It aimed at producing the same "s.n." standard to which pilots had been trained, but allowed only two extra weeks for the fact that observers had neither the flying experience nor the general basic grounding of pilots.

/In October

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I. No.1	A.O.N.S.	Prestwick	(390 pupils)
No.2	"	Yatesbury	( 30 pupils)
No.3	"	Desford	( 60 pupils)
No.4	"	Ansty	( 60 pupils)
No.5	"	Weston-super-Mare	( 60 pupils)
No.6	"	Gloucester-Cheltenham	(120 pupils)
No.7	"	Perth	( 60 pupils)
No.8	"	Sywell	( 60 pupils)
No.9	"	Blackpool	(120 pupils)
No.10	"	Grangemouth	( 90 pupils)

Martin's School of Air Navigation had moved from Shoreham to Gloucester-Cheltenham, and became Airwork Civil School of Air Navigation in May 1939: Gloucester-Cheltenham was renamed Staverton in September. No.9 A.O.N.S. was opened in September 1939.

S.75988

In October Reserve Command attempted to improve the standard of observer training by raising the requirement of flying hours to 50 and stressing the importance of long flights with frequent alterations of course. It was far from easy, however, for the schools to do more cross country or night flying. Training areas were restricted, and the A.O.N.S.'s near the east coast were seriously handicapped by the restrictions<sup>1</sup>. Beacons had to be authorised and installed for night flying, while all long distance flying was severely limited by lack of wireless facilities<sup>2</sup>.

September/  
October 1939.

Training at the School of Air Navigation after the outbreak of war became unsatisfactory and ineffective. The school moved from Manston to St. Athan, where it was cramped by lack of accommodation. It was also, like the civil schools, handicapped by restrictions on flying and lack of wireless facilities. Three out of four observer courses which it had running were cancelled, and all training for the fourth, as well as for Specialists "N", "s.n.", and astronomical navigation courses, was held up until well into October.

In November Wing Commander Fressanges (T. Nav.) drew up a formidable list of shortcomings in navigation training. The civil schools not only suffered from restricted flying

/areas,

1. In November three A.O.N.S.'s moved from the east coast area to the west; No.10 from Grangemouth to Prestwick (where it was absorbed by No.1), No.8 from Sywell to Blackpool (where it merged with No.9), and No.3 from Desford to Carlisle. The reduction in training capacity was partly made up by opening No.11 A.O.N.S., with 60 pupils, at Hamble, also in November.
2. The limited use which could be made of wireless affected all navigation training. In the early days of the war no communication whatever was allowed except the use of MF/DF in dire emergency. In October Reserve Command obtained permission for aircraft to use H/F for making position reports at hourly intervals, but there was no regular service of fixes or bearings available to training aircraft. A.O.N.S.'s were not given MF/DF stations, and MF/DF could still only be used in serious emergency. Loops were of little value because beacons were few and badly placed for training flights. The School of Air Navigation had to work under the same conditions, except that a HF/DF station was provided at St. Athan towards the end of 1939.

areas, lack of wireless, and difficulty in night flying, but were also short of aircraft and had master mariners, with little or no air experience, as instructors; moreover, by no means all the schools were efficient, and they were not coordinated in their standard and methods of instruction. The School of Air Navigation, apart from the congestion at St. Athan and lack of wireless and beam facilities, was handicapped by inadequate provision for high altitude work and shortage of astronomical navigation equipment.

To make some improvement, he proposed that the length of the A.O.N.S. course should be increased from 12 to 16 weeks, that the A.O.N.S. instructors should be given a course at St. Athan, that a navigation specialist should be established at Reserve Command to look after the civil schools, and that the astro. training commitment of the school of Air Navigation should be cut down from 2,000 to 500 per year.

These proposals were carried out, but they were described by Wing Commander Mackworth as rather a counsel of despair. He added suggestions that the effect of operational restrictions on flying should be avoided by putting as much training as possible in Canada, and that astro. training should be put on a satisfactory basis by giving the School of Air Navigation a satellite in the south of France.<sup>1</sup>

The inadequacy of observer training as well as difficulty in disposing of surplus output were taken into account in Air Marshal Portal's proposals for a general lengthening of courses by 25%, and the A.O.N.S. course was extended to 16 weeks in December.

/Attention was,

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1. This suggestion came to nothing, as also did a later proposal that the school should send a detachment from St. Athan to Prestwick. Providing extra aircraft and facilities, as well as administrative and maintenance complications, were the main objections in the latter case.

Reliance on pilots for navigation could not, however, go on: war-trained pilots were coming forward with little knowledge of navigation. On the other hand, observers were unsuccessful. Yet making the observer responsible seemed the only practicable policy.

Two fundamental problems - pilot or observer responsibility for navigation and the composition of crews - had to come under review again.

S.40289 The arguments for observer responsibility were stated by Air Commodore Saundby (D.O.R.). A full-time navigator unhampered by other duties was required, and second pilots could not be trained to the required standard under war conditions until they had had considerable operational experience. It followed that unless an observer were carried only the captain (i.e. the first pilot) would have the necessary navigational knowledge. The captain, however, had so many other responsibilities, such as tactical control and supervision of the whole crew, that he could not give full-time attention to navigation. Hence it was necessary to include an observer, trained to navigate the aircraft, and free from the other crew duties except in emergency.

S.47667 In January, 1940, however, Bomber Command asked that all pilots should be given more navigation training<sup>1</sup>. This request did not specifically raise any question of the policy of observer responsibility for navigation, but it was quite clear that if pilots were fully trained in navigation they would continue to be responsible for it, and the navigation-trained observer would become largely unnecessary. At the beginning of March a conference under the chairmanship of Air Commodore McClaughry decided that all pilots should be given 4-6 weeks navigation courses, justifying this

decision

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1. Two alternatives were proposed:- a 4-6 weeks course after leaving the S.F.T.S., or a similar course (including flying) between the I.T.W. and E.F.T.S.

Attention was, however, focussed at this time more on defects in the pupils than on shortcomings in their training. Difficulty in recruiting observers before the war had led to the acceptance of men with very moderate intelligence and general education, while Volunteer Reserve observers had been selected more for quantity than for quality, and some 30% of pupils were in consequence being rejected at the A.O.N.S.'s.

War-time entrants, it was held, should be of a much higher standard, and a marked improvement was expected in future for this reason. However, some 40 hours' preliminary ground navigation instruction, mainly on the mathematical aspect, was included in the I.T.W. syllabus.

Whether the main reason was the low standard of pupils, the inefficiency of civil schools, or the cramping effect of restrictions and shortages, observers were not being trained to a high enough standard. Bomber Command criticised them consistently for lacking experience of practical navigation<sup>1</sup>. As a result, the only men on whom squadrons could rely for competent navigation were pilots who had been trained before the war and the few experienced observers.

Inevitably, therefore, and in spite of the policy of observer navigation, many squadrons did not use or accept the observer as a navigator. Air Vice Marshal Sholto Douglas drew attention to this at the end of December, and put the lack of faith in observers down to two probable causes:-

- (i) an extensive fostering of the prestige of the pilot, with consequent belittlement of the other members of aircrew, and
- (ii) the low standard and inadequate training of the direct entry or V.R. observers who had so far reached squadrons.

/Reliance on

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1. The criticism at first referred to observers whose training had begun before the war, but continued in spite of the changes made in A.O.N.S. training. See Appendix 19.

decision by the argument that pilots needed full navigation training to be capable of acting as captains of aircraft.

Pilot or observer navigation was however only one question in the general problem of crews. The others were summarised by Air Commodore Saundby as a choice between:-

- (i) simplifying the duties performed by each man, which meant increasing the size of crews, but would simplify training and make possible a higher standard. Any simplification, of course, would have to be in accordance with Air Chief Marshal Newall's ruling<sup>1</sup> that as far as possible there should be two men capable of performing each duty.
- or (ii) multiplying the duties performed by each individual. This would mean a smaller crew, but would add to strain and fatigue. Again there would have to be two men capable of each duty.

The policy agreed before the outbreak of war had been to build on the wireless operator, training him on to become an observer. The observers who had proved unsuccessful were not products of this policy, but "stop-gap" direct entries. In January 1940 Air Chief Marshal Ludlow Hewitt urged the advisability of drawing observers from wireless operators, partly to produce better observers, and partly to provide a way of advancement for wireless operators.

Air Vice Marshal Sholto Douglas raised another aspect of crew policy by pointing out that it was extravagant to train all air gunners as wireless operators, and suggesting that "straight" air gunners should be revived and wireless operator air gunners kept down to the minimum.

Some clarification of the various types of aircrew and the sources from which they were drawn was highly necessary. At the beginning of February Air Marshal Portal defined the crew problem in war as providing a large number of efficient observers and air gunners at the earliest possible moment, and said that the time

/required

S.40289

required to train observers in wireless as well as navigation and gunnery would mean failure to meet observer requirements. He dealt with the career aspect by proposals to give air gunners equal status with pilots and observers.

The result was that direct entry observers went on, and the policy of drawing observers from wireless operators disappeared. The "two men capable of each duty" ruling was followed, so far as wireless was concerned, by putting two wireless operator air gunners in every aircraft which had room for them, and extravagance in wireless training avoided by establishing "straight" air gunners where more were needed<sup>1</sup>.

There remained the question of pilots' training in navigation, with its corollary of pilot or observer responsibility. Air Commodore McClaughry's conference in March decided, in effect, to reverse the policy which had been laid down in May 1938 and May 1939, but the decision was challenged by Air Vice Marshal Philip Babington (D. of P.). Air Vice Marshal Babington pointed out that the trouble was really due to the low standard of observers being turned out, and that the fault lay not in the policy of observer navigation but in the existing observers and their training. Air Vice Marshal Sholto Douglas agreed with this diagnosis, and the policy of observer responsibility, with pilots trained only to a supervisory standard in navigation, was reaffirmed by a letter<sup>2</sup> which explicitly refuted the recommendation of Air Commodore McClaughry's conference.

April 1940.

During all

1. This made the crew of a Wellington 2 pilots, 1 observer, 2 wireless operator air gunners, and 1 straight air gunner. Other crew requirements decided on at about this time were:-

"Engine watchers" or flight engineers, trained in gunnery, and with no ground duties, for four-engine bombers (November 1939).

Wireless trained observers for "speed (i.e. high-speed) bombers" (February 1940) and Beaufighters (March 1940).

Wireless operators trained in A.S.V. for G.R. aircraft.

2. Appendix 16 - Letter from Air Ministry to all Commands (except Maintenance Command) dated 24th April 1940.

During all this reconsideration of navigation and crew policy the Hampden had been an exceptional case. This aircraft, which Air Vice Marshal Harris described as having been designed and accepted in defiance of every Air Staff requirement and tenet, carried a crew of four, of whom only the pilot and navigator could change places with reasonable ease. As a result, it set a crewing conundrum: a second pilot was needed, partly because captains of aircraft could only be trained by a period as second pilot, and partly because the aircraft had long range and endurance, but the second pilot could not take over the aircraft without a lengthy feat of contortion unless he either occupied the navigator's position or travelled as a passenger.

After the decision of May 1938 on observer responsibility for navigation, with its corollary of whether there was any real general need for observers, was in the melting pot there was little further action about improving observer training. By April 1940, however, it had been decided that observers would remain responsible, that the observers would be direct entry, and that pilots were in general to have only the navigation training in the S.F.T.S. syllabus. It was clear that the navigation training given to both pilots and observers would have to be improved.

Some steps had already been taken: elementary navigation instruction had been added to the Initial Training Wing syllabus for both pilots and observers; S.F.T.S. instructors were to be experienced men with "s.n." training and each S.F.T.S. was to have a specialist "N" to supervise the teaching; and the civil A.O.N.S. instructors were being given courses at St. Athan.

In April the amount of flying to be done during the A.O.N.S. observer course was increased to 67 hours, but night flying ceased to be a requirement because of the

/difficulty in

April 1940.

difficulty in doing it satisfactorily without wireless aids. There were not enough aircraft, however, to provide the increased amount of flying. Ansons were needed for training overseas. At the largest A.O.N.S. in operation<sup>1</sup>, Prestwick, the shortage of Ansons was largely overcome by the use of three Fokkers, each of which held some thirty pupils and was fitted up as a flying classroom. The Fokkers solved a great deal of the problem of providing flying hours, but their training value was not considered high: the flying classroom did not develop much independence and self reliance, while the amount of Anson flying done after elementary instruction in Fokkers was seldom enough to overcome this handicap.

Observer training was hampered by lack of instructional equipment. Hamble, for instance, began to train observers on 20th November, 1939, but did not receive any equipment until 12th December, and was not fully supplied until 1st May 1940.

The navigation training of pilots also showed no marked or rapid improvement. Experienced men for training as navigation instructors could, in the main, come only from Bomber Command, and Bomber Command had hardly enough such men for its own first line training requirements.

Navigation training, at the end of the first eight months of war, was thus a patchwork affair. Pilots were getting a largely theoretical grounding at the I.T.W. and

/S.F.T.S.

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1. The A.O.N.S.'s at the end of April 1940 were:-

No. 1 Prestwick	(390 pupils)
No. 2 Yatesbury	(30 pupils)
No. 3 Carlisle	(60 pupils)
No. 4 Ansty	(60 pupils)
No. 5 Weston-super-Mare	(60 pupils)
No. 6 Staverton	(120 pupils)
No. 7 Perth	(60 pupils)
No. 9 Blackpool	(120 pupils)
No. 11 Hamble	(60 pupils)

S.F.T.S. Hampden pilots and prospective S.F.T.S. instructors were being trained on "s.n." courses at the School of Air Navigation. Observers were being trained at civil schools, almost entirely in day and fair weather D.R. navigation. Night and bad weather experience, as well as practice in using wireless aids, were effectively ruled out by the lack of wireless facilities, while shortage of aircraft made the requirement of flying hours hard to achieve. Astro had ceased to be part of the regular sequence of navigation training, the few men to whom St. Athan could give courses being specially selected from squadrons or O.T.U.s

The effects of these difficulties and shortcomings fell heavily on Bomber Command, whose O.T.U.s had to make good the deficiencies in training<sup>1</sup>. Again, it was found in the spring of 1940 that fighter pilots often lost themselves if for one reason or another they were unable to rely on wireless. Their squadron navigation officers were not competent to train them<sup>2</sup>, and Fighter Command asked for one officer from each squadron to be given a navigation course.

S.47667

Coastal Command pilots were trained in navigation at the School of G.R. The duration of the course was reduced in October 1939 to 12 weeks (50 hours' flying), but the scheme of using it to replace the A.T.S. part of S.F.T.S. training was abandoned<sup>3</sup>. The war-time output from the School of G.R. was 416 pilots per year: but more maritime pilots would eventually be required for the expanding first line, and it was planned to open a second school<sup>4</sup>.

/Armament

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1. Appendix 19.
  2. These Fighter Command squadron navigation officers were not qualified in any way to hold the post, and were "merely the individuals who held the map cupboard keys".
  3. The War Training Organisation (S.D.138(1)) had laid it down that pilots would go to the School of G.R. after passing through only the I.T.S. of the S.F.T.S. The G.R. course was to cover armament training, and was to include a fortnight's visit to an armament training station.
  4. In April the original School of G.R. moved from Thorney Island to Guernsey.

Armament.

Just before the outbreak of war it had become clear that there were too few armament training stations to deal properly with all the basic training needed for regular and reserve pilots, observers, and air gunners. After the September 1939. outbreak of war there were fewer armament stations still: those in the east coast area were closed<sup>1</sup>, and only six, plus the Air Armament School, remained. Of the two new armament stations planned for the autumn of 1939, Jurby was opened in September, but the aerodrome at Pembrey was not ready, and the station was used for training ground tradesmen displaced from Eastchurch.

The Armament Training Stations were all scheduled, under the War Training Organisation to change into Air Observer Schools training observers in navigation, bombing, and gunnery, and air gunners in gunnery. They changed in name, but navigation training was out of the question, and in November 1939 they were more accurately renamed Bombing and Gunnery Schools. Each was planned to have a pupil population of 60 observers on 6-week courses (15 hours flying) and 60 air gunners on 4-week courses (12 hours flying)<sup>2</sup>, and the total theoretical output was about 3,600 observers and 5,400 air gunners per year.

The amount of training which could be done, however, was restricted by lack of accommodation at the schools and by shortage of aircraft and equipment. The lack of accommodation was slowly overcome, but shortage of aircraft became an increasing handicap.

/In September

1. No.1 A.T.S. Catfoss was absorbed by Aldergrove; No.1 A.O.S. North Coates by Penrhos; No.2 A.O.S. Acklington by Warmwell; No.3 A.T.S. Sutton Bridge by West Freugh; and the temporary half-size A.T.S. at Leuchars by Evanton. The armament training facilities available in September 1939 were:-

- |                         |                       |
|-------------------------|-----------------------|
| No.1 A.A.S. Manby       | No.6 A.O.S. Warmwell  |
| No.3 A.O.S. Aldergrove  | No.7 A.O.S. Porthcawl |
| No.4 A.O.S. West Freugh | No.8 A.O.S. Evanton   |
| No.5 A.O.S. Jurby       | No.9 Penrhos          |

The schools were called Air Observer Schools (A.O.S.) in September, but they were renamed Bombing and Gunnery Schools (B. & G.S.), their numbers remaining unchanged.

2. The gunnery part of the observers' syllabus was the same as the air gunners' syllabus, but more time was allowed for teaching it to air gunners.

September 1939.

In September only 90 Harrows and Heyfords (for which there were no spares) were available against a minimum requirement of 170 T.E. attack aircraft (more were desirable for a proper balance of training on S.E. and T.E. types). There were enough S.E. attack (162) and target towing (117) aircraft for the requirements at this time, but they were a mixed bag of doubtful serviceability and durability. None of the attack aircraft had power operated turrets. More aircraft would be required, but would not be available as schools built up to war establishments, so that a growing deficiency was in prospect.

March 1940

In October shortage of drogues, target towing gear, and cine camera gun films began to limit training, and the limitation, like the shortage of aircraft, grew progressively more hampering as the schools' increasing accommodation enabled them to handle their full planned pupil population. Target towing aircraft became scarcer: by March the schools had only half their establishment, and of the 125 T.T. aircraft they held some 45 were Wallaces and Seals which were already overdue for replacement.

December 1939

S.58474

Courses at the B. & G. Schools were lengthened as a result of A/M. Portal's general proposals for extending the duration of training. Surpluses of 392 observers and 1,127 air gunners, in the absence of intensive fighting, were forecast for April 1940, and the need for replacing skilled tradesmen wanted in their ground trades would swallow up only a fraction of these numbers. Another reason for reducing the rate of training, in the case of air gunners, was that it was becoming difficult to supply the intakes required: in theory, only wireless operators were trained as air gunners, and fewer wireless operators than had been expected were coming forward<sup>1</sup>. The air gunner course at B. & G. Schools was /increased to

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<sup>1</sup>. Trained wireless operators were needed for ground work, and few either volunteered or could be spared for aircrew. V.R. wireless operators were found to need far more wireless training (16 weeks instead of 2-6) than had been anticipated. In practice, about 25% of the air gunners trained at this time were not wireless operators.

increased to 6 weeks in November, and the observer course to 8 weeks in December.

In January attachments of Group II pilots from S.F.T.S.'s came to an end, but this made little difference to B. & G.S. commitments since visits from O.T.U.s took their place. The schools' equipment and aircraft remained seriously inadequate for the training to be done.

Several factors - lack of accommodation in the early months, lengthening of courses, shortage of aircraft and equipment, and bad weather in the winter of 1939-40 - combined to reduce the output from the B. & G. Schools far below what had been planned. The number of observers and air gunners actually turned out was only about half the schools' theoretical capacity, and by March it had to be accepted that they could not complete the syllabus.

S.56180 The quality of gunnery training at the outbreak of war was not high. Shortage of equipment and shortage of instructors were the chief reasons, according to G/C. Gray (D.D.T.Arm.), for the unsatisfactory results produced by squadron gunnery training: and the B. & G. Schools were as badly handicapped as squadrons had been. Attention to the quality of instructors as well as to the quantity was however required: gunnery instruction was needed on three aspects - maintenance, gunnery technique, and tactics - and the Senior Armament Instructors teaching the subject were really satisfactory only on maintenance.

S.56180 The need for instructors competent to teach gunnery technique and tactics had been one of the chief reasons for deciding, just before the war, to establish a Central Gunnery School. Nothing was done about starting it, however, until A/C/M. Ludlow Hewitt discussed the matter with A/V/M. Tedder (D.G.R.D.) at the end of September. From this discussion came a proposal to make the Central

/Gunnery School

October 1939

Gunnery School not only a centre for instructor training, but also a place for research and development work on gunnery technique and tactics, with a specially selected staff working in the closest touch with the Armament Development Establishment and Professor Melville Jones. The same discussion also brought out the need for specially-trained gunnery officers in flights and squadrons to teach gunnery in the air and act as leaders and commanders of air gunners.

S.56180

This conception of the Central Gunnery School envisaged it as something of a university for air gunnery, with functions which a conference defined as:-

- (i) the evolution and development of air gunnery technique and tactics for non-fighter operational units<sup>1</sup>,
- (ii) the training of:
  - (a) Fighting Controllers and Air Gunnery Instructors for operational and Group Pool units<sup>2</sup>,
  - (b) Air Gunnery Instructors for Bombing and Gunnery Schools.
  - (c) Air Gunnery Instructors for the Advanced Training Squadrons of S.F.T.S's.

The research and development side, in spite of A/C/M. Ludlow Hewitt's insistence on its importance, began to drop into the background. It depended largely, if it was to become a strong element in the school, on a specially selected staff and on the possibility of close liaison with the Aircraft and Armament Experimental Establishment, the Air Fighting Development Establishment, and the projected Bomber Development Unit. Efforts to put the A. & A.E.E., the B.D.U., and the C.G.S. at the same station failed (except as an uncertain hope for an indefinite future); the formation of the B.D.U. was put off; the C.G.S. establishment was scaled down and the selected staff was not available.

/The "leader

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1. Fighter Command had considered in August 1939 that it was unnecessary for the Central Gunnery School to include single seater fighters.

2. i.e. the "leaders and commanders" who were needed in flights and squadrons.

S.56180

The "leader and commander" aspect, on the other hand, came into greater prominence. A/C/M. Ludlow Hewitt stressed that the immediate requirement was leadership to develop good gunnery technique, instil fighting spirit, and make air gunners a corps d'elite. He said that next to the captain of aircraft air gunners had a more exacting responsibility and a more dangerous task than anyone else, and suggested that Fighting Controllers should be called "Gunnery Leaders", with the duty of commanding air gunners and fostering their technique and spirit.<sup>1</sup>

November 1939.

Thus when the Central Gunnery School was formed at Warmwell on 5th November 1939 it was mainly concerned with training Gunnery Leaders. Research, development, and the training of school instructors were comparative side issues to which the school's difficulties and handicaps did not allow attention.

The C.G.S. started with a selection of operational aircraft lent by Bomber Command, plus a few Harvards for simulating fighter attacks. (Most of its staff were also lent by Bomber Command). It was a lodger unit on No.6 B & G.S., Warmwell, where accommodation was inadequate and the aerodrome and ranges crowded and congested. It was badly handicapped by lack of equipment. Extra accommodation and D/F wireless were not provided at Warmwell because it was intended that C.G.S. should move to Exeter or Boscombe Down in the spring of 1940.

S.57999

The problem of air gunners' morale and responsibility had been tackled in September 1939, by the introduction of officer air gunners, drawn from serving air gunners,

/serving

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1. To help in raising air gunnery to a higher standard by setting it on a more ambitious basis, an A.G. brevet was introduced in December 1939, and air gunners given the same status as pilots and observers in May 1940.

S.56180

...serving officers, and direct entries of men with suitable character and experience, and trained by special courses (for those who needed them) at Manby and Warmwell. Pupils for the first Gunnery Leader course (which began on 13th November) were drawn from these officers, but only a proportion of the direct entries were found suitable for the training given by the C.G.S., and future intakes came to be drawn more and more from squadrons, with a few men direct from air gunner courses and some ex-V.R. observers. The early courses contained a fair proportion of unsuitable or unwilling pupils, mainly because the requirements for a Gunnery Leader and the nature of his work were not generally understood. Their employment in Bomber Command was defined in November<sup>1</sup>, and by the end of January 1940, they had been established in Coastal and Fighter Commands as well.

The size of Gunnery Leader courses was 20 pupils, and they lasted four weeks. All the output went to operational Commands, where Gunnery Leaders were urgently needed to produce a higher standard of gunnery efficiency and morale. The C.G.S. thus had no immediate effect, as had been intended when the school was planned, on the standard of basic gunnery training.

Bombing training was also meant to benefit, in much the same way that gunnery was to be improved by the research and development side of the C.G.S., by the work of the B.D. The B.D.U. did not come into existence, however, and bombing training went on without change. Some difficulty came from the different types of bombsight (A.B.S. or C.S.B.S.) used in operational aircraft and the desirability of giving pupils their basic training on the appropriate type, while similar

/difficulty

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1. Appendix 17 - Letter from Bomber Command to A.A.S.F. and Groups dated 27th November, 1939.

difficulty arose in gunnery training from the different types of guns, mountings and turrets in operational use.

Night gunnery and night bombing were discussed, but the practical difficulties were considerable, and no training was given in them.

#### Initial Training Wings.

The Flying Personnel Reception Depots which Brigadier General Critchley had proposed before the war became the concern of a new Group, in Reserve Command on 31st August, 1939. Reserve Command pointed out that there was no real difference between Flying Personnel Reception Depots and the Initial Training Schools planned under the War Training Organisation, and for a short time they were called Initial Training Schools, until the name "Initial Training Wing" was adopted on 15th September.

S.51385

It was at first intended that there should be ten Initial Training Wings, each with 1,000 pupils, but on 27th September the scheme was reduced to five I.T.Ws of 1,000 each (three being for pilots and observers, and the other two for wireless operators and air gunners)<sup>1</sup>. In November the number was cut down to four, but in December the size of each I.T.W. was reduced from 1,000 to 800, and the number increased to five in order to keep the total capacity unchanged. In January 1940 formation of the fifth I.T.W. was postponed until the flying training organisation had

/expanded

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1. No.54 Group formed at Reading, with Brigadier General Critchley (who was given the rank of Air Commodore) as A.O.C., on 4th September 1939: it moved to Bexhill in March 1940. No.1 I.T.W. opened at Cambridge on 7th September; No.3 I.T.W. at Hastings (its address was changed to St. Leonards in December) on 18th September; No.4 I.T.W. at Bexhill on 27th September; and No.5 I.T.W. at Hastings, on 13th November. Cambridge had been chosen as a place for an Initial Training School under the War Training Organisation; the others were selected under Air Commodore Critchley's scheme for billeting and improvising accommodation. The possible sites for I.T.Ws were restricted in October 1939 by political opposition to requisitioning and billeting on the west coast; and projects for using Torquay and Grange-over-Sands had to be abandoned. Staff for the I.T.Ws was mainly recruited by Air Commodore Critchley, as he had undertaken in his original proposals.

54G/  
S.1846/  
Air

expanded enough to require it: smaller intakes to the schools meant that, even with only four I.T.Ws in use, there was a long waiting period at the I.T.W. before flying training began. The effect of having fewer I.T.Ws was that more prospective pupils had to remain in civil life.

S.51385

At first the I.T.Ws were intended to be holding pools at which men would learn the rudiments of service routine life and be given physical preparation before they went on to flying training schools. G/C. Lockyer (D.D.T.F.) suggested at the very beginning that since the plan was for reception depots with a comparatively indefinite length of course, education officers to teach general educational subjects should be established. This was done, and each I.T.W. had ten education officers (increased to twelve in November 1939).

The I.T.Ws handled a variety of pupils during the autumn of 1939. Pilots and direct entry observers who had been under training before the war were sent for the disciplinary course which was part of the peace-time sequence: V.R. pilots and observers were sent to await entry to flying training. War-time entries from civil life did not arrive until considerably later (the first direct entries for pilot training entered I.T.Ws in May 1940). The courses given were at first ad hoc training, according to individual requirements, for pre-war pupils, and the four-weeks syllabus of basic service knowledge and ground instruction laid down by the War Training Organisation, for V.R. entries. By November, however, it was clear that better preparation in mathematics and navigation was needed before the flying training stage and also that pupils would have to stay longer in the I.T.Ws. The basis of I.T.W. planning was changed to an eight weeks course on 18th November, standardised mathematical instruction during the first month and more navigation teaching for pilots and observers during the

second being introduced. An eight-weeks' syllabus which gave more attention (40 hours' instruction) to navigation for pilots and observers was prepared, and brought into use at the beginning of February. At the end of February visual instruction for pilots on the Link Trainer was introduced: Link Trainers were installed at the pilot and observer I.T.Ws (Cambridge, St. Leonards, and Hastings). Carrying out the new syllabus was, however, somewhat handicapped by shortages of equipment and qualified instructors.

54G/29/Air.

In the early months of 1940 the I.T.Ws were crowded, and the period for which pupils stayed in them was long because of the restricted intake to flying training. A total duration of ten weeks (two in a reception wing, and eight in the training wing proper) was often exceeded. In February, in fact, it seemed possible that men might have to stay in I.T.Ws as long as 7-8 months. Discontent, unrest, and political pressure were expected to be the consequences of so protracted a wait, and various remedies were considered but found impracticable. The flow through E.F.T.Ss could not be speeded up: neither the number nor the capacity of S.F.T.Ss could be increased, while Flying Practice Units to hold elementary-trained pilots could not be improvised because aerodromes and instructors could not be found for them. Air Commodore Critchley proposed that gliding should be included in the I.T.W. course, civil gliding club's equipment being taken over for the purpose, but it was generally agreed that gliding could not be justified as part of the training sequence and that it should be regarded as an organised game which No.54 Group might run unofficially to relieve the tedium of long delays before the start of flying training. Eventually, the flow from I.T.Ws was quickened by starting advanced elementary courses, increasing E.F.T.S. capacity, and shortening the E.F.T.S. and S.F.T.S. courses. The  
/possibility

S.60255

possibility of giving pupils general experience by a 2-4 weeks stay at an operational station during their I.T.W. period was investigated.

#### Group Pools.

At the outbreak of war Fighter Command had the only Group Pool in existence<sup>1</sup>. Bomber Command was using nine non-mobilisable squadrons, at five stations, as temporary substitutes. Coastal Command had neither a Pool nor any substitute for one.

There were two raisons d'être for Group Pools in wartime. The first was the need for a reservoir of trained men, kept in flying practice, to replace casualties. The second was the need for a stage of training to bring pilots and aircrews up from the standard at which they left schools to the standard at which they were fit to take their places in squadrons.

The development of Group Pools depended to a large extent on the force and cogency with which these reasons applied to the Command concerned. Reservoirs of trained replacements, for instance, might clearly be an urgent necessity for Fighter Command; and so the first Pools were established for Fighter Groups. Bomber Command, on the other hand, had pressing need for an interim stage of training; hence adequate training of the output to squadrons became the chief consideration in planning Bomber Pools. Coastal Command was not expected to have a high casualty rate, and was comparatively well served by the training given at the School of G.R. and the Seaplane Training Squadron; the Coastal Pool developed slowly.

After the outbreak of war, training gradually came to be recognised as the primary function of Group Pools, and the minimum periods of instruction necessary to produce

/operational

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1. At St. Athan, for No. 11 Group.

operational fitness slowly became the accepted basis for planning them<sup>1</sup>. The consideration of casualty replacement still came in, of course, but in the form of matching the rate of fully-trained output to the rate of wastage, rather than as the provision of a reservoir where some flying practice was done.

In the early months of the war, consideration of the rate of flow brought in further complications. The capacity of Group Pools was not matched to the output from S.F.T.Ss, and this in turn was not matched to the estimated rate of operational wastage; the actual rate of wastage during the winter of 1939-40 was very low; and accumulations of pilots between various stages of training therefore seemed inevitable.

The requirements of Group Pools, if planned to give adequate training to the estimated rate of casualty replacement, proved difficult to meet. Operational types of aircraft, experienced instructors, and ground staff were essential, but they could be provided only at the expense of the first line, and the extent to which Commands could afford this first line depletion for training purposes varied.

Fighter Command wanted all the scanty production of Hurricanes and Spitfires for new squadrons or first line reserves, A/C/M. Dowding preferring to have a larger first line, though its squadrons would be partly engaged on training, while German fighters were at a distance from Britain.

Bomber Command's first line was depleted, willy nilly, by the existence of the non-mobilisable squadrons which served as Bomber Group Pools, and so competition between the first line and operational training for the output of operational aircraft did not become really serious until first line expansion came into the picture.

/Two further

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1. They had been regarded before the war as a means of reducing the amount of "working up" by squadrons, but not as a complete replacement for it.

Two further general considerations had to be taken into account in the development of Group Pools. Undue economy of aircraft and man-power for operational training, with consequent reduction in the amount of instruction, was likely to lead to increased loss through casualties and accidents, and to defeat its own purpose. The amount of instruction given at the basic stages of school training was very relevant to the effort needed in Group Pool training: the higher the standard of school output, the less required from Group Pools to produce operational fitness, and vice versa.

Bomber Group Pools.

Bomber Command had made proposals about Group Training Squadrons just before the outbreak of war. The war-time development of these proposals was formulated by a conference on 5th September and approved on 16th September. The Training Squadrons were transferred from the various operational Groups to No.6 Group, which was to deal exclusively with their work, and the number of training squadrons was increased<sup>1</sup>. Their training staff was screened from posting, their aircraft and personnel were regarded as sacrosanct, and they were given priority over operational squadrons in the supply of aircraft. The length of course was fixed at six /weeks,

S.46938

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- Four non-mobilisable squadrons (Nos.35, 166, 207 and 215) were added, while No.90 (Blenheims) was withdrawn from the operational strength of No.2 Group to become a Training Squadron.

There were various moves from one aerodrome to another, and at the end of September the Bomber Group Pools were:-

Nos. 97 & 166	Sqns.	training on	Whitleys	for	No.4 Group	at	Abingdon.
Nos. 35 & 207	"	"	" Battles	"	No.1 Group	at	Cranfield.
Nos. 104 & 108	3	"	" Blenheims	"	No.2 Group	at	Bicester.
No. 90	Sqn.	"	" Blenheims	"	No.2 Group	at	Upwood.
Nos. 75 & 148	Sqns.	"	" Wellingtons	"	No.3 Group	at	Harwell.
No. 215	Sqn.	"	" Wellingtons	"	No.3 Group	at	Bassingbourn.
Nos. 63 & 52	Sqns.	"	" Battles	"	No.1 Group	at	Benson
Nos. 7 & 76	"	"	" Hampdens	"	No.5 Group	at	Upper Heyford.
No. 185	Sqn.	"	" Hampdens	"	No.5 Group	at	Cottesmore.

weeks, and a syllabus was laid down<sup>1</sup>.

The whole of these arrangements were made with training as the primary consideration, and were satisfactory so far as the giving of adequate instruction was concerned<sup>2</sup>. They could provide trained pilots (with crews) for operational squadrons at a rate of about 1,600 per year, but made no provision for any reservoirs to hold crews after they had been trained.

The need for reservoirs was however inevitable, especially at a time when practically no active operations were going on, and so Reserve Squadrons<sup>3</sup> were used to hold trained crews and keep them in practice.

October 1939.

The rate of flow through the Pools was a serious problem. 1,600 pilots and crews per year was too small to match either the S.F.T.S. output for Bomber Command (planned as 3,196 per year) or the rate of wastage expected, and would therefore cause an inevitable accumulation of pilots and crews awaiting Group Pool training<sup>4</sup>, as well as a probable shortage of casualty replacements when active operations began.

S.46938

This bottleneck in the flow of pilots to Bomber squadrons was investigated, and the result was startling.

To provide adequate Group Pool training (i.e. 55-60 hours'

/flying

1. For Whitley, Wellington and Hampden pilots 55 hours' flying was required: for Battle and Blenheim pilots, 60 hours. Courses were to be 15 pilots (with crews) for Battle or Blenheim squadrons, and 11 pilots (with crews) for Whitley, Wellington or Hampden squadrons. The Battle and Blenheim squadrons were to have 16 I.E. aircraft, and the heavier squadrons 12; and these numbers were to be raised to 24 and 16 as soon as possible. It was at first intended that half the aircraft should be Ansons, but this was possible only for squadrons training on Hampdens: the others had 75% operational types and 25% Ansons. Each Group Pool station was given two Link Trainers. The course was extended temporarily to nine weeks during the winter. The syllabus was interpreted in detail by each Group Pool.
2. The aircraft were fully equipped, the Group Pool stations had HF/DF for homing, and the Group Pool squadrons had wireless operators. Night and bad weather training could therefore be done.
3.
 

No. 98 (Battles)	at Hucknall and later in France.
No. 101 (Blenheims)	at West Raynham.
No. 214 (Wellingtons)	at Methwold.
No. 78 (Whitleys)	at Linton-on-Ouse.
No. 106 (Hampdens)	at Finningley.

In September 1939 some officers and airmen were taken from No. 98 Sqdn. to strengthen the Group Pool squadrons at Cranfield.
4. This was one of the factors which led to the general lengthening of all basic training courses in December 1939 (see page 149).

flying per pilot) for either the whole flow from S.F.T.S's or the estimated rate of casualty replacement would need more aircraft in Group Pools than in all the first line squadrons.

The effect of reducing the flying hours at Group Pools to 45 or 30 was worked out, but the figures remained formidable. They were summarised by A/V/M. Sholto Douglas in November:-

Heavy Bombers (operational strength 17 squadrons, or 272 aircraft: casualty replacement 3,432 pilots per year).

30 hours' flying at Group Pools	355	Group Pool aircraft
45 " " " " "	534	" " "
55 " " " " "	652	" " "

Medium Bombers (operational strength 16 squadrons, or 256 aircraft: casualty replacement 1,248 pilots per year).

30 hours' flying at Group Pools	120	Group Pool aircraft
45 " " " " "	180	" " "
60 " " " " "	240	" " "

In each case the numbers made no provision for first line expansion: they were merely enough to sustain the existing squadrons.

November 1939.

The way in which the problem had developed was set out by A/M. Welsh<sup>1</sup> at the end of November. There were two main considerations:- the flow from schools to squadrons, and the amount of training to be given between the school and the squadron. The paper pointed out that the scope of Group Pool training seemed to have increased until it was now intended to produce fully-competent pilots and crews, leaving no "working up" to be done by the squadrons.

On Bomber Command's estimate of 55-60 flying hours for adequate training the ratio of Group Pool to first-line aircraft would be 250% for Wellingtons, etc., and 100% for Battles and Blenheims. On a compromise between full training and economy of aircraft, by allowing 45 flying /hours

1. Appendix 18 - Paper on Advanced Operational Training (Group Pools) dated 28th November 1939.

hours<sup>1</sup>, the ratios became 200% and 66% respectively. The paper then asked two main questions:-

- (i) Were Group Pools to produce fully-trained crews, leaving no working up to be done by the operational squadron, or were they to be an "interim stage" and merely assist squadrons?
- (ii) Were Group Pools to be given enough aircraft to provide a fixed number of flying hours per pilot, or were they to be given an agreed number of aircraft and left to make the most effective use of them?

S.46938

When these questions were considered at a conference on 4th December, A/C/M. Ludlow Hewitt outlined how the existing output from schools fell short of operational standard<sup>2</sup>, and made it clear that pre-squadron training up to this standard, either at schools or in Group Pools was essential. The need for training up to operational standard before crews went to the first line was agreed, the existing practice of giving such training in Group Pools and Reserve squadrons was confirmed, and it was decided to re-name Group Pools "Operational Training Units". In effect, A/M Welsh's first question was answered by a decision that men should be fully trained before they joined operational squadrons.

His second question was answered by a decision that Group Pools (or O.T.U.s) should have a fixed number of aircraft - or rather, a fixed ratio between the number of operational training aircraft and the number of first line aircraft they were backing. The ratio decided on was tantamount to providing enough aircraft to give full training to the whole flow of pilots and crews if two favourable

/contingencies

1. Some training being left to be done by operational squadrons.
2. "The worst deficiencies were found in the case of pilots who were unskilled in blind flying, and wireless operators who were of no use in the air on account of the negligible air experience they had received during training. The deficiency in the standard of air observers and air gunners was less but was still very noticeable."

contingencies were taken into account:- the improvement in school training<sup>1</sup> expected to follow the 25% lengthening of courses and the possibility of reducing the flow through O.T.U.s by cutting down the scale of operational effort.

Consideration of these questions inevitably raised the fundamental issue of how to reconcile expansion of the first line with adequate training for the pilots and crews manning the first line. Operational training needed operational types of aircraft, but operational aircraft were not abundant, and the fewer that were locked up in training the more there would be for expanding the first line.

The operational training to operational ratio<sup>2</sup> for aircraft reflected this conflict between the claims of expansion and operational training. It was a compromise between economy in aircraft and the need for thorough training: it would permit satisfactory O.T.U. training if the standard of school output were considerably raised, and it would provide enough trained men to expand the first line if the wastage rate were kept down. In the case of heavy bombers, for instance, the one-to-one ratio that was agreed would give about 38 hours' flying per pilot to the rate of

/flow

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1. Improvement in school training depended however as much on the supply of additional aircraft, equipment, and facilities as on extra time.
  2. The ratio varied according to the type of aircraft used at an O.T.U., S4.6938 and the following figures were agreed by A.C.A.S., D.S.D., and A.D.O.P. on 5th December:-

Heavy Bombers (Other than Hampdens)	O.T.U.	I.E.	aircraft to be 100%	of operational I.E.
				(75%O: 25%T)
Hampdens	O.T.U.	"	" " " 100%	" operational I.E.
				(50%O: 50%T)
Medium Bombers	"	"	" " " 60%	" operational I.E.
				(75%O: 25%T)
Fighters	"	"	" " " 20%	" operational I.E.
				(75%O: 25%T)
G.R. landplane	"	"	" " " 20%	" operational I.E.
				(80%O: 20%T)
A.Co-op S.E.	"	"	" " " 25%	" operational I.E.
				(100%O)
A.Co-op T.E.	"	"	" " " 50%	" operational I.E.

The O.T.U. aircraft were to be made up of operational and training types in the ratio O : T given.

flow required by current estimates of casualty replacement, whereas Bomber Command considered 55 hours the minimum for pilots of the existing S.F.T.S. output standard.

Thenceforward, operational training was planned on the basis of the agreed aircraft ratios, but it was not until April 1940 that these ratios were applied to the existing Bomber Group Pools. In the meantime the Pools continued to work on the original Training Squadron basis, with considerably fewer aircraft in the heavy bomber Pools than the one-to-one ratio allowed.

S.1925 In some cases the two squadrons at a Group Pool station worked more or less independently. In others they pooled their resources and divided the work up between the four flights so that one dealt with conversion to the operational type, one with armament, one (with Ansons) with navigation and wireless training, and one with operational exercises. Ground training was generally done on a station basis.

S.1925 The limited number of aircraft in the heavy bomber Pools kept their output down to about 400 per year, whereas the actual wastage rate in heavy bomber squadrons at the time was some 680 per year<sup>1</sup>. The deficiency was made up later by converting Battle and Blenheim crews (of which the Group Pool output was larger than the wastage) to the heavier types.

In spite of the low rate of flow through Group Pools<sup>2</sup>, the expected accumulation of pilots between the S.F.T.S. and Group Pool stages did not become serious. The S.F.T.S. output was heavily reduced as a result of longer courses

/combined with

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1. This included postings for courses, sickness, and accidents as well as operational casualties.
  2. The actual output from the Bomber Group Pools between the outbreak of war and 30th April 1940, was 448 pilots, 450 observers and 475 air gunners, i.e. annual rates of 672, 675 and 712.

combined with exceptionally bad weather, and although a Flying Practice Unit for pilots awaiting Group Pool training was opened at Meir in March 1940, it was called on to handle only about 100 pilots before it was disbanded in June.

The Bomber Group Pools were eventually changed into O.T.U.s, and their establishment raised to the one-to-one ratio on 8th April<sup>1</sup>. Each heavy bomber O.T.U. had a total of some 70-80 aircraft. It had at first been proposed that O.T.U.s should have 72 I.E. aircraft, but Bomber Command, in February, considered that a total of more than 72 would be impracticable, and also that an O.T.U. could handle as many as 72 only if it had runways and a satellite.

The one-to-one ratio was also applied to the long-term planning of heavy bomber O.T.U.s to back the ultimate target force. The result was a most formidable requirement of aircraft which, as A/V/M/ Sholto Douglas remarked, stuck in everyone's gizzard. The ultimate first line was to contain just over 2,000 heavy bombers, and a one-to-one O.T.U. organisation matching this figure called for 1,548 operational aircraft and 516 trainers to be used on operational training, with a further 516 and 172 as I.R. The man-power needed by this heavy bomber O.T.U. organisation would be some 2,000 officers and 30,000 airmen, while the requirement of stations with satellites would be at least 29<sup>2</sup>.

Moreover,

1. Seven of the Group Pool squadrons (Nos. 75, 148, 215, 7, 76, 185 and 97) were to become operational, and it was intended that they should re-form before the O.T.U.s were brought up to a one-to-one strength in aircraft. The remaining Group Pool squadrons (Nos. 166, 35, 207, 104, 90, 63 and 52) were to be reduced to a "number only" basis until they could be reformed. After 8th April operational training was done by the following O.T.U.s:-

No.10 Abingdon	established with	53 Whitleys	and	17 Ansons
No.11 Bassingbourn	"	52 Wellingtons	"	17 Ansons
No.12 Benson	"	72 Battles	"	24 Ansons
No.13 Bicester	"	36 Blenheims	"	12 Ansons
No.14 Cottessmore	"	39 Hampdens	"	39 Ansons
No.15 Harwell	"	53 Wellingtons	"	17 Ansons
No.16 Upper Heyford	"	39 Hampdens	"	39 Ansons
No.17 Upwood	"	36 Blenheims	"	12 Ansons

No.18 O.T.U. was a small unit at Hucknall, training Poles on Battles, and one more (Whitley) O.T.U. was planned.

2. Or more if Bomber Command's estimate that one O.T.U. could not handle more than 72 I.E. and I.R. aircraft were justified.

Moreover, even this extremely large organisation would not provide the full 55 flying hours' training which Bomber Command considered essential: it had the inevitable corollary of the one-to-one ratio of providing only about 38 hours' flying for the anticipated rate of casualty replacement.

These estimates of the ultimate heavy bomber O.T.U. requirement were made in January, but the formidable nature of the problem caused a decision to be deferred until April. In the meantime, A/C/M. Ludlow Hewitt made it quite clear that Bomber O.T.U.s had to undertake a great deal of training, and that this training was indispensable.

On 4th February he defined the function of an O.T.U. and pointed out the extra burden thrown on O.T.U.s by defects in school training.

"The proper role of the Operational Training Unit is to convert otherwise fully trained pilots, air observers and air gunners to the type of aircraft in which they will be required to operate and to give them sufficient operational training to fit them to take their place in operational squadrons. At present, a considerable amount of elementary training for all members of the crew, which ought to have been done previously, has to be undertaken in the Operational Training Units. . . . . The necessity for carrying out this elementary training at O.T.U.s means that service aircraft, of which there is a great shortage, have to be employed on training which could be done better on elementary types, and also takes up time which ought to be given to operational training, but has, in fact, to be devoted to elementary flying and conversion courses."

On 5th February he described what was involved in training new flying crews up to operational standard:-

/"Obviously the

"Obviously the first essential is to teach the new pilots how to fly a service type by day and by night, which entails a considerable amount of local flying at the O.T.U. Once a pilot has mastered the new type he has to be trained in advanced instrument flying, and long distance flying by day and by night, but to enable him to do this the remainder of the crew must have reached a satisfactory standard in wireless operating and navigation. During these flights, the whole crew must be trained in regional control procedure and bad weather flying. Finally, the complete crew must be taught bombing and air firing."

The same points, that the standard reached at the end of school courses left a good deal to be done at the O.T.U. stage, and that it was essential for this training to be given, were made in a paper<sup>1</sup>, which set out the reasons why at least a one-to-one ratio of aircraft was necessary for heavy bomber operational training. This paper also showed that the one-to-one ratio would give a standard of pilot training below that considered necessary by Bomber Command.

S.46938

The whole problem of O.T.U. organisation was considered at a C.A.S.'s conference on 19th April. As A/C/M. Newall said, the crux of the matter was the heavy bomber requirement; in comparison, other operational training demands were light<sup>2</sup>.

April 1940.

It was agreed that no reduction of the existing standard of first-line training could be accepted, and that further training was necessary between the S.F.T.S. and the squadrons. O.T.U. requirements could therefore be reduced only by reducing the amount of training needed at the O.T.U. stage - which meant raising the standard of output from the earlier stages of training.

/A/M. Portal

1. Appendix 19 - Paper on Aircraft Requirements for the Operational Training of Heavy Bomber Crews dated 11th April 1940.
2. The ultimate metropolitan first line planned at this time was 4,000 aircraft, of which 2,000 were to be heavy bombers. The total operational type aircraft requirement for operational training was 2,000, of which 1,500 would be heavy bombers.

A/M. Portal (who had succeeded A/C/M. Ludlow Hewitt as C.-in-C., Bomber Command) said that he was prepared to reduce the amount of heavy bomber O.T.U. training to 30 hours for pilots already trained on T.E. aircraft and to 35 for those trained on S.E. aircraft provided:-

- (a) Only the best pupils, after rigorous weeding out during their basic training, were sent to Bomber Command.
- (b) The S.F.T.S. syllabus, including practical cloud flying, was completed under efficient instructors.
- (c) Every requirement for "synthetic training" on the ground was provided in order to save flying time.

The fulfilment of these provisos was, however, unlikely for at least a year, and until they were fulfilled no reduction in the existing requirement of 55 hours' flying per pilot at O.T.U.s could be accepted.

It had therefore to be agreed that for the immediate future, and until Bomber Command's provisos could be satisfied, nothing less than the 55 hours standard of O.T.U. training would be satisfactory. It had also to be agreed that the heavy bomber O.T.U.s should be brought up to their one-to-one establishment<sup>1</sup>, which meant delaying first line expansion in order to provide the aircraft, and that the operational effort would probably have to be reduced because the one-to-one ratio could not produce enough pilots trained to the 55 hours standard to meet the anticipated rate of wastage.

The ultimate requirement of heavy bomber O.T.U.s had to be left unsettled. It could only be brought down to /less

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1. At the end of April one Wellington O.T.U. (No.15 Harwell), the Battle O.T.U. (No.12 Benson), and the two Blenheim O.T.U.s (No.13 Bicester, and No.17 Upwood) were brought up to the one-to-one establishment. The others remained with the same number of aircraft (24 Wellingtons or Whitleys and 8 Ansons, or 16 Hampdens and 16 Ansons) that they had had when the training was done by Group Pool squadrons.

less formidable dimensions if S.F.T.S. training were improved, synthetic training developed<sup>1</sup>, and more rigorous selection done, and the conference could do no more than decide that special attention should be given to these matters. Future O.T.U. requirements would depend on what was done about them.

Fighter Group Pools.

Fighter Command's attitude towards operational training was entirely different from Bomber Command's. Bomber Command insisted that pilots needed a definite course of training between the S.F.T.S. and a first line squadron, and accepted the fact that operational aircraft would have to be used for that training. Fighter Command, on the other hand, contended that first line squadrons could give all the training that pilots needed after leaving the S.F.T.S., and strongly resisted the use of any Hurricanes or Spitfires in Group Pools.

At the outbreak of war No.11 Group Pool had 17 Hurricanes and 6 Harvards. Its establishment was 22 Hurricanes and 6 Harvards, and with this it was considered capable of training some 300 pupils per year on 4 week courses with 30 hours' flying<sup>2</sup>. In September the Pool was dealing with inexperienced pilots sent to it by squadrons which had found unit training expensive in accidents, as well as with pre-war Volunteer Reservists and below-standard Auxiliary pilots.

At conferences on 15th and 21st September A/C/M. Dowding made it clear that he preferred newcomers from S.F.T.Ss to be trained in first line squadrons, that he

/wanted

1. A number of successful synthetic training devices had already been produced, under stress of necessity, by various Group Pools. A/C/M. Ludlow Hewitt and A/V/M. Harris urged strongly that such methods should be developed, and A/V/M. Sholto Douglas had set up in March a committee to foster the "Simulation of Air Training on the Ground".
2. The pre-war course had been of two months' duration with 45 hours' flying.

September 1939 wanted St. Athan to deal only with reinforcements for France, and that he considered it unnecessary to open the second Group Pool planned for Aston Down. While Fighter Command A.H.B. II H1/18. was still at long range from German fighters he considered it wiser, since there was so grave a need for additional squadrons, to put all available resources into the first line and undertake final training in squadrons, provided pilots from S.F.T.Ss had done some formation flying and night flying, and had fired their guns in the air.

A/V/M. Sholto Douglas put forward the argument that lack of Group Pools would mean lack of casualty replacements when fighting became intense, and that Group Pool aircraft could if necessary be taken for operational use. A/C/M. Dowding then, somewhat reluctantly, agreed to the opening of Aston Down on a limited basis provided it did not absorb any Hurricanes or Spitfires. Training was to go on in squadrons: the need for it was impressed on Group Commanders, and each squadron continued to hold a dual-control aircraft for instructional work.

No.12 Group Pool opened at Aston Down on 25th September, and began work about a month later with 6 Harvards, 3 Blenheims, and 11 Gladiators. This was only a nucleus, capable of training at the rate of 230 pilots per year, but it was intended to expand the Pool as and when aircraft became available. Both Fighter Pools were handicapped by shortage of cine camera guns and reflector sights, and by lack of proper armoury and ground R/T facilities. In addition, the aircraft with which Aston Down began in October were not fully equipped, because waiting for fully equipped aircraft would have meant a delay of two months.

October 1939

When the general adequacy of Group Pools to S.F.T.S. output was examined in October, however, the two Fighter Pools appeared satisfactory. Their planned capacity at

/full

S.46938

full establishment<sup>1</sup> almost matched the S.F.T.S. output rate of 1,100 fighter pilots per year. In actual fact, of course, they were far below establishment, capable of dealing with less than half the planned numbers, and able to do little Blenheim and no Spitfire training.

December 1939

In December, when the one-to-one ratio for heavy bombers was agreed, 20% was fixed as the proportion of operational training to operational aircraft for Fighter Command. In December, too, the Inspector General

S.1924

(A/C/M. Ellington) drew A/C/M. Newall's attention to the high proportion of accidents not due to enemy action in operational, and particularly in Blenheim fighter squadrons.

This prevalence of accidents, and the existence of the Blenheim conversion flight at Hendon<sup>2</sup>, seemed to show the need for an intermediate, O.T.U., stage of training between the S.F.T.S. and the squadron. A/V/M. Sholto Douglas pointed out in January that they confirmed the view that squadrons would not be able to give adequate training if engaged in intensive operations, and that fighter O.T.U.s were therefore a real requirement.

S.1924

A/C/M. Newall agreed in principle that an adequate O.T.U. organisation should be established for Fighter

January 1940.

Command, but ruled that it was much more essential for Blenheims than for Hurricanes and Spitfires and that the latter should be kept down.

It was then planned to enlarge the Fighter O.T.U.s by 1st April 1940. At the end of January the Air Ministry produced a scheme for three O.T.U.s with a total aircraft

/strength of

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1. No.11 Group Pool, St. Athan:- 16 + 6 Hurricanes, 3 + 3 Harvards.
  - No.12 Group Pool, Aston Down:- 12 + 4 Blenheims, 24 + 8 Hurricanes.  
or Spitfires, 6 + 3 Harvards.
  2. No.11 Group had organised a Blenheim conversion flight at Hendon, in November, to deal with the day and night conversion of pilots for a number of new squadrons then being formed and equipped with Blenheims.

strength of 132<sup>1</sup>. This was only an interim enlargement: the planned first line strength for 1st April was 57 squadrons, or 912 aircraft, so that the 20% ratio called for O.T.U. backing by some 180 aircraft (three quarters of which were to be operational types).

A/C/M. Dowding had not agreed that the increase in accidents was due to inadequate training, and had pointed out that there were other causes, such as unreliable engines, for the Blenheim accidents. He had resisted Training Command's proposal to omit air firing from S.F.T.S. training and transfer it to O.T.U.s, with the consequence that the difference between Group I and Group II pilot training at S.F.T.S.s became more marked. He now formally put on record that if the aircraft and personnel were available to provide 48 Hurricanes and 34 Spitfires for training he would prefer to use them to create an increase in the number of fighter units "rather than to increase the size of the Pools which are (except as regards the commitment for training pilots for France) a comparative luxury". He also objected to the opening of a third O.T.U. before all first line requirements had been met.

S.59818

A/V/M. Sholto Douglas did not accept the dictum that O.T.U.s were a comparative luxury, and at the end of February again put forward the arguments that the high accident rate showed squadrons to be sorely lacking in facilities for conversion and proper instruction and that O.T.U.s would be badly needed when intensive operations began.

S.59818

It was agreed by A/V/M. Peirse (D.C.A.S.) that O.T.U.s should be gradually brought up to establishment as /soon as

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1. 48 Hurricanes, 34 Spitfires, 20 Blenheims, 4 Defiants, 2 Gladiators and 24 trainers (Harvards or Battles).

March 1940.

soon as the first line re-equipment then in hand had been completed. Blenheims were to be supplied at once; Hurricanes and Spitfires (of which considerable reserves without operational equipment or fittings for that equipment<sup>1</sup> were available) as soon as the first line rearming was done. Fighter Command, however, pointed out that aircraft without operational equipment were of very little use for operational training.

By the beginning of April no expansion of the Fighter O.T.Us had taken place<sup>2</sup>. The total number of operational aircraft in the Fighter O.T.Us was 20, instead of 102 as the interim enlargement had planned, or 135 as the 20% ratio provided. The combined output from both O.T.Us was barely enough to back the fighter squadrons in France and supply 90 Blenheim pilots a year to Fighter Command. Nonetheless, twelve Finnish pilots were sent to No.6 O.T.U. for priority training in the early part of 1940.

S.1924

The standard of Fighter O.T.U. training was seriously criticised from France (by B.A.F.F.) at the beginning of April. Some pilots from No.6 O.T.U. had reached France after having done only 10-12 hours on Hurricanes, and with no instruction in high altitude flying, the use of oxygen, or fighter attacks.

The training was admittedly inadequate. Shortage of spares and maintenance personnel caused No.6 O.T.U. to have only 4-5 out of their 16 Hurricanes serviceable; and much the same state of affairs existed at No.5 O.T.U. Lack of operational equipment was another handicap, and so was

/shortage of

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1. i.e. Cols. 7 and 9 equipment.

2. No.11 Group Pool had been renamed No.6 O.T.U. in February, and had moved to Sutton Bridge on 6th March, but had only 16 Hurricanes and 12 trainers. No.12 Group Pool, renamed No.5 O.T.U., was still at Aston Down, and was still working with its original nucleus strength of 4 Blenheims, 11 Gladiators and 4 trainers. When the change from Group Pools to O.T.Us was made, it was planned to end the affiliation to particular Groups and provide O.T.Us specialising on the various types of aircraft and serving all requirements for fighter pilots, but the plan was not carried into effect until six months later.

shortage of qualified instructors. Flying from Sutton Bridge was limited to a five miles radius unless special permission was obtained, and the aerodrome at Aston Down was being reconstructed. The O.T.U.s were controlled by different Groups, Aston Down by No.11 Group and Sutton Bridge by No.12 Group, a proposal by the Air Ministry that Fighter O.T.U.s, like Bomber O.T.U.s, should all be under one Group having been rejected by Fighter Command in February in favour of control by the nearest Group H.Q.

All this time new pilots for Fighter Command, except a few Blenheim pilots from Aston Down, were trained in squadrons. There had been steady pressure from Fighter Command for the dual Battles which squadrons held for this purpose to be replaced by first Harvards and then Masters, but advanced trainers were badly needed in S.F.T.Ss and few were available. At the end of April 1940, Fighter Command had a mixed bag of 23 Battles, 5 Harvards, 9 Masters and 12 Hinds in use for squadron training.

After the criticism from B.A.F.F. of Fighter O.T.U. training A/C/M. Dowding reiterated his view that every nerve should be strained to increase the first line strength and that every non-operational unit was a drain on the war effort. He offered to surrender all the O.T.U.s to B.A.F.F., and rely entirely on squadron training for the supply of pilots from S.F.T.Ss.

S.1924

The Air Ministry, however, decided to bring the Fighter O.T.U.s up to increased establishments<sup>1</sup>, and use aircraft without full operational equipment, in spite of Fighter Command's objection, on the ground that it was better to use partly equipped aircraft than no aircraft at all. This was done at the end of April, and the Fighter O.T.U. syllabus was brought under review.

/Coastal Group

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1. No.5 O.T.U. Aston Down:-	10 Spitfires, 20 Blenheims.
No.6 O.T.U. Sutton Bridge:-	24 Hurricanes.

Coastal Group Pools.

In September 1939, the Air Ministry suggested that although shortage of equipment and man-power made it impossible to set up a Coastal Command Pool on a large scale, a small unit might be located either with the School of G.R. at Thorney Island or with the Torpedo Training Unit at Gosport. The proposed functions of the unit were advanced training for pilots, and conversion courses, on operational types of aircraft.

Coastal Command agreed that a Pool was urgently needed, but could find no room at either Thorney Island or Gosport. Speke, Hooton Park, and Silloth were then considered, and Silloth, which was being built for a Bomber Group Pool, was chosen in October.

The Coastal Pool was to deal only with land aircraft, since crew requirements for flying boats could be met by adding to the Seaplane Training squadron. Its work was defined as converting pilots to operational types and giving ~~them~~ operational training, and also giving wireless operators and air gunners training in their operational duties.

S.1887

Coastal Command drew up a syllabus which provided 40 hours of flying per pilot, with another 20 hours as navigator, during a six week course. An aircraft establishment of 10 Ansons, 6 Hudsons, 5 Bothas, and 4 Beauforts was agreed.

Coastal Command, in planning the Pool, realised the need to match its capacity to the wastage rate, but since all its pupils had to be G.R. trained the initial planning was based on the School of G.R.'s output of 416 per year, less about 80 pilots per year who went to the Seaplane Training Squadron.

When the adequacy of Group Pools to deal with the output from S.F.T.Ss was reviewed in October 1939, the Coastal Pool called for no comment, since the planned

/S.F.T.S. output

S.F.T.S. output for Coastal Command was already matched to the School of G.R.'s intake.

Coastal Command were anxious to get the Pool working quickly, chiefly in order to deal with the partly-trained pilots and crews in Auxiliary squadrons. It was proposed to provide Hudson instructors, move a Blenheim training flight from Thorney Island, and draw Ansons from the Auxiliary Squadrons. The Pool was to be controlled by No.17 Group.

The Coastal Pool opened at Silloth on 1st November, 1939, but was handicapped throughout the winter of 1939-40 by unserviceability of the aerodrome and the unfinished state of the buildings and ranges. A certain amount of conversion and ad hoc training was done, and an elaborate synthetic crew trainer for Hudsons developed, but in April 1940 the Pool was still unable to accept crews for normal operational training.

In December 1939, when the ratios of operational training to operational first line aircraft were agreed, 20% was fixed as the proportion for G.R. landplanes. The Pool was renamed No.1 O.T.U. in February, and in April its establishment was 14 Ansons, 8 Hudsons, 7 Bothas, 6 Beauforts, and 6 Battle T.T.

Two other Coastal Command units were in function, though not in name, Operational Training Units. The Seaplane Training Squadron was at Calshot, and the Torpedo Training Unit at Gosport until it moved to Abbotsinch in March 1940.

#### Army Co-operation Group Pool.

The specialised post S.F.T.S. course given 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 to be backed during the winter of 1939-40 was 4 S.E. and 4 T.E. squadrons, or 96 operational aircraft: the estimated wastage rate was 464 pilots a year. A reservoir at Andover was added to the School at Old Sarum, making the combined capacity 58 pilots, and the course duration was fixed at 6 weeks (35 hours' flying on S.E. aircraft, or 40 hours on T.E.). The planned output of the Pool then balanced the estimated wastage, and was comfortably matched to the number of pilots earmarked for Army Co-operation work from the S.F.T.S. output.

An increase in the number of Army Co-operation squadrons was due in the summer of 1940, and the necessary Group Pool expansion was allowed for by agreeing the operational training to operational ratio of aircraft, in December 1939, as 50% for T.E. types and 25% for S.E. The Army Co-operation Group Pool was not troubled by aircraft limitations, since its establishment for backing the 96 aircraft first line was 40 I.E. and 11 I.R.

The Empire Air Training Scheme.

At the outbreak of war the possibility of training in Canada was again being considered. A/C. McClaughry, after discussing it with G/C. Godfrey of the R.C.A.F., made it the subject of a paper dated 2nd September in which he suggested that Canada might be willing to concentrate on training rather than on the formation of more operational units, and that as a first step the War Training Organisation should be applied in Canada and a modest increase made in the number of Canadian Flying training schools.

A/C. McClaughry's paper mentioned the possibilities of starting Elementary F.T.Ss, based on civil flying clubs in Canada, of setting up schools for aircrew and ground staff, and of "arranging for the move of Flying Training Schools which may be in the operational zone".

/The paper

The paper also discussed the question of finance. 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 the precedent of 1914-18, when Canada had borne the whole cost of Canadian personnel. A/C. McClaughry suggested that Canadians might be trained as members of the R.C.A.F. and that some squadrons could be manned entirely by Canadians.

S.56584

Training in Canada was the main subject of a meeting called by A/M. Portal on 10th September "to go into the 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 war". The estimate was that some 3-4 times the output of pilots and crews planned for 1939-40, or something over 20,000 per year, would be needed, but the training organisation for producing such an output was too big for the United Kingdom; the Dominions would have to be asked to help on a very large scale.

It would be necessary to ask Canada to train 8,000 per year, and to persuade her to devote her resources first to training and later to sending an air expeditionary force. A strong mission would be needed to put forward these proposals.

At this stage it was recognised that such a training scheme should be controlled by the R.C.A.F., and that the supply of T.E. training aircraft for it would be a major difficulty. The possibility of transferring R.A.F. Schools to Canada in the event of operational interference with training in the United Kingdom was considered, but the loss of output involved by moving was held to make transfer undesirable until the training organisation had expanded to its peak and airfields were required for operational work.

/The conception

S.56584

A.H.B. IIIc/3/1.

The conception of training in Canada was greatly widened by a proposal made by Mr. Bruce (High Commissioner for Australia) to Captain Harold Balfour on the morning of 22nd September. Mr. Bruce outlined a principle that each Dominion should have its own Air Force contingent in the field, but that training should be rationalised in the most economical way by concentrating all advanced training in Canada, the other Dominions doing only elementary training. The advantages of doing all advanced training in Canada would be:-

- (i) freedom from enemy interference,
- (ii) easier transport of trained men and aircraft than to or from Australia,
- (iii) Canada had greater production possibilities than Australia,
- (iv) nearness to the U.S.A.

The proposal was considered in detail the same afternoon. An ultimate Air Force based on a monthly production of 2,550 aircraft would require to be backed by about 45 S.F.T.Ss and 45 E.F.T.Ss, turning out some 19,500 pilots per year, with a corresponding number of schools for training other air crew. The existing R.A.F. organisation had 14 S.F.T.Ss, and it was hoped to provide five more in the United Kingdom. This left about 25 S.F.T.Ss to be located in Canada. (The possibility of specialising them for bombers, fighters, etc. was envisaged).

The 25 E.F.T.Ss necessary to feed the proposed S.F.T.Ss in Canada were to be divided between the three Dominions concerned<sup>1</sup> New Zealand was already preparing to supply the R.A.F. with 600 trained pilots per year, but her

/two schools

1. Canada, Australia and New Zealand. South Africa was left out from the start because the extent to which she was willing to co-operate in the war effort was doubtful, and any approach politically unwise.

two schools had as yet no modern types of aircraft, and could therefore only be counted as E.F.T.Ss. This left 23 E.F.T.Ss: 13 were provisionally allocated to Canada, and 10 to Australia. Australia's existing Flying Training Schools would be able to back the six operational squadrons which Australia wanted to send on active service without delay.

The training of other aircrew was also to be concentrated in Canada, and twelve armament schools, two G.R. schools, and two navigation schools were planned.

A.H.B. IIIc/3/1. When these main outlines of the scheme had been sketched it was discussed by the Dominion High Commissioners in London, and then formally proposed by a telegram<sup>1</sup> dated 26th September from Mr. Neville Chamberlain to the Prime Ministers of Canada, Australia and New Zealand. A copy of this telegram was also sent to the U.K. High Commissioner in South Africa for the information of General Smuts.

S.56584

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. The main requirements of the training scheme were discussed before the mission left. The Elementary F.T.Ss would need 1,350 aircraft (Moths) and a monthly production of 75: two Canadian firms were already making elementary trainers and it was thought that these firms together with Australian production would supply the numbers required. Engines could be provided from the United Kingdom.

The Service F.T.Ss needed 1,125 S.E. trainers, plus a monthly production of 62, and 1,575 T.E. trainers plus 87 monthly. It was planned to use Harvards and Ansons. The Harvards would come from the U.S.A. if American neutrality laws and dollar exchange allowed, and the Ansons, except possibly their large wooden wings, would come from /the United

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1. Appendix 20. - Telegram dated 26th September 1939 from the Prime Minister to the Prime Ministers of Canada, Australia and New Zealand.

the United Kingdom.

The Armament Schools needed 1,125 aircraft and a monthly output of 64. Battles for target towing could be supplied from the United Kingdom, but the supply of service type attack aircraft with turrets was difficult. It seemed likely that training standards would have to be lowered to suit the aircraft which could be provided<sup>1</sup>. Finally, the navigation and observer schools would need a further 396 Ansons plus a monthly output of 20. These were to be supplied from the United Kingdom.

The instructor requirements would be 550 flying instructors for the E.F.T.Ss (i.e. 22 per school), 675 C.F.S. trained flying instructors and 325 staff pilots for the S.F.T.Ss (i.e. 27 and 13 per school), about 1,000 staff pilots for the crew training schools, and some 350 ground instructors. For maintenance and the repair organisation some 12,000 Group I tradesmen and 25,000 others would be needed.

Against these requirements of personnel, the R.A.F. could provide no ground instructors or ground staff, about 300-400 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 mission<sup>2</sup> arrived in Ottawa on 14th October, with a brief "to secure the agreement of the Dominion Governments

/to the

1. Battles were eventually used as attack aircraft.
2. Consisting of Lord Riverdale, A/M. Courtney and Mr. F.T. Hearle. A/M. Courtney took the place of A/C/M. Brooke-Popham, who did not reach Ottawa before 12th November. After A/C/M. Brooke-Popham's arrival A/M. Courtney remained in Ottawa until the mission returned to England in December. Mr. Hearle was taken ill, did not arrive in Ottawa until 23rd October, and returned to England on 28th October; his place was not filled, technical advice being provided by A/V/M. R.M. Hill of Col. Greenly's Purchasing Mission. The Riverdale Mission had as advisers Mr. J.B. Abraham, G/C. L.N. Hollinghurst, G/C. J.M. Robb, G/C. A. Gray, Mr. F.R. Howard and Mr. J.R. Smyth. Captain Harold Balfour was also in Ottawa from 23rd October to 28th November.

to the establishment of the proposed Dominion Air Training Air Training Scheme for pilots and aircrews" but no formal terms of reference. Preliminary examination showed that the scheme could be got working to full capacity by the end of July 1942.

Report of  
Riverdale Mission  
A.H.B. IIIc/4.

Negotiations began on the basis of recruiting pilots and aircrews in Canada, Australia and New Zealand, giving them elementary training in their own Dominions and advanced training in Canada, and employing them on operational duties with the R.A.F. Dominion man-power and (mainly) Canadian training were to provide 5/9 of the flying personnel required by the R.A.F. (i.e. about 11,000 pilots, 6,600 observers and 11,300 air gunners per year), of which this first scheme proposed that 48% should come from Canada, 40% from Australia, and 12% from New Zealand<sup>1</sup>.

Canada's attitude was stiff. She was committed to a heavy expenditure on her Navy and Expeditionary Force, and wanted her air contribution to be by operational squadrons rather than by 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. For these reasons, Canada argued the United Kingdom should bear the lion's share of the cost.

The Australian representatives arrived in Ottawa on 1st November, and the New Zealand on 3rd November. Both considered that the scheme under discussion planned too much training in Canada. Australia and New Zealand had training facilities of their own, New Zealand's having been provided by arrangement with the United Kingdom, and wanted

/to make

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1. The remaining 4/9 of the estimated total requirement (20,000 pilots and 30,000 aircrew per year) were to be provided by the United Kingdom and trained in R.A.F. schools. The United Kingdom proposed to make a substantial contribution (\$140 million out of a total estimated cost of \$908½ million) in aircraft and equipment; and to bear the cost of operational employment after training, while the Dominions providing the men would share the remaining cost of training according to the use made of the schools.

to make full use of them. Moreover, both Dominions objected to spending money in Canada on training which would cost less if it were done at home. Finally, the proposed quotas of recruits were more than they could supply.

The scheme was then revised so that more training would be done in Australia and New Zealand, and less in Canada, thus reducing the cost to Canada. Of the 25 S.F.T.Ss, 16 were to be in Canada, 7 in Australia, and 2 in New Zealand, but some advanced training of Australians and New Zealanders was still to be done in Canada: two Canadian S.F.T.Ss were earmarked for Australian and one for New Zealand pilots.

This revised scheme required Canada to supply 52% of the total Dominion pilot output, Australia 36% and New Zealand 12%. Canada was to have 14 E.F.T.Ss, Australia 9 E.F.T.Ss feeding 7 Australian and 2 Canadian S.F.T.Ss, and New Zealand 3 E.F.T.Ss feeding 2 New Zealand and 1 Canadian S.F.T.S. The training of other aircrew was to be allocated in much the same way.

The United Kingdom contribution to the cost (in aircraft and equipment) was redistributed because advanced training was now to be done in Australia and New Zealand, and the proportion of the Canadian cost to be borne by the United Kingdom was slightly increased.

Australia and New Zealand were prepared to agree on this basis, but Canada was not satisfied.

Agreements about the training to be done in Australia and New Zealand were signed on 27th November, and the Australian and New Zealand representatives went home. Negotiations between Canada and the mission went on, Canada insisting that the training done in Canada must be a Canadian undertaking controlled by the R.C.A.F., and flatly rejecting all attempts to make the scheme "nominally Canadian but virtually British".

/Canada also

Canada 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 here was that Dominion reinforcements for the R.A.F. should be unmistakeably associated with the name of the Dominion, preferably as Dominion contingents under Dominion officers. Canada also wanted full public acknowledgment that training was considered the most effective immediate help she could give in the war effort.

Negotiations on these matters, and on financial details, dragged on for some considerable time. The most critical point was the insistence of Col. Ralston (Canadian Minister of Finance) that all the Canadian output from the training scheme should 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 aircrews. This stipulation was strongly resisted by A/C/M. Brooke-Popham, and the agreement with Canada was ultimately signed on the night of 16th-17th December, 1939 with an Article 15 which stated<sup>1</sup> (as had similar Articles in the agreements signed earlier with Australia and New Zealand):-

"The United Kingdom Government undertakes that pupils of Canada, Australia and New Zealand shall, after training is completed, be identified with their

/respective

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1. And was interpreted in a letter dated 16th December from Lord Riverdale to Mr. Norman Rogers (Canadian Minister of National Defence):-

"On the understanding that the numbers to be incorporated or organised at any time will be the subject of discussion between the two governments, the United Kingdom Government accepts in principle, as being consonant with the intention of Paragraph 15 of the Memorandum of Agreement that the United Kingdom Government on the request of the Canadian Government, would arrange that Canadian pupils, when passing out from the training scheme, will be incorporated in or organised as units and formations of the Royal Canadian Air Force in the field. The detailed methods by which this can be done would be arranged by an inter-governmental committee for this purpose under Paragraph 15."

respective Dominions, either by the method of organising Dominion units and formations or in some other way, such methods to be agreed upon with the respective Dominion 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 in their share in it) formed the major part of the Empire Air Training Scheme, but was by no means the whole of it. The arrangements made by Lord Riverdale's Mission included the training organisations in Australia and New Zealand as well. They were called collectively the "Empire Air Training Scheme" and covered:-

- (i) the setting up and operating of training organisations in Canada, Australia and New Zealand,
- (ii) the numbers of pilots and aircrew to be recruited, and the numbers to be trained, by each Dominion,
- (iii) the operational employment of Dominion pilots and aircrew in the R.A.F. or in Dominion units operating with the R.A.F.
- (iv) the distribution of cost, rates of pay, training syllabus, 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 organisation was to deal with pupils from Australia, Canada and the United Kingdom<sup>1</sup> as well as with Canadians.

The complete scheme planned the following schools:-

/In Canada

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1. Up to 10% of the Canadian quota for pilot and observer training might be filled by pupils from the United Kingdom or Newfoundland.

<u>In Canada</u>	13 E.F.T.S.	16 S.F.T.S.	10 A.O.S.
	10 B. & G.S.	2 A.N.S.	
<u>In Australia</u>	9 E.F.T.S.	7 S.F.T.S.	4½ A.O.S.
	4½ B. & G.S.		
<u>In New Zealand</u>	3 E.F.T.S.	2 S.F.T.S.	

The provision of man-power did not follow the distribution of schools, since some training was to be done in Canada for the other two Dominions. The intake of recruits<sup>1</sup>, and output of trained men, was planned to be:-

Canadians (all trained in Canada)

Recruits for pilot training	8112
(of whom 811 might be from the U.K. or Newfoundland)	
Output of trained pilots	5746
(of whom 575 might be from the U.K. or Newfoundland)	
Recruits for observer training	4368
(of whom 437 might be from the U.K. or Newfoundland)	
Output of trained observers	3536
(of whom 354 might be from the U.K. or Newfoundland)	
Recruits for wireless operator air gunner training	7488
Output of trained wireless operator air gunners	6032

Australians

Recruits for pilot training	5616
(all given E.F.T.S. training in Australia)	
Output of trained pilots	3978
(of whom 884 would have S.F.T.S. training in Canada)	
Recruits for observer training	2938
Output of trained observers	2352
(of whom 442 would have been trained in Canada)	
Recruits for wireless operator air gunner training	5096
Output of trained wireless operator air gunners	3939
(of whom 754 would have been trained in Canada)	

New Zealanders

<sup>1</sup> All intakes and outputs are given as annual rates.

New Zealanders

Recruits for pilot training (all given E.F.T.S. training in New Zealand)	1872
Output of trained pilots (of whom 442 would have been trained in Canada)	1326
Recruits for observer training	546
Output of trained observers (all trained in Canada)	442
Recruits for wireless operator air gunner training	936
Output of trained wireless operator air gunners (all trained in Canada)	754

The scheme thus planned an annual output of 11,050 pilots, 6,370 observers and 10,725 wireless operator air gunners from effort contributed as follows:-

	<u>Canada</u>	<u>Australia</u>	<u>New Zealand</u>	<u>U.K. and Newfoundland</u>
<u>MAN POWER</u>				
Pilots	46.8%	36%	12%	5.2%
Observers	50%	37.5%	7%	5.5%
W.O.A.G.	56%	37%	7%	-
Total	51%	37%	9%	3%
<u>TRAINING</u>				
Pilots(E.F.T.S.)	52%	36%	12%	-
Pilots(S.F.T.S.)	64%	28%	8%	-
Observers	69%	31%	-	-
W.O.A.G.	70%	30%	-	-

The United Kingdom undertook to supply almost all the aircraft<sup>1</sup> and engines required for training in each Dominion<sup>2</sup>, viz:-

/Canada

1. The number of aircraft required for the scheme was:-

		<u>Annual Wastage</u>
<u>Canada</u>	702 Moths (E.F.T.Ss)	117
	720 Harvards (S.F.T.Ss)	120
	1368 Ansons (S.F.T.Ss, A.O.Ss and A.N.Ss)	228
	750 Battles (A.A.S. and B.G.S.)	125
<u>Australia</u>	486 Moths	81
	315 Harvards or Wirraways	52
	591 Ansons	98
	336 Battles	56
<u>New Zealand</u>	162 Moths	27
	67 Harvards	11
	126 Oxfords or Ansons	21

(These requirements subsequently changed (after the signature of the Riverdale Agreement) because the ultimate target first line required a considerably higher proportion of T.E. pilots).

2. The United Kingdom also undertook to supply spares for these aircraft, and replace wastage.

Canada:- 136 Ansons (without wings, which were to be made in Canada).  
750 Battles  
553 Harvards  
468 engines for Moths

Australia:- 591 Ansons (without wings, which were to be made in Australia)  
336 Battles  
233 Wirraways (which were to be made in Australia)  
324 engines for Moths

New Zealand:- 126 Oxfords or Ansons  
67 Harvards  
108 engines for Moths

Canada, Australia, and New Zealand were to supply the Moth airframes required. In addition, Canada was to provide 167 Harvards and Australia 82 Wirraways.

The remainder of the cost was to be borne by the Dominion concerned, except that Australia was to contribute 11.29% and New Zealand 8.08% of the cost of S.F.T.S., A.O.S., B. & G.S., A.N.S. and Wireless School training in Canada (representing the proportion of Canadian facilities used by those Dominions)<sup>1</sup>.

The whole scheme, in each of the three Dominions, was planned in accordance with the War Training Organisation of S.D.138(1), with the sole exception that navigation and armament training were not to be carried out at combined schools but separated, as was being done in the United Kingdom, between Air Observer Schools (for navigation) and Bombing and Gunnery Schools. The syllabus, duration of courses, and size of schools were to be the same as in the United Kingdom<sup>2</sup>, i.e.:-

/E.F.T.S.

1. The cost of the Canadian scheme was divided:-

Canada (Initial and E.F.T.S. training)	£ 68 million
Canada (other training)	£285½ million
United Kingdom (in kind)	£185 million
Australia	£ 40 million
New Zealand	£ 28½ million

2. The wastage rates for which allowance was made were:-

E.F.T.S. 162/3%, S.F.T.S. 15%, A.O.S. 162/3%, B. & G.S. 3¼%, W/T. School 16/2/3%.

E.F.T.S.	Capacity	96 pupils:	course duration	8 weeks
S.F.T.S.	"	152 "	: course duration	16 weeks
A.O.S.	"	120 "	: course duration	12 weeks
B. & G.S.	}	60 air gunners:	course duration	4 weeks
		60 observers :	course duration	6 weeks
A.N.S.	"	170 observers :	course duration	4 weeks

It was planned that the E.F.T.Ss and A.O.Ss should be civilian operated, as in the United Kingdom, in order to make use of existing organisations and so enable the scheme to be developed more quickly.

Time was, of course, needed to build the schools, train the instructors, and provide the aircraft. No time schedule was laid down for Australia or New Zealand, but the Canadian scheme had the following target dates:-

First E.F.T.S. A.O.S. and Wireless School to open in May 1940.

First S.F.T.S. to open in July 1940.

First B. & G.S. to open in August 1940.

Last A.O.S. to open in December 1941.

Last E.F.T.S. to open in February 1942.

Last B. & G.S. to open in March 1942.

Last S.F.T.S. to open in April 1942.

The first outputs of trained pilots and other air crew would thus leave the schools between September and November 1940, while the scheme would reach its full size by July 1942, and its full output by November 1942. The manpower required to run the Canadian schools and the necessary ancillary organisations such as repair and equipment depots was estimated as 40,000 (including 2,686 officers and 30,666 airmen) when the scheme was fully developed. The agreements made with Canada, Australia and New Zealand were all to remain in force until 31st March 1943.

No question arose over the control of training in Australia or New Zealand: in each case men from the Dominion were to be trained in schools belonging to the Dominion, and the training was to be run by the Dominion Air

/Force

Force concerned, with such help from the United Kingdom by the loan of officers and men as might be required. Canada, however, was at first thought to be in somewhat different case; the original plan proposed to do all advanced training there, and the Canadian scheme would therefore have been so large that the Air Ministry considered Canada would not have officers with enough experience to run it. Control by a high R.A.F. officer as Director General, with a staff mainly composed of R.A.F. officers experienced in training, was therefore contemplated.

The original scheme shrank, however, until training in Canada became preponderantly Canadian, with comparatively small commitments for Australia, New Zealand, and the United Kingdom. Moreover, Canada was strongly insistent that any Canadian scheme should be under R.C.A.F. control. Accordingly, though not without misgiving on the part of the Riverdale Mission, it was agreed that Canadian training should be run by the R.C.A.F. with a strong liaison staff in Ottawa to watch over the interests of the United Kingdom, Australia and New Zealand.

Executive control<sup>1</sup> over the Canadian scheme was thus exercised by the Canadian C.A.S., A/V/M. Croil, while the whole scheme was directed by a Supervisory Board consisting of:-

Minister of National Defence (Chairman)  
Minister of Finance  
Minister of Transport  
Representatives of the United Kingdom, Australian  
and New Zealand Government  
Deputy Minister of Air, Department of National  
Defence  
Chief of Air Staff (R.C.A.F.)

The Riverdale Mission returned to England after the signature of the Canadian agreement, with the exception of A/C/M. Brooke-Popham, who remained in Ottawa as United Kingdom Liaison Officer-in-Chief<sup>2</sup>.

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1. These arrangements for control and supervision were agreed by a letter dated 27th November, 1939, from Mr. Rogers to Captain Balfour (U.S. of S.).  
2. The staff of the Liaison Mission was:-  
Mr. H.A. Jones, W/Cdr. J.W. Jean, G/C. G.G. Banting and Mr. A.D. Hayward.

Sites for practically all the schools in the Canadian scheme had been selected while the Riverdale Mission's negotiations were going on, and after the agreement was signed work began.

Contracts were made for aerodromes and buildings, for the training to be done by civilian organisations, and for Anson wings. The training of flying instructors began at Camp Borden, and the training of ground staff at St. Thomas and the Air Armament School at Trenton. A/C. Leckie became the R.C.A.F. Director of Training. R.A.F. officers and men arrived in Canada to help with the initial stages of staff instruction.

There were some delays - in the contracts for civil schools, in receiving specifications of Anson wings from the United Kingdom, and in the supply of aircraft and equipment for training instructors and ground staff. Little construction work could be done during the Canadian winter. Criticism of the Canadian Government and of the Air Ministry for the apparently leisurely progress of the scheme began to be heard in Canada.

There was also some suspicion that the United Kingdom still wanted R.A.F. control over Canadian training, and the fact that the Liaison Officer-in-Chief considerably outranked the R.C.A.F. C.A.S. gave some colour to this suspicion. As a result, there was a tendency for executive development of the scheme to go on with comparatively little collaboration between the R.C.A.F. and the U.K. Liaison Mission.

A/C/M. Brooke-Popham therefore suggested that his place should be taken by a more junior R.A.F. officer. On his return to England in March to head a Mission to South Africa, he was succeeded by A/V/M. L.D.D. McKean. After this change the United Kingdom was represented on the Supervisory Board only by the U.K. High Commissioner: the Head of the Liaison Mission no longer had a seat on it.

Difficulties began to appear over the supply of aircraft. An immediate, but minor, trouble was a hold-up in instructor training at Camp Borden because the initial consignment of Ansons and Battles was delayed<sup>1</sup>. The major trouble was a long-term matter: the Empire Air Training Scheme had been planned to produce S.E. and T.E. pilots in the ratio of 1 : 2, whereas the ultimate ration required for E.T.S.2(40) the first line force had now come out to 1 : 6.5. The 1 : 6.5 ratio should be reached in training aircraft by November 1941, and in output by 1942: but it was not possible to build more T.E. trainers than had originally been planned. As a result, it had to be accepted that in 1942 some 100-200 pilots per month who had been given S.E. S.F.T.S. training would have to be converted to twins at O.T.U.s or by refresher courses in the United Kingdom.

Ways of carrying out the Article 15 undertaking about March-April 1940, organising Dominion units and formations were considered by the Air Ministry, and a memorandum sent to the U.K. High Commissioner in Ottawa. This memorandum pointed out that for a typical heavy bomber station only 240 out of a total establishment of 1,012 were pilots or other air crew, and that at a typical fighter station there were only 40 pilots out of a total of 626. Establishing units as Canadian when the officers, pilots and aircrew were Canadian would therefore have the result of putting large numbers of R.A.F. personnel under Canadian control.

Accordingly, the United Kingdom's draft proposal was that Canadian squadrons and formations should come into existence when they could be manned wholly or predominantly, both in the air and on the ground, by Canadians. Some definite suggestions were put forward:-

/(i) the Canadian

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1. The reasons were bad weather and railway delays in Britain.

- (i) the Canadian output of pilots and other air crew would ultimately feed 42 squadrons, and these 42 squadrons could be all-Canadian if 20,000 ground staff were recruited and trained.
- (ii) reduce Canadian output of pilots and other air crew so that Canada would supply the same total amount of man-power, but properly balanced between air and ground crews: the number of squadrons on this basis being 30.

For comparison, it was stated that the expenditure which Canada was devoting to the training Scheme would, if put exclusively to the raising, equipping and maintaining of squadrons in the field, have enabled 15 Canadian squadrons to be gradually built up.

The whole matter was one of great delicacy, and remained for the time being as a draft discussed between London and the U.K. High Commissioner.

By the end of April 1940, no flying training had started in Canada. The original R.C.A.F. Flying Training School, at Camp Borden and Trenton, was working on instructor training, a Wireless School was open at Montreal, and a maintenance and supply organisation of equipment and repair depots was being built up.

In Australia four civil operated half size Elementary Flying Training Schools had opened<sup>1</sup>, one Service Flying Training School at Point Cook, was working; flying instructors were being trained at Camden; and a Wireless School was open at Ballarat.

In New Zealand two Elementary E.F.T.Ss (No.1 Taieri and No.2 New Plymouth) and two Service F.T.Ss (No.1 Wigram, and No.2 Blenheim) were at work, though below full strength and largely with obsolete aircraft.

Initial  
1. No.1 E.F.T.S., Parafield; No.2 E.F.T.S., Archerfield;  
No.3 E.F.T.S., Essendon; and No.4 E.F.T.S., Mascot.

Initial Training Schools, for the preliminary ground training of crew, were at work in all three Dominions: at Toronto (Canada), Somers (Australia), and Levin (New Zealand).

Training Overseas.

Though the possibility of doing more training overseas had been discussed and investigated more or less steadily from 1936 onwards, the R.A.F. found itself at the outbreak of war, with no more than one old-established reality and two newly conceived schemes.

The reality was No.4 F.T.S., which had been working at Abu Sueir since 1921. The schemes were for a Flying Training School in Kenya, which had been approved in May 1939, and for Flying Training Schools in France, to which the French Government had agreed two days before the outbreak of war.

The project of training in Canada which developed into the Empire Air Training Scheme was fundamentally different from these other plans for doing training overseas. The Canadian, and Empire scheme dealt with the training of Dominion man-power: recruits from Canada, Australia, and New Zealand were to be trained in Dominion schools for service in Dominion Air Forces working with the R.A.F. No.4 F.T.S. and the schools planned in Kenya and France were R.A.F. establishments training R.A.F. recruits for service in the R.A.F. itself.

No.4 F.T.S.

At the outbreak of war No.4 F.T.S. moved to Habbaniya in Iraq and began working to the 16-weeks war course. Its pupil population did not go up to war establishment, and its output, just over 300 pilots a year, went to the Middle and Far East.

/Kenya

Kenya.

Nothing was done about the school in Kenya until December 1939. Before the war some question had arisen of whether the site at Nakuru was Crown land or whether it would have to be bought. After war broke out no decision to go ahead with the school was taken until the ultimate requirement of schools and the size of the Empire Air Training Scheme became fairly clear.

November-  
December 1940.

S.50935

When the target first line force was approved at the end of 1939 it was seen that the training backing for this force would call for at least ten schools over and above those to be provided in the United Kingdom and by the Empire Scheme. Work was then begun on Nakuru, some objections by the local civil aviation representative on the ground of dangerous air conditions being overruled. In February 1940 it was estimated that the aerodrome would be ready in July, and the buildings finished in November.

It was at first intended that No.4 S.F.T.S. should move from Habbaniya (which was unsuitable for a school) to Nakuru in July, but this scheme was cancelled in April. No.4 S.F.T.S. was to stay at Habbaniya, and a new S.F.T.S. to form at Nakuru in July or August.

France.

Flying Training Schools in France were at first regarded with some suspicion for security reasons<sup>1</sup>, but A/C/M. Newall decided that they should go ahead. At the end of September A/M. Barratt was told of the scheme and the progress already made, and was informed that an aerodrome, complete with buildings, was required in the Tours area. No ready made aerodrome was available, but after reconnaissance a site at Vendome was selected early in October.

/A/M. Wel

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1. Presumably espionage and leakage of information were considered the dangers. There was also a possibility that schools in France might be more vulnerable to attack.

A/M. Welsh asked the French authorities in October for more aerodromes, and was offered sites in Morocco. Morocco and North Africa were not considered suitable, however, and a request was made for four or five sites in the Orleans area. This was amended early in November to a request for locations, not necessarily in the Orleans area, which would enable a group of schools to be supplied from the same base.

S.1617

On 11th November the French allotted to the R.A.F. a large area stretching west from Vendome. Reconnaissance was done in January 1940, and in February S.F.T.Ss at Lignières (near Vendome), Sougé (near La Chatre) and Parce (between Sable and Le Mans) were authorised<sup>1</sup>. The original selection of Vendome had been requisitioned by the French for the R.A.F. in December. In addition, five relief landing grounds were selected.

The aerodromes were to be grass. Vendome was to be sown in the spring of 1940, and might come into use in the late summer. The others would not be ready for sowing until the autumn, and were unlikely to be brought into use before 1941. Even these dates were uncertain: shortage of labour and equipment might cause delay. Some re-arrangement of the aerodromes was done, and at the end of April the scheme was for five Service Flying Training Schools in France, to be controlled by a Group of Training Command:-

S.D.155(330/40)

No.30	S.F.T.S.	Sougé
No.31	S.F.T.S.	Herbouville
No.32	S.F.T.S.	Iuble
No.33	S.F.T.S.	Houssay
No.34	S.F.T.S.	(location undecided.)

/Southern Rhodesia

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1. The aerodromes and schools were to be built by the Air Ministry, and not by G.H.Q., and a Works Area was set up to deal with them.

Southern Rhodesia.

In 1934 S. Rhodesia offered to contribute £10,000 a year to Imperial defence, and the Committee of Imperial Defence considered that the contribution could most usefully be devoted to pilot training in the Colony.

Early in 1939, following a request from Mr. Huggins (Prime Minister of S. Rhodesia), Group Captain Harris visited the Colony and advised its Government. The proposal for pilot training developed into a scheme for building up a Southern Rhodesian Air Unit which would be available either for the defence of S. Rhodesia itself or as a contribution to Imperial defence, if necessary outside S. Rhodesia.

S.37926

Group Captain Harris advised that the Air Unit should be created by progressive steps:-

- (i) ab initio pilot training at the civil school in Salisbury, and technical training of ground staff apprentices by the R.A.F. at Halton.
- (ii) formation of a service training flight with obsolescent service types of aircraft.
- (iii) formation of the Air Unit's other flights.
- (iv) creation of reserves.

This was done. Two R.A.F. officers and three N.C.Os were loaned to S. Rhodesia, and six pilots a year were taken into training. By July 1938 the training flight of the S. Rhodesian Air Unit, equipped with Harts, had dealt with its first batch of pupils, and the Colony asked for aircraft to form the operational flights. No aircraft, however, could be provided until some Gauntlets became surplus in April and Audax in September 1939<sup>1</sup>.

/The formation

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1. The supply of aircraft to the S. Rhodesian Air Unit was somewhat unfortunate. A charge of £700 each was made for the Harts used for service training, although other Harts were sold very shortly after to South Africa (which had no intention of using them to help in Imperial defence) for £200 each. The disparity was explained by a dividing date when the Harts officially became surplus, but Southern Rhodesia considered the higher price to be an unhelpful gesture. The delay over the Gauntlets and Audax was due to waiting until they were officially surplus and could therefore be supplied cheaply.

The formation of a V.R. centre to train reserves was suggested by S. Rhodesia in July 1938: in February 1939 it was discussed by a conference at the Air Ministry, which decided that the Air Unit should be expanded to include a V.R. centre training reserves both for itself and for the R.A.F., the Air Ministry supplying aircraft and instructors. There was opposition, however, from the war Office and the Treasury to relieving S. Rhodesia of financial liability for its own defence by providing instructors, and nothing was done.

S.51244

In July 1939 Mr. Huggins visited the United Kingdom and expressed S. Rhodesia's wish to go on with pilot training in addition to the war commitment of sending the Air Unit to Kenya. He suggested setting up a Flying Training School in S. Rhodesia, and stressed the advantages of the country for air training.

After the outbreak of war, in October 1939, S. Rhodesia offered to supply two more squadrons (making, with the existing Air Unit, three in all). This offer was discussed in November and December 1939, and was eventually replaced by an agreement to set up and operate three E.F.T.Ss and three S.F.T.Ss in the Colony. Aircraft and practically all the instructors and staff were to be provided by the R.A.F., and the schools were to train R.A.F. pupils and Rhodesians.

S.51244

In January 1940, Belvedere (near Salisbury) was chosen for the first E.F.T.S., and Cranbourne (also near Salisbury) for the first S.F.T.S. Two sites for aerodromes were selected at Guinea Fowl and Kumalo. Arrangements were made for Moths, Harvards and Oxfords to be shipped, and for the Harvards and Oxfords to be erected at Durban<sup>1</sup> and flown to Rhodesia by South African Air Force pilots. The South African Government gave considerable help over the erection

/and

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1. The packing cases were too large to be taken to S. Rhodesia by rail.

and ferrying of these aircraft.

South Africa.

September 1939. South Africa's early attitude to the war was that she would take an active part in it only if the Union were directly threatened. Any suggestion that South Africans should serve outside Africa - that, for instance, they should be trained to reinforce the R.A.F. as Canadians, Australians, and New Zealanders were to be trained under the Empire Scheme - would have provoked violent political conflict in the Union; and South Africa was therefore not included in the negotiations and discussions which produced the Empire Air Training Scheme.

December 1939. S.2896. The Union, however, was concerned with self defence and with the defence of Africa generally, and began to plan expansion of the South African Air Force for this purpose. Increased training arrangements were naturally part of the plan, and in December 1939 General Smuts offered to make part of South Africa's increased training facilities available for European British subjects, who lived in Southern Africa. In making this offer he pointed out that training in the Union would be more economical than setting up schools in Rhodesia or Kenya. Early in January the United Kingdom accepted the offer gratefully, and asked for it to be extended to include pupils from the United Kingdom. It was made clear that there was no intention of setting up any United Kingdom organisation in South Africa, and that all work would be under the control of the Union, which would act as the United Kingdom's agent. General Smuts agreed to the extension.

It was then decided that the United Kingdom should negotiate for training capacity in South Africa roughly equivalent to that scheduled for Southern Rhodesia, i.e. for an output of some 1750 pilots a year<sup>1</sup> over and above the /output

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1. This was broadly the output of 4 S.F.T.Ss.

output of 720 a year which South Africa was planning for the S.A.A.F. One difficulty could be foreseen at once: it would be a long time before South Africa could be provided with aircraft and equipment, since the whole production of training material was already committed to R.I.F. expansion, the Empire Scheme, and Rhodesia.

February 1940

There was some delay in telling South Africa of these hopes and limitations: not until February was the Union informed of the numbers which the United Kingdom hoped to have trained and warned that the scheme would be a long-term project which would extend into 1942 and could not be implemented "for some time to come". It was then proposed that a party of experts should visit South Africa to arrange the details. South Africa agreed both to the target Scheme and to the target Scheme and to the proposed visit, but no public announcement was made because such an announcement might raise hopes of more rapid development of South African training than was in fact likely to be possible.

A little later it became clear that South Africa was considerably concerned about the equipment and operational employment of the S.A.A.F., and that any mission would have to discuss these matters as well as training. A/C/M. Brooke-Popham was proposed as head of the mission, and South Africa welcomed the proposal. The mission<sup>1</sup> arrived in South Africa on 30th April, 1940.

South Africa's primary concern was expansion of the S.A.A.F., and she wanted help over this, in the form of aircraft, instructors, and experience, in return for the training capacity she was putting at the United Kingdom's disposal.

/The existing

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1. Consisting, in addition to A/C/M. Brooke-Popham, of Sir James Ross, G/C. A.L. Paxton and S/L. E.F. Porter, with Mr. A.L.M. Cary and Miss M. Holder.

The existing S.A.A.F. training organisation was scattered about in small schools all over the Union; it fell far short of R.A.F. standards in many respects, notably in ground training and armament training; and it was unbalanced in having a much larger elementary than service training capacity.

Higher Organisation.

At the outbreak of war Training Command had three Groups, Nos.21, 23 and 25, primarily concerned with aircrew training. The first two controlled the Service Flying Training Schools, No.21 being also responsible for the Electrical and Wireless Schools until No.26 Group was formed in January 1940, and No.23 for the Central Flying School of Air Navigation. No.25 was the Armament Group<sup>1</sup>.

Reserve Command consisted of three Groups. Nos.50 and 51 controlled the Elementary Flying Training Schools and the civil navigation schools. No.54 was formed at the outbreak of war to control the Flying Personnel Reception Depots which were set up as the eventual result of Brigadier General Crichley's suggestion.<sup>2</sup>

No.6 Group, which became responsible for the Bomber Group Pools in September 1939, was at Abingdon. The training units in Coastal Command, including the School of G.R. and the Group Pool at Silloth when it was formed in

/November,

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1. Training Command was at Market Drayton: it moved to Shinfield Park, Reading in January 1940<sup>2</sup> for better accommodation and easier accessibility to London. No.21 Group was at Cranwell. No.23 moved from Grantham to South Cerney on 10th October 1939. No.25 Group, which had moved from Eastchurch to Brize Norton in June 1939, moved to Market Drayton in February 1940.
  2. Reserve Command was at Wantage Hall, Reading. No.50 Group was at Bristol until it moved to Reading at the end of April 1940. No.51 Group was at Leeds. No.54 Group was at Reading, and moved to Bexhill in March 1940.

<sup>2</sup> The move began on 12th January.

S.59818

November, remained under No.17 Group at Lee-on-Solent. Fighter Command had no Group specially concerned with training, and Air Chief Marshal Dowding in February 1940, resisted the Air Ministry proposal to concentrate the Command's few training units under the single control of No.10 Group.

E.P.M.44(40)

By the spring of 1940, it had become obvious that Training Command was seriously overloaded, and that Reserve Command's raison d'etre had largely disappeared with the end of the Volunteer Reserve civil organisation at the outbreak of war. Training Command had some 4,400 officers and 84,600 airmen, as well as 1,500 Poles and 1,000 W.A.A.Fs, against Reserve Command's 450 officers and 8,000 airmen. Four fifths of Training Command's personnel were in Recruit Centres, Technical Training schools, or other non-flying units. Air Marshal Courtney (A.M.S.O.) proposed in April that Training and Reserve Command should be re-organised into Flying Training and Technical Training Command. Flying Training Command was to control No.21, 23 and 25 Groups, plus the Groups (Nos.50, 51 and 54) of Reserve Command. Technical Training Command was to deal with the remainder. These proposals, which gave Flying Training Command 54 stations, 3,200 officers and 26,000 airmen, compared with Technical Training Command's 23 stations, 1,650 officers and 69,000 airmen, were approved.

The higher control of armament matters remained an unsolved problem. The disadvantages of handling development, tactics, and training in three more or less water-tight compartments had been pointed out by Air Commodore McClaughry just before the outbreak of war, and they again became obvious when the formation and functions of the Central Gunnery School were being discussed. The solution put forward by Air Commodore McClaughry had been the

/setting up

S.58408

setting up of an Armament Directorate in the Air Ministry to supervise and co-ordinate all aspects of armament. In October Air Vice Marshal de Crespigny (A.O.C. No.25 Group) put forward another possible solution - the creation of an Armament Command with two Groups, one dealing with training and the other with tactical development. Armament training (he said) was tending to become divided among still more separate compartments: Group Pools were dealing with it, and the transfer to them of some S.F.T.S. armament attachments would increase their share. Air Vice Marshal de Crespigny envisaged the development of Group Pools into Crew Training Schools under the control of the Armament Training Group. Nothing was done, however, about either this suggestion or A/C. McClaughry's: armament matters remained diffusely controlled and without any effective co-ordination.

The rapidly growing importance of the O.T.U. stage was reflected by a number of changes in the organisation of the Air Ministry. The Assistant Chief of the Air Staff, who controlled operational training, became A.C.A.S. (operational requirements and tactics<sup>1</sup>) in February, and his Directorate of Staff Duties was renamed the Directorate of War Training and Tactics (D.W.T.T.) in March. An Assistant Director (A.D.W.T.) for O.T.U. training was established, and the Directorate had branches dealing with Fighter and Bomber Command units and O.T.U.s (T.W.1.), Coastal Command units and O.T.U.s (T.W.2), and army co-operation matters (T.W.3.).

The Directorate of Training was also reorganised in March. It had three Deputy Directors:- D.D.T.F., responsible for flying training (T.F.1, 2 and 3), navigation (T. Nav.), and naval matters (T.N.); D.D.T. Arma., responsible for armament training (T. Arma. 1, 2 and 3); and D.D.T.Tech.,

/responsible

1. i.e. A.C.A.S.(T). The post of Director General of Operations was abolished and replaced by that of A.C.A.S. (operations and intelligence).

responsible for trade training (T. Tech. (Mech.)), instructional films (T. Tech (Instr. Films)), signals (T. Tech. (Sigs.)), and photography (T. Tech. (Photos.)). In this reorganisation T.G. ceased to exist: its gas defence duties were taken over by D. of O., and its responsibility for chemical warfare by T. Arm. I.

Matters concerning the Empire Air Forces were at first handled by a Deputy Directorate of Dominion Air Co-operation (D. Dom. A.C.), which was formed in November 1939 to co-ordinate the Dominion Air Forces and Dominion Training Scheme. After the signature of the Riverdale Agreements, however, a standing committee of the Air Council was appointed to keep in touch with the developments of the Empire Air Training Scheme. This was known as the E.A.T.S. Committee and consisted of:-

The Under Secretary of State (Chairman)  
A.M.P.  
A.M.S.O.  
2nd D.U.S.

Its terms of reference were subsequently extended to cover all training overseas.

In February 1940, responsibility for co-ordination on Office Mem. 23/40. Empire Training matters and for communication with the Dominions was transferred from D. Dom. A.C. to the Deputy Directorate of Organisation (O.5), and in March D. Dom. A.C. ceased to exist, its remaining functions being taken over by a new section in the Directorate of Plans.

#### Summary.

At the outbreak of war the number of schools working in the United Kingdom went down. Reserve training came to an end, and some 28 of the E. & R. F.T.Ss either closed or disappeared by amalgamation. Five armament training stations on the east coast could not be used because they were in the operational area. The number of S.F.T.Ss remained unchanged at 14, of which two were /training

training for the Fleet Air Arm. One more civil A.O.N.S. came into operation.

The "War Training Organisation" changes laid down in S.D.138(1) came into force as far as possible. The S.F.T.S. course was shortened from 26 weeks<sup>1</sup> to 16, the observer course remained unchanged, and the school training of air gunners on 4-week courses began. The capacity of schools was gradually increased, as accommodation and the supply of aircraft and equipment allowed. The theoretical result of these changes was to make possible an output of 5,600 pilots, 3,600 observers and 5,400 air gunners per year from the reduced number of schools.

This rate of output was not achieved. Shortage of aircraft, equipment, accommodation and instructors slowed down the expansion of schools to their planned war-time size<sup>2</sup>. The standard of proficiency produced by school training was found lacking in several directions, and this fact, coupled with the difficulty of keeping trained men employed at a time when few were needed to replace casualties, caused a general lengthening of school courses by about 25%, with a corresponding reduction in output, in December 1939. Training generally was severely handicapped by exceptionally bad weather during the winter, and by unserviceability of aircraft and lack of spares in the spring.

Intakes to school training were somewhat miscellaneous. The training of Volunteer Reservists was, to a large extent, finished off before the training of war time entrants was begun. As a result, there was great pressure on the more advanced stages of pilot training, and a comparatively light load on the E.F.T.Ss, until the early months of 1940.

Volunteer Reserve observers were found in many cases to be

/lacking

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1. The peace-time duration was extended to 30 weeks in winter.
  2. The same factors also compelled the navigation training of observers to be continued at civil schools instead of being transferred to armament training stations.

lacking in general education and suitability, and their failure rate was high. The Initial Training Wings became crowded with Volunteer Reservists and war-time entrants waiting for places in schools, and began to give pilots and observers more instruction in mathematics and navigation.

A.P.1388

S.D.138(1)

The standard of proficiency which war-time school training aimed at producing was the peace-time passing out standard from schools. In theory, this standard enabled a pilot to take part at once in the flight training of his squadron, or take part in operations against the enemy after a week or so in his squadron, and was defined for war training as producing pilots and aircrew "qualified to assume their full responsibilities in the duties for which they have been trained". In practice, however, an "assumption of full responsibilities" standard for passing out from schools was approximated only for day fighter work: for other squadrons a good deal of additional basic individual instruction, as well as flight or operational training, was needed.

Some aspects of basic training had been merely begun, but not carried to any satisfactory degree of competence or mastery, at schools in peace-time. Conspicuous examples were:-

- (i) instrument flying, night flying, and navigation for pilots,
- (ii) practical experience of navigating, particularly in bad weather and at night, and of using aids to navigation, for observers,
- (iii) practice in operating in the air, for wireless operators.

The extent to which full proficiency in these aspects had to be developed after pilots and air crew left school varied from one type of squadron to another. So, too, did  
/the organisation

the organisation (such as navigation courses, G.R. courses, seaplane training, etc.) for giving instruction after basic school training had been completed. The result was that a varying burden of additional training, part basic and part operational, lightest for fighters and heaviest for bombers, had fallen on squadrons in peace-time.

War-time school training, while aiming at the same passing-out standard, had the handicaps of shorter time, shortage of aircraft, balck-out, dispersal and operational restrictions on flying, in achieving it. Rather more additional instruction therefore remained to be done in war-time, but squadrons could not deal with it and carry on active operations as well.

The existence of this gap in training was foreseen, and the original functions laid down for Group Pools provided that in war-time they should "train the output of the Flying Training Schools up to operational standard". This, however, still left vague the exact standard at which squadrons would accept pilots and air crew in war-time: "operational standard" was an ill-defined criterion, so much so that Air Marshal Welsh in November 1939 could describe<sup>1</sup> the intention of having "practically no operational training in a squadron" as a considerable drift from the original purpose of Group Pools.

Thus, though the need for filling the gap in training between the passing out standard of schools and "operational standard" was accepted, it was necessary to define squadrons' standard of acceptance before Group Pools or O.T.U.s could be planned satisfactorily.

About this standard there was considerable divergence of opinion. Fighter Command, with comparatively little post S.F.T.S. training to do, was prepared to accept pilots

/into

into squadrons at their S.F.T.S. passing out standard and leave the squadrons to do what training was needed. Bomber Command, which had to give a good deal of additional instruction to both pilots and air crew, insisted that squadrons should be saddled with only the bare minimum of training.

Other considerations had considerable bearing on whether training should be done in squadrons or O.T.Us. First line expansion and rearmament was a matter of vital urgency for Fighter Command, and there were not enough Hurricanes and Spitfires to equip O.T.Us as well as expand and rearm the first line. Bomber Command, on the other hand, used 14 non-mobilisable and 6 other squadrons to provide a training backing for 33 operational squadrons.

The facts that continuance of sustained operational effort would depend on the supply of fully-trained casualty replacements, and that squadrons could not train men while engaged on operations, gradually became dominant. A policy of leaving squadrons to do only the irreducible minimum of training slowly crystallised from the conference of 4th December, Air Chief Marshal Newall's ruling on Fighter Group Pools in January, and the conference on 19th April. The renaming of Group Pools "Operational Training Units" was an outward and visible sign of this policy.

Fighter Command resisted the transfer of operational training to O.T.Us. The amount of training needed for fighter squadrons, though appreciable, was not heavy; to devote operational aircraft to O.T.Us while there was still need to expand the first line seemed to Air Chief Marshal Dowding a luxury.

While this policy - that O.T.Us should be a matching stage to bring the quality of schools' output up to the full requirements of operational squadrons - was taking

/shape there

shape there was no change in the quantity of pilots and air crew that Group Pools, or O.T.U.s, could handle. Bomber Command had organised fifteen Group Pool squadrons and five Reserve Squadrons in September 1939, and they went on working, practically unchanged, until April 1940. Fighter Command had the nucleus of an O.T.U. organisation in its Group Pools at St. Athan and Aston Down, but it was a nucleus with the minimum of aircraft and equipment, which could do little more than train replacement pilots for the squadrons in France during a quiescent period. Coastal Command had a well-planned Group Pool which existed mainly on paper. In no case was the actual operational training organisation large enough to train either the flow of men from schools or the expected numbers for casualty replacements.

The major factor in putting any policy about operational training into force was that O.T.U.s needed aircraft, equipment, and man-power. Aircraft were the chief difficulty; the numbers required were large, and a high proportion of them, if the training were to be efficient, had to be of operational types.

O.T.U. planning had to be done, obviously, on the basis of training all casualty replacements up to the required standard - that is, of matching the schools' output to the requirement of the first line in quantity as well as quality. In December 1939 it was agreed that ratios of operational training to operational aircraft varying between 20% for fighters and 100% for heavy bombers were needed to train the full flow of casualty replacements. But in arriving at these ratios the claims of quality in training were somewhat tempered by the difficulty of providing so many operational types, the limitation of first line size that would inevitably follow the diversion of a large number of aircraft to training, and the hope that schools'

/output

output standard could be materially improved.

A beginning was made in applying the ratios to O.T.U.s towards the end of April 1940, though in the case of Fighter Command only an interim O.T.U. strength, well below the agreed 20% was aimed at. Until the increased strength of training aircraft began to affect output, several weeks later, the flow through O.T.U.s remained, as it had been since the outbreak of war, mismatched to both operational wastage and the output from schools.

The amount of operational training, and consequently the flying hours and aircraft requirements of O.T.U.s, depended entirely, once the standard of acceptance into squadrons had been fixed, on the passing out standard from schools. The formidable number of aircraft required for adequate operational training accordingly focussed attention on the possibility of improving basic instruction. Courses were lengthened in December 1939, but the lengthening produced little improvement, and they had to be shortened again in April to cope with the large number of men in I.T.W.s awaiting flying training.

Shortness of courses was by no means the only factor responsible for the defects of school training. Shortage of aircraft and lack of a wireless organisation for operating them at night and in bad weather handicapped night flying, instrument flying, observer, and wireless operator training. Incompetent or unsuitable instructors lowered the standard of navigation and gunnery training. Shortage of equipment handicapped all training, especially night flying and gunnery. War time conditions affected serviceability, through dispersal and black out, and limited the areas for cross-country flying.

Giving more time to school training could not change these other factors. More flying time, with suitable

/facilities

facilities and equipment, were essential for remedying the shortcomings in school training.

O.T.U.s had operational aircraft, up-to-date equipment, and an adequate wireless organisation, while the amount of pilot training falling to them called for a great many flying hours. More and more of the advanced training with which schools could not cope therefore tended to drift to the O.T.U.s<sup>1</sup>: the transfer of bomber pilots' practical armament training from S.F.T.S.s in January was an indication of the limited field of instruction with which schools could deal efficiently<sup>2</sup>.

Various factors - reduction of squadron training to a minimum, defects in school training, and a tendency to transfer advanced instruction - thus combined to increase the training responsibility of O.T.U.s. It was hard to find all the flying time needed, and accordingly some ingenious devices for simulating air experience - "synthetic" trainers - were invented and an Air Ministry committee set up to foster their development.<sup>3</sup>

Aircraft to provide more flying time at schools, however, could not be found quickly, while the value of the aircraft which schools had was considerably reduced by maintenance difficulties and lack of spares. In the early part of 1940 the need of trainer aircraft was so acute that buying some from Italy was discussed.

Another important cause of weakness in school training was instructors. Only flying instructors were trained to teach their subject; others, in general, had knowledge of what was to be taught, but not of how to teach it.

Instructors' knowledge was not always of the right sort,

/or full

1. For example, the practical training of observers in navigation and teaching wireless operators how to work in the air.
2. Other factors tending to throw more advanced instruction on O.T.U.s were absence of priority, and hence delay, in supplying schools with the new equipment, and reliance on obsolete service types of aircraft for armament training.
3. See page

or full enough: "master mariners" at civil navigation schools were criticised for ignorance of navigation in the air, service navigation instructors had in many cases been trained only up to the standard of what they were supposed to teach, and armament instructors were far more competent to deal with the maintenance of equipment than to teach its offensive use.

The original conception of the Central Gunnery School was largely intended to remedy the weakness of instructors so far as gunnery was concerned. By allying the training of gunnery instructors with the evolution and development of gunnery technique and tactics it was hoped to produce expert teachers with first-hand knowledge of the subject and enthusiasm for its efficient improvement. The urgent first-line need for raising the existing standard of gunnery, however, led to concentration by the C.G.S. on "leadership" in squadrons, with corresponding neglect of instructor requirements at schools.

While immediate experience of war-time training in the United Kingdom was defining the field which O.T.U. training would have to cover, and emphasising the failings and limitations of existing school training, planning was going on for the ultimate, full size, first line. This was to be the maximum which could be achieved on a production of 2,550 aircraft per month.

A first rough estimate in September 1939 showed that about 45 S.F.T.Ss<sup>1</sup>, with other schools to match, would be necessary to back this first line. So many schools could clearly not be accommodated in the United Kingdom, and the long standing, but unfulfilled, project of training in Canada was revived.

/Canadian

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1. Of the capacity laid down in S.D.138(1) for war training.

Canadian training became linked with the general question of how the Dominions should contribute to the common air effort, through a suggestion from the High Commissioner for Australia that each Dominion should furnish an aircrew contingent for service with the R.A.F., the advanced training of aircrew from all Dominions being centralised in Canada. This suggestion was accepted in principle by Canada, Australia and New Zealand. South Africa was informed of the scheme, but not invited to take part because of the political difficulties which it was known that any active participation in the Imperial war effort would arouse.

The first draft of the Empire Air Training Scheme planned that the three Dominions concerned should provide 5/9 of the Empire's total requirement of aircrew, and that 25 S.F.T.Ss should operate in Canada. The various Dominions would contribute to the cost according to the amount of training they required for their contingents, and the whole Canadian scheme (as visualised in London) would be under the control of an experienced R.A.F. Director General and staff.

Canada was lukewarm to the plan, disclaimed responsibility for its conception, preferred a more spectacular, first-line, form of contribution to the war effort, and was dubious about the financial burden it would impose. Australia and New Zealand were enthusiastic about the scheme and eager to make it a success, but doubtful about the cost to them of doing so much advanced training in Canada.

The whole plan was therefore revised so that, broadly, each Dominion did the bulk of advanced, as well as elementary, training for its own contingent; only a comparatively small part of the training of Australians, and a somewhat larger part of the training of New Zealanders, remaining in Canada. This reduced the cost to Canada, and made training cheaper

for Australia and New Zealand: the United Kingdom offered to bear an increased share of the expense.

This revised scheme was fundamentally acceptable, Australia and New Zealand agreed to it, but Canada went on negotiating over details. These details all had one feature in common - insistence that Dominions were sovereign and independent, and not appendages of the Imperial Government. Each Dominion must be master in its own house, and have control over the training ~~zone~~ in that Dominion. There had been no question about this in the case of Australia and New Zealand<sup>1</sup>, but Canada insisted on Canadian control for the joint part of the scheme. Each Dominion's contingent was to be organised, not as a reinforcement of Dominion man-power supplied to the R.A.F., but as an acknowledged formation of the Dominion Air Force concerned. The negotiations ended, and the Empire Air Training Scheme became an agreed fact, on 16th December, 1939.

The Empire scheme, however, dealt only with the training of aircrew from Canada, Australia and New Zealand - that is, with 5/9 of the ultimate training. Men from the United Kingdom and the rest of the Empire, i.e. the remaining 4/9 had also to be catered for.

By December, however, the ultimate force and its training backing had been recalculated. The number of S.F.T.Ss required went up from 45 to 60, some 35 over and above the Empire scheme were needed (with a corresponding number of other schools), and 7/12 of the total number of pilots and aircrew had now to be trained outside the Empire scheme.

Various plans were worked out, and offers of training assistance received. Five S.F.T.Ss were to be located in France; the building of a school in Kenya was put in hand;

/it was

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1. The C.A.S's in Australia and New Zealand were R.A.F. officers.

It was agreed that Southern Rhodesia should provide 3 S.F.T.Ss; South Africa offered training capacity in the schools to be developed for expanding the South African Air Force, and it was hoped that the equivalent of 4 S.F.T.Ss would be forthcoming. By March 1940 a survey by Air Marshal Courtney<sup>1</sup> showed that only 10 S.F.T.Ss, with a proportion of the other types of schools, still remained to be sited.

All these schemes and plans, however, were for the more or less distant future. The Empire scheme, Southern Rhodesia, and Kenya would begin to produce trained men towards the end of 1940, but would not reach their full output until late in 1941 or 1942. The French schools had still to be built, and the mission to arrange South African training did not leave until April 1940. In the meantime the output of pilots and aircrew was entirely governed by the capacity of the existing schools in the United Kingdom.

These plans for the future training organisation required a very considerable number of trainer aircraft, and an examination of this aspect by Air Marshal Courtney<sup>2</sup> showed that production plans by no means fitted training requirements. Enormous deficiencies of T.E. trainers and target towers, and a surplus of S.E. trainers, were likely to occur as the plans for training were put into practice.

All the war-time planning of schools was based on the organisation and syllabus laid down in S.D.138(1). It followed that war-time outputs from schools would all be of about the same standard that experience in the United Kingdom had shown to need a good deal of O.T.U. training. The complete organisation would therefore need a large number of O.T.U.s, particularly for the heavy bombers which would form a high proportion of the ultimate first line,

/and these

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1. Appendix 21 - E.P.M.37(40). Note on the War Training Scheme for Flying Personnel dated 28th March 1940.
  2. Appendix 22 - E.P.M.32(40). Note on Anticipated Deficiencies of Trainer Aircraft dated 16th March 1940.

and these O.T.Us would require more than 2,000 operational aircraft in addition to the training types covered by Air Marshal Courtney's paper.

By April 1940, the general shape of the war-time training system had become clear. Basic schools, distributed throughout the Empire and in France, and working under varied higher control, would train pupils drawn from all parts of the Empire. Their output would pass, for a considerable and essential further stage of training, to O.T.Us located in operational theatres<sup>1</sup>. So large and widespread an organisation would probably require refresher courses after the breaks involved by travelling, and conversion courses to deal with any mismatchings of output and intake. It was likely to meet some trouble over the supply of the large number of aircraft involved.

The system which existed in April 1940, was to some extent a collection of bits and pieces. The school organisation in the United Kingdom was mainly under two Commands (Training and Reserve), and the Director of Training. The O.T.Us were under the three operational Commands (from the training in whose squadrons they had evolved), and D.W.T.T. and A.C.A.S.(T). Schools in the Empire were controlled by the various Dominion Air Forces, the E.A.T.S. Committee, through O.5, keeping in touch with their development.

That satisfactory co-ordination of training under this system was far from easy was shown by a meeting held by the Secretary of State on 3rd April<sup>2</sup>. One step towards better control, was, however, taken by the decision to reorganise Reserve and Training Commands into a Flying Training and a Technical Training Command.

/Throughout

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1. The advisability of putting some O.T.Us overseas was raised by A/C/M. Udlow Hewitt in February 1940, and by A/M. Portal in April 1940. The advantages of close liaison with operational work were, however, held to outweigh the advantages of location in such places as Canada.
  2. Appendix 23 - Notes of a Meeting held by the Secretary of State on 23rd April 1940 to discuss the War Training Scheme for Flying Personnel (E.P.M. 43(40)).

Throughout the first eight months of war considerations of the number of aircraft required for training and of the consequent effect on the aircraft strength of the first line hampered both the immediate and the ultimate development of the training organisation. The amount of instruction needed to support the first line by an adequate flow of fully trained men had been underestimated before the war, but the required size and scope of organisation soon became clear. Planning, however, aimed at the minimum training organisation which, under favourable circumstances and conditions, could support the operational squadrons: the spearhead was to be at the end of the slenderest shaft that could bear it.

5. MAY 1940 - MARCH 1942.

(A few basic facts and considerations governed much of the planning and development of flying training during 1940 - 1942. The first six sections of this chapter describe these matters, and are placed at the beginning for that reason.)

30 May -  
3 June  
21 June

On 10th May 1940 the German blitzkrieg in Western Europe began. Holland and Belgium were overrun, the Channel ports passed into German hands, and at the end of the month Fighter Command was giving air cover to the evacuation of French and British armies from Dunkirk. By the last week in June the Battle of France was over, France had capitulated, the French Empire had passed out of the war, and Italy was ranged with Germany. The United Kingdom faced the prospect of immediate short-range attack.

The Metropolitan Air Force was drawn into intensive operations. Fighter Command at first sent a few squadrons as daily visitors to the continental battle, and then gave full daylight protection at Dunkirk. Bomber Command began by attacking a variety of strategic and tactical targets, and then settled down to a routine of night raids whose weight was limited by the smallness of its first line strength. Coastal Command's responsibilities widened with the passing of the French coast under German control.

There was urgent need for trained pilots, partly to replace casualties and partly because experience suggested that squadrons would want larger establishments to meet the effort of sustained operations. But trained pilots were hard to find: there was no surplus, as had been thought likely six months earlier, from over production in the winter of 1939-1940; Empire training had not begun to turn out qualified men; <sup>(1)</sup> and only a few could be provided

/by the return

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(1) The first Empire Scheme pupils began ground training on 29th April, and were not due to finish their flying courses until seven months later. The first Rhodesian pupils began flying training on 24th May, and would not leave the schools until November.

by the return of the British Air Forces from France. The pilots needed must come either from United Kingdom schools or from the handful of New Zealanders whom that Dominion had undertaken, before the Empire Scheme was devised, to train and send to the R.A.F.

21 May  
9 July.

There was urgent need, too, for every aircraft capable of operational use. An embargo was put on the sending of pilots, Ansons, and Battles out of the United Kingdom. The embargo was intended to last for two months, and provide a breathing space in which shortages might be made good, but it was ended after some six weeks.

The fall of France put a sudden end to the schools which it had been planned to open near Vendome, and also to projects of training in Morocco and North Africa. The threat of short range attack on the United Kingdom, by increasing the need of a clear sky for fighter defence, imposed additional handicaps on training's freedom of action in and around Britain, and so reinforced the long-considered arguments for moving as much as possible outside the United Kingdom.

August  
September  
1940.

German attacks on England began in July, and mounted to a climax in the Battle of Britain. Fighter Command met and defeated the attacks in heavy and constant engagements, while Bomber Command made a sustained night effort against strategic targets and invasion preparations. Pilot losses were heavy, and the need for trained men grew larger and more urgent. Towards the end of September German activity changed to heavy night attacks.

Germany's furious onslaught, and the United Kingdom's imminent danger, had important indirect consequences. The Empire sought and found ways of giving more, and more immediate, help. The United States moved from cool

/friendliness

friendliness to practical help and warm sympathy.

August  
1940.  
September  
1940.  
October  
1940.

In the Middle East, the picture changed slowly after the disappearance of the French Empire from the war. Italy invaded British Somaliland. The Italian army advanced gently into the Western Desert, up to the Egyptian border. Italy opened a campaign from Albania against the Greeks, and gratified her enemies by a notable display of military inefficiency. Italian aircraft made attacks on Malta throughout the autumn, but were beaten off without undue difficulty or any pressing need for heavy reinforcement. Small packets of air power, armed partly with obsolescent aircraft, came into operation in all the Middle East theatres - the R.A.F. in Malta, the Western Desert, Greece, the Sudan, and Aden, the South African Air Force and Rhodesians in Kenya.

Dec. 1940.  
Feb. 1941.

January  
1941

Towards the end of 1940 a thin but steady flow of bombers and trained crews began to pass from Bomber Command through Malta to the Middle East, and Malta began offensive operations. The Italians in the Western Desert were driven back to the border of Tripolitania, Marshal Graziani's army was largely destroyed, and the Italian Air Force crippled. The Italians in East Africa were driven out of Somaliland, the campaign going on until by July 1941 they were completely eliminated from Abyssinia and East Africa.

November  
1940.

In Western Europe, during the winter of 1940-1941, military operations consisted of an exchange of night bombing between Britain and Germany and of steadily intensifying activity at sea. German bombing had among its results a serious interruption of trainer engine production at Coventry and the production of a growing demand for heavier bombing of Germany. Considerable and continuous attention was given to the expansion of Bomber Command, but

/disquieting

disquieting evidence began to appear that only a small proportion of the British bombing attacks found and hit their targets.

The United States gave more and more help. Deliveries of operational aircraft began to flow across the Atlantic and to the Middle East in the first half of 1941. The Lend-Lease Act relieved the United Kingdom of financial difficulties, and "all aid short of war" opened the doors to the U.S.A.'s vast resources.

March  
1941.

The defensive organisation of Fighter Command was steadily built up during the winter, both against the immediate and urgent problem of night raiding and against the reasonable expectation that Germany might, with a spring offensive, resume the attack which she had broken off after the Battle of Britain. Germany, however, turned first to the Middle East and then to Russia.

In January 1941 the Germans took charge of operations against Malta and in the Sicilian Channel. In March Rommel, the Afrika Korps, and the German Air Force began to press forward through Cyrenaica to the Western Desert. In April Germany invaded Greece and Jugo-Slavia, and in April, too, a revolt in Iraq seemed to be preparing the way for a German tentacle to stretch out by way of Greece and Syria. The small packets of British air power had to meet heavy and determined opposition. Malta was largely neutralised, the Germans advanced to the Egyptian frontier, and Greece was lost. From Greece the Germans went on to Crete, and captured the island. On the other side of the account, the Italian forces in Abyssinia surrendered and the revolt in Iraq was overcome after a month's strenuous work by No.4 S.F.T.S., aided by a few Wellingtons and Blenheims.

April 1941

May - June  
1941

May 1941

June 1941

Germany did not press on in the Middle East, but turned to attack Russia. There was a breathing space in  
/the Western Desert,

the Western Desert, Egypt, and East Africa for systematic building up in men and machines.

May 1941

German night raids on the United Kingdom came to an end before the invasion of Russia, and operations in Western Europe were confined to the struggle at sea and offensive Fighter sweeps by Fighter Command over France. The demand for heavier bombing of Germany went on, since bombing was the only practicable and weighty offensive contribution Britain could make to the war in Europe, but Bomber Command remained obstinately at much its original size - an inability to grow which could not wholly be explained by the steady transfusion of trained crews from the United Kingdom to the Middle East. Moreover, the disquieting evidence that British raids often failed to find and hit their targets not only persisted but grew stronger.

During the autumn aircraft were sent to Russia, and there was a slowing down of aircraft production. The German Air Force made sporadic night raids on the United Kingdom, and Bomber Command's raids on Germany continued to be largely ineffective.

November  
1941

In the Middle East, after a summer of preparation and reorganisation, fighting began again in the Western Desert. After a period of inconclusive struggle, the Germans were driven back to the border of Tripolitania, and the pressure on Malta slightly eased.

December  
1941

December  
1941  
January  
1942

At the beginning of December Japan, after a few months of mounting tension, began war with the attack on Pearl Harbour. Hong Kong and Malaya were overwhelmed. The Japanese landed in New Guinea. They advanced on Singapore. The small force of partly-obsolete British aircraft at Singapore was overwhelmed, and reinforcements were diverted from the Middle East to strengthen India, Burma, and Ceylon.

/The Royal Australian

January -  
February  
1942

The Royal Australian Air Force attacked Japan's advance into New Guinea by a sustained series of raids, and the

February -  
March 1942

R.A.F. fought steadily against the Japanese drive into Burma.

In the Middle East, the Germans advanced again into the Western Desert, and the fighting line went back from the border of Tripolitania to Gazala in Cyrenaica.

January -  
February 1942.

#### Logistics

From May 1940 until the end of 1941 flying training was dominated by the mathematics of production and supply. The facts were simple: a great many pilots were wanted, and wanted quickly, but few aircraft were available for training them.

#### Pilot Logistics

In the early days of June, after the Dunkirk operations, Fighter Command found itself in immediate need of 500 pilots.<sup>(1)</sup> To this had to be added the continuing demands of wastage replacement (estimated at some 3,000 per year for Fighter Command, 4,000 per year for Bomber Command, and 1,600 per year for Coastal Command), and deficiencies of about 350 pilots in Bomber and Coastal Commands. Against these calls for pilots the S.F.T.S. output was 5,600 per year, and there were about 6,300 trained men not employed on operational flying.<sup>(2)</sup>

S.1924

S.1925

S.1987

/These ill-matched

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(1) Over 200 were needed to replace casualties, and the rest for raising squadron establishments to meet the effect of fatigue during sustained operations.

(2) Of whom roughly 2,700 were on staff, administrative, or technical work, 1,800 were employed on instructing, and 1,800 were still pupils in the advanced stages of training (i.e., O.T.U.'s School of G.R. or Advanced Training Squadrons of S.F.T.S.'s).

S.4928

These ill-matched figures were considered in May and June by three Training Progress Meetings called by Sir Archibald Sinclair (S. of S.), mainly with an eye to the urgent pilot needs of Fighter Command. Immediate requirements were met by combing out pilots from non-operational work, taking pupils from advanced training before their courses ended, and obtaining Fleet Air Arm pilots from the Admiralty. The output from S.F.T.S.'s was stepped up a little, to 6,400 per year (any change in S.F.T.S. plans took some 3-4 months to become fully effective because of the length of the course).

At the beginning of July responsibility for dealing with the logistics of training passed to the newly-created (8th July) Air Member for Training, Air Marshal Garrod, whose duty was defined as "to satisfy himself that the training organisation 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".<sup>(1)</sup> It was at first intended that Training Progress meetings should continue, but in fact their purpose was served by Air Council meetings.

The demand for pilots increased. More schools, and the constantly-expanding O.T.U. organisation, swallowed more and more trained men for instructor duties. Whether experienced pilots or newly trained men straight from S.F.T.S. were used for teaching was mathematically immaterial: the output from the training organisation had to provide operational wastage plus the men required for instructing. The numbers required for instructing were not light: no less than 2,000 pilots a year were needed

/to staff

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(1) Appendix 24 - Office Memorandum dated 5th July 1940 on the Appointment of an Air Member for Training (Air Ministry Office Memorandum 146/40).

S.64591

S.47667

to staff the planned expansion of pilot training alone;<sup>(1)</sup>  
300 more per year were wanted as navigation instructors;  
each O.T.U. had to have from 20-50 pilots (according to its  
type) for instructing: each service navigation school and  
every expansion of armament training called for staff pilots.  
Moreover, the pilots needed to staff new schools had to be  
trained before those schools could be opened, so that the  
whole burden of nourishing both the operational and the  
expanding instructional effort fell at first on the S.F.T.S's  
in the United Kingdom.

A.C.I(40)

The consequences were clear and inevitable. It had to  
be acknowledged in July that there would be a shortage of  
pilots until at least June 1941, and that the training  
organisation would be in a weakened and delicate condition  
until it was fully staffed with experienced instructors.  
The new Air Member for Training made a preliminary statement  
on training arrangements<sup>(2)</sup> a fortnight after taking up his  
duties, in which he outlined the weakening effect of a  
greater drain of pilots than the schools were intended to  
supply, the difficulty of finding suitable instructors, and  
the great handicap of an inadequate supply of advanced  
trainers.

A/M Garrod advocated the deferring of first line  
expansion until existing shortages of trained men had been  
made up and a sufficient margin of pilots and crews, over and  
above wastage requirements, had been passed through an

/adequate

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(1) This figure is only for the schools manned by the R.A.F.,  
and does not include the Empire Scheme schools, for which the  
Dominion Air Forces provided the majority of the instructors.

(2) Appendix 25. Preliminary statement on Training  
Arrangements Generally by Air Marshal Garrod dated 20th July  
1940. (A.C.5(40)).

adequate and adequately strengthened training organisation. But the Battle of Britain was clearly about to start, and it was not the time for accepting anything less than the maximum first line strength, however good the long-term reasons might be. (1) The prospect might be that a year ahead there would not be enough trained crews to man the operational aircraft which would then be available, but Fighter Command must have the pilots it wanted to fight in August and September 1940.

During those months the demand for fighter pilots rose to over 100 per week. Not only men fresh from the schools, but Allied pilots - Poles, Czechs, French, Belgians - and every qualified man who could be spared was fed into Fighter Command. Only a thin trickle remained to satisfy the needs of Bomber and Coastal Commands. The output from the S.F.T.S's in the United Kingdom - virtually the only source of trained pilots at the time - was stepped up to a theoretical 11,200 per year. (2)

No relief to the urgent pressure for more pilots could come from a hurried opening of extra schools. A large programme of training expansion - the Empire Scheme and new R.A.F. - manned schools in Africa - was in hand, and was bringing aerodromes, aircraft, and instructors quickly into operation. The programme was speeded up everywhere, but the first result of speeding up was the paradox of smaller immediate output, because the earliest pilots to be trained had to be "ploughed back" as instructors in the speeded-up later schools.

/Trainer Aircraft Logistics

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(1) Appendix 26 - Minutes of a Meeting held on 26th July 1940 (A.C.14(40)).

(2) This figure does not allow for winter conditions: the actual rate of output was considerably lower.

Trainer Aircraft Logistics.

The programme of training expansion constantly tended to outstrip the supply of trainer aircraft. A/M Courtney had foreseen<sup>(1)</sup> in March that a serious shortage of T.E. trainers would become apparent towards the end of 1940, rising to 2,000 in 1941 and 3,000 in 1942. It would, however, be partly offset by a surplus of S.E. trainers, and the net result would be a total shortage of some 1,000 advanced trainers in the middle of 1941, when schools would have to work with 80% of their establishment, and a high proportion of S.E. pilots (many of whom would have to be converted later to multi-engined aircraft) would be produced. The training problem would be rather worse than the mere figures indicated, however, since perhaps 14% of the aircraft in use at S.F.T.S.'s would be Hart variants. A formidable deficiency of target towers was also foreseen.

Attempts were made to buy Capronis from Italy for use in training wireless operators, but the supply of engines was a difficulty, and nothing came of the negotiations before Italy declared war.

When A/M Garrod assessed matters in his paper of 23rd July<sup>(2)</sup> the trainer aircraft situation looked considerably blacker. It seemed probable that schools would by March 1941 be between 20% and 50% below their establishments of aircraft. In particular, there would be shortages of 930 advanced trainers (Ansons, Oxfords, Harvards, and Masters), 454 crew trainers (Ansons), 382 target towers, 540 attack aircraft, and 372 miscellaneous types. He put this serious handicap on training development down to the undue reliance which had been placed in the past on using for training

/purposes

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(1) Appendix 22.

(2) Appendix 25.

purposes aircraft thrown-up by first-line units, and the consequent postponement of any demand for specialised trainers, as well as to delays and disappointments in producing the trainers when at last they were ordered. He asked that trainers should be given a higher production priority than operational aircraft. Priority was given them, but there was no remarkable spurt in production, which remained throughout 1940 little more than half the planned programme.

A.C.5(40)

Office  
Memorandum  
175/40

T.P. 7/5

Training logistics clearly needed to be put on a satisfactory basis, and A/M Garrod decided that his department needed a specialised statistical and planning staff directed by an experienced business management consultant. This staff came into existence, as Training Progress (T.P.) on 28th August with Mr. H.O.R.Hindley in charge. Its function was to assist A.M.T. in ensuring "that the training organisation is at all times adequate to provide in quantity and quality.....", and it dealt with training statistics (running statistics and forecasts of schools' work) and training requirements (aerodromes, aircraft, spares, etc.). Centralised forecasting of training outputs and future strengths was soon added,<sup>(1)</sup> but the original plan of equipping T.P. with a progress-chasing as well as a statistical side began to fall into the background.

Early in August A/M Garrod defined the basic principles of training logistics in a paper<sup>(2)</sup> which formulated the aim of training planning as "to man and maintain the

/operational

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(1) The previous system was for branches to work on various assumptions and use data supplied from the Directorate of Manning: it was not satisfactory. With centralised forecasting by T.P. the D. of M. was concerned only with the figures of recruiting requirements which T.P. supplied.

(2) Appendix 27 - Memorandum on The Aim of Training Planning dated 3rd August 1940 by A/M Garrod. (A.C.12(40)).

operational force available with the latest production forecast" - a definition which might seem so obvious as to suggest there had previously been some lack of co-ordination. The disparity between training requirements based on the current production forecast and those based on the programme of December 1939 was demonstrated by a series of graphs, which also showed that existing pilot-training schools were notably fewer than the requirements on either basis.

The proper basis for dividing aircraft production between operational and trainer types was reviewed by A.M.S.O's Department, and a paper<sup>(1)</sup> produced at the end of August proposed as a rough rule that "the total number of training types of aircraft required in any one month may be assessed at 40% of the forecasted output of operational types of aircraft six months later". The ratio of 40%, it was emphasised, was only an approximate guide for use when the production of an expanding air force was being planned (the ratio for a static force was at 20%), and the complete calculation of trainer requirements was justly described as "a long, laborious, and intricate series of processes".

The actual production of trainers remained well below 40%, and at the end of 1940 was only 25%, of the total output. The current programme, moreover, planned for the ratio to swindle to 20% in 1941. Twin engine aircraft were scarcest, and presented the most awkward part of the problem: their scarcity was increased when the factories at Coventry which made Cheetah engines (used in both Ansons and Oxfords) and magnetos for those engines were seriously damaged by bombing in November 1940.

Ansons were an especial difficulty. They were used  
/for basic

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(1) Appendix 28 - Paper on the Co-ordination of Production of Operational and Trainer Types of Aircraft by G/Capt. Betts (W.O.1) dated 26th August 1940. (CWE/7).

for basic navigation and G.R., as well as pilot, training. They were also wanted for preliminary pilot, navigation, and wireless training at Bomber and Coastal O.T.U.s. Canada refused to accept Oxfords in place of Ansons for S.F.T.S. work because the Oxford was unsuitable for Canadian conditions.

To make matters more difficult, the United Kingdom was virtually the only source of supply for T.E. trainers. Single engine types were built elsewhere - Harvards in the United States and Wirraways in Australia - and although such American types as the Cessna Crane and the Beechcraft were investigated there was little prospect of large or early deliveries. In July 1940 Canada decided to build Ansons in the Dominion, but there were various delays, including the supply of suitable engines, and the first aircraft were not turned out until late in 1941.

S.68654

The possibility of taking Ansons away from Bomber O.T.U.s for pilot and observer training was discussed in January 1941, but so much basic training had to be done at O.T.U.s that they could not be spared. (A suggestion that Ansons might be replaced by Wellingtons for this basic work was found impossibly extravagant because of the Wellington's lower serviceability).

Again, the United States was not an immediate large-scale provider of even S.E. aircraft. Contracts had to be placed and productive capacity increased while the requirements of the United States' own expanding air forces had first claim on the output.

Thus during 1940 and 1941 the rapidly-growing training organisation, in the United Kingdom and the overseas training theatres, was cramped and forced to lead a hand-to-mouth existence by shortage of advanced trainers, Ansons, and target towers. New schools were delayed in starting work, aircraft were transferred and reallocated to yield

/their maximum

their maximum training value, and all training plans had to be contingent on aircraft being found for them.

Any and every aircraft not wholly unsuitable for instruction was pressed into service. Some Yales and Northrops were taken over, after the fall of France, from French orders in the United States; they were used in Canada and South Africa. A miscellaneous handful of aircraft was bought by Canada from the United States in the summer of 1940. Bothas, after they were rejected for operational work, were used for navigation and G.R. training to reduce the demand for Ansons. In Australia miscellaneous civil types were impressed, or bought from the United States.

The whole world-wide shortage of advanced trainers was seriously aggravated by an equally general shortage of spares. Cannibalism of unserviceable machines and improvised local manufacture of essential parts became widespread. The handicap imposed by lack of spares on the Empire Scheme in Canada was so bad as to be the subject of a personal telegram from the Canadian Prime Minister.

By November 1940 it was clear that the advanced trainer situation was critical. Sir Archibald Sinclair went over the possible courses of action - which included trying to buy aircraft from Russia - and came to the conclusion that the Ministry of Aircraft Production must be urged to increase trainer production. In December the supply of advanced trainers was recognised to be the limiting factor on future expansion: a meeting foresaw<sup>(1)</sup> that by the autumn of 1941 there would be more operational aircraft than could be manned, because M.A.P's production programme contained

/too few

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(1) Appendix 29. Minutes of a Meeting held on 21st December 1940 to discuss the Achievement of the Future Expansion Programme. (C.A.S./Misc/29).

November  
1940  
T.P. 7/2

26th  
November

C.A.S.  
Misc/29  
21st  
December

too few advanced trainers for turning out pilots in numbers to match the operational types. The meeting considered ways and means of reducing the use of advanced trainers to a minimum until they could be produced in larger numbers.

Lord Beaverbrook (Minister of Aircraft Production) was consistently anxious to avoid putting productive effort into the building of trainers. When M.A.P.'s production forecasts showed, in August 1940, that a great increase in the number of operational aircraft was to be expected during 1941, it was pointed out that an increase in training generally, and in trainer production in particular, was needed. This involved the development of training capacity outside the United Kingdom, but Lord Beaverbrook objected to transfer of schools overseas on the ground that it would keep aircraft idle while they were in transit, lock up a high proportion of spares, and would separate the aircraft from the skilled labour of the factories and the repair organisation. He proposed that new schools should be formed overseas, using aircraft and equipment there, rather than that existing schools should be transferred from the United Kingdom. At the end of August the Prime Minister decided that movement of schools from the United Kingdom should be deferred, as far as possible, for three months, and that transfers should be so made as to use all available overseas ability and material. (1) During this debate on transfer and movement overseas the urgent need for increased trainer production disappeared from sight. Three months later, when the trainer production programme was found, in November and December, to be still seriously below the Air Ministry's requirements, it was again not increased. Training expansion had therefore to be planned according to an inadequate programme of trainer aircraft.

W.P. (40) 305

W.P. (40) 323

W.P. (40) 326

W.P. (40) 38

T.P. 7/2

W.P. (40) 447

Realised production however, fell far short of even  
/the inadequate

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(1) Appendix 30 W.P. (40) 305 and W.P. (40) 338.

T.P. 7/2

the inadequate programme. Between November 1940 and March 1941 only 60% 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. (1) The result was that up to June 1941 the output of pilots was some 560 below schedule.

A.C. 6(41)

Early in 1941 the prospect of this below-schedule output of pilots, coupled with the handicap of an inadequate supply of trainers, made it seem likely that the first-line expansion (chiefly in bombers) promised later in the year by the current aircraft production programme would not be achieved for lack of pilots to man the aircraft. Thus, although shortage of trained men to back the existing first line (which had been the dominating factor in 1940) was now becoming a thing of the past, the drive for larger pilot output and a more intensive use of schools had still to go on, in order to make first line expansion possible.

American Help and Intensified Work.

From the middle of 1941 onwards, however, matters began to improve, though there was no rapid increase in the production of advanced trainers. In March the United States offered to provide some 285 Harvards and Yales, under Lend-Lease, for training British pupils in American schools, and followed this offer with another, in April, for training British pupils in U.S. Army schools - an offer roughly equivalent to 400 more advanced trainers.

To this reinforcement of pilot training resources had to be added the considerable increase in pilot-training capacity provided by a more intensive use of trainer aircraft

/in R.A.F.

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(1) Canadian schools at this time were opening and starting to operate with as little as 40% of their proper aircraft establishment.

A.C.14 (40)

in R.A.F. and Empire Schools. In July 1940 the tempo of work in S.F.T.S's had been adversely criticised, but in the following months the flying hours obtained, with much the same number of aircraft, were greatly increased. Further steps in the same direction - higher efficiency in the use of trainer aircraft - were made with an experiment in a shift system at Little Rissington in the summer of 1941. It was found possible to handle as many as 240, or even 288, pupils with the same number of aircraft as had been used for 160 pupils in the summer of 1940. The flying hours produced by S.F.T.S's rose from an average of 4,200 per month per school in 1940 to some 7,000 in 1941, while the experiment at Little Rissington showed that 9,000 could be reached. (1)

C.S.10488

By the summer of 1941 the shortage of pilots, in spite of the delays and handicaps imposed by lack of advanced trainers, disappeared. Calculations had of necessity been based on the assumption that German attacks would be resumed, but Germany had turned towards Russia, and the expected wastage of fighter pilots did not occur. Reinforcements had been sent to the Middle East, but the balance was heavily on the right side. The Metropolitan Air Force had some 5,000 more pilots in June 1941 than it had in September 1940. (2) Schools in the Dominions, Southern Rhodesia, and the United States were turning out a steadily-growing flow of trained men, and the theoretical rate of pilot output from all schools went up from about 12,000 per year /at the end of 1940.

T.P.  
S.of S. } file  
C.A.S. }

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(1) These figures represented 66-2/3 hours per month per aircraft on charge (i.e. a theoretical figure of 7,200 hours for an S.F.T.S. with 108 aircraft) in the general case, and 88-1/3 hours for the Little Rissington shift system. The Little Rissington figure was considered reasonable for schools overseas, with good weather and no dispersal of aircraft.

(2) Rather less than a third of this increase went into operational units. The rest were swallowed up by the expanding O.T.Us (over 40%) and the training organisation.

at the end of 1940 to some 24,000 in June 1941 and to 45,000 at the end of the year. The total actual output of pilots during 1941 was 22,394.

The forecast of a large output of operational types during the summer and autumn was not justified: (1) there were not enough aircraft for appreciable first line expansion, and a large surplus of pilots began to appear in the second half of the year. It became possible to slow down the output from schools, and reverse what had been done under pressure in 1940. For this there were three main causes - the expanded training organisation, the absence of heavy casualties, and a disappointing production of aircraft coupled with Bomber Command's inability to expand.

#### Bomber O.T.U. Logistics

A long struggle had been going on with the logistics of bomber expansion. Bomber pilots needed a large amount of training, after leaving the S.F.T.S., before they were fit for work in a first-line squadron. Most of this training had to be given on operational types of aircraft, and two pilots had to be trained for every first line bomber. Since sustained bomber operations required a steady flow of fully-trained men to replace casualties and those in need of a rest (it became clear that crews had to be taken off operational work after some 200 hours, or 30 sorties), any first-line expansion called for a formidable increase in O.T.U.s. This increase in O.T.U.s made enormous demands for instructors and operational types of aircraft. Since instructors could be provided, and operational aircraft found, only at the expense of the first-line which it was proposed to expand, the result was a logistic deadlock. (2)

/In April

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(1) Instead of some 700-800 bombers a month, as had been expected, the actual production was under 400.

(2) Neither the production of operational bombers nor the available number of experienced pilots was large enough to provide both an expanded first-line and the increased O.T.U. organisation to back that first-line.

September -  
November  
1941.

In April 1941, when the demand for bomber expansion was insistent and the outlook on bomber production optimistic, the experiment of turning out more crews by cutting down the amount of O.T.U. training given to Wellington pilots before they went to the first-line was tried. The experiment failed: either pilots were not passed on to squadrons before they were fit for operations (which left the amount of training as large as ever) or squadrons became so diluted with half-trained men as to be incapable of successful or sustained operations. When aircraft production proved disappointing there were not enough bombers being made to replace wastage, expand the first-line, and increase the number of O.T.U's. There was only one possible solution to the dilemma - to halve the amount of O.T.U. training needed, and cut down the number of aircraft required, by having only one pilot to each bomber - and this solution was adopted in March 1942.

Aircraft for Training Non-Pilot Aircrew.

Though by the middle of 1941 lack of aircraft for producing pilots was no longer the dominant fact about training, other forms of training, however, were badly handicapped. Navigation and G.R. schools suffered from the general scarcity of Ansons, and in the United Kingdom had to make considerable use of Bothas. The Botha was underpowered, and its engines were not notable for reliability: as a result, a good deal of flying over the sea had to be done with undependable engines in aircraft which could not fly satisfactorily on one of them. (1)

T.P. 2/1

Gunnery training was affected by shortage of target towers, and particularly of target towers with any

/pretensions

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(1) Bothas were also rather extravagant: it needed four to do the work of three Ansons, with an increased number of staff pilots.

T.P. 2/1

pretensions to speed. Modifying the Master for target towing was first proposed towards the end of 1940: the project was abandoned, brought forward again and agreed in June 1941, and then left in the air, with nothing done, for four months more. Finally, an order for T.T. Masters (later named Martinets) was placed in November 1941. Until specialised target towers became available a miscellaneous variety of aircraft - Lysanders, Defiants, Battles, Henlleys, as well as older types - was used for the work.

The signals training of wireless operators gave them far less experience of working in the air than they needed because there were not enough aircraft (large "flying classrooms" and Proctors) to provide the flying time. (1)

Logistics: Training Planning

The logistic aspect of training - the statistics of forecasting and planning - became more and more the specialised scientific concern of T.P. In June 1941 the statistical side of general logistics also became a matter for specialists. (2)

In 1940, 1941, and 1942 a great deal of hard thinking and thorough scientific analysis had to be devoted to the "laborious and intricate" processes of making statistical plans for training. The main principles evolved, and the chief factors to be taken into account in this work, were later described in a paper by T.P. (3)

/Flying

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(1) The situation was made worse by the fact that Proctors gave only a third of the flying hours they were intended to provide. In Canada Moths with Menasco engines, and not Proctors, were used for wireless operator training.

(2) Organisation Forecasting (O.F.) in A.M.S.O.'s Department - with Mr. Hindly in charge. Mr. M.S. Laing became head of T.P.

(3) Appendix 31 - General Notes on the Planning of Training by T.P. dated 23rd November 1942.

Flying Training Schools

In May 1940 the R.A.F.'s supply of pilots came from 12 S.F.T.S's in the United Kingdom, <sup>(1)</sup> each dealing with 160 pupils on 16-week courses, and each training both Group I and Group II 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 8-week courses. Two of the E.F.T.S's were giving advanced elementary training.

The urgent demand for more pilots which arose suddenly towards the end of May was met, so far as the S.F.T.S's were concerned, to a small extent by posting pupils away from schools a week or so before the normal end of the course, but mainly by increasing the rate of output.

Taking pilots early from training was a short-term measure which could give only limited help. It was, in a way, living on capital, and could be done only when a course had been lucky in its flying weather and when some incompleteness in training could be accepted. During May 52 fighter pilots were found in this way, but they had not been trained in air firing and had flown no more modern type than the Hart.

S.4928

The First Revise.

Increasing the rate of output meant shortening courses, since no more training capacity than the twelve United Kingdom S.F.T.S's could be brought into use for some considerable time. Shortening courses brought up the difference between Group I and Group II training. The immediate purpose of increasing the S.F.T.S. output was to turn out more fighter pilots, and the Group I (fighter) course could be cut down more than the Group II. At the

/first Training

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(1) There were also two S.F.T.S's in the United Kingdom training for the Fleet Air Arm and No.4 S.F.T.S. at Habban-  
iya in Iraq. All three were below full war establishment,  
and No.4 S.F.T.S's output went to R.A.F. units outside the  
United Kingdom.

S.4928

first Training Progress Meeting, on 21st May, it was decided to reduce the Group I course to 12 weeks, cutting bombing, reconnaissance, photography and air firing out of the S.F.T.S. syllabus (but retaining cine-camera gun training), and start "pre-fighter" training for Group I pupils at the two E.F.T.S.'s (Yatesbury and Ansty) which were already doing advanced elementary work. It was proposed to omit night flying training for half the fighter pilot output, but Fighter Command would not agree to this.

Different course lengths for Group I and Group II training at once raised the question of specialising schools. One S.F.T.S., 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, with a 12-week course for Group I pupils and a 14-week course for Group II,<sup>(1)</sup> and this change became known later as the First Revise of pilot training. To provide the necessary larger flow of pupils from elementary training, the E.F.T.S. course was reduced to 7 weeks, and the E.F.T.S. pupil population increased by 15%.

Specialising S.F.T.S.'s was a process which needed time. Existing courses had to pass out from the schools, and fresh courses start, before it could be applied fully,<sup>(2)</sup> and so the change and re-equipment with aircraft had to be spread over some three months. The aim was for specialisation to be complete by the end of September,<sup>(3)</sup> but there was some

/doubt

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(1) The F.A.A. schools (Nos.1 & 7) continued with the 16 wk. course.  
(2) While schools were still training mixed courses of Group I and Group II pupils the course duration was 14 weeks for both Groups.

(3) The Group I S.F.T.S.'s were to be No.5, Sealand, No.8 Montrose, No.9, Hullavington, and No.15 (Brize Norton and South Cerney). The Group II schools were to be No.2, Brize Norton, No.3 South Cerney, No.6, Little Rissington, No.10, Ternhill, No.11 Shawbury, No.12 Grantham, No.14 Cranfield, and Cranwell.

June 1940.

S.2546

doubt about the supply of aircraft: Harts and Battles had to be used for lack of Harvards, Masters, Ansons, and Oxfords. It was at first calculated that with a 12-week course it would be necessary to have 144 aircraft per school, instead of 108, in order to provide 100 hours per pupil, but there were not enough trainers to give S.F.T.S's more than 108 apiece, or 80 hours per pupil.

S.4928

At the Training Progress 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 consequently rampant. Completing the syllabus to time was a problem: schools had neither the relief landing grounds nor the local bombing ranges needed for full and economical working. Both instructors and aircraft were scarce: there was a constant compromise between efficiency and what could be provided. (1)

At this stage was responsibility for the planning and co-ordination of training passed from the Training Progress Meetings to the newly-created Air Member for Training. The First Revise, when the change over to specialisation was complete, would increase the pilot output from the twelve S.F.T.S's by about 20% - to some 6,400 per year - but it was becoming 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 advanced trainers to be had.

/The Second Revise

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(1) 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: spares and aircraft had to be ordered and manufactured: relief landing grounds had to be built.

The Second Revise.

In his preliminary statement on training of 20th July<sup>(1)</sup> A/M Garrod described a plan for using operational aircraft to make up for the deficiency of trainers by transferring the armament instruction of Group II pilots (a fortnight's work) from the S.F.T.S's to the O.T.U's. This scheme - the Second Revise of pilot training - was introduced during August, and made all S.F.T.S. courses 12 weeks in duration. The Bomber and Coastal O.T.U. courses were lengthened to deal with the instruction thus displaced from S.F.T.S's, and more O.T.U's became necessary to keep up the rate of flow to the first-line.

August 1940.

As A/M Garrod pointed out, the Second Revise gave pilots more flying experience on operational types of aircraft, and gave them armament training on the types which they would use in the first line. It also had the advantage of making training expansion a matter of forming more O.T.U's - which was easier than forming more S.F.T.S's because operational aircraft were available and O.T.U. instructors did not need C.F.S. training.

The Second Revise, however, made no very large increase in the output of pilots. The theoretical annual production went up by about 10% to 7,000, but the Battle of Britain was making abundantly clear that the largest possible pilot output was an urgent and vital necessity. There were only two ways of putting up the S.F.T.S. output: by getting greater productive effort from the instructors and aircraft at the schools, and by cutting the course to a still shorter duration.

/The third Revise

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(1) Appendix 25.

The Third Revise.

These possibilities were investigated during August. (1) Working the schools harder was to be the subject of an experiment: six of the S.F.T.S's were to handle an additional 25% of pupils (i.e. four courses of 50 each, or a total of 200) with no increase in instructors or aircraft. If the experiment proved successful the other schools were also to have this overbearing of 25%. A further shortening of courses on the lines of the Second Revise, by transferring instruction from S.F.T.S's to O.T.U's, was proposed. (2) The S.F.T.S. period was to go down to 10 weeks, and the O.T.U. period go up by another fortnight (to 10 weeks for Bomber and Coastal O.T.U's, and to 6 weeks for Fighter).

S.4928

A 10-week S.F.T.S. course, however, meant only 72 hours flying, and the question at once arose whether pilots would be capable of handling operational types of aircraft at O.T.U's after a total of only 120 hours flying at the E.F.T.S. and S.F.T.S.

Bomber Command considered that the curtailment would be successful only if bomber pilots were selected early and given thorough training in instrument flying. Flying Training Command held that a ten weeks course would be too short to allow enough attention to some very important exercises (such as navigation and night flying) which demanded considerable time and concentration but required comparatively little flying. A/M Pattinson (C.-in-C, Flying Training Command) said:-

/I am strongly

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(1) Appendix 32. Note on Increase of Output of Pilots by A/M Garrod and A/M Courtney dated 6th August 1940 (A.C.15 (40)) and Note by A/M Garrod dated 20th August on Reduction of S.F.T.S. Courses at both Group I and II Schools to 10 weeks (E.T.S.76(40)).

(2) Appendix 33 - Note by A/C Orlebar (D.T.F.) dated September 1940 on the layout of the Syllabus of Pilot Flying Training.

A.H.B.  
IIin/a9/1a

"I am strongly of the opinion that the bringing of pupils up to a standard at which they will be fit to be trained on the ultimate operational types at the O.T.U's must be gauged by length of course and not by flying hours, at least as regards the S.F.T.S. course. I assume that the aim of the S.F.T.S. is to turn out pupils that are adequately trained in the basic aspects of flying, i.e. accurate handling of their aircraft and sound aimanship, simple air navigation, instrument flying, night flying and accurate instinctive flying when undertaking advanced flying exercises. On that assumption I consider that pupils with a total of 120 flying hours and with only ten weeks' training in the S.F.T.S. will not be fit to fly operational types. In my opinion, a reduction to ten weeks would have the effect of increasing flying accident rate and reducing the flying ability of the pilots that were finally passed out of the O.T.U's.

I would emphasise that the period required for covering the present minimum of ground instruction must be considered, and that the obtainment of a safe standard in night flying and cross-country flying depends on course duration and not upon flying hours."

On the other hand, there was a considerable body of opinion that cutting the S.F.T.S. course to ten weeks and lengthening the O.T.U. period by a fortnight would make no material difference to the ultimate output standard, and Flying Training Command's attitude appeared conservative and reactionary. (1) The need for a greater output of pilots was vitally urgent, and the Third Revise of pilot training

/was introduced

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(1) Events during the following year, however, seemed to justify A/M Pattinson's opinion completely. The standard deteriorated, and a marked increase in course lengths had to be made at the end of 1941. It should, however, be remembered that the Third Revise intention of longer O.T.U. courses never became effective as far as bombers were concerned. The bomber O.T.U. course was of 8 or (after April 1941) 6 weeks against the 10 weeks of the Third Revise proposal.

September -  
October 1940.

was introduced. (1) In addition a general overbearing of 25% came into operation.

The theoretical rate of output became 11,200 per year - more than double what it had been in May - 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 schools' Advanced Training Squadrons had been whittled down by successive transfers of training to the O.T.U. syllabus until there was practically none of it left. With the Third Revise, the A.T.S. was abolished, and the S.F.T.S's (2) concerned themselves only

/with I.T.S.

- (1) This disregard of Flying Training Command's considered opinion gave A/M Pattinson a conviction that what experience suggested to be possible or wise over training was being subordinated to theoretical planning which seemed feasible on paper but would prove disappointing in practice. In October 1940 he urged that the Air Ministry should not issue detailed orders and instructions, but confine itself to broad policy and leave its execution to Flying Training Command, and in January 1941 he wrote:- " I am quite certain that a great deal of time is being wasted by working out by D.T.F's people schemes that greatly affect this Command and without consulting us as to their value in the early stages of their consideration. One unfortunate result of that method is that I am constantly, as you are aware, having to oppose suggestions that have been accepted as sound by an Air Ministry Director."

A.H.B.  
IIlin/a9/1a

In February 1941 A/M Pattinson objected strongly to some investigations made by Mr. M.S.Laing (T.P.) at certain schools into the organisation of S.F.T.S's for maximum efficiency. He disapproved of such investigations unless they had the supervision and collaboration of Flying Training Command, and considered them "symptomatic of wrong methods in handling training matters, mainly on a purely figure basis, by clever people with no knowledge". He later urged that it was impossible for "a civilian who had been associated with training only a year" to have the necessary knowledge and experience, but A/M Garrod refused to accept this view of Mr. Laing's investigations, saying that it was of the utmost importance to keep flexible and receptive minds towards proposals. A/M Garrod also made it clear that his T.P. staff was constantly, and rightly, watching to see that training facilities were adequate, and that its work on this aspect overshadowed the work of all A.M.T's Directors.

(2) The two schools training for the Fleet Air Arm were unaffected by any of the Revises: they went on with 16-week I.T.S.-A.T.S. training; but expanded to war establishment, any pilots trained in excess of Naval requirements being at the disposal of the R.A.F.

I.T.S. training.<sup>(1)</sup> All these changes, which had happened rapidly and in little more than the duration of one S.F.T.S. course, were summarised in a tabular form usually known as the "batting averages".<sup>(2)</sup>

In the meantime most of the S.F.T.S's changed over to specialisation, and were re-equipped with aircraft. No. 15 S.F.T.S. had an unsettled existence: it was evicted<sup>(3)</sup> from Middle Wallop, some two months after it arrived there from Lossiemouth, when the station was urgently wanted by Fighter Command, and had to work throughout the summer partly at Brize Norton, partly at South Cerney, and partly at a relief landing ground at Chipping Norton. Its scattered parts were  
/gathered together

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(1) The changes in the S.F.T.S. syllabus made by the Third Revise were summarised by A/C Orlebar as:-

- S.4928
- (i) The complete deletion of all gunnery and bombing exercises and all higher tests and high flying.
  - (ii) The deletion of all photography except for photographs of pinpoints included in the navigation air exercises.
  - (iii) The new Navigation syllabus, which has lately been co-ordinated with O.T.U. and Operational Command requirements is retained in full.
  - (iv) Formation flying has been deleted from the second half of the T.E. S.F.T.S. syllabus, but has been retained in the first half. In the S.E. syllabus formation flying is retained in the first half, plus para.3 of the old A.T.S. formation flying syllabus.
  - (v) Pending the availability of additional R.L.Gs and the additional hours of darkness which winter might bring if weather conditions permit, night flying has of necessity been reduced to 3 satisfactory dual and 6 satisfactory solo landings as a minimum, with goose-necked flares (hooded if possible) and floodlight, to be repeated with Glin lamps and aircraft headlamps; night flying instruction to be given on at least 4 separate nights.
  - (vi) In regard to instrument flying, S.F.T.S. pilots with 5 hours solo and approved by instructors have been authorised to act as safety pilots in order to raise the general standard of instrument flying. This measure both increases the proportion of instrument flying time in the total time of the course, and spreads the practices more fully throughout the course.
  - (vii) In the method of instruction it is intended to direct increased concentration on to cockpit drill and to other forms of flying drill."

(2) Appendix 34. Table dated 26th August 1940 showing Hours of Flying involved per Pupil, per Instructor, and per Aircraft at E.F.T.S's, S.F.T.S.'s, and O.T.U's in the United Kingdom under the Various Schemes for the Acceleration of Pilot Output (incorporating amendments dated 22nd October 1940).

(3) On 12th June 1940.

gathered together again on one station at Kidlington between August and October. The other schools had no more disturbance than came from changes in syllabus, overbearing, and sporadic enemy attacks, and were helped to meet the demand for more intensive work and a faster tempo by a summer of remarkably fine weather. (1)

E.F.T.S. Changes.

The E.F.T.S's changed in sympathy and phase with the S.F.T.S. changes. The First Revise increased the E.F.T.S. pupil population by 15% (in June) and reduced the course duration to seven weeks. The Second Revise brought the course down to six weeks (in August), with a theoretical requirement of 50 hours and an acceptable minimum of 44. The Third Revise cut the E.F.T.S. period to five weeks (in September) and the flying hours to 35, but it soon became clear that 35 was too little, and in December 1940 the flying

/hours went up

(1) At the end of August 1940 the S.F.T.S's in the United Kingdom were:-

No.1	S.F.T.S. Netheravon	(Harts and Battles) F.A.A. - 16 week course)
" 2 "	Brize Norton	(Oxfords) (Group II)
" 3 "	South Cerney	(Oxfords) (Group II)
" 5 "	Sealand	(Masters) (Group I)
" 6 "	Little Rissington	(rearming to Ansons) (Group II)
" 7 "	Peterborough	(Harts) (F.A.A. - 16 week course)
" 8 "	Montrose	(Masters) (Group I)
" 9 "	Hullavington	(Harts) (Group I)
" 10 "	Ternhill	(rearming to Ansons) (Group II)
" 11 "	Shawbury	(Oxfords) (Group II)
" 12 "	Grantham	(Battles & Ansons) (Group II)
" 14 "	Cranfield	(Oxfords) (Group II)
" 15 "	{ Kidlington South Cerney Chipping Norton }	(Harvards) (Group I)
-	Cranwell	(rearming to Oxfords) (Group II)

hours went up to 42 without any lengthening of the course duration.

Some of the E.F.T.S's were in the operational areas of southern England, and there were various moves, partly for this reason. (1) There was no change in either the number of elementary schools or in their total capacity during the summer. The special "pre-fighter" courses at Yatesbury and Ansty came to an end in September.

"X" Courses

The heavy and urgent demand for fighter pilots during the Battle of Britain caused every pilot who was suitable for fighters, even if he had been nominally trained for Group II, to be sent to a Fighter O.T.U. Fighter O.T.U's had priority of supply from the S.F.T.S. output (which was too small to meet all demands), while Bomber O.T.U's were at the bottom of the list. As a result, the Bomber O.T.U's were partly idle for lack of pupils, and experimental courses were begun to see what would come of training selected pupils, after 50 hours flying at E.F.T.S's, on operational types of aircraft. These "X" courses began in

/September

(1) No.15 E.F.T.S. (which was training and grading Polish pilots) moved from Redhill to Carlisle in June, No.5 E.F.T.S. from Harworth to Meir in June, No.3 E.F.T.S. from Hamble to Watchfield in July, No.24 E.F.T.S. from Belfast to Luton in July, No.2 E.F.T.S. from Filton to Staverton in August, and No.10 E.F.T.S. from Yatesbury to Weston-super-Mare in September.

The E.F.T.S's at the end of September were:-

No.1 E.F.T.S.	Hatfield	No.10 E.F.T.S.	Weston-super-Mare
No.2 "	Staverton	" 11 "	Perth
" 3 "	Watchfield	" 12 "	Prestwick
" 4 "	Brough	" 13 "	White Waltham
" 5 "	Meir	" 14 "	Elmdon
" 6 "	Sywell	" 15 "	Carlisle
" 7 "	Desford	" 16 "	Derby
" 8 "	Woodley	" 18 "	Fairoaks
" 9 "	Ansty	" 22 "	Cambridge
		" 24 "	Luton

September at Abingdon (eight pupils on Whitleys) and Bicester (sixteen pupils on Blenheims).<sup>(1)</sup> They were intended to last for 12 weeks, but had to be extended by a fortnight because of bad weather. The pupils did over 120 hours' flying, more than half of it at the controls, and about one third at night: they were fresh and keen, quick in their reactions and in learning, and with retentive memories: but it was found that going direct from elementary trainers to operational types of aircraft did not pay in the long run. The "X" course experiment showed that the "advanced trainer" stage could not be cut out completely, and the need for Masters, Harvards, Oxfords and Ansons thereby avoided.

Difficulties and Moves.

While the "X" course experiments were going on, in the last months of 1940, the S.F.T.S's were beginning to work to the Third Revise programme, and finding difficulty in doing it. The programme called for 7,200 flying hours per month from 108 aircraft, but shortage of spares and winter weather made it impossible to reach this target, with the result that courses had to be extended by several weeks,<sup>(2)</sup> with a consequent reduction in the output of pilots. By December lack of spare parts caused 21% of the schools' Masters, and 13% of their Oxfords, to be unserviceable, and much the same proportion of advanced trainers continued to remain immobilised for lack of spares until about July 1941, when matters began slowly to improve. The direct effects of

/bad weather

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(1) Further experimental courses began in October at Kinloss (Whitleys), Bassingbourn, Harwell, and Lossiemouth (all on Wellingtons).

(2) In fact, no Third Revise S.F.T.S. course was completed in the scheduled ten weeks before June 1941.

AMT/447

A.H.B.  
IIM/a9/1

bad weather in reducing the hours fit for flying were seriously aggravated by unserviceability of grass aerodromes caused by the heavy traffic of intensive work. The flying times of No.14 S.F.T.S. at Cranfield, which had runways, were markedly better than those of the other schools, which had grass aerodromes.

Another serious difficulty was night flying. Only three aircraft could be operated at night, at the same time, from one landing ground: 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 R.L.Gs. The possibility of lighted aerodromes being bombed also came into the calculation, and night flying was confined to R.L.Gs unless it was essential to use the parent aerodrome. Each school had only one R.L.G. at this time, and the amount of night flying that could be done was severely limited. (1)

A.H.B.  
IIM/a9/1

October  
1940.

A.H.B.  
IIM/a9/1b

Some slight improvement came about with the introduction, after experiments by No.3 S.F.T.S., South Cerney, of hooded goose neck flares. These flares could be seen at 1,000 feet, but the flare path was practically invisible from 3,000 feet. In October it was decided that night flying at R.L.Gs, which had previously stopped on receipt of a "purple" or "red" warning, might go on irrespective of warnings, while parent aerodromes, which had hitherto stopped on a "yellow" warning, might go on until a "purple" or "red" was received.

A.H.B.  
IIM/a9/1b

The difficulty of finding enough night flying time stimulated experiment on ways and means of simulating night conditions in daytime. A method of using sodium flares and filters was developed at No.7 S.F.T.S. Peterborough and

/tested in October

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(1) Each S.F.T.S. was scheduled to have two R.L.Gs, but it was not until July 1940, in most cases, that the first was brought into operation. The amount of night flying per pupil at United Kingdom S.F.T.S's in the winter of 1940-41 averaged some  $1\frac{1}{2}$ -2 hours.

tested in October at Peterborough and at South Cerney, but although results were promising it was not brought quickly into general use.

S.60029

Night flying was done at E.F.T.S's, but only as an extra subject of instrument when the normal syllabus had been completed. It was not possible at all E.F.T.S's, partly because only a proportion of elementary trainers were equipped for night flying and partly because night flying was prohibited at schools beside aircraft factories. (1) At the others it was carried out as far as possible, but there was little room for extras in the five-week ab initio course of the Third Revisé. In July 1941 half-an-hour's night dual, with priority for T.E. pupils, was laid down for some of the E.F.T.S's and was gradually extended to more during the autumn.

Apart from their indirect result of limiting night flying because of the danger that lighted aerodromes and near-by factories might be bombed, German attacks during the Battle of Britain and the following winter had comparatively little effect on training. Most of the S.F.T.S's were bombed at one time or another, and some of the E.F.T.S's, but the attacks were sporadic, casual, and in no great strength. A few pupils were attacked in the air, while one S.F.T.S. pupil destroyed a German raider by collision (though it was uncertain whether the collision was deliberate or accidental).

Two S.F.T.S's (No.7, Peterborough, and No.10 Ternhill) were transferred to Canada in the autumn of 1940, and No.5 S.F.T.S. moved, between November and January, from Sealand to Ternhill as No.10 S.F.T.S. moved out. Two more S.F.T.S's

/(No. 6,

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(1) i.e., at Hatfield, Brough, Meir, Woodley, Ansty, Prestwick, Derby and Luton.

(No.6, Little Rissington, and No.12, Grantham) were earmarked for transfer to Canada, but never moved: their re-equipment with Oxfords was delayed<sup>(1)</sup> until it was decided that they should stay in the United Kingdom and two new "transferred" R.A.F. schools be formed in Canada. In February 1941 No.9 S.F.T.S., Hullavington; which had previously been using Harts, was re-equipped, as an experiment, with 84 Masters and 24 Hurricanes.

More E.F.T.S. capacity was needed because the ab initio course was lengthened to six weeks in December, and the United Kingdom E.F.T.S.'s had to supply pupils for the two new "transferred" schools in Canada as well as for the original fourteen S.F.T.S.'s (two of which were now in Canada). The E.F.T.S.'s at Desford, Perth, Cambridge, and Woodley were expanded in December 1940, and new schools opened at North Luffenham (January 1941), Sealand (February 1941), and Yeadon (March 1941). The E.F.T.S. at White Waltham was moved to Peterborough in December 1940 (because White Waltham was wanted by M.A.P. for ferrying), and that at Prestwick closed in February 1941 (to make room for a

/Coastal O.T.U.

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(1) Grantham was equipped with Oxfords in November 1940, and Little Rissington in February 1941. Their Ansons were wanted for use in schools overseas.

S.64591

S.D.155:  
1158/40

S.D.155  
13/41  
64/41

Coastal O.T.U. which it was then proposed to put there).<sup>(1)</sup>

The E.F.T.S's at North Luffenham, Sealand, Yeadon, and Peterborough were service manned and operated.

Extensions of courses in the winter of 1940-41, because of bad serviceability and the effects of the weather were common, and S.F.T.S. delays compelled extensions and delays at E.F.T.S's. The output of pilots fell below schedule in numbers, while in quality it lacked night flying practice.

Instrument Flying

A.45454/39

In December 1940 and January 1941 an investigation<sup>(2)</sup> by S/Ldr. Macdonald (T.F.4) revealed that the existing Link Trainer 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

(1) The United Kingdom Flying Training Schools at the end of March 1941 were:-

No.1	S.F.T.S.	Netheravon (Harts & Battles)	(F.A.A. - 16 week course).
" 2 "		Brize Norton	(Oxfords) (T.E.)
" 3 "		South Cerney	(Oxfords) (T.E.)
" 5 "		Ternhill	(Masters) (S.E.)
" 6 "		Little Rissington	(Oxfords) (T.E.)
" 8 "		Montrose	(Masters) (S.E.)
" 9 "		Hullavington	(Masters & Hurricanes) (S.E.)
" 11 "		Shawbury	(Oxfords) (T.E.)
" 12 "		Grantham	(Oxfords) (T.E.)
" 14 "		Cranfield	(Oxfords) (T.E.)
" 15 "		Kidlington	(Masters) (T.E.)
		Cranwell	(Oxfords) (T.E.)

(No.15 S.F.T.S. changes from S.E. to T.E. training during the winter)

S.D.155  
884/40

Note: Group I and Group II schools were renamed "SE" and "T.E." respectively in September 1940.

No.1	E.F.T.S.	Hatfields	No.13	E.F.T.S.	Peterboro'
" 2 "		Staverton	" 14 "		Elmdon
" 3 "		Watchfield	" 15 "		Carlisle
" 4 "		Brough	" 16 "		Derby
" 5 "		Meir	" 17 "		N.Luffenham
" 6 "		Sywell	" 18 "		Fairoaks
" 7 "		Desford	" 19 "		Sealand
" 8 "		Woodley	" 20 "		Yeadon
" 9 "		Ansty	" 22 "		Cambridge
" 10 "		Weston-super-Mare	" 24 "		Luton
" 11 "		Perth			

There was also a Polish F.T.S. (dealing with both E.F.T.S. and S.F.T.S. stages) at Hucknall.

(2) Appendix 35 - Minutes dated 12th December 1940 & 5th Feb. '41 from S/Ldr. D.F.Macdonald to A/C Cochrane (D.T.F.) (A.45454/39)

instructors were largely ignorant of the first principles of instrument flying and of its importance in operational work. In fact, 95% of the instructors examined were not noticeably better on instrument flying than the average pupil turned out of an S.F.T.S., while a fair proportion of them believed that it was unnecessary for an instructor to be himself competent in instrument flying in order to teach it. Instrument flying was then standardised by notes laying down what should be taught at the C.F.S. and S.F.T.S.'s, by requiring S.F.T.S. instructors to practice instrument flying for half an hour per week, and by revising the S.F.T.S. Link Trainer and instrument flying syllabuses, and the E.F.T.S Link Trainer syllabus.

July  
1941

A.H.B.  
IIM/a9/1

One or two interesting observations were made on this need for a drastic overhaul of instrument flying teaching. The off-hand attitude of instructors towards it was put down to lack of emphasis on its importance and to the impression given by the lack of any standardised method of instruction that instrument flying was of no special significance, while A/C Cochrane (D.T.F.) asked what the C.F.S. had been doing to allow such a state of affairs to come about.

#### Aircraft and Airfields

Various ways of reducing the demand for advanced trainers were investigated during the winter of 1940-41. At the meeting on 21st December<sup>(1)</sup> a number of suggestions were put forward. Adapting such aircraft as Lysanders and Hurricanes for use as advanced trainers turned out to be impracticable; the modifications involved were formidable and would need a great deal of time to put into production. Synthetic training was fostered, but the balance between

/synthetic

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(1) Appendix 29.

AMT/LM/182

synthetic and air training had to be watched carefully, and it appeared likely that synthetic training would have more value for improving the output standard than for replacing practice in the air.

S.69512

The use of Hurricanes instead of Masters in the later weeks of S.F.T.S. training was the subject of an experiment which began at Hullavington in February. The Hurricanes were used, with check dual on Masters, during the last five weeks of the (ten-week) course: night flying was done on Masters. (1) The experiment was found to be entirely satisfactory from the training point of view: there was a marked improvement apparent at Fighter O.T.U's in Hurricane-trained pilots, and in May Hurricanes were brought into use at No.5 S.F.T.S. Ternhill and No.8 S.F.T.S. Montrose. By August, however, it was found that the Hurricanes' accident rate was high: their average wastage was some four times that of Masters. The main causes were heavy landings and engine failure. (2) Because of this high wastage and the fact that more maintenance staff were needed for a mixed establishment of advanced trainers and single-seater fighters the use of Hurricanes at S.F.T.S's died out.

AMT/LM/182

A somewhat similar proposal, following from the X courses, that a Wellington S.F.T.S. should be formed, was discussed in January 1941, but never reached the experimental stage. At the ab initio stage of training, some pupils were trained at Desford in November 1940 on a twin /engined.

A.H.B.  
IIM/a9/1

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(1) Of the 72 hours flying in the Third Revise S.F.T.S. course, 22 were done on Hurricanes.

(2) The explanation was put forward that the high Hurricane accident rate was due to the generally low standard of flying instruction in the summer of 1941, to the rough surface and inadequate size of Montrose and Ternhill, and to the aircraft's high speed and small endurance, which caused pupils to lose themselves and make forced landings.

engined elementary trainer designed by Reid and Sigrist, but nothing more came of the experiment.

A.H.B.  
IIM/a9/lb  
S.58474

In February 1941 S.F.T.S. training in the United Kingdom was badly held up by unserviceable aerodromes, and Bomber Command agreed that schools which were short of serviceable R.L.Gs should use certain operational aerodromes where there was room for trainers.<sup>(1)</sup> The primary purpose was to increase the amount of night flying done, but this purpose was only partly achieved.

Planning and the Shift System.

S.58474

February  
1941

The lengthening of E.F.T.S. training to 6 weeks brought up the problem of phasing E.F.T.S. output with the 10-week S.F.T.S. course, and it was suggested that outputs and intakes should be made fortnightly, thus giving S.F.T.S.'s five courses of 40 instead of the four courses of 50 which had previously operated. The suggestion was opposed by Flying Training Command on the ground that a five course organisation would need more instructors and accommodation, would be wasteful, and would be difficult to work. Flying Training Command's reception of this attempt at planning suggested that the Command's inherent resistance to change might be greater than its eagerness to try experiments for improving training, and the organisation of schools was brought under review by the Air Ministry with the object of raising the general level of efficiency.<sup>(2)</sup>

/In April

S.58474

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(1) The aerodromes used were Driffield (No. 5 S.F.T.S.), Lindholme (No. 11 S.F.T.S.), West Raynham (No. 14 S.F.T.S.), and Watton (No. 15 S.F.T.S.). At the end of March the use of Driffield had to stop because of persistent enemy attacks at night in consequence of the lights shown while training.

(2) See footnote on page 305.

May  
1941

In April G/C Gordon Dean investigated the maximum capacity of which S.F.T.S's were capable (i.e. how their aircraft and staff could best be used to produce flying time) and reported in May<sup>(1)</sup> that by organising a school so that the load was spread as evenly as possible over the aircraft, instructors, pupils, and maintenance staff it should be capable of handling 288 pupils with an establishment of 108 aircraft and 63 (i.e. an increase of nine)<sup>(2)</sup> instructors, and the addition of 100 men to the ground maintenance staff. To achieve this he proposed working by day in a system of five-hour shifts, keeping flying going constantly throughout all fit day flying weather. By this system each instructor would have 6 pupils. The main difficulty was night flying: a school with two landing grounds in use for night flying would be barely able to give each pupil, in summer, the  $4\frac{1}{2}$  hours required by the syllabus.

S.58474

By contrast, Flying Training Command estimated that the maximum training effort would be produced by giving each instructor four pupils, and requiring him to do 80 hours flying per month. In June Flying Training Command put forward an alternative scheme for increasing S.F.T.S. efficiency.<sup>(3)</sup>

It was clear that the S.F.T.S's could work more intensively than the Third Revise with 200 pupils required,

/and in June

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(1) Appendix 36 - Report on the Maximum Training Capacity at Service Flying Training Schools in the United Kingdom dated 16th May 1941 by G/C Gordon Dean and a Memorandum on Increase of Output S.F.T.S. dated 4th June by Flying Training Command (S.71940).

(2) S.F.T.S's were working with six instructors fewer than the number quoted in G/C Gordon Dean's report.

(3) See Appendix 36.

and in June seven of the T.E. S.F.T.S.'s<sup>(1)</sup> began to handle 240. The eighth, No.6 S.F.T.S., Little Rissington, began on 18th June an experiment in working to G/C Gordon Dean's shift system with 288 pupils. Some increase in staff was needed for both 240 and 288 pupils, while Little Rissington was given priority in the supply of spares, to avoid delays which would upset the experiment.

#### Maximum Output

An increased flow of pupils from the E.F.T.S.'s was wanted, partly to fill the expanded S.F.T.S.'s, and partly to feed the growing number of R.A.F. S.F.T.S.'s in Canada (for which E.F.T.S. training was at this time done in the United Kingdom. In May and June ten flights (of 30 pupils each) were added to the schools,<sup>(2)</sup> the service operated school at Peterborough was closed and replaced by a civilian operated E.F.T.S. (No.21) at Booker, and the ab initio part of the Polish Flying Training School at Hucknall was made a separate unit and established at Peterborough as No.25 (Polish) E.F.T.S. In June and July all the E.F.T.S.'s except seven<sup>(3)</sup> increased their pupil population by 20% (i.e. from 30 to 36 per flight). In July, August, and September six more flights were added to existing schools,<sup>(4)</sup>

/and three new

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(1) No.2, Brize Norton, No.3 South Cerney, No.11 Shawbury No.12, Grantham, No.14 Cranfield, No.15 Kidlington, and the College S.F.T.S. Cranwell. The S.E. schools could not deal with more than 200 pupils because lack of spares for Masters prevented any intensification of their flying.

(2) Two flights (one in May and one in June) were added to No.15 E.F.T.S., and one flight was added to each of Nos. 1, 4, 6, 9, 17, 18, 22 and 24 E.F.T.S.'s.

(3) The E.F.T.S.'s at which the 20% increase of pupils came into force were Nos. 1,3,5,6,7,8,9,11,15,17,18,19,20,21, and 24.

(4) One flight was added to each of Nos. 3,6,15,16,18 and 20 E.F.T.S.'s.

and three new civilian operated E.F.T.S's opened, No.26 at Sheffield Farm in August, and Nos. 28 and 29 at Wolverhampton and Clyffe Pypard in September.

By the end of the summer of 1941 the United Kingdom flying training organisation reached its maximum intensity of production. Eleven S.F.T.S's were training for the R.A.F. and turning out pilots at the rate of some 11,300 per year. In addition, there was one S.F.T.S. training for the Fleet Air Arm and another training Poles. Twenty-five E.F.T.S's (one of them Polish) were turning out pupils at the rate of about 22,000 per year.<sup>(1)</sup> This was the peak of basic pilot training in the United Kingdom.

Need for Better Training

The shortage of pilots which had caused so much anxiety had disappeared, a rapidly mounting flow of trained men was coming from schools overseas, and the supply of pilots was at last greater than the first line requirement. It was

/possible to

(1) The United Kingdom pilot training organisation at the end of September 1941 was:-

No.1 S.F.T.S. Netheravon (F.A.A.)	No.11 S.F.T.S. Shawbury (T.E.)
" 2 " Brize Norton (T.E.)	" 12 " Grantham (T.E.)
" 3 " South Cerney (T.E.)	" 14 " Lyneham (T.E.)
" 5 " Ternhill (S.E.)	" 15 " Kidlington (T.E.)
" 6 " Little Rissington (T.E.)	" 16 " Hucknall (Polish)
" 8 " Montrose (S.E.)	College S.F.T.S. Cranwell (T.E.)
" 9 " Hullavington (S.E.)	
(No.14 S.F.T.S. moved from Cranfield to Lyneham in Aug.1941).	
No.1 E.F.T.S. Hatfield (5 flights)	No.16 E.F.T.S. Derby (5 flts)
" 2 " Staverton (2 " )	" 17 " N.Luffenham (5 " )
" 3 " Watchfield (3 " )	" 18 " Fair Oaks (4 " )
" 4 " Brough (5 " )	" 19 " Sealand (4 " )
" 5 " Meir (4 " )	" 20 " Yeadon (3 " )
" 6 " Sywell (6 " )	" 21 " Booker (4 " )
" 7 " Desford (5 " )	" 22 " Cambridge (6 " )
" 8 " Woodley (3 " )	" 24 " Luton (5 " )
" 9 " Ansty (5 " )	" 25 " Peterboro' (Polish)
" 10 " Stoke Orchard (3 flts)	" 26 " Sheffield Farm (2 flts)
" 11 " Perth (5 " )	" 28 " Wolverhampton (4 " )
" 14 " Elmdon (4 " )	" 29 " Clyffe Pypard (4 " )
" 15 " Carlisle (6 " )	

(No. 10 E.F.T.S. moved from Weston-super-Mare to Stoke Orchard in August 1941).

August  
1941

possible to give attention at last to the quality rather than to the quantity of the output. For some time it had been realised that the standard of pilot training was not as high as it should be: the standard of instruction was generally low because good and experienced instructors were hard to find; a large percentage of accidents was caused by bad flying technique and bad airmanship; there was general ignorance of the principles of handling modern aircraft; squadrons devised undesirable methods because the C.F.S., without a handling Squadron, was not a live centre for disseminating sound technique. (1)

855861/38

S.58474

Thus, when the results of the Little Rissington experiment (2) were considered in August 1941 the main purpose to be served by greater efficiency and intensity at S.F.T.S's had changed from turning out larger numbers of pilots to the producing of better trained men. The experiment was hampered by shortage of spares (about 15 aircraft out of the total of 108 being constantly out of action for this reason), and took place rather too late in the summer for the hours of daylight to allow three five-hour shifts. It produced a higher accident rate and a lower standard of output. Within these limitations it was successful in showing that S.F.T.S's could achieve greater intensity of flying. (3)

S.71940

It was clear that many factors had to be taken into

/account

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(1) The Handling Flight at C.F.S. was reconstituted (it had been disbanded in 1940) and made a Handling Squadron in July 1941, but it remained ineffective.

(2) Appendix 37 - Extracts from the Minutes of a Conference held on 6th August 1941 (A.H.B. IIM/a9/1a) and Reports from No.23 Group and No.6 S.F.T.S. on the Little Rissington experiment (S.71940).

(3) It also showed the need for efficient airfield control, and that a shift system had the drawback of causing irregular meals.

account when planning for maximum efficiency. Winter conditions made a course of 10 weeks' duration beginning between April and August equivalent to one of 12 weeks beginning in March, or of 14 weeks beginning in September, October, January or February, or one of 18 weeks beginning in November or December. Unserviceability of aerodromes showed that grass surfaces would not stand up to the heavy traffic of intensive flying: the lesson of Cranfield and experience in Canada<sup>(1)</sup> led to a decision that United Kingdom S.F.T.S's should have two runways at right angles. Night flying was a problem in landing grounds: three were necessary to carry out the syllabus properly.<sup>(2)</sup> Maintenance difficulties could be a serious handicap if there were delays over replacement aircraft and spares, or if hangars could not be used because of dispersal.

S.58474

In September the basic length of S.F.T.S. courses in the United Kingdom was raised to 12 weeks, with planned equivalents of 14, 16 and 18 weeks in the winter, and the flying hours went up to 85.<sup>(3)</sup> The night flying target remained at 5 hours.

#### Pilot Training Goes Overseas.

The need for basic pilot training in the United Kingdom began to disappear towards the end of 1941. There  
/was a surplus

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(1) Canadian S.F.T.S's had three runways on parent aerodromes and R.L.G.s, and in some cases the parent aerodrome had double runways. There was at first some concern about the need for off-wind landings, but it proved unfounded. Canadian E.F.T.S's were also being provided with runways.

(2) The use of parent aerodromes, as well as R.L.G.s, for night flying was allowed in the United Kingdom from July 1941. The "Drew" electric, centrally controlled, system of lighting was adopted in October 1941, but not brought into use until later.

(3) Previously the syllabus required 72, but in the summer 1941 the schools actually averaged 80 hours per pupil.

November 1941 - was a surplus of pilots, and schools overseas were turning  
March 1942. out larger and larger numbers. The United Kingdom schools  
gradually changed over, during the winter of 1941-1942, from  
basic S.F.T.S. instruction to refresher courses for  
acclimatising pilots trained overseas. By March 1942 the  
S.62856 change was practically complete. (1) Cranwell was the only  
S.F.T.S. left in United Kingdom: it was kept (half on S.E.  
and half on T.E. training) for experimental and research  
work on new ideas.

This virtual disappearance of S.F.T.S. training in the  
United Kingdom was, of course, accompanied by a reduction in  
the amount of E.F.T.S. training needed, and the reduction  
was accentuated by a decision to do elementary training in  
Canada for the R.A.F. S.F.T.S.'s there. E.F.T.S. capacity  
in the United Kingdom, however, dropped only slightly (by  
seven flights) at the end of 1941, (2) and the drop was more  
than made up in January 1942, when nine E.F.T.S. flights  
were added. From the beginning of November 1941 E.F.T.S.  
capacity not wanted for ab initio training was used for  
grading pupils who were to receive their flying training  
overseas.

#### Wastage and Selection

That the elementary stage of flying training was useful  
for selection and weeding out, as well as for teaching, had  
been recognised for some considerable time. In February  
1941 A/M Garrod wrote:-

/What is the

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(1) Except at Montrose (which became a Flying Instructors  
School), Lyneham (which was transferred to Ferry Command),  
Netheravon (which went on to Glider and Parachute training)  
and Kidlington (which became a Glider O.T.U.).

(2) No.2 E.F.T.S., working from Worcester, became a Supple-  
mentary Flying Instructors School in November. No.5 E.F.T.S.  
Meir, was closed in December. No.24 E.F.T.S., Luton was  
reduced by one flight in October. No.3 E.F.T.S. moved with-  
out any other change from Watchfield to Shellingford in  
December.

A.M.T/447

"What is the object of our elementary flying stage? It is to teach the rudiments of the art of flying on the simplest possible type of aeroplane. It is important that the pilot should be able to go solo as early as possible and that he should be able to make mistakes without fatal consequences. It is also important that he should be introduced as early as possible in the air to instrument flying and night flying. By having a simple and foolproof type aeroplane which is also easy to maintain and to handle on the ground, and which does not require first class aerodrome space, we are achieving our object in the easiest manner.... (1)

Another point is that there is a great deal of weeding out of pupils in the elementary stage. I am trying to reduce this wastage by a more skilful selection of pupils as between pilots, observers and air gunners while they are in the I.T.W., but the weeding out will always be heavy in the elementary stage, and it is desirable to use a simple and economical aeroplane for this purpose."

With the increase of training overseas in 1941 the problem of wastage at the elementary stage became important. Rejects from pilot training were in most cases sent for training as other categories of aircrew, but this meant that R.A.F. pupils rejected in the United States or Canada had to be brought back to the United Kingdom, since almost all R.A.F. training of non-pilot aircrew was done in Britain. The problem first became serious as a result of training in the United States, (2) and giving R.A.F. pupils their elementary training in Canada was clearly likely to make it bigger. The obvious way of dealing with it was to use E.F.T.S. facilities in the United Kingdom for weeding out pupils before they were sent overseas, thus cutting down the elimination rate in the United States and Canada, and

/so providing

August 1941

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(1) A/M Garrod went on to point out the disadvantages of a proposal which A.V.M. Harris (D.C.A.S.) had made for using operational types of aircraft such as Blenheims and Whitleys for ab initio training. The need for an elementary trainer which resembled operational types more closely than did the Moth was, however, recognised.

(2) Principally from United States Army Air Corps schools, which had a high elimination rate. The civil B.F.T.S's were more inclined to persevere with slower learners.

so providing smaller numbers of rejected pupils for transfer to other forms of training.

Grader trainer, as introduced in 20 United Kingdom E.F.T.S. flights in November 1941, consisted of a three weeks' course, with up to 15 hours' flying (dual only) and normal ab initio ground instructions. Pupils who showed promise of making satisfactory pilots could be taken off grader training at any time after 5 hours' flying and passed as fit to on on to their flying training overseas. Pupils not considered promising enough to be sent overseas either went to United Kingdom schools (if they appeared to be slow starters<sup>(1)</sup>) or were transferred to other training.

In January 1942 grader pupils were allowed to go solo if they could do so within the three weeks, and in March a solo flight was made essential for passing on to overseas training. The first outputs from the grading scheme were to the United States Army and Navy schools. As the flow increased graded pupils were also sent to B.F.T.S's in the United States and to South Africa.

S.68889

December  
1940  
Org. Memo  
1175/40

S.B.A. The Lorenz system of making approaches in bad visibility was introduced late in 1940, when a few operational aerodromes were equipped with beams. Training in the system was at first confined to pilots in operational squadrons, and was done by small flights working where the beams were installed. The question of Blind Approach Training <sup>(2)</sup> generally had, however, soon to be considered: experience in both the R.A.F. and the German Air Force showed the need for some means of ensuring the safe landing of aircraft

/returning from

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(1) Perseverance with slow starters and backward pupils had always been a characteristic of R.A.F. instruction, and special treatment of such men was required by A/M Garrod when the quicker tempo of the Third Revise was introduced.

(2) The Lorenz system for large aircraft and a similar system for single seater fighters were at first named "Blind Approach".

returning from operations during the winter, when night and early morning fogs were prevalent,<sup>(1)</sup>

In February and March 1941 it was agreed that training in blind approach should be regarded, like night flying, as part of every pilot's basic training, and that it should therefore not be taught at O.T.U's (whose proper function was crew traing). It was further agreed that since S.B.A. instruction, like night flying, needed a multiplicity of aerodromes because only a few B.A.T. aircraft could operate from one aerodrome at a time it should be given at S.F.T.S's and not at special schools of Blind Approach. This policy, although decided in March, was not announced until July 1941.<sup>(2)</sup>

There was difficulty over equipment and instructors. Men already qualified as flying instructors had not been trained in Blind Approach, and special arrangements had therefore to be made. The number of pupils to be trained was formidable: there were men without B.A. training in squadrons and O.T.U's, there was the output of S.F.T.S's at home and overseas, and there were the pupils passing through the O.T.U's. All the time it was becoming clear that without general B.A. training Bomber Command would be handicapped in its operations during the winter of 1941-1942.<sup>(3)</sup>

A Blind Approach Training and Development Unit had existed on a small scale (with four Ansons and four /instructors)

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(1) The same experience also caused a rapid development and extension of Regional (later called Flying) Control.

(2) Appendix 38 - Minute by A/M Garrod dated 26th February 1941 and a letter dated 9th July 1941 from the Air Ministry to all Commands and Groups at Home and Overseas.

(3) B.A. training for single seater fighters sank into the background because of lack of equipment.

August  
1941

instructors) since September 1939. It was increased in size (to twelve Ansons) at the end of August and began intensive work throughout the 24 hours on instructor training. B.A. training at the C.F.S. was also begun in August. Some use was also made of the beams at operational aerodromes for instructor training.

At the end of August the amount of B.A. training which could be done was governed by the limited number of beams available, and since practically all the beams in existence were on operational aerodromes the only way of training any considerable number of pilots was by putting a small B.A.T. Flight (with eight Oxfords) at each beam. Bomber Command agreed, and it was decided to form 15 new Flights, the necessary aircraft being found by deferring the opening of an S.F.T.S. overseas.<sup>(1)</sup> These B.A.T. Flights gradually came into operation during the autumn and winter.<sup>(2)</sup> It was at first intended that they should be under the control and supervision of Flying Training Command, but Flying Training Command showed only moderate interest in Beam

/Approach

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(1) At the same time, the end of August 1941, it was decided, on psychological grounds, to change the name from "Blind" to "Beam" Approach Training.

(2) The B.A.T. Flights at work in March 1942 were:-

No.1501	Abingdon	No.1514	Coningsby
" 1502	Driffield	" 1515	Swanton Morley
" 1503	Mildenhall	" 1516	Middleton St. George.
" 1504	Wyton	" 1517	Ipswich
" 1505	Honington	" 1518	Scampton
" 1506	Waddington	" 1519	Feltwell
" 1507	Finningley	" 1520	Home-on-Spalding- Moor
" 1508	Horsham St.Faith	" 1521	Stradishall
" 1509	Thornaby	" 1523	Little Rissington
" 1510	Leuchars	" 1526	Thruxton
" 1511	Upwood	" 1527	Prestwick
" 1512	Dishforth	" 1528	West Malling
" 1513	Honington (Marham)	" 1529	Wittering

Nos. 1501-1510 were the original flights which began in 1940. The numbering 1501....was introduced in November 1941.

Approach and appeared to understate its importance, while the operational Groups tended to foster the Flights and move towards complete control of them. As a temporary measure, B.A. training was supervised by the Air Ministry during the winter of 1941-1942.

Bomber O.T.U's

At the beginning of May 1940 eight bomber O.T.U's had just been formed from the original Group Pools. Seven of them were to back the operational squadrons of Bomber Command, but only three of the seven were being brought up to full size, the others remaining at the "Group Pool" strength of 32 aircraft each. The eighth was the Battle O.T.U., backing the Battle squadrons in France. Bomber Command's first line consisted of  $23\frac{1}{2}$  squadrons, (1) to which it was planned to add seven of the former Group Pool squadrons as soon as they had been reformed into operational units.

Summer 1940: O.T.U. Expansion

The seven O.T.U's backing Bomber Command were turning out crews at the rate of some 930 per year, and this was pointed out by A/M Portal (C.-in-C. Bomber Command) on 11th May (2) to be inadequate for a conservatively estimated probable wastage of 1,350 crews per year. A/M Portal raised the matter as one "of the first importance" since a sustained air campaign demanded a powerful organisation for the provision of trained crews, and providing half-trained crews would increase losses and so cause additional demands for replacements of men and aircraft.

When the matter was discussed at a conference on 14th May A/M Portal raised his estimate of probable wastage, by

/taking into

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(1)  $6\frac{1}{2}$  Wellington, 5 Whitley, 6 Hampden, and 6 Blenheim.

(2) Appendix 39 - Letter from Bomber Command to the Air Ministry dated 11th May 1940. (BC/S.23616/Org).

May  
1940

S.1925

taking into account the need for relieving tired crews after about 100 hours' operational flying, to 2,300 crews per year (for 24 squadrons). Against this, the seven O.T.U's backing Bomber Command would, if brought up to full size, be capable of turning out 1,750 per year. It was decided to bring them up to full size and also form two additional O.T.U's<sup>(1)</sup> which A/M Portal proposed. To provide the aircraft and instructors necessary for this O.T.U. expansion six<sup>(2)</sup> of the seven Group Pool squadrons reforming as operational units were rolled up, but even so there was a lack of operational types which had to be made up by using Wellingtons, Whitleys, and Blenheims without full operational equipment and by employing the rather unreliable Hereford at Hampden O.T.U's. A serious deficiency of more than a hundred Ansons had to be accepted.

S.60810

The output from O.T.U's backing Bomber Command went up to some 2,180 per year, and was planned to reach nearly 3,000 per year when all nine O.T.U's were in full operation on six week courses. (About 1,000 of these were Blenheim crews from the two Blenheim O.T.U's, and the output from the seven "heavy bomber" (i.e. Wellington, Whitley and Hampden) O.T.U's was at the planned rate of 1,200 crews per year, rising to 1,900). This output was, more or less, enough to meet A/M Portal's estimated wastage for 24 first-line squadrons, but needed a great many more pilots (3,500 - 5,000) than the 1,900 per year then being turning out by

/S.F.T.S's

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(1) At Kinloss (No.19, Whitleys) and Lossiemouth (No.20 Wellingtons) The recently-displaced S.F.T.S's were not moved again because of the loss of pilot output which would have been caused. Nos. 19 and 20 O.T.U's began training in June 1940.

(2) Nos. 148, 215, 7, 76, 185 and 97 were dissolved and used to reinforce the O.T.U. organisation. No.75 (New Zealand) Squadron was rerieved because of its special character, and became an operational unit.

the S.F.T.S's for Bomber Command. Working O.T.U's at their full size made it necessary for each to have a satellite, and O.T.U. satellites were given priority in constructions.

S.1925

The Reserve squadrons remained unchanged,<sup>(1)</sup> and the conference of 14th May decided that in future any O.T.U's needed to back new first-line squadrons should be formed six weeks (i.e. the length of the O.T.U. course) in advance of the new squadrons.

This expansion of bomber O.T.U's caused demands for more observers and air gunners. The bomber O.T.U's accordingly gave up their share of armament training facilities at the Bombing and Gunnery Schools, and dispensed with target towers (with which they had just been established) so that more air crew might be trained. Bomber Command strongly resisted a suggestion that air gunners should be trained ab initio at O.T.U's, and it was dropped.

S.1925

On 18th June it was decided that six of the eight Battle squadrons which had come back after the French campaign should remain Battle squadrons, and (with two Polish Battle squadrons) form No.1 Group, which would be backed by the Battle O.T.U. at Benson and the Polish O.T.U. at Hucknall. The remaining two squadrons from France were converted to Blenheims and added to No.2 Group. Bomber Command's first-line strength then became 34 squadrons, rising to 37 in August when three Reserve squadrons became operational units. To provide the trained crews for this first-line there were

/eleven

S.D.155  
741/40

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(1) They ceased to be Reserve squadrons, and were gradually converted into operational units, in August 1940.

eleven O.T.U's, <sup>(1)</sup> some of them working considerably below full size, capable of producing trained crews at the rate of 3,000 per year and requiring an intake of about 4,300 pilots per year.

Shortage of Pupils

S.4928

Throughout the summer of 1940, however, the bomber O.T.U's had to work far below their planned figures. The output of pilots from S.F.T.S's was not enough to meet all demands, and the claims of Fighter and Coastal Commands ranked above those of Bomber Command, so that pupils could not be found to fill the bomber O.T.U's. Again, the bomber O.T.U's were markedly short of their full establishment of instructors, the deficiency being over 200 pilots out of an establishment of some 600 (with corresponding shortages of other aircrew instructors), and more instructors could be found - directly or indirectly - only if a full flow of pupils was passing through the O.T.U's. One result of this light loading of the bomber O.T.U. organisation was that there were enough facilities to spare to try the "X" course experiment at No.10 O.T.U. Abingdon and No.13 O.T.U. Bicester, but the small flow of pupils and consequent

/shortage of

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- (1) No.10 Abingdon (Whitleys)  
" 11 Bassingbourn (Wellingtons)  
" 12 Benson (Battles)  
" 13 Bicester (Blenheims)  
" 14 Cottesmore (Hampdens)  
" 15 Harwell (Wellingtons)  
" 16 Upper Heyford (Hampdens)  
" 17 Upwood (Blenheims)  
" 18 Hucknall (Battles) - quarter size - Polish  
" 19 Kinloss (Whitleys)  
" 20 Lossiemouth (Wellingtons) - half size

(It had been proposed in May to start a Blenheim O.T.U., No. 21, at Wyton, but nothing came of the proposal). Full size O.T.U's had 48 Whitleys and 24 Ansons, or 54 Wellingtons and 18 Ansons, or 37 Hampdens and 37 Ansons, or 48 Blenheims and 16 Ansons, or 60 Battles and 18 Ansons. The annual output of this organisation, on 6-week courses, was about 1,000 Blenheim crews, 1,200 "Heavy bomber" crews, and 800 Battle crews.

shortage of suitable men (the whole of the E.F.T.S. output being required for S.F.T.S.'s) helped to bring the experiment to an end.

Effects of the Second and Third Revises.

When the Second Revise was introduced the bomber O.T.U. course was lengthened from six to eight weeks, the flying time being increased from 60 to 75 hours for Battles and Blenheims, and from 55 to 70 for Wellingtons, Whitleys, and Hampdens. The change affected O.T.U. courses starting after the end of September 1940, and reduced the theoretical rate of output (the actual output was at the time governed by the scarcity of pilots for intake as pupils) from the existing O.T.U.'s.

The Third Revise proposed to lengthen the bomber O.T.U. course by another two weeks, to ten in all, and to put up the flying hours to 90 for Battles and Blenheims and to 85 for Wellingtons, Whitleys, and Hampdens.<sup>(1)</sup> The output from the existing O.T.U.'s would go down still further, but it was intended to open more O.T.U.'s. How many more O.T.U.'s was not clear: the possibility of working O.T.U. aircraft more intensively, and so getting more flying hours from the existing units was not promising, but Bomber Command was strongly of the opinion that it would be unnecessary to make the course longer than eight weeks and 70-75 hours, even though Third Revise pupils would have only 120 hours pre-O.T.U. flying experience.

S.69865

September -  
October  
1940

Bomber Command urged that much could, and should, be done by way of preliminary instruction before flying training began, early selection of pilots for bomber work,<sup>(2)</sup> and

/cutting out

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(1) Appendix 34.

(2) On the scientific basis of tests then being developed by Professor Bartlett.

cutting out teaching not strictly necessary for wartime pilots from the school syllabus, to turn out an output from the S.F.T.S's which even with the Third Revise length of S.F.T.S. course would need no more than eight weeks' O.T.U. training. A/M Garrod, however, was suspicious of Bomber Command's arguments for the shorter course, which were also arguments for not putting into additional O.T.U's the skilled instructors and operational aircraft otherwise available for expanding the first-line. He knew "that Bomber Command was desperate to obtain more pilots so that the bomber force could expand", and felt "that in their desperation they were prepared to lower the standard although they would not admit it". Bomber Command, in spite of all its protests, was instructed on 21st October 1940 to introduce the ten-week O.T.U. course when "Third Revise" pilots came forward (i.e. in November). The corollary was, as A/M Peirse (C.-in-C. Bomber Command) pointed out, that four more O.T.U's would be needed to maintain the rate of output, while Bomber Command had neither the aerodromes to accommodate the units nor the pilots to instruct at them.

Early 1941: Too Few O.T.U.s for Expansion.

The bomber O.T.U. organisation <sup>(1)</sup> remained largely unchanged during the winter of 1940-41, and were theoretically <sup>(2)</sup> capable of producing Wellington, Whitley, and

/Hampden crews

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(1) The training of Battle crews came to an end in the autumn of 1940, and No.12 O.T.U. Benson was converted into a half-size Wellington O.T.U. in early December, as the first-line squadrons of No.1 Group gradually changed over from Battles to Wellingtons. The Polish O.T.U. (No.18) moved from Hucknall to Bramcote in November, and was also converted into a half-size Wellington unit.

(2) With ten-week courses the theoretical output rates went down slightly, to 1,500 and 750 respectively. The actual training capacity of the O.T.U's was considerably lower: they were limited by shortage of instructors and staff pilots.

S.4928

S.D.155  
1124/40  
1125/40

A.C.6(41)

January  
1941

Hampden crews at the rate of about 1,800 a year, and Blenheim crews at about 900 a year, on eight week courses. The pilot intake needed to produce this output was some 4,700 per year, and this matched the allocation of pilots from S.F.T.S's between November 1940 and April 1941. When the adequacy of this O.T.U. output for expanding the bomber first-line was examined, however, the outlook was depressing. Operational wastage of the existing first-line had to be budgetted for at 2,650 pilots a year, the withdrawal of experienced pilots for instructor duties at 540 a year, and Middle East reinforcement at some 600 a year. The surplus of pilots available for expansion would be less than 1,000 per year, and when Bomber Command's existing pilot deficiency<sup>(1)</sup> (some 320 on 1st November 1940) and the need for forming new O.T.U's in advance of the squadrons they were to back (O.T.U. development might absorb pilots at the rate of 600-700 a year for instructor duties) were taken into account expansion seemed almost impossible.

After April 1941 the flow of pilots from S.F.T.S's to Bomber Command was due to rise sharply, as schools overseas began to turn out trained men in large numbers, to a rate of some 8,000 per year. This, however, did not promise to be an unmixt blessing. A greater influx of pilots would call for more O.T.U's to train them, and the O.T.U's could only be staffed by taking experienced men from the first line to serve as instructors.

This logistic basis for expecting that Bomber Command would be unable to make any appreciable first-line expansion before the summer of 1941 at the earliest was challenged. Casualty rates were not as heavy as had been

/expected

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(1) Bomber Command's pilot strength was consistently well below establishment all through 1940.

expected, and were being revised as the basis for future planning. Optimism for this reason was misplaced, however: no planned allowance was being made for war-weariness, and so an uncertain additional wastage factor existed until the "operational tour" of 200 hours was introduced in March 1941.

The central problem in expanding the bomber first-line was how to provide trained crews for the new, additional, squadrons which expansion meant. Training the crews in O.T.U's would absorb large numbers of experienced men and occupy aerodromes, at the expense of the first-line. The alternative was to make the new squadrons "work up" - i.e. to train the crews for expansion purposes in the new squadrons themselves. It was not a good alternative. A/M Peirse described it as "grossly uneconomical and liable to produce a heavy increase in training accidents and to result in a lower standard of crews generally". He also remarked that "such training methods involve the wide dispersal of key instructors, and the lack of synthetic methods of training would prove a serious obstacle". A/C/M Portal had little faith in "working up" as the way to expansion, and it was not used except for the first Manchester, Halifax, and Stirling squadrons. (1)

Operational Training or Operational Effort?

The problem of Bomber Command expansion to meet the larger production of aircraft expected later in the year was the problem of getting a larger output of trained crews from O.T.U's without neutralising that larger output by the number of instructors required. Lack of pilot output from S.F.T.S's

/was no longer

January  
1941

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(1) These came into existence late in 1940 and early in 1941. Their results had little bearing on the question of "working up" by new squadrons, since they were composed of selected and experienced men.

S.60810

was no longer the difficulty: in fact, so many pilots would be coming forward to Bomber Command after June 1941 that 11½ more O.T.U's (making some 20 in all)<sup>(1)</sup> would have to be opened in the first six months of the year if they were all to be trained. These additional O.T.U's would need over 600 pilots as instructors, the 600 pilots could only come from the first line, and there were no more than 1,120 pilots in the first line.

S.1925

There were divergent views on these facts. A/M Garrod urged that O.T.U's should be opened to give full and proper training to all the pilots coming forward. A/M Courtney held that neither aerodromes nor instructors could be provided for all these extra O.T.U's. A/M Peirse said that forming so many new O.T.U's would cause excessive dilution of the first line, too high a proportion of inexperienced crews, an increase in the accident rate, and so a further demand for more O.T.U. output.

S.60810

S.1925

February  
1941

These various factors were peculiarly intractable and irreconcilable. They were set down, shrewdly analysed, and discussed in a minute<sup>(2)</sup> by G/C Whitworth Jones (D.D.H.O.). A/V/M Harris urged that O.T.U's should be established in Canada, that new squadrons should "work up" by doing their own training, and that aerodromes should be used as fully and intensively, and by as many squadrons as possible.<sup>(3)</sup>

/The fact remained

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(1) Assuming the O.T.U. course to be of 8 weeks' duration.

(2) Appendix 40 - Minute dated 1st February 1941 by G/C Whitworth Jones. (S.1925).

(3) "By the time we have won this war we shall have six squadrons on an aerodrome, and have learnt to like it. It is only a question of deep enough dispersal points. The idea that we can afford the present luxurious provision of aerodromes, with one squadron of aircraft in use on each, has always struck me as being fantastic; although (being very simple-minded) I concluded that the great idea would be later to thicken up the squadrons when we were pushed to it, rather than to make despairing efforts to thicken up the aerodromes until the entire country was aerodrome from end to end."

The fact remained, though, that unless a very marked increase could be made in O.T.U. output without undue expense in aerodromes and instructors Bomber Command's first-line expansion would be negligible. One factor in the problem changed slightly: Bomber Command reported at the end of January that "Third-Revise" pilots were found to be of much the same standard as their predecessors who had received longer S.F.T.S. training, and that they needed only an eight weeks' O.T.U. course with 55-60 hours flying. In March it was agreed that the bomber O.T.U. course should be of eight weeks' duration: (1) the amount of flying (55-60 hours) would be the same as the original six-week course, an extra two weeks' ground instruction being added. This theoretical shortening of the course, however, was no practical help in solving the problem of expansion: all the planning and discussion had been done on the basis of an eight-week course.

S.69865

The call for heavier bombing of Germany was insistent. A/C/M Portal wrote: "It is of vital importance to obtain a greater output from the O.T.U's, since if we do not do so I do not see how we are to produce the crews for our expansion and, at the same time, keep up our pressure on Germany". Sir Archibald Sinclair restated the problem: "The need for expansion of our Bomber Force is urgent. Aircraft are available - pilots who have passed through their S.F.T.S's have now filled the O.T.U's and will be coming forward in increasing numbers. The aerodromes are there."

S.69865

March 1941

At the end of March A/M Garrod proposed that O.T.U. output should be increased without a correspondingly heavy

/dilution

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(1) This meant that pilots would go forward to first line bomber squadrons after only 177 hours flying (50 hours at E.F.T.S., 72 at S.F.T.S., and 55 at O.T.U.). The total duration of E.F.T.S., S.F.T.S., and O.T.U. training would be 24 weeks.

dilution of the first line by using experienced men for instructing only where it was absolutely necessary and by training a proportion of the O.T.U. output to less than "captain" or "first pilot" standard. Investigation showed that the existing O.T.U. establishment of 72 pilot instructors could be cut down to 55, and that only 35 of these need have operational experience: the other twenty were wanted either for conversion instruction to the operational type or for staff pilot work in Ansons, and could if necessary be drawn (with suitable training) direct from the S.F.T.S. output. There seemed to be some waste of training effort in bring all pilots turned out by O.T.U.'s up to "captain" standard when half of them would of necessity be employed in the first line as second pilots: half the O.T.U. output (A/M Garrod suggested) could go forward at second pilot standard for further training in squadrons.

The intractable logistics of bomber O.T.U.'s and their effect on expansion were set out again in a paper<sup>(1)</sup> by A/C/M Freeman (V.C.A.S.). This paper showed the remarkable way in which O.T.U. output disappeared without leaving any surplus available for expansion,<sup>(2)</sup> pointed out that the immediate bomber expansion would be negligible unless unorthodox methods (i.e. other than O.T.U. training) were used to stimulate the flow of pilots to the first line, and emphasised that the O.T.U. system was extremely slow in yielding a dividend while being very expensive in material (some 40% of all the Wellingtons in the United Kingdom were being used in O.T.U.'s, compared with 50% in the first line). The output of pilots from S.F.T.S.'s would very soon  
/be ample for

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(1) Appendix 41 - Paper on R.A.F. Expansion and O.T.U. Training by A/C/M Freeman. (April 1941). (S.69865).

(2) In spite of the fact that the wastage rates used in planning were now considerably lower than before.

be ample for expansion, but the O.T.U. requirements for turning them into operationally-fit men for the first line were enormous, and were the limiting factor. A/C/M Freeman also observed that the German policy of one-pilot crews for bombers gave a great advantage by reducing the resources devoted to training.

Spring 1941: Larger Output by Shorter Courses.

At a conference on 3rd April an answer to the obstinate riddle was hammered out - that O.T.U's should turn pilots out at a lower standard. A/C/M Portal stated the problem: "The only way to obtain a further expansion<sup>(1)</sup> seemed to be to form further O.T.U's first, and that could only be done by robbing operational squadrons of pilots. The reduction in strength of the operational squadrons and in our bomber effort was quite unacceptable, and it was necessary to consider whether the expansion could be obtained by any other means." He thought the position "sufficiently serious to warrant a thorough re-examination of the essential requirements for operational training and the basic organization of the course in an O.T.U.", and came to the conclusion that "the present O.T.U. course tried to train the pilot to too high a standard: in fact it tried to teach him to become a captain". A/C/M Portal suggested that "the course should be radically cut, that trainees should go to squadrons for a short period as second pilots" and have a subsequent short course, in squadrons or at O.T.U's, to convert them into captains.

Bomber Command objected to shortening the O.T.U. course and argued that eight weeks were necessary in order to produce a man who would be fit to become a captain later.

/A lower

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(1) Over and above the 37 "heavy" squadrons which would be reached by June 1941, chiefly by converting the former Battle and some of the Blenheim squadrons to Wellingtons.

A lower output standard would be fundamentally unsound, and it therefore followed that the O.T.U. course could be shortened only if more instruction, especially in night flying, were given at the S.F.T.S. stage. A/M Peirse also considered it would be better to introduce one-pilot crews than to lower the O.T.U. output standard.

Discussions shortly after this conference, however, led to Bomber Command's agreement, (1) on 12th April, that the Wellington and Whitley O.T.U. course should be reduced from eight weeks to six, that the output of crews from these O.T.U.'s should be doubled, that their O.T.U. aircraft establishment should remain unchanged, and that their establishment of pilot instructors should be reduced from 72 to 64. Bomber Command emphasised that this revised Wellington and Whitley O.T.U. course, which aimed at giving pilots 30 hours (at least five of them by night) at the controls and a further 20 hours as second pilot, should be regarded as experimental and dependent for its success on a number of provisos:-

- (i) an all round improvement in the pre-O.T.U. training of pilots, observers, and W.Op. A.Gs., (2)
- (ii) the provision of sodium synthetic night training equipment, because of the difficulty of giving enough night flying practice,
- (iii) dual control in operational Wellingtons, so that training might continue in squadrons,

/(iv)

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(1) Appendix 42 - Summary of Revised Heavy Bomber O.T.U. Syllabus dated 16th April 1941 by W/Cdr R.H.S. Spaight and a letter from Bomber Command to the Air Ministry dated 12th April 1941. (S.69865).

(2) The intensification of O.T.U. work meant that less flying time would be available for observers and wireless operators and so brought up the adequacy of their basic training.

- (iv) full serviceability at O.T.U's, by the use of the latest marks of aircraft,
- (v) improvement of O.T.U. aerodromes,
- (vi) a speeding up in the supply of synthetic trainers.

While these discussions were going on the bomber O.T.U. organisation was expanding,<sup>(1)</sup> and by June it was ~~the~~oretically capable of turning out some 5,200 crews per year for Bomber Command and 180 per year for the Middle East, and of absorbing about 13,200 pilots a year from the S.F.T.S's.<sup>(2)</sup> This output was, however, dependent on the success of the six week Wellington and Whitley courses and of the more intensive working which they meant, while the six-week courses in turn depended on a number of somewhat wishful provisos

/about basic

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(1) Lossiemouth (Wellingtons) was brought up to full size during the winter. Moreton-in-the-Marsh (Wellingtons) and Finningley (Hampdens and Manchesters) started training in March. Pershore (Wellingtons) began in April, Wellesbourne Mountford and Lichfield in May. In May, however, Harwell stopped training crews for Bomber Command and began to produce Wellington reinforcements for the middle East, working on the old eight-week course with 55 hours flying. At the beginning of June 1941 the O.T.U. organisation was:-

No.10	O.T.U.	Abingdon	(Whitleys)
" 11	"	Bassingbourn	(Wellingtons)
" 12	"	Benson	(Wellingtons) - half size
" 13	"	Bicester	(Elenheims)
" 14	"	Cottesmore	(Hampdens)
" 15	"	Harwell	(Wellingtons) - for M.E.
" 16	"	Upper Heyford	(Hampdens)
" 17	"	Upwood	(Elenheims)
" 18	"	Bramcote	(Wellingtons)- Polish, half size
" 19	"	Kinloss	(Whitleys)
" 20	"	Lossiemouth	(Wellingtons)
" 21	"	Moreton-in-the-Marsh	(Wellingtons)
" 22	"	Wellesbourne Mountford	(Wellingtons)
" 23	"	Pershore	(Wellingtons)
" 25	"	Finningley	(Hampdens and Manchesters)
" 27	"	Lichfield	(Wellingtons)

(2) The wastage rate at O.T.U's was assumed as 10% of the intake.

about basic training and the supply of equipment.

Failure of Shorter Courses.

S.69865

August  
1941

By the beginning of August it was evident that the six-week courses were not working out according to plan. The O.T.U.'s had, in general, received the proper intakes from S.F.T.S.'s, but they had not turned out a corresponding number of trained crews, and as a result they were becoming crowded with partly-trained men. A statistical analysis indicated that, instead of the theoretical six, they were in fact taking anything between seven and twelve weeks to train their pupils. Lack of flying time - in spite of the fact that practically all the O.T.U's were markedly short of aircraft<sup>(1)</sup> - was not the reason: they were achieving their target of flying hours.

Bomber Command gave several explanations at a conference on 26th August. O.T.U's had to give more training than was bargained for when the six-week course was agreed upon, because the standard of pilots from S.F.T.S.'s was low and because squadrons had no dual control Wellingtons<sup>(2)</sup> and so could not accept men at "second pilot" standard. There had been delay over satellites and synthetic night flying equipment. Pilots with operational experience were not necessarily good instructors, and there was a shortage of C.F.S.-trained men. Nevertheless, Bomber Command insisted that there was no need to lengthen the course above a basic six weeks, with winter variations to 8 and 10, and held that the output from O.T.U's would soon reach the planned /figures.

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(1) The O.T.U's were particularly short of Ansons. Wellingtons were used in place of them for preliminary training.

(2) There was difficulty over the supply of dual control conversion sets. In addition, squadrons objected to dual control in operational aircraft because it hampered the movements of the observer during operations.

figures.

The output from bomber O.T.U's, however, continued to be well behind the programme. Congestion increased, intakes from S.F.T.S's could not be accepted, and the whole planned flow through the training organisation began to become dislocated. In October Bomber Command asked for the winter length of the course to be extended by another two weeks (i.e. to 12 weeks as a maximum) as a margin of safety, principally because of the difficulty of doing enough night flying.

Autumn 1941: Dilution and Weakening of the First Line.

Another factor now began to come in. The output of trained crews, though falling behind what had been wanted for first-line expansion, was in excess of the expansion that could be achieved,<sup>(1)</sup> and squadrons became over-full of crews fresh from the O.T.U's. Unusually bad weather during the autumn cut down the operations and the amount of flying which could be done, and squadrons found difficulty in keeping all their crews in practice. In November it became impossible for 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 organisation. Bomber Command then extended the O.T.U. course to 45 hours at the controls in order to slow up the flow. This change involved no lengthening of the current (winter) course duration, but implied a basic (summer) duration of eight weeks, and was made without reference to the Air Ministry.

November  
1941

S.69865

At about the same time it was suggested to A/C/M Portal that "the main cause of our rather heavy losses of bomber crews has been that there is a high percentage of "raw"

/and "inexperienced"

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(1) There was an unexpected set-back in the production of operational aircraft,

December  
1941

and "inexperienced" crews in the Bomber Command resulting from too great a shortening of the O.T.U. course." At the beginning of December he placed the responsibility for this squarely on Bomber Command:-

"I am under the impression that when it was decided to reduce the O.T.U. course it was agreed by all concerned that the reduced course would be adequate to produce the necessary training. I understand that the course is to be lengthened once more and I fully support this, but there arises out of these ideas a point upon which we must insist most firmly. It is the responsibility of the Bomber Command, its Group and Station Commanders to ensure that no crew is normally sent on an operation if they are considered to be insufficiently trained. We in the Air Ministry have no means of knowing immediately whether the training periods we prescribe are adequate. We can do no more than lay down what we think necessary. The Command, on the other hand, receive immediate evidence in the shape of O.T.U. output indicating whether we have in fact cut things down too much. It is vitally important that the Command should not relax the standard required for operations simply because the Air Ministry have cut down the training courses."

The responsibility of Bomber Command for ensuring the operational fitness of crews sent out on missions was emphasised by a letter from the Air Ministry on 12th December, but pre-O.T.U., as well as O.T.U., training was involved. As A/C Goodwin pointed out:-

S.69865

"It is true that it has not yet been represented officially by Bomber Command that the syllabus of training or the number of hours flying involved at O.T.U.'s does not produce the necessary standard of training expected of crews passing into Operational Units, but the Command have represented on numerous occasions that the standard of pre-O.T.U. training is far from satisfactory. We were forced to accept this low standard of training in the past to meet the expansion of the striking force, but arrangements are now being made to increase the pre-O.T.U. training. It is vital that this increase as far as it affects Bomber Command should be made immediately and substantially, and should include a substantial increase in night flying hours".

The problem of bomber O.T.U. training, in fact, had reached a point at which the balance between O.T.U. and pre-O.T.U. training, and the adequacy of the whole training sequence for Bomber Command's requirements, had to be reconsidered.

While the problems of policy had been moving towards

/this point,

this point, the bomber O.T.U. organisation expanded slightly.<sup>(1)</sup>

The "New Deal" Reorganisation

For just over a year, from May 1940 to the summer of 1941, all training was dominated by the urgent need for producing the maximum number of pilots in the shortest possible time. This urgent need came when there was a serious shortage of advanced trainer aircraft and, to a lesser degree, of instructors. As much training as possible was therefore shifted to operational types, and advanced trainers used only where they were indispensable. The whole organisation was worked intensively, and courses were reduced to the minimum in both duration and flying time for the sake of output. In particular, instruction was transferred from the S.F.T.S's to the O.T.U's until a pilot's pre-O.T.U. flying training lasted only 16 weeks and consisted of about 122 hours' flying. Correspondingly more O.T.U. training and a large O.T.U. organisation were needed, but in consequence the heavy bomber O.T.U's, where night flying

/presented

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(1) The one-time Battle O.T.U. at Benson moved to Chipping Warden, and became a full-size Wellington O.T.U., in September. Finningley became a completely Manchester O.T.U. in November. Part of the Blenheim output from Bicester was earmarked for the Middle East after October.

The bomber O.T.U. organisation at the end of 1941 was:-

No.10	O.T.U. Abingdon	(Whitleys)
No.11	" Bassingbourn	(Wellingtons)
No.12	" Chipping Warden	(Wellingtons)
No.13	" Bicester	(Blenheims) - partly for M.E.
No.14	" Cottesmore	(Hampdens)
No.15	" Harwell	(Wellingtons) for M.E.
No.16	" Upper Heyford	(Hampdens)
No.17	" Upwood	(Blenheims)
No.18	" Bramcote	(Wellingtons)
No.19	" Kinloss	(Whitleys)
No.20	" Lossiemouth	(Wellingtons)
No.21	" Moreton-in-the-Marsh	(Wellingtons)
No.22	" Wellesbourne Mountford	(Wellingtons)
No.23	" Pershore	(Wellingtons)
No.25	" Finningley	(Manchesters)
No.27	" Lichfield	Wellingtons)

In February and March 1942 two more Wellington O.T.U's were opened:-

- No.24 O.T.U. Honeybourne
- No.26 " Wing.

presented a particular problem, absorbed so high a proportion of the available resources that first-line heavy bomber expansion became almost impossible.

The standard of proficiency produced by the training sequence in the summer of 1941 was perhaps, in spite of the speeding up and altered distribution of training between stages, not materially different from that produced before pilot training was revised in 1940. There had been no major change in what was taught, and against the handicaps of newly-opened schools and inexperienced instructors could be offset improved methods, greater emphasis on night flying, instrument flying, and navigation, and greater use of synthetic trainers. In fact, it was sometimes put forward that the overall training process of the Third Revision produced a standard higher, if anything, than that of 1940.

Comparison with the standard of 1940, however, was not enough. There was a progressively-mounting accident rate, the incidence increasing sharply as pilots went on to more complex types<sup>(1)</sup> - a fact which suggested that, although they were being taught to handle the aircraft, they were given too little background of general flying experience.

/It became clear

(1) From 1st January 1941 to 30th September 1941 the numbers of aircraft written off per 10,000 hours flying were:-

E.F.T.S.	2.5	
S.F.T.S.	5	
O.T.U.	15	decreasing to 10) Decreases
Operational Squadrons	20	" " 10)

Largely seasonal

(These "write-offs" alone represented some 20% of the output of operational aircraft during the period).

The progressively-mounting accident rate was, however, not a new development. For a similar period of the previous year(1940) the casualty figures of killed per 10,000 hours flying had been:-

E.F.T.S.	.8
S.F.T.S.	2.1
O.T.U.	11.5

(Note. These figures are not directly comparable with those quoted above for 1941).

A.H.B.  
IIm/a9/1a

It became clear in the summer of 1941 that the proficiency required for operational fitness - and in particular the requirements of heavy bomber operations at night - called for a considerably higher standard of training. In August plans were made for increasing the United Kingdom S.F.T.S. course to 12 weeks (85 hours' flying) in the autumn, and to 14 weeks (100 hours' flying) in the spring of 1942. (1)

More factors than the need for better training came in. Pilots and other aircrew from overseas schools needed some form of acclimatisation and refresher training when they arrived in the United Kingdom: long voyages meant that they lost skill and grew rusty, while of necessity their overseas training gave them no experience of European conditions and topography. From the summer of 1941 onwards there was a surplus of trained pilots, partly because operations, and consequently casualties, were comparatively light, and partly because first-line expansion was much less than had been anticipated. Bomber Command was losing aircraft - largely from accidents - faster than they could be built and repaired, (2) and its first-line was to a considerable extent occupied with training. (3) Both the accidents and the preoccupation of squadrons with instructional work were due to too low a standard in the training sequence.

/In September

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(1) These were basic (summer) durations: the equivalent winter periods for the United Kingdom were 18 and 20 weeks. Corresponding increases, to 12 and 14 weeks all the year round, were planned for schools in Canada. The possibility of lengthening S.F.T.S. courses was due to the facts that more trainers were expected to be available and that S.F.T.S. aircraft were being made to yield a considerably greater amount of flying time.

(2) Bomber Command's balance sheet for August 1941 was:-

Aircraft destroyed	259	New Production	200
Aircraft damaged and struck off strength	266	Aircraft Repaired	219
	525		419
		<u>Net diminution</u>	106

(3) Some 40% of bomber squadrons' flying was for instructional purposes at this time.

In September A/Cdre Baker (D.B.Ops) described the position as serious and requiring drastic action if matters were not to go from bad to worse: he suggested that more emphasis might be laid on night flying, instrument flying, and navigation throughout the training of bomber crews.

Bomber Command's Criticism of Basic Training

S.77400

December  
1941

On 2nd December A/M Peirse stated Bomber Command's difficulties in a letter to the Air Ministry. (1) Operations were being handicapped by a low standard of airmanship and navigation (which meant that a large proportion of bomber did not reach the target area), by the need to devote a great deal of wuasrons' time to training, and by a high wastage rate (which made it practically impossible to expand the first-line).

"The result is that we are falling into a vicious circle - valuable aircraft are crashed and lost owing to the incapacity of the crews; and the shortage of aircraft brought about by this wastage limits the training which can be given both at the O.T.U's and at the Service Squadrons".

A/M Peirse put the responsibility for this state of affairs on inadequate basic training, which produced too low a standard of proficiency to allow O.T.U's to carry out "their function of operational training and training in crew procedure so as to enable a pilot and his crew to take their places on operations immediately they arrived at a squadron".

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/ "The standard

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(1) Appendix 43 - Letter from Bomber Command to the Air Ministry dated 2nd December 1941. (BC/C.22872/Tr/C.-in-C).

"The standard and experience of aimanship necessary to enable a pilot to handle a modern medium or heavy bomber in the face of the enemy and the extremely exacting hazards of the weather is something far in excess of what we have to-day. We are but deluding ourselves and expecting the impossible, with the net result that the dividend we earn in damage to the enemy is not commensurate with the wastage in men, material, and labour expended.

In present circumstances it is no exaggeration to say that by the time the best pilots become reliable captains they are due to leave their operational squadrons. This is readily understandable since, even at this stage, they will only average about 300-350 hours solo flying".

The inadequacy of basic training A/M Peirse put down partly to too short a period of instruction (he contrasted the R.A.F.'s 6-7 months and 177 hours flying with the German Air Force pilot's  $1\frac{1}{2}$ -23 months and 220-270 hours, in preparation for smaller and less complicated aircraft), and partly to the selection of indifferent raw material as pupils. He pointed out that during the period when more aircraft were available than crews to man them the emphasis had been put on quantity, rather than quality, in the output from training, whereas one of the advantages of a policy of using comparatively few large bombers should be economy in the number of crews needed, and hence the opportunity of training those crews to a very high standard. Inadequate training would undermine morale, and signs of it could already be seen. A/M Peirse summed up the position by saying:- "In my view a dangerous situation has arisen which, if allowed to continue, may well become disastrous".

Bomber Command's proposals for putting training on a more satisfactory basis were contained in a number of recommendations:-

- "(i) Flying training must be designed to produce pilots and crews with sufficient experience to fit them for the task which lies ahead of them. They must be ready to take their share in night operations as soon as they arrive in their Service Squadrons, so trained that the maximum use can be made of them throughout their operational tour.

/(ii)

- (ii) The Flying Training Command and Dominion Training Organisation should endeavour to work to a standard rather than to a syllabus, and all personnel who fail to reach the standard should be turned down.
- (iii) An extended course at the S.F.T.S. should aim at giving each pupil 30 hours solo at night. The minimum standard should be 20 hours.
- (iv) The principles of long-range flying and correct manipulation of engine controls should be taught to pupils before they arrive at the O.T.U.
- (v) The Air Observers' course should include at least 20 hours night flying.
- (vi) The amount of air firing given to air gunners should be substantially increased.
- (vii) The discipline of aircrew personnel, which is satisfactory when they leave the I.T.W., should be maintained at a high level".

A.M.T.'s Proposals

The need for more thorough training had for some time been considered by A/M Garrod and A/V/M Cochrane who, also at the beginning of December, produced plans (1) for a higher standard of basic training, for the more economical use of operational aircraft, and for increased effectiveness of operational effort. Their paper reviewed the reduction of training, through the Third Revise and the "second pilot" standard for Bomber O.T.U.'s, which had led to bomber pilots going forward to squadrons after only some 160 hours flying in all, and then advocated a minimum of 300 hours' flying before pilots reached the first line. The reasons given were:-

- (i) Experience in all the operational Commands pointed to the need for longer training.
- (ii) The first line's more powerful and complicated aircraft called for higher standards of flying technique.
- (iii) It was not possible to pick and choose in

/selecting aircrew

December  
1941

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(1) Appendix 44 - Note on Aircrew Training Policy by A/M Garrod dated 6th December 1941. (A.C.70(41)).

selecting aircrew: many pupils had little or no mechanical knowledge, had never driven a motor car, and required longer to absorb the instruction.

- (iv) The transfer of training overseas had brought the necessity for an acclimatisation period of training after the voyage.

The paper proposed that all S.F.T.S. training should be transferred overseas. Pupils from the United Kingdom would be graded by some 10-15 hours on elementary aircraft before being sent abroad, and unsuitable or indifferent raw material rejected. Pilots arriving in the United Kingdom from training overseas would pass through Advanced Flying Units for a refresher and acclimatisation course. The paper also proposed that the selection and training of instructors should be improved, and that an Empire Central Flying School should be set up in order to maintain standards of training at a high and uniform level throughout the overseas training organisation.

#### Longer Basic Training

With the approval of these proposals by the Air Council on 9th December a very much longer period of training than ever before was agreed to be necessary.<sup>(1)</sup> Before the war pilots had reached squadrons after 150 hours' flying (and squadrons had then given a good deal of instruction). In 1939 and 1940 their pre-first-line flying had been 205 hours (150 pre-O.T.U., 55 O.T.U.) for bombers and 180 (150 pre-O.T.U. and 30 O.T.U.) for fighters. Through 1940 and 1941 it had sunk to 164 (122 pre-O.T.U., 42 O.T.U.) for bombers and 162 (122 pre-O.T.U., 40 O.T.U.) for fighters. The "New Deal" now aimed at 300 hours (270 pre-O.T.U., 30 O.T.U.)

/with an interim

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(1) It was recognised that the full aim of 300 hours' flying could not be achieved immediately: the target for 1942 was 260 hours, made up of 80 on elementary types; 120 at S.F.T.S., 30 at ...F.U., and 30 at O.T.U. It was intended at this time that conversion to operational types should ultimately be done at the ...F.U.

with an interim figure of 260. (1)

The change was very marked. The reasons which brought it about were that the original 1939-1940 training period had been barely adequate for requirements then, that war experience raised the standard to be attained by a fully-trained man, that war conditions had affected both training and the standard of raw human material with which it had to work, and that the impossibility of relying on the first line in war time for more than an irreducible minimum of training had been repeatedly and conclusively demonstrated. From September 1939 onwards these reasons had steadily been growing more cogent, but it was not possible to act on them and reshape the training system earlier for a variety of causes:- lack of trainer aircraft, lack of instructors, staff and facilities, and pressure for the largest and quickest output of pilots (caused first by lack of pilot reserves and then by insistence on first line expansion).

Bomber Crews.

S. 77400

Though the "New Deal" was practicable so far as pre-O.T.U. training was concerned, some awkward bomber O.T.U. problems remained. Bomber Command's first-line was clogged up with inexperienced, partly-trained, crews, and could neither operate nor train efficiently. Bomber Command had lengthened the O.T.U. course to 45 hours in order to reduce the flow into squadrons and produce better trained men, but had lengthened it without the approval of the Air Ministry, thereby dislocating the flow of men from S.F.T.S's and creating a surplus of over 1,000 pilots who should have been in O.T.U's but for whom the O.T.U's had no room.

/Two main questions

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(1) A comparison of the durations of the total flying training period (with no allowance for leave or travelling time) shows:- pre-war 34 weeks, 1939-40 28-30 weeks, 1940-41 22-24 weeks, New Deal 35-37 weeks. The amount of preliminary ground training was steadily increased from '39-'42.

Two main questions had to be solved. The first was how to train the over-diluted bomber first line, restore its operational efficiency, and make expansion possible. The second was O.T.U. capacity: there were not enough O.T.U's to give each pilot more than 30 hours training, and 30 hours would not be enough to keep the first line efficient.

The first line problem had been made more manageable by stopping the flow from Bomber Command's squadrons to the Middle East, and so reducing the dilution due to this cause.<sup>(1)</sup> A/M Garrod suggested that it might be solved by rationing operational effort and so enabling squadrons to devote uninterrupted periods to training inexperienced crews, but the "raw" crews were in fact brought up to standard without recourse to "rationing" by means of training schemes devised by the bomber Groups.

O.T.U. capacity set the familiar riddle of what proportion of the first line aircraft and resources should be devoted to operational training and what to operational effort. The Inspector General was asked to examine the Bomber O.T.U. problem, and recommended that the O.T.U. syllabus should be expanded so as to ensure the full standard necessary for entry to squadrons, and that an appropriate course duration should then be fixed and adhered to.

December  
1941

S.77400

In January 1942 Bomber Command's revised basis of 46 hours flying per pilot, with a further 29-33 hours as second pilot,<sup>(2)</sup> at O.T.U's was approved.<sup>(3)</sup> This was considered /to meet the

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(1) This flow was stopped in November 1941. Middle East crews were then drawn from the O.T.U's.

(2) These figures were for Wellingtons and Whitleys. Hampdens were now on pilot aircraft, and Hampden pilots were to have 72 hours on conversion or at the controls. Blenheim pilots were to have 60 hours.

(3) A programme was laid down which provided that O.T.U's should give a preliminary week's ground instruction and then a flying course of eight, ten, or twelve weeks' duration according to the season. Crews would have some 60 hours' flying (each wireless operator was to spend half the time at the set and half in a turret). All training was to be done on operational types, and Ansons withdrawn from O.T.U's.

to meet the need for quality of output, and the flow through O.T.U's was brought under stricter control to avoid future disturbance of the planned phasing of training. On 21st January Bomber Command was reproved for altering the length of the O.T.U. course, and upsetting the planned training flow, without prior approval.

O.T.U. training for four-engined aircraft came under consideration,<sup>(1)</sup> and planning was based on a 12 weeks course (18 in winter) allowing 55 hours flying on Wellingtons (plus 43 hours as second pilot) followed by 20 hours (plus 12 as second pilot) on the four engined type.

With the expansion plan visualised in January 1942, some 20 bomber O.T.U's were required at once, while 60 would be needed when expansion was complete in 1944. By 1944 the O.T.U's would have absorbed 1,300 more aircraft than had been allowed for them, and there would have to be a reduction of some 50-60 bomber squadrons in the planned first line.

The repercussion of adequate O.T.U. training on the first line was immediate as well as long-term. 45 hours' flying at O.T.U's meant that 25% fewer squadrons could be formed in 1942 than had been estimated on the previous 30-hour basis. Agreement to the longer course could therefore only be provisional, since the C.A.S. was in the United States and the matter could not be settled until he returned. The old, original, impasse still existed: the number of pilots who had to pass through the O.T.U's if the first-line was to be adequately backed and the 45 hours flying that each required if the backing was to be well-trained and competent called for more aircraft and

/facilities

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(1) Experiments in four-engine training had been going on through 1941, and it had been agreed in August that most of the O.T.U. training for four engined aircraft would have to be done on mediums (such as the Wellington) with a final conversion stage.

January  
1942

facilities than could be spared if the first line was also to expand. There were clearly only two possible solutions - either to cut down the training or reduce the number of pilots passing through the O.T.U's. Failure to find a solution would mean abandoning all hope of expanding the bomber force. Cutting down training had been tried, and had produced the alarming result of a part-trained, inefficient, ineffective first line. The only solution was to reduce the number of pilots needed for the first line.

#### One-Pilot Crewing

This meant changing from two-pilot to one-pilot crews. It was unwelcome, and was regarded with grave distrust. A/Cdre Breen (D.of P.) tentatively mentioned it at the beginning of January, but did not pursue it. The inevitability of one-pilot crewing if any solution was to be found, however, soon became obvious, and at the beginning of February 1942. February Bomber Command was considering one pilot crews in Halifaxes, Whitleys and Wellingtons, and two-pilot crews (with only one of the pilots fully trained) for Stirlings, Lancasters, Manchester, and Liberators.

By the time the C.A.S. came back from America the possibility of one-pilot crewing had virtually broken the back of the bomber O.T.U. problem. A conference was held on 12 February, and some papers prepared for it summed up the difficulties and troubles of the training organisation during 1940 and 1941, set out the experience which had been gained, and went on to discuss future policy. The first paper was on pre-O.T.U. training.<sup>(1)</sup> In it A/M Garrod went over much of the ground he had covered in his paper of 6th December 1941,<sup>(2)</sup> and amplified his proposals for /the future.

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(1) Appendix 45 - Paper on Pre-O.T.U. Aircrew Training by A/M Garrod dated 8th February 1942.

(2) Appendix 43.

the future. The reduced basic flying training which followed the Third Revise had proved inadequate in instrument and night flying, in navigation and map reading, and in formation flying: moreover, it had given too little general air experience and too little knowledge of bad weather flying. Minimum standards for basic flying training in the future were laid down - standards which would enable O.T.U's to concern themselves solely with operational crew training. Those standards ranged from 210 to 290 hours pre-O.T.U. flying, dependent on the operational employment for which a pilot was destined, and would, with the O.T.U. courses planned, produce "well-trained pilots fit to take part in operations immediately on joining their squadrons". The minimum standard of pre-O.T.U. training was markedly higher than that to which the training organisation had previously been working. Pilot training was doubled in its total length, more than doubled in its flying hours, and increased sixfold in night flying. Observer training was increased by more than 50% in both total duration and flying time. Wireless operator training was increased slightly, and "straight" air gunner training greatly increased.

The other papers were by A/C Goodwin,<sup>(1)</sup> and dealt with two aspects of prime importance in O.T.U. planning. The standard at which pilots should be turned out by O.T.U's was discussed, and the conversion of second pilots into captains shown to be an impracticable task for squadrons. So far as one-pilot crewing was concerned, fatigue had been shown not to be a great factor, so that the fatigue argument for two pilots could be disregarded: casualties to first pilots and the need for a second pilot

/to take over

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(1) Appendix 46. Two papers dated 8 February 1942 by A/C Goodwin. (Appendices to the Agenda of a Conference on 12 February) (S.77400).

to take over had proved rare, and could be many times offset by the accidents which occurred while second pilots were being trained: captaincy and the need for someone to relieve the first pilot while he acted as captain were the main factors, but the "captain's relief" need not be a highly trained pilot.

The incompatibility of bomber O.T.U's and first line bomber expansion was at last coming to an end. Higher standards of pre-O.T.U. training meant that the operational training stage would no longer have to deal with a miscellaneous assortment of basic instruction. Reduced flow, through one-pilot crewing, meant that the numbers which had to be handled would not produce expansion-stopping demands for aircraft and men. The O.T.U. maintenance organisation was overhauled, and various belated improvements put in hand. The number of instructors needed by O.T.U's came down, largely as a result of one-pilot crewing, by about 30%, and the demand for experienced men from the first line was correspondingly reduced.

February  
1942

On 27th February the last step in settling these "New Deal" plans was taken when Bomber Command accepted one-pilot crewing. (The arrangements had previously been tentative, since A/M Harris was taking over as C.-in-C. Bomber Command). A/M Harris made it clear that he personally would have preferred two-pilot crewing, and accepted one-pilot crews only because of the logistic relation between adequate training, numbers which could be trained, and the possibility of expansion. He stipulated. (1) that aircraft should have automatic pilots, that Flight Engineers should be carried in Stirlings, Liberators, Halifaxes, and Lancasters, that one member of the crew should

/be capable

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(1) Appendix 47 - Letter from Bomber Command to the Air Ministry dated 27th February 1942. (BC/S.20173/Air).

be capable of bringing the aircraft back in emergency, and that provision should be made (by establishing 26 pilots per squadron) for pilots to get operational experience before they took charge of aircraft on missions. He also proposed other changes in crewing: the development of radar meant that the observer could not deal with both navigation and bomb aiming,<sup>(1)</sup> and so a separate bomb aimer who could also act as front gunner was needed: there was no need for two wireless operators because in practice only one was used on wireless work. He emphasised that the whole plan depended on adequate training, and urged even higher standards than the New Deal contemplated.

#### Navigation

In May 1940 pilots and observers were given their basic navigation training partly as an item in the syllabus at I.T.W's, E.F.T.S's, S.F.T.S's and O.T.U's and partly by specific courses at the School of Air Navigation, the School of G.R., or the civil A.O.N.S's.<sup>(2)</sup> Navigation training flights were severely restricted by operational requirements, by lack of wireless, and by difficulties over night and bad weather flying. Competent and experienced instructors /were rare,

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(1) The reason given was difficulty in adjustment of vision: but experience showed later that the navigator had too much to do in navigating to spare the time for bomb-aiming.

(2) The S. of A.N. was training Hampden pilots on 6-week courses at the rate of about 600 per year and selected observers on astro courses at about 550 per year. The S. of G.R. was training pilots for Coastal Command on 12-week courses at about 400 per year. The civil A.O.N.S's were training observers on 20-week courses at some 2,500 per year. Hampden pilots, G.R. pilots, and observers were all trained in D.R. navigation to much the same standard. The I.T.W's, E.F.T.S's, and S.F.T.S's gave a general preliminary grounding. Astro was a separate post-graduate course.

S.47667

were rare, and though the School of A.N. was running courses for training specialists and instructors<sup>(1)</sup> it was far from easy to find enough suitable men to fill the courses. During the summer of 1940 German attacks on the United Kingdom, and the consequent increase in operational restrictions, limited flying still more, and astro-training in particular became almost impossible.

June - July  
1940

In these circumstances no immediate improvement in the admittedly unsatisfactory quality of navigation training could be expected. When Bomber Command pointed out in July 1940 that although observers were responsible for navigation they were not taught astro as part of their basic training, could not be given it at O.T.U's, and could not be sent on "post-graduate" astro courses without breaking up crews, it had to be explained that an observer's basic D.R. training was not good enough to warrant the addition of astro until he had gained more experience and that in any case the teaching of astro in the United Kingdom was practically out of the question. When the observer's basic course was extended in June to a duration of 15 weeks and a flying target of 80 hours little difference in results followed: the limitations on flying areas and night flying, and the competence of the instructors, remained unchanged.

Transfer Overseas and Changes at Home.

December  
1940

The flying restrictions inevitable in an operational area, and the handicaps on training of British weather, could be avoided only by moving schools overseas. Expansion and transfer therefore went on together during the autumn of 1940, until at the end of the year there were two Schools of Air Navigation, one in Canada and one in the United Kingdom, and three Schools of G.R., one in South Africa, /one in Canada,

(1) Considerable numbers were wanted to staff the navigation schools, schools of G.R., and S.F.T.S's in the expanding training organisation.

one in Canada, and one in the United Kingdom, while two A.O.N.S's had moved from the United Kingdom to South Africa.<sup>(1)</sup> There were also some changes in the A.O.N.S's remaining in the United Kingdom,<sup>(2)</sup> which were capable at the end of 1940 of turning out observers at a rate of about 2,000 per year.<sup>(3)</sup>

Transfers overseas interrupted training and so reduced the total output, but their effect was delayed because observers had to pass through a six-weeks armament course after the end of their basic navigation training. At the end of 1940 there was a surplus of observers; the needs of Fighter Command had cut down the flow of pilots, and so

S.75988

/of crews,

(1) No.1 S. of A.N. (specialist "N" and astro courses) left St. Athan on 30th September and started work at Port Albert, Ontario, on 18th November (it was at first intended to move the school to South Africa, but there were no astro tables for the southern hemisphere). No.2 S. of A.N. (Hampden pilot and instructor courses) was formed from the remainder of the original school and started work at Cranage on 21st October.

No.1 S. of G.R. came back from Guernsey on 16-19 June, and after a month at Hooton Park went to Squires Gate until it began, on 30th September, to move to George: it started work in South Africa on 1st December. No.2 S. of G.R. formed at Squires Gate at the end of May, moved to Debert in November, and started training in Canada in January 1941. No.3 S. of G.R. formed at Squires Gate as Nos.1 and 2 S. of G.R. moved away.

No.5 A.O.N.S., Weston-super-Mare, was converted into a service operated school and moved to Oudtshoorn on 30th August: it started training in South Africa on 22nd October. A service operated A.O.N.S. of 120 pupils was drawn from No.1 A.O.N.S. Prestwick, moved to Vereeniging on 23rd October, and started training in South Africa on 23rd December.

S.D.155  
301/40  
474/40  
559/40

(2) No.9 A.O.N.S., Squires Gate, closed in May 1940 to make room for No.2 S. of G.R. No.3 A.O.N.S. moved from Carlisle to Weston-super-Mare, and was absorbed by No.5 A.O.N.S. (which then increased to 120 pupils) at the beginning of June. No.11 A.O.N.S. moved from Hamble to Watchfield in the middle of July. No.2 A.O.N.S., Yatesbury, closed in December. The United Kingdom A.O.N.Ss at the end of 1940 were:-

No.1, Prestwick	(290 pupils)
No.4, Ansty	{ 60 " }
No.6, Staverton	{ 120 " }
No.11 Watchfield	{ 60 " }

(3) The observer's basic navigation course was cut down to 12 weeks in December 1940 because a shortage of observers was expected in 1941.

A.C.6(41)

January  
1941

of crews, to Bomber Command; but a large deficiency seemed probable in 1941. The bomber expansion promised for the second half of 1941 suggested in January that unless more capacity were provided for training observers in navigation there would be a shortage of some 200 in June and 600 in September, even when shortening the course from 15 weeks to 12, the output from Empire Scheme schools in Canada and Australia, the settling down of transferred schools, and the start of basic training at No.31 A.N.S.<sup>(1)</sup> in Canada were taken into account.

To provide the additional capacity there were new schools at Bobbington, which had been due to open as a service operated A.O.N.S. in December 1940 but did not in fact start until April, 1941, and Millom, which began observer training in February 1941. On the other hand, Prestwick was due to reduce its pupil population of observers from 300 to 180 in order to make room for a Coastal O.T.U. The possibility of converting Little Rissington from a S.F.T.S. to an A.O.N.S. was considered, but dropped, and it was decided to postpone the shrinkage of Prestwick until an additional A.O.N.S. could be brought into operation. These changes, when they were complete, would put the United Kingdom output of observers up to 3,900 per year, of which Prestwick would train only 650.

This was a considerable change from Prestwick's previous dominant position of producing nearly 1,100 observers out of a total annual output of 2,000, and the operating company of No.1 A.O.N.S., Scottish Aviation Ltd., protested against the reduction, urging that the school had in the past shown itself able to handle as many as 390 pupils, using two

/Fokkers

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(1) i.e. No.1 S. of A.N. After the school moved to Port Albert it was renamed No.31 A.N.S. Basic training of observers was begun there in January 1941.

Fokkers and 32 Ansons for their flying, and suggesting that it would be better, if an increase in the observer output were wanted, to raise Prestwick's number of pupils to 390 rather than reduce it to 180. None the less, the proposals remained unchanged: using such big aircraft as Fokkers at an A.O.N.S. was considered to produce a lower standard of output, replacing the Fokkers by Ansons would produce air congestion with the larger pupil population, while adding an O.T.U. to a 390-pupil A.O.N.S. would cause crowding.

Aircraft were a difficulty in all plans for expanding observer training. The shortage of Ansons was serious and world-wide, while their supply to overseas training theatres had priority: none were available for navigation training in the United Kingdom. The possibility of using more large aircraft had been considered in the autumn of 1940, and the Albatross and Ensign (i.e. civil types) were investigated, but the project was dropped. This left only the Botha, an "operational reject", available for equipping new schools and replacing the Fokkers. (1) Millom and Bobbington were given Bothas when they opened.

#### Criticism and Shortcomings.

While these transfers and changes were going on Bomber Command remained seriously dissatisfied with the navigational competence of observers. In November 1940 Air Commodore Cochrane (D.T.F.) investigated the shortcomings which O.T.U.'s found in their training. Considerable emphasis was laid on the interposition of a bombing and gunnery course between an observer's basic navigation training and his arrival at an O.T.U.: it was thought that during the armament course a pupil forgot a good deal of the navigation he had been taught. The absence of night flying training /and of astro . . .

S.69236

November  
1940

S.D.155  
958/40

(1) It was decided in September 1940 that Bothas would be used for training purposes. At first they were intended as attack aircraft for armament training, but they were later employed (in spite of reports that they were unsuitable) for navigation training.

and of astro instruction was criticised, and so was a lack of practical, as opposed to theoretical, teaching about compasses, wireless aids, and maps and charts.

S.47667

December  
140

In December Air Marshal Peirse (C.-in-C. Bomber Command) stated that three out of every four aircraft lost on operational sorties were lost in and around England, from causes other than enemy action. (1) He put this down to lack of supervision by captains, who were unable to check the observer's work because they had not been given enough navigation training, and asked that pilots should be given more navigation instruction somewhere in the training sequence. Providing a special navigation school for training bomber pilots was, however, quite impossible because there were too few facilities available to set up all the schools needed for more essential work. The most that could be done was to increase the attention given to navigation at I.T.W's and E.F.T.S's, put up S.F.T.S. ground instruction on it from 50 to 62 hours, and urge that pupils should have 15 hours' navigation flying in the back seat of Oxfords at the S.F.T.S's. The figures quoted by Bomber Command for losses were not agreed by the Air Ministry, who said that of 548 operational aircraft lost between April and December 1940 only 97 might have been caused by bad navigation.

D.D.T. Nav.  
Branch  
Jacket 13

Observer training underwent some minor changes.

S.75988

Efforts were made to get night flying going at the A.O.N.S's, and their internal organisation was altered in November 1940 by adding one or more specialist "N" officers to each school's establishment, to act as Chief Instructor and relieve the operating company of responsibility for training. The company's representative was to remain C.O. of the school, but he was not responsible for training:

/that fell

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(1) These figures referred to the period April - December 1940.

S.47667

that fell entirely to the specialist "N" Chief Instructor<sup>(1)</sup> New "master mariner" instructors<sup>(2)</sup> at A.O.N.S.s were given courses and some experience of air navigation at No.2 S. of A.N., while in February 1941 it was decided that the Education Officers who taught navigation at I.T.W's should also have a course (including flying) at Granage.

February  
1941

S.75988

The criticism that observers grew rusty on navigation during their armament training was met by trying an experimental combined course, with navigation, bombing and gunnery taught concurrently, when Millom opened.<sup>(3)</sup> This combined course was of 18 weeks duration (i.e. the twelve weeks of the navigation course plus six weeks for bombing and gunnery training).

Navigation and Piloting: Policy and Doctrine -

D.D.T. Nav.  
Branch  
Jacket 13

These changes at A.O.N.S's and S.F.T.S's were attempts to improve the existing system of navigation instruction - but the policy and organisation of the existing system were by no means generally accepted. In December 1940 Air Marshal Garrod suggested that a Navigation Group might be formed. The arguments advanced were that true air navigation involved both flying and finding the way, that the School of Air Navigation was the only unit dealing with this true navigation, that A.O.N.S's did not benefit by the School of Air Navigation's experience, that S.F.T.S's could not deal successfully with more than elementary pilot-navigation, and that a common control for all navigation

/training

(1) This dual system led, by the beginning of 1942, to a curious position where the C.O., of Staverton was answerable to No.50 Group, while the C.O., of Staverton was responsible to No.25 Group.

(2) Transfers and changes had made it necessary to recruit some additional instructors.

(3) Millom had originally been intended to be an armament school.

training units (including the School of G.R.) was desirable in order to ensure the general teaching of true navigation. There was a lack of enthusiasm for these arguments: Training Command (Air Marshal Pattinson) did not see anything wrong with the existing system of navigation schools, and disliked the proposal to mix service and civilian schools in one Group: Coast Command considered the School of G.R.'s work akin to O.T.U. training. The proposal for a Navigation Group quietly dropped, but T.Nav. became a Deputy Directorate of D.T.F. at the end of 1940, with Group Captain Kelly-Barnes in charge.

The policy of training pilots to a lower navigational standard than observers, and expecting them to be capable of supervising the navigation of the aircraft, was put forward as an explanation of the navigational ineffectiveness which was troubling Bomber Command. Group Captain Kelly-Barnes was of the opinion that it would be wise to divert more resources to training pilots, at the expense of a reduction in operational effort, and make up for the reduction by a lower rate of loss. Putting more resources into training, however, would mean that first of all more really suitable men would have to be trained as specialists or instructors, but the operational Commands - chiefly Bomber Command - were reluctant to let good men go. In fact, it became necessary to cut down the number of specialists "N" being trained<sup>(1)</sup> and to examine the posts established for specialists to see whether any could be filled satisfactorily with less-well-qualified men. The attempted economy was a failure: it was not possible to make do with fewer navigation specialists.

/In February

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(1) Spec. "N" courses were at this time being given only at No. 31 A.N.S. in Canada.

T.Nav.  
Branch  
Jacket 13

S.47667

In February Bomber Command objected to relying on observers for "N" specialists and "s.n." instructors.<sup>(1)</sup>

S.47667

February  
1941

"It cannot be accepted that a man trained purely in navigation is as good an air navigator as the man who trained in both piloting and navigation. The arts of piloting and navigation are very closely allied, and it is more important for senior navigators to have piloting experience than for any other specialist".

Bomber Command went on to blame the separation of navigation from piloting for a substantial reduction in the standard of navigation, and to state that captains' efficiency was reduced by their ignorance of navigation. The standard of navigation was already so low as to have an adverse effect on the bombing effort, and employing observers in specialist and instructor posts would lower it further. Observers were not produced from such good raw material as pilots, and lacked pilots' background of general service experience.

In fact, (Bomber Command said) the standard of navigation throughout the R.A.F. was too low. Co-ordination between the various types of school dealing with navigation had been poor because of a lack of specialist higher direction for inculcating a common doctrine of air navigation. Navigation and piloting had been separated, with the result that navigation languished because the men chiefly concerned with it (observers) had not full all-round experience. The standard of men selected to be trained as observers was not high enough, most of the pupils being deficient in mathematical ability. Their periods of training were too short for the existing syllabus, and the existing syllabus was not adequate to produce the fully competent men wanted by Bomber Command. In addition, there were the well-known

/difficulties

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(1) See Appendix 16. The policy of employing observers as specialists or instructors was introduced in April 1940, and the general shortage of pilots later in the year caused a high proportion of those selected for these duties to be observers.

difficulties of poor facilities, operational restrictions, and "master mariner" instructors.

Proposals for Improvement.

S.47667

April  
1941

Most of Bomber Command's points were covered in a comprehensive paper<sup>(1)</sup> by Group Captain Kelly-Barnes. In it he also stressed that concentrated "cramming" instruction was not enough: experience and practice were needed to produce instinctive working and skill, and although courses could not aim at giving full experience the courses then running were too short either to cover all that should be learned or to give an adequate understanding of what they did include. Though the separation of navigation from piloting had produced a lower standard, it was not possible to set matters right by giving all pilots full navigation training: neither the time nor the facilities could be spared. The next best way of tackling the low standard was to start a vigorous drive for improving the quality of the pupils - probably by preliminary education - and for raising the observer to equal status with the pilot.

Group Captain Kelly-Barnes divided the whole process of navigation training up under five headings:-

- (i) preparatory general education,
- (ii) general education closely linked with navigation,
- (iii) ground training in navigation,
- (iv) air training in navigation, and
- (v) non-navigational matters.

The first two, he said, might be dealt with by selection of men, by education, or by a non-flying stage of training. The third and fourth had hitherto been done concurrently: this had always been accepted practice and was probably best, but it was leisurely. Air exercises in 1941, however,  
/were strictly

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(1) Appendix 48. Paper on Training of Aircrews in Navigation dated 11th April 1941 by G/C Kelly-Barnes. (S.47667).

were strictly limited by lack of facilities, and so the idea of treating all ground training and air training together at one stage must be abandoned. Hence he proposed a re-division of navigation training into three stages - ground training, synthetic training and air exercises.

May  
1941

From this developed, in May, a plan to introduce a "six weeks advance I.T.W. course for those observers who will continue their training in the United Kingdom". The difficulty was accommodation. Somewhere to handle 800 pupils in classes of 20-25 was wanted: splitting up into smaller units was considered undesirable because it would require an extravagant number of instructors and because strict discipline and supervision of the pupils was wanted. The search for a site went on fruitlessly throughout the summer. In July this additional training stage was named the "Elementary Air Observers School".

Combined Training in Service Schools.

A.H.B.  
IIM/a9/1a  
S.70633

By the middle of April 1941 the experimental combined navigation and armament course at Millom was judged successful. "Better observers were being produced in a shorter time", while it was thought that elimination of the civilian element and commercial background of the A.O.N.S's had raised the quality of the training. Combined courses were introduced generally. This meant starting navigation training at the armament training stations, and six of them<sup>(1)</sup> were earmarked for the purpose. Each of the six had 240 pupil observers, so that the output was some  
/3,500 per year.

June-Sept.  
1941.

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(1) West Freugh, Penrhos, Jurby, Dumfries and a new station being built at Wigtown, in addition to Millom. West Freugh and Penrhos began navigation training in June, Jurby in July, Wigtown and Dumfries in September.

S.D.155  
789/41  
790/41  
791/41  
792/41  
793/41  
906/41

3,500 per year. (Schools doing combined training of observers had to have facilities for dealing with bombing and gunnery, and so had to be at armament training stations). The change was gradual, the full pupil population of observers at each school being built up by successive intakes, and the schools carrying on with a diminishing armament training commitment until they were completely converted to combined training (except Wigtown, which was a new station). When the change was finished, some four months after it began, these schools were renamed Air Observers Schools. As navigation training was taken over by the combined schools most of the A.O.N.S's closed.<sup>(1)</sup> The civil schools' instructors went, in many cases, to the new combined schools. So did some of their staff pilots, but not their staff wireless operators. Their Ansons also went to the combined schools.<sup>(2)</sup>

S.D.155  
649/41

S.70633

The civilian element in navigation schools did not, however disappear entirely. The civil maintenance staffs /who had serviced

S.D.155  
653/41  
S.D.155  
905/41

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(1) No.1 A.O.N.S. at Prestwick (which was now wanted as a Transatlantic airport and a Radar School) closed in July, and so did No.11 A.O.N.S. at Watchfield. No.4 A.O.N.S. at Ansty closed at the end of August. No.3 A.O.N.S. at Bobbington was converted to combined navigation and armament training at the beginning of November. Only No.6 A.O.N.S. at Staverton remained of the original civil schools.

The navigation training units in the United Kingdom at the end of 1941 were:-

No.2 S. of A.N. Cranage	No.4 A.O.S. West Freugh
No.3 S. of G.R. Squires Gate	No.5 A.O.S. Jurby
No.1 A.O.S. Wigtown	No.9 A.O.S. Penrhos
No.2 A.O.S. Millom	" 10 A.O.S. Dumfries
No.3 A.O.S. Bobbington	" 6 A.O.N.S. Staverton.

(2) The use of Bothas was abandoned at Bobbington in the summer of 1941 because they were too dangerous for the aerodrome. They could not be used at Penrhos (where the aerodrome was too small), and No. 9 A.O.S. was equipped with Ansons and Blenheims. No.5 A.O.S. at Jurby was also equipped with Blenheims. No.1 A.O.S. had Ansons, and the other schools Bothas. One of the corollaries of introducing combined training was the production of a multiplicity of aircraft types at the schools: target towers (usually Battles) and armament training aircraft (at schools where Ansons were used for navigation training) had to be established. In addition, since the other types were not suitable for night training, six Ansons were established at each school to deal with the syllabus requirement for night flying.

who had serviced aircraft at the A.O.N.S's were available, there were contracts in existence with the operating companies, civil maintenance was cheaper both in money and manpower than service maintenance, and civil maintenance staffs would in general set less of an accommodation problem than service maintenance. In May 1941 the possibility of entrusting maintenance at some of the combined schools to a civil company, as had been done in the case of No.3 S. of G.R. at Squires Gate, was discussed. It was opposed by D.S.M. and by Flying Training Command. D.S.M. pointed to the experience of Squires Gate, which showed that the system produced criticism, bickering, and competitive fault-finding. Flying Training Command based their objections on the complexity of the equipment to be serviced at A.O.S's and the doubtful availability of skilled labour for such things as armament equipment, the undesirability of mixing civil and service staffs because of comparisons between living conditions and pay, and the advisability of training pupils as far as possible under service conditions. The arguments of economy and existing contracts, however, prevailed, and at the end of May A.M.S.O. decided that three of the Air Observer Schools should have their aircraft maintained by civil companies. (1)

At all the combined schools navigation training and flying were done by the service, which then had to cope with the same difficulties that had handicapped the A.O.N.S's. Wireless services had been practically non-existent when the schools had been B & G.S's, while no more D/F stations were available for the combined schools

/than the

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(1) These arrangements did not start until later in the year. Service maintenance continued at Dumfries and Bobbington until October. Wigtown did not open until September. Wigtown was entrusted to Airwork Ltd., Dumfries to Scottish Aviation Ltd., and Bobbington to Marshalls Ltd. When Staverton was eventually converted to an A.O.S. its maintenance was to be done by Airwork Ltd., (who were operating it as an A.O.N.S.).

than the A.O.N.S's had been allowed to use, so that flying in bad weather and at night were still almost impossible.

The combined schools had three more difficulties from which the A.O.N.S's had been comparatively free: they had, except at the Anson-equipped schools, troublesome aircraft; they had practically no experienced staff pilots; and they had no staff wireless operators. Nothing could be done about aircraft until some more suitable type than the Botha became available. The civil schools had not employed a large number of staff pilots, and the largest of them, Prestwick, had made a considerable saving in pilots by relying so much on the Fokkers to provide flying time. The S.F.T.S's were working at high pressure and with short courses to turn out large numbers of pilots, and Bomber Command was asking insistently for the best men they turned out: the pilots available for the combined schools had therefore been quickly trained and were not the best of the S.F.T.S's output. Wireless operators did not become competent to work in the air on cross-country flights until they had been trained at O.T.U.s., and it was of course impossible to spare any of the O.T.U. output for Air Observers Schools; moreover, it was found impossible to transfer experienced civilian staff wireless operators from the A.O.N.S's to the service A.O.S's.

#### Staff Pilots and Wireless Operators.

Staff pilots and staff wireless operators had therefore July-December 1941 to be trained at the combined schools before observers could be given satisfactory navigation training in the air, and this staff training went on during the summer and autumn, while the schools were building up to their full population of observer pupils. Pilots were converted to the type concerned and instructed in a staff pilot's

work<sup>(1)</sup> partly by a touring "circus" of three or four flying instructors, and partly by the school itself. Wireless operators were produced (from men who were waiting to finish the normal sequence of training as Wireless Operator Air Gunners)<sup>(2)</sup> by improvised, home-made, courses which achieved much the same result as the more orthodox and better equipped Air Crew Wing and O.T.U. stages. Thus by the end of 1941 ~~the~~ combined Air Observer Schools were training pilots and wireless operators as well as dealing with their primary commitments of training in navigation, bombing and gunnery. Pilot-training (which soon had to include considerable attention to night flying) and signals training were done to uniform syllabuses and under the supervision of No.25 Group.<sup>(3)</sup>

#### Wireless Services.

Before any great improvement could take place in navigation training flying, however, the wireless services of the Air Observer Schools had to be improved. It was still laid down in the summer of 1941 (as it had been since October 1939) that wireless communication was allowed only once per hour from each aircraft, and that only coded messages giving the aircraft's opinion of its position

/might be

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(1) The standard required can be seen from a decision, taken in March 1940, that all staff pilots at A.O.N.S.'s should be qualified navigators, trained to "s.n." standard, in order to be capable of supervising pupils and of bringing the aircraft safely back. This "s.n." requirement for staff pilots also applied to the A.O.S.'s, but very few "s.n." pilots could be found for the work.

(2) There was an enormous pool of part-trained W.Op. A.G.'s at this time, waiting (often for very long periods) to pass through the Air Crew Wing bottleneck to gunnery training and the O.T.U.'s. A.O.S. staff operators were drawn from these men, trained in air operating (there was plenty of flying time in navigation-training aircraft for the purpose), given gunnery training at the A.O.S., and then held against the A.O.S. staff establishment - thus by-passing the bottleneck. From the first staff operators trained, and from any other suitable men, instructors were selected, and a regular system of signals training for producing staff wireless operators put in operation at each A.O.S.

(3) A certain amount of signals training was also done experimentally at Penrhos to see whether the Air Crew Wing bottleneck could not be relieved to some extent.

might be passed. During the autumn a wider use of MF/DF was allowed and it was decided that each A.O.S. should have a HF/DF station for homing. These homing D/F stations came into use during the winter, and reasonable training flights at night and in bad weather became possible. The greater number of navigation training aircraft and the longer range of their exercises set more signals problems, and it was necessary to increase the number of wireless channels and re-arrange their frequencies.

#### Criticisms and Suggestions

S.75988

While the Air Observer Schools were building up their staffs and getting under way, criticism of the navigational standard of observers continued to come from Bomber Command. Generally, there was considered to be too much theoretical instruction and too little practical experience, while men trained overseas lacked knowledge of the European problems of map-reading and were, of course, unfamiliar with black-out. There were suggestions, both from Bomber Command and from Flying Training Command, that certain observer-training schools should be earmarked for certain Commands and specialise in particular requirements. These suggestions were turned down by the Air Ministry, which stoutly maintained that A.O.S.'s should give a satisfactory basic training, and that no part of basic training (however much the teaching of it might have fallen on O.T.U.'s in the past because of earlier defects in basic instruction) should be regarded as specialisation for a particular Command.

#### Preliminary Training

S.72830  
S.D.155  
991/41

In October 1941 the Elementary Air Observers School was at last opened at Eastbourne, to give a 6-weeks ground navigation course to observer pupils between the I.T.W. and A.O.S. It was made clear, after some discussion, that the E.A.O.S. was not an advanced kind of I.T.W., but a preliminary

/part of

part of service flying training. Its function was to extend the time spent on navigation training without the waste of aerodrome capacity which would be involved by lengthening A.O.S. courses, and it was hoped that by covering the navigation syllabus fairly thoroughly at the E.A.O.S. it would be possible to leave the A.O.S. course free for the practical digestion of what had been learned and for gaining experience.

S.75988

The New Deal.

By the end of 1941 the "New Deal" proposals for a drastic improvement and lengthening of basic training put the combined A.O.S. course requirement of flying hours up from 98 to 130 (25 of them by night) during the 18-week course. The flying commitment became formidable - 4,300 hours per month per school - and the need for better staff pilots, better wireless facilities, and properly organised Flying Control became urgent. Until they were provided, the commitment could not be achieved in 18 weeks, and the course duration was temporarily extended to 24. At the same time, also as part of the "New Deal", it was planned to rely almost entirely on overseas for basic observer training, and to convert the Air Observer Schools, as their current basic courses came to an end, to (0) Advanced Flying Units for acclimatizing and refreshing men who had been trained overseas. (1)

S.72830

With the projected reliance on overseas for basic navigation training it was planned to provide Elementary Air Observers Schools in the various training theatres, and this plan was agreed by the Empire Aircrew Training

/Conference

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(1) Millom, Dunfries, Wigtown and Penrhos changed over to (0) A.F.U. training in the early part of 1942 (Millom's change started late in December 1941), West Freugh went on to the basic training of W/T observers, and Staverton dealt with W/T observers and radio observers.

Specialised types of observers began to be trained about this time for certain types of aircraft. The W/T observer combined the qualifications of an observer and a wireless operator, and was destined for long range fighters. The radio observer was qualified in navigation and radar (A.I.) and was destined for night fighters.

Conference in January 1942. Until arrangements for E.A.O.S. training had been made overseas, the school at Eastbourne went on working at its full capacity of 2,000 pupils.

S.60154

While these changes and re-arrangements were being made No.2 S. of A.N. went on uneventfully at Cranage. Its move from St. Athan was at first no advantage. The weather at Cranage was consistently poor, and for most of 1941 there was a lack of wireless facilities which handicapped flying. Bomber Command complained that the training of Hampden pilots was less adequate than it had been at St. Athan, but it was not possible to move No.2 S. of A.N. to a more satisfactory aerodrome. Cranage was dealing with a variety of miscellaneous courses - practically all to "s.n." standard and of six weeks' duration - which could not reasonably be moved out of the United Kingdom.

Training Overseas.

Overseas the variations of navigation training did not follow its changes in the United Kingdom. In Canada the combining of navigation and armament training at the same school was considered in April 1941, but was not introduced because of practical difficulties. The armament training stations were generally remote, with their ranges in deserted places, while the navigation schools (civil operated and working from ex-civil aerodromes) were near large towns: uprooting the civil schools and transferring them to remote places was hardly practicable. An alternative way of achieving the same end was adopted in May: the A.O.S. course was revised to include bombing instruction, so as to get the advantage of concurrent navigation and armament instruction, and the B & G.S. period (which included the bomb-dropping practices) was reduced to 4 weeks. At the same time astro training was moved from the A.N.S. to the

E.T.S.  
258/41  
266/41

May  
1941

/A.O.S.

A.O.S. (1) The A.O.S. course went up to 14 weeks, and the A.N.S. stage of observer training was dropped.

The basic training of observers in transferred schools increased during 1941. No.31 A.N.S., Port Albert, started to build up a population of 120 observers on basic courses in January, and the A.O.N.S. which moved to Vereeniging increased from 120 to 180 pupils in February. Two newly-formed schools in Canada, No.32 A.N.S., Charlottetown, and No.33 A.N.S., Hamilton, also trained observers. (2)

#### Civilian Maintenance

S.70633

In the United Kingdom some of the Air Observer Schools had maintenance and administrative difficulties arising from the employment of civil companies. Very soon after civilian maintenance began at A.O.S.'s - at the end of October 1941 - Flying Training Command asked for the system to be replaced by service maintenance on four grounds:- security (because there was no control over civilian workpeople living on the stations), discontent caused by disparity between service and civilian conditions and pay, discipline, and economy. This request for a change in the system was pressed strongly by Flying Training Command during the following two months, and Bobbington (where Marshalls Ltd. held the maintenance contract) became a test case.

The pros and cons were debated at considerable length. A large number of assertions were made and arguments advanced, many of them either speculative or erroneous. There were strong prima facie suggestions of service prejudice in Flying Training Command's opposition to the scheme when it was first proposed in May and in the

/Command's

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(1) In the United Kingdom, astro training was also introduced at the A.O.S. stage.

(2) No.33 A.N.S., Hamilton, at first trained Hampden pilots.

Command's haste to attack it as soon as it came into operation and before there was time for it to have a reasonable trial.

The opposition to civilian maintenance was based on:

- (i) Security (i.e. jeopardising the secrecy of such equipment as I.F.F. This was not a strong point: The equipment concerned was made by civilians and unreliable people could not be expected to become reliable when they put on a blue uniform).
- (ii) Discipline.
- (iii) Unsatisfactory maintenance. (This was a very contentious point, allegations of bad civilian servicing being met by counter-allegations that the service was making good maintenance impossible by failure to provide stores and spares and by allowing far too little time).
- (iv) Accommodation (it being suggested that the civilian maintenance staff wanted more and more expensive accommodation than a service staff).
- (v) Discontent among service personnel (caused by disparity in pay and conditions).
- (vi) Civilian staff could not be called on to help in the defence of the station (though of course the civilians could join the Home Guard).
- (vii) A bad effect on the pupils at the schools, caused by an atmosphere of inefficiency and indiscipline, and by the handicap of inefficient maintenance on air exercises.

The civil maintenance system was defended on the following grounds:-

- (viii) Civil maintenance was cheaper, both in man-power and money, than service maintenance. Moreover,

/it could make

it could make good use of people who were in one way or another unfit for the R.A.F. (This argument was somewhat confused in the discussions by the fact that the R.A.F. had at the time a surplus of man-power in a few maintenance trades).

- (ix) Difficulty and obstruction from the service side of the station over such matters as stores, transport, accommodation, and barrack stores. The C.O. had no responsibility to the operating company, and there was no incentive to co-operation. (Co-operation seemed remarkably absent at Bobbington, and would have avoided many petty troubles of which the most was made by exaggeration).
- (x) Civilian maintenance would be more efficient than service in the long run, when it had got into its stride.
- (xi) The opposition was based largely on service prejudice.
- (xii) Compensation (estimated at £25,000) would have to be paid if civil maintenance were terminated.

The schools concerned were affected in varying degrees, but there was at each of them a tendency for the service side to take a non possumus attitude on many matters, making civil maintenance the scapegoat for shortcomings. The same tendency was less strongly marked on the civilian side, which ascribed its defects mainly to lack of service co-operation. The friction was most acute at Bobbington and least noticeable at Dumfries.

In February 1942 a special investigation of the civil-maintained Air Observers Schools was made by Sir Harold Howitt, who found that there was a material saving in the numbers employed with civil maintenance, that the

/cost per

cost per head of civilians was much the same as that of service personnel, that serviceability of aircraft was worse with civil than it was with service maintenance, and that there was nothing very weighty in the security and defence arguments. He did not consider the difficulties of running a station with a mixture of service and civilian staff to be as great as they were made out to be - and pointed out their reflection on the discipline of the R.A.F. He said that the C.O. should take an interest in the civilians, and that he should be picked carefully with this in mind.

Sir Harold Howitt came to the conclusion that civil maintenance had not proved a failure. Improvements, however, were necessary, and he made a number of detailed recommendations, the chief being that the scheme should be given three months' further trial and the service side of the stations concerned instructed to co-operate.

This was not the end of the matter. Sir Arthur Street (P.U.S.) observed that a decision to replace civil by service maintenance might be held to show:-

- (i) that labour had become slack and uncontrollable,
- (ii) that the R.A.F. was able to obstruct a decision of the Air Council,
- (iii) that civil maintenance was inefficient - a suggestion which the civilian contractors would resent.

Captain Harold Balfour (U.S. of S.(C)) said it was clear that the best was not being got out of the schools, and that the civil maintenance system could not be patched up to get the best out of them because there was prejudice everywhere. He diagnosed the main fault as lack of direct responsibility: the C.O. had only circuitous control over civilian maintenance.

/Finally,

Finally, on 2nd April 1942, it was decided to end the civil maintenance system at the three A.O.S's.<sup>(1)</sup> The reasons were division of responsibility, lack of discipline among civilian employees, and disparity in pay and conditions which could not be explained away to people in the service. Discipline depended on control by the C.O. There was prejudice, but it was honest prejudice and must be accepted. The general principle was laid down that there could be civil maintenance where there was civilian control of operation as well as maintenance, but that in other cases there must be service maintenance, i.e. that control of a school's functional operation should not be divided from control of its aircraft maintenance.

#### Transfer Overseas

In September 1939 the advantages of transferring United Kingdom schools out of the operational area were not considered worth the dislocation and loss of output which would be involved - at least not until a much larger training organisation made the loss of output comparatively unimportant and many more operational aerodromes made air congestion in the United Kingdom serious.

By July 1940 the balance had changed. The imminent threat of heavy attack which followed from the German conquest of France was expected to produce serious difficulties for schools in the United Kingdom because of:-

- (i) the restriction of areas, height and weather conditions for training flights in order to leave the air clear for fighter operations,
- (ii) the vulnerability of training aircraft,
- (iii) the vulnerability of training aerodromes,

/(iv)

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(1) And also at Staverton.

- (iv) the vulnerability of lighted training aerodromes at night, particularly when the aerodromes were near factories or storage units.

These difficulties would press heavily on navigation schools and S.F.T.S's, and more lightly on schools chiefly concerned with local flying by day. Moreover, the troubles of limited flying areas and war-time night flying had already proved considerable, even when they were not accentuated by the threat of imminent close-range attack.

Canada was quick to realise the changed situation, and decided by the end of May to give all possible help if schools had to be moved out of the United Kingdom. Britain was informed unofficially of Canada's readiness to provide homes for schools from the United Kingdom, but it was still considered that conditions did not justify interruption of training and loss of output.

At the end of June, however, A/V/M McKean in Ottawa was asked to find out if Canada could make room for S.F.T.S's transferred from the United Kingdom without upsetting the planned development of the Empire Scheme. Canada had made excellent progress in building aerodromes, and the reply, given on 1st July, was that transferred schools could be accommodated. There would naturally be some interference with the Empire Scheme because schools from the United Kingdom would have to use the most nearly finished aerodromes if they were to go on training with the least possible delay, but the interference would not be serious if a revised building scheme were put in hand quickly.

By 8th July the Air Ministry decided that it would be desirable to move four S.F.T.S's out of the United Kingdom immediately. (1) Canada, Southern Rhodesia, and South

/Africa

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(1) The possibility that such a move might become necessary had already been raised to the War Cabinet.

S.5614 .

May  
1940.

E.T.S.  
44(40)

July  
1940

Africa were considered as possible destinations, but the balance was heavily in favour of Canada because aerodromes and buildings would be available more quickly there, because the resources of the United States would be near at hand, and because communications with Africa might become difficult. The moves were expected to take one or two months, and there was talk of borrowing an aircraft carrier from the Admiralty to take the schools' aircraft across the Atlantic.

Transfer to Canada.

S.62894

An official request for transfer to Canada was made on 13th July 1940. It asked that four S.F.T.S's, complete with their staff, equipment, and aircraft, might be received from the United Kingdom, and proposed that they should be administered generally by the R.C.A.F. (1) Canada agreed on 15th July, and said that four aerodromes - relief landing grounds for Empire Scheme schools - could have the necessary buildings ready by 31st August and second runways finished by the end of September. Canada asked at the same time whether it was proposed to transfer any more schools, (2) in order that any necessary changes in the building programme might be made.

E.T.S.  
56/40

The request made on 13th July had been only a feeler: it was intended to move more than four S.F.T.S's, and other types of school as well. The R.A.F. would ultimately, when it had expanded, need the backing of some 60 S.F.T.S's, of which only six (for experimental purposes) would be in the United Kingdom. The hoped-for schools in France and Morocco had vanished, and as a result some 20

/S.F.T.S's

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(1) The schools were to continue to draw their pupils from the United Kingdom.

(2) The "foreign military force" objection to R.A.F. schools which had existed before the war disappeared because a Visiting Forces Act would apply to the R.A.F. in Canada as it applied to Canadians in the United Kingdom.

S.F.T.S's over and above the Empire Scheme now had to be located overseas.

S.62894

On 18th July the United Kingdom expressed appreciation of Canada's alacrity, and asked that fourteen schools<sup>(1)</sup> might be accommodated, four of them (S.F.T.S's) by the autumn of 1940. R.L.Gs were wanted for the S.F.T.S's, the United Kingdom would bear the cost, all the schools should be compactly located for ease of R.A.F. control, and building should be put in hand at once. Canada agreed generally to this request on 21st July, but pointed out that the transferred schools could be accepted only because of the good progress already made with Empire Scheme aerodromes, that compact location for the transferred schools was impracticable, and that the number of R.A.F. schools to be transferred was so large that R.C.A.F. control was necessary. Because the preparations for the Empire Scheme had been an indispensable preliminary to the acceptance of transferred schools Canada stipulated that the supply of aircraft should enable the Empire Scheme to develop according to plan.

Transfer to South Africa.

Transferring schools from the United Kingdom to South Africa was also pursued in spite of the fact that it appeared less promising than transfer to Canada. The development of flying training in South Africa was considerably less advanced than it was in Canada. There was no Empire Scheme in the Union, while plans for joint South African and R.A.F. training had been agreed only six or seven weeks earlier and were still in a fluid and early stage. It was moreover not certain that schools from the United Kingdom would be politically welcome, and although

/there was

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(1) 8 S.F.T.S's, 2 A.O.N.S's, 1 B. & G.S., 1 S. of G.R., 1 A.N.S., and a Torpedo Training School.

there was plenty of shipping available to South Africa<sup>(1)</sup>  
it seemed unlikely that communications would be maintained as  
effectively as with Canada.

S.62905

July  
1940

None the less, on 20th July, a request was sent to  
General Smuts that the Union would accept the transfer of  
four schools from the United Kingdom. The schools concerned  
were an A.O.N.S., a School of Air Navigation, a School of  
G.R., and a F.A.A. Observers School which the Admiralty  
wanted to put in South Africa. (Although the approaches

E.T.S.  
57 (40)

to Canada had laid stress on moving S.F.T.S.'s, there was in  
fact less urgency about moving pilot training out of the  
United Kingdom than there was about navigation and G.R.  
training). There was a danger that the request might be

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politically inopportune, but on 26th July, General Smuts  
accepted the proposals in principle. The schools were to  
be administered by South Africa through senior officers from  
the United Kingdom, the United Kingdom was to bear the cost  
and provide the equipment, and the schools were to be additional  
to those already planned in South Africa.

Plans and Problems

S.62894

At the end of July the schools earmarked for transfer  
from the United Kingdom during 1940 were:-

July  
1940

No.1 S. of A.N., from St. Athan to South Africa.

An A.O.N.S. of 180 pupils from Prestwick (part of  
No.1 A.O.N.S.), to South Africa.

No.7 S.F.T.S., from Peterborough to Canada.

No.10 S.F.T.S., from Ternhill to Canada.

No.12 S.F.T.S., from Grantham to Canada.

No. 6 S.F.T.S., from Little Rissington to Canada.

No. 1 S. of G.R., from Squires Gate to South Africa.

There were various limitations and conditions on transferring  
these schools. Deliveries of aircraft to Canada, South

/Africa

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(1) At the time it was considerably easier to find shipping  
space to South Africa than to Canada.

Africa, and Southern Rhodesia for other training schemes were not to be interfered with; only one S.F.T.S. was to move at a time because of the dislocation of output; and moves to Canada were to be made while the St. Lawrence River was open.

Transfer brought up a number of other problems. A.O.N.S's in the United Kingdom were civilian operated, but there would be political objections to United Kingdom companies operating A.O.N.S's in South Africa, and there were no suitable South African civil firms to operate them. The A.O.N.S's would therefore have to be service-operated, and the United Kingdom civil companies would have to be compensated. Again, one of the S. of A.N's chief functions was the teaching of astro, but there were no astro tables for the southern hemisphere: if the school went to South Africa it could train only "s.n." pupils. Aircraft were a constant difficulty: the S.F.T.S's could not have more than their I.E. without interfering with Empire Scheme deliveries, and there were barely enough Ansons for the navigation schools.

The plans were changed so that two A.O.N.S's would go to South Africa, and a S. of A.N. to Canada, and early in August it was intended to transfer:-

S.62894  
S.62905

Peter (No. 7 S.F.T.S., Peterborough) to Canada,  
starting on 16th September.

Tern (No.10 S.F.T.S., Ternhill) to Canada, starting  
on 12th September.

August  
1940

Grant (No.12 S.F.T.S., Grantham) to Canada, starting  
on 7th October.

Mare (No.5 A.O.N.S., Weston-super-Mare) to South Africa

Prest (An A.O.N.S. of 120 pupils from Prestwick) to  
South Africa, starting on 23rd September.

Gate (No.2 S. of G.R., Squires Gate) to South Africa  
starting on 12th December.

Card (No.1 S. of A.N., St. Athan) to Canada.

Small No.6 S.F.T.S., Little Rissington) to Canada.

/Squire

Squire (No.1 S. of G.R., Squires Gate) to Canada. Later in August, Squire and Gate were interchanged, so that Squire was to go to South Africa, and Gate to Canada. Mare was eventually to do "s.n." as well as observer training, and Card to train observers as well as "N" specialists and astro pupils. Each move, whether to Canada or South Africa, was estimated to involve a seven-week break in training.

These transfer plans, however, were opposed by Lord Beaverbrook<sup>(1)</sup> on the grounds that a high proportion of spares would be locked up in transit (and a large number of aircraft therefore idle, so that more aircraft would be needed) and that the schools would be divorced from the skilled technical backing of the aircraft industry. At a Cabinet meeting on 20th August, Lord Beaverbrook added the further objections that the loss of trained output would be heavy, that it would be folly to disperse the "last reserves" of instructors and aircraft, and that large-scale transfer overseas would exaggerate the scale of German attack and give rise to false rumours. He urged that it would be better to form new schools overseas, and that the risk of casualties to trainer aircraft and pupils from enemy action was small and should be accepted.

Against these arguments Sir Archibald Sinclair put forward the handicaps on training in the United Kingdom, the urgent need for a larger operational force, and the fact that no aircraft were available to start more new schools than were already planned. Maintenance difficulties would be greater outside the United Kingdom, but they would not be insuperable.

Towards the end of August the Prime Minister decided that it would be unwise to take any large part of the

/United Kingdom's

W.P. (40)  
323  
August  
1940

W.P. (40)  
326

W.P. (40)  
238

W.P. (40)  
327

W.P. (40)  
338

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(1) See Appendix 30.

United Kingdom's reserves of men and machines out of the country while the air battle was in progress. Transfer plans were therefore to be postponed, in general, until the beginning of December. Night flying training would have to go on as much as possible in the United Kingdom, perhaps with the help of new methods such as infra-red lighting. More aerodromes were to be built rapidly. Preparations for the reception of schools in the Dominions were to go ahead, and the first navigation school should move to South Africa, since navigation training was especially handicapped in the United Kingdom. Canada was told of these decisions on 5th September. (1)

Two navigation schools, Card and Mare, moved as had been planned. One S.F.T.S., Peter, had already begun to move, and went on moving. The rest of the transfer programme was held up until late in October, when Tern, Squire, and Prost started to leave the United Kingdom. Gate did begin to move until December. Complete transfers of existing schools then came to an end, and new R.A.F. schools were started overseas, as Lord Beaverbrook had proposed, on the aerodromes which had been earmarked for transferred schools. These new schools were intended, eventually, to replace United Kingdom schools, and were often called "transferred". In fact, however, only five schools were transferred as going

/concerns

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(1) Appendix 49. Telegram from Mr. Churchill to Mr. Mackenzie King dated 5th September, 1940. (S.62894).

concerns<sup>(1)</sup> (Peter, Tern, Gate, Squire, and Card). Of the

rest of the original programme, Prest and Mare were new

service-operated schools replacing civil-operated A.O.N.S.'s

at Prestwick and Weston-super-Mare while Grant and Small

became new schools which formed in the United Kingdom and

started training in Canada.<sup>(2)</sup>

/Armament training

(1) The process of bodily transfer was lengthy. The schools moved in echelons to minimise dislocation, sections going overseas as the end of a course in the United Kingdom enabled them to move in a period between courses.

Peter began to move on 26th August, started training in its first course in Canada on 7th October, and was working at full capacity again on 24th February 1941.

Tern began to move on 21st October, started training in Canada on 9th December, and was at full capacity in Canada on 20th January 1941.

Card began to move (specialist "N" and astro) on 30th September started training in Canada on 18th November, and added the basic training of 120 observers on 6th January 1941.

Squire began to move on 30th September, started training in South Africa on 1st December, and was at full capacity in South Africa on 12th January 1941.

Gate began to move on 12th December and started training in Canada on 20th January 1941.

Mare closed (as No. 5 A.O.N.S.) on 1st September, and began training (as a Service operated school) in South Africa on 22nd October. In February 1941 "s.n." courses were begun in addition to the basic training of 120 observers.

Prest closed (as part of No. 1 A.O.N.S.) on 23rd October, and began training (as a Service operated school) in South Africa on 23rd December. Its size was increased from 120 to 180 pupil observers in February 1941.

The size of the schools, when transferred, was:-

Peter:- 52 officers, 996 airmen, 72 + 36 Battles, (152 pupils)

Tern:- 57 officers, 1103 airmen, 72 + 36 Harvards, (152 pupils)

Card:- 101 officers, 763 airmen, 40 + 16 Ansons, (204 pupils)

Squire:- 142 officers, 419 airmen, 27 + 9 Ansons (96 pupils)

Gate:- 94 officers, 530 airmen, 27 + 9 Ansons (96 pupils)

Mare:- 27 officers, 275 airmen, 16 + 8 Ansons (120 pupils)

Prest:- 27 officers, 375 airmen, 16 + 8 Ansons (120 pupils)

The locations after transfer were:-

Peter:- Kingston, Ont. (No. 31 S.F.T.S.)

Tern:- Moose Jaw, Sask. (No. 32 S.F.T.S.)

Card:- Port Albert, Ont. (No. 31 A.N.S.)

Squire:- George, S.A.

Gate:- Charlottetown, P.E.I., (No. 31 S. of G.R.)

Prest:- Vereeniging, S.A.

Mare:- Oudtshoorn, S.A.

(2) Grant (No. 33 S.F.T.S.) formed at Wilmslow on 20th Nov. 1940, and started training at Carberry, Man., on 1st Jan. 1941. Small (No. 34 S.C.T.S.) formed at Wilmslow on 26th Feb. 1941 and started at Medicine Hat, Alta, on 14th March.

S.5614

Armament training had to be arranged for observers from the transferred navigation schools. So far as Mare and Prest were concerned, two of the armament schools in the main South African scheme were used. Observers from Card in Canada were catered for by opening a B. & G. School, Bray, in April 1941. (1) The Third Revise was introduced into United Kingdom schools during October 1940, and was applied to transferred S.F.T.S's with the exception of Peter. (2) Overbearing of 25%, increasing the pupil population to 200, was also applied to the transferred S.F.T.S's.

S.62894

The reasons for the selection of the schools transferred in 1940 were straightforward. Card, Squire, Gate, Prest and Mare were moved because navigation training flights, and particularly flights over the sea, were virtually impossible in the United Kingdom. Peter moved because Peterborough was in the operational area, and was in any case not a very satisfactory aerodrome for a S.F.T.S. Ternhill was wanted as a fighter station. (3)

Transfers in 1941.

E.T.S.  
69(40)

At first the S.F.T.S's transferred to Canada were fed from E.F.T.S's in the United Kingdom, but Canada's desire to undertake more training brought about a decision in February 1941 to form two "transferred" E.F.T.S's. These (4)

/were service

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(1) Bray (No.31 B. & G.S.) was a "transferred" school of the type which formed as a new school in the United Kingdom and started training overseas. It formed in the United Kingdom on 5th March 1941 and arrived at Picton, Ont., on 2nd April.

(2) Peter, which was training for the F.A.A., was governed by the Admiralty's requirement of 16-week courses.

(3) In fact, although fighters operated from Ternhill, the station was occupied by No.5 S.F.T.S. after No.10 S.F.T.S. went to Canada.

(4) Fauna (No.31 E.F.T.S.) started training at Calgary, Alta., on 16th June 1941, and moved to De Winton, Alta., in October 1941. Litmus (No.32 E.F.T.S.) started training at Swift Current, Sask, on 14th July, and moved to Bowden, Sask., in November 1941. (Calgary and Swift Current were S.F.T.S. stations at which these E.F.T.S's were temporarily accommodated). Each had 180 pupils.

were service operated schools, and started training in June and July 1941.

After Peter and Tern had moved to Canada, and Grant and Small had started work, four of the eight transferred S.F.T.S.'s asked for in the 14-schools request of July 1940 were in operation. The remaining four, Nos. 35, 36, 37, and 39, opened between August and November 1941. (1)

Feb.-May  
1941.

S. 5614.

Canada was anxious to undertake more training, and after considerable discussion whether the additional R.A.F. schools called for by the expansion programme should be located in Canada, the United States, or Southern Rhodesia, she was asked in May 1941 to find room for another six "transferred" S.F.T.S.'s. Two of the six (2) were opened in the winter of 1941-1942 (making ten transferred S.F.T.S.'s in all) and the other four left until the summer of 1942.

August 1941

Early in August it was decided to replace E.F.T.S. capacity in the United Kingdom by opening six more E.F.T.S.'s, each with 180 pupils, in Canada. They were to be service operated schools. Four of them (3) started work between January and March 1942.

#### Initial Difficulties

Throughout the setting up of transferred schools in Canada aircraft were a constant difficulty. There were never enough intermediate trainers to allow S.F.T.S.'s to start appropriately or adequately equipped for their

/work.

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(1) No. 35 S.F.T.S. (T.E.) started at North Battleford, Sask., on 19th August 1941, No. 36 S.F.T.S. (T.E.) at Penhold, Alta., on 29th September 1941, No. 37 S.F.T.S. (T.E.) at Calgary, Alta., on 21st October 1941, and No. 39 S.F.T.S. (S.E.) at Swift Current, Sask., on 28th November 1941.  
(2) No. 41 S.F.T.S. (T.E.) started at Weyburn, Sask., in February 1942. No. 38 S.F.T.S. (T.E.) was delayed, and started at Estevan, Sask., in April 1942.  
(3) No. 33 E.F.T.S., Caron, Sask., began on 9th January, No. 34 E.F.T.S., Assiniboia, Sask., on 28th February, No. 35 E.F.T.S., Neepawa, Man. on 14th March, and No. 36 E.F.T.S., Pearce, Alta., on 29th March.

work. (1) Peter had to start in December 1940 with Harvards borrowed from schools which could not really afford to spare them: Battles began to arrive in January, but by April a very high proportion of them were unserviceable for lack of spares. Tern was seriously short of aircraft (it was equipped with Harvards) until the autumn of 1941. Grant, which was intended to be a T.E. school, had to start with Harvards because of the shortage of Ansons, and was not completely equipped with T.E. aircraft until May 1941: it was short of aircraft throughout 1941, and had a high proportion of its Ansons unserviceable for lack of spares. Small was also partly equipped with Harvards instead of Oxfords. Nos. 35, 36 and 37 S.F.T.S's had to be equipped with Oxfords: their aerodromes were some 2,500 to 3,600 feet above sea level, but it was Hobson's choice: all available Ansons were wanted for the Empire Scheme or for navigation schools, what Harvards there were for transferred schools were earmarked for No. 31 S.F.T.S., and Canada would not accept Masters or Battles.

Peter and Tern had a difficult time when they were first transferred in the winter of 1940-41. The aerodromes were unfinished, the camps unprepared, and there was enforced idleness because aircraft were scarce and the aerodromes unfit for use. At first pupils learned less than if they had stayed in England, while food was inadequate and it was necessary to supplement messing with extras bought out of pay. These difficulties disappeared as the schools settled down, buildings were finished, and proper training became possible. Morale, however, continued for some time to be affected because schools in Canada were in safety while civilians were exposed to attack in the United Kingdom and

/because

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(1) Elementary trainers were never a handicap. The supply was always satisfactory.

S.5614

E.T.S.  
163/41  
E.T.S.  
187/41

because there were no free passages to Canada for families.

#### Other Developments

Outside pilot training in Canada there was comparatively little extension of "transferred" schools. An E.F.T.S. and S.F.T.S. which had originally been intended for Kenya were actually set up in South Africa - the E.F.T.S. at Wonderboom and the S.F.T.S. at Waterkloof - in February 1941. For a time these schools retained their R.A.F. numbers (No.30 E.F.T.S. and No.16 E.F.T.S.), but they were merged later in 1941 in the South African training scheme. Two more navigation schools were "transferred" to Canada - Cedar and City. City began work at Hamilton (Mount Hope) Ont. in June, and Cedar started at Charlottetown, P.E.I. in August 1941.<sup>(1)</sup> Both gave observers their basic navigation training (City at first trained Hampden pilots), and ran astro courses until astro navigation was included in the basic course.

The distinction between transferred schools and those established under other schemes disappeared in South Africa in June 1941. In Canada the transferred schools and the Empire Scheme schools were unified after May 1941, and the R.A.F. schools set up after this date were more closely connected with the general development of training in the Dominion than with transfer from the United Kingdom because of German attacks and operational restrictions.

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(1) City, No.33 A.N.S. began training on 9th June 1941.  
Cedar, No.32 A.N.S. began training on 18th August, 1941.  
(City was at first known as No.31 A.O.S.)

C A N A D A

E.T.S.  
50(40)

The first Canadian Empire Scheme pupils began their initial ground training at Toronto on 29th April 1940 and passed on to elementary flying training on 27th May. No E.F.T.S. was, however, ready by that date and the pupil pilots<sup>(1)</sup> had therefore to be given their ab initio instruction at some fifteen flying clubs before going to No.1 S.F.T.S. at Camp Borden on 22nd July.

Criticism and the Accelerated Programme.

May 1940

By the beginning of May public opinion in Canada was critical of the Empire Scheme's apparently slow progress, and criticism increased as Germany overran Holland, Belgium and France. In fact, the scheme's progress was reasonably satisfactory if it was remembered that work had not begun until after the Riverdale Agreement was signed on 16th December. Instructors and staff were being trained at Trenton, Camp Borden, and St. Thomas, while aerodrome construction was going ahead well. Some delay was being caused by the Canadian C.A.S's 'over-centralisation of executive work and by the rigidity of departmental control, but the scheme's late start was the main reason for the absence of large or quick results which was the target of public criticism.

A.H.B.  
IIIC/3/5

The late start had been caused by protracted negotiations in the autumn of 1939, and the protracted negotiations had followed from the lukewarm attitude of the Canadian Government expressed by Mr. Mackenzie King in statements that "it was not Canada's war in the same sense that it was Great Britain's" and that the Empire Scheme was an idea "suggested by the British Government, and for which the British Government must be mainly responsible." The Canadian Government could not well offer this explanation in the summer of 1940, and

/public agitation

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(1) Observer pupils went to No.1 A.O.S. at Malton, Ont., which started work on 27th May.

public agitation against the scheme's slow progress continued to grow.

E.T.S.  
48 (40)

May  
1940

A/V/M Croil was replaced as Canadian C.A.S. by A/V/M Breadner in May, and the new C.A.S. was given instructions to make development less dependent on central control and to collaborate more closely and effectively with the United Kingdom Liaison Mission. The Canadian Government actively fostered and encouraged the scheme, and an accelerated programme for producing larger and quicker results in 1940 was drawn up. This accelerated programme planned to have 8 S.F.T.Ss, instead of 5, in operation by the end of the year, with a corresponding increase in other types of school.

E.T.S.  
65(40)

E.T.S.  
50 (40)

The accelerated programme, however, was completely hamstrung by the embargo on sending aircraft and instructors out of the United Kingdom. Training in Canada was almost entirely dependent on the supply of aircraft from Britain, and the effect of the embargo was not merely to make expansion and acceleration impossible but to compel a contraction of the original plan whereby only 4 instead of 5 S.F.T.Ss would be at work by the end of 1940. Plans were made for building Ansons in Canada, but they, like plans for aircraft production in the United States, could not improve the situation for at least six months or a year. An attempt to buy suitable "ready made" aircraft in the United States produced only 27 machines. The Canadian Government could therefore make no answer to the public pressure for larger and quicker results. Canadian dissatisfaction with the Empire Scheme's progress became known in the United Kingdom, and the various factors involved were explained by A/V/M McKean at the end of June. (1)

When the question of transferring schools from the United Kingdom to Canada was raised at the beginning of

/July

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(1) Appendix 50. Letters from A/M Gossage to A/V/M McKean dated 5th June 1940 and from A/V/M McKean to A/M Gossage dated 28th June 1940. (E.T.S. 49(40) and 65 (40)).

July 1940

July, the Canadian Government saw a prospect of intensified public criticism that transferred schools working at full establishment would be contrasted with the tardy and stunted development of the Empire Scheme. Mr. Power

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(Canadian Minister for Air), against whom the agitation had chiefly been directed, threatened to resign and put the blame for his resignation on the United Kingdom because of their failure to provide aircraft.

The embargo was lifted on 9th July, and the United Kingdom undertook to supply enough Ansons and Battles to enable the accelerated programme to be carried out. Canada made this undertaking a condition of accepting the transfer of schools from Great Britain,<sup>(1)</sup> and also put itself in a position to meet accusations of delay by insisting on an acknowledgement that transfer was made possible only by the Empire Scheme's<sup>(2)</sup> good progress.

#### Preparation and Initial Openings

Both the accelerated programme and the acceptance of transferred schools depended on the speed with which construction went ahead. The chain of aerodrome developed since 1936 for the trans-Canada airway was providing an excellent nucleus for the Empire Scheme's stations.<sup>(3)</sup> Some 24 aerodromes were spared from their civil use as part of the chain for conversion into schools, while the work already done on the trans-Canada airway had created an invaluable fund of constructional knowledge and experience.

/The training

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(1) See page 392.

(2) At about this time the Empire Scheme began to be called the Joint Air Training Plan, or J.A.T.P. For simplicity and convenience, however, the name "Empire Scheme" is used throughout in this narrative.

(3) Paper on Aerodrome Construction for the British Commonwealth Air Training Plan 1940 by Mr. J.A. Wilson (Canadian Controller of Civil Aviation). (Montreal Branch of the Engineering Institute of Canada).

The training aerodromes were widely spread, partly for the sake of development (particularly of post-war civil aviation) throughout the Dominion, and partly to ensure that all parts of the country benefitted from the large expenditure on building. In spite of the difficulties of distance and water supply entailed when aerodromes had to be constructed in Western Canada, progress was rapid. By the end of September 1940 the aerodromes for some 32 schools were ready, and another 33 schools were complete by the end of the year.<sup>(1)</sup> In fact, by the end of 1940 more aerodromes than the original programme had required were ready—eighteen months ahead of schedule.<sup>(2)</sup>

The original R.C.A.F. establishments at Trenton, Camp Borden, and St. Thomas <sup>(3)</sup> were used for training the instructors and ground staff needed by the first Empire Scheme Schools, and a nucleus of 68 officers and 182 airmen arrived from the United Kingdom in February to help with this staff training, but there was little further reinforcement of experienced men from the R.A.F. In June a number of Canadian instructors who had been trained for the Empire Schools were sent to the United Kingdom to help meet the serious shortage of pilots there. Some of these instructors were replaced by experienced pilots from the United States, but the employment of Americans in the

S.62894

/Empire Scheme

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(1) The aerodromes varied in design. The A.F.T.Ss had turf surfaces. The A.O.Ss, A.N.S's, B. & G.S's, and relief landing grounds for S.F.T.S's each had three 1,000 yard runways 500 feet wide. The parent aerodromes of S.F.T.S's had three 1,000 yard runways 1,000 feet wide.

(2) The original programme had been due for completion by mid-1942.

(3) Flying instructors were trained at Trenton and Camp Borden, armament and navigation instructors at Trenton, and ground staff mainly at St. Thomas. After Camp Borden became No.1 S.F.T.S. of the Empire Scheme, in July, all flying instructor training was done at Trenton.

Empire Scheme helped to intensify public criticism of the scheme's slow development. In August Canada asked the United Kingdom for 106 experienced men as instructors and staff pilots to enable the accelerated programme to be carried out. The United Kingdom, however, could spare only 49 staff pilots, and so nearly two thirds of the first pilot output from the Empire Scheme in Canada had to be "ploughed back" as instructors to enable the later schools to open towards the end of 1940. In addition, some 118 instructors and staff pilots went to Canada in September from the United States.

E.T.S.  
38 (40)

November  
1940

E.T.S.  
104 (40)

Apart from No. 1 Initial Training School at Toronto, the first Empire Scheme School to open in Canada was No. 1 A.O.S. at Malton, Ont. The first E.F.T.S's began at Malton, Fort William, Ont., London, Ont., and Windsor Mills, P.Q., on 24th June. (1) No. 1 S.F.T.S. started at Camp Borden on 22nd July. The first B. & G. School opened at Jarvis, Ont., on 19th August, and the first A.N.S. at Rivers, Man., on 25th November.

#### The Accelerated Programme

The accelerated programme was carried out, and by the end of 1940 8 S.F.T.S's, 16 E.F.T.Ss, 4 A.O.S's, 3 B. & G.S's and 1 A.N.S. were at work. These were the target figures which the programme set, but they were achieved with great difficulty because of shortage of aircraft. In fact, the last two S.F.T.S's to be opened before the end of the year had only seven aircraft between them instead of the 72 appropriate to their stage of development, while the full establishment of an S.F.T.S. was reduced from 108 to 100 (2) in order to spread the available aircraft over more schools.

E.T.S.  
74 (40)

/Again, the

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(1) Ab initio training at flying clubs ended when these E.F.T.S's opened.

(2) In July 1940.

Again, the proportion of S.E. pilots being trained was higher than it should have been, and the proportion of T.E. far lower, because the United Kingdom could not supply enough Ansons. Oxfords were not successful in Canada, and their use was opposed by the R.C.A.F.

E.T.S.  
74(40)  
E.T.S.  
71(40)  
90(40)

The Canadian training organisation at the end of 1940<sup>(1)</sup> consisted of thirty Empire Scheme schools, and four transferred schools. Its growth in the second half of 1940 /was very rapid,

(1) No.1 S.F.T.S. Camp Borden, Ont.	No.5 S.F.T.S. Brantford, Ont.
No.2 " Ottawa, Ont.	No.6 S.F.T.S. Dunnville, Ont.
No.3 " Calgary, Alta	No.7 S.F.T.S. McLeod, Alta.
No.4 " Saskatoon, Sask.	No.8 S.F.T.S. Moncton, N.B.
No.1 E.F.T.S. Malton, Ont.	No.9 E.F.T.S. St. Catherine's, Ont.
No.2 " Fort William, Ont.	No.10 " Hamilton (Mt. Hope) Ont.
No.3 " London, Ont.	No.11 E.F.T.S. Cap de la Medeleine
No.4 " Windsor Mills, P.Q.	No.12 E.F.T.S. Goderick, Ont.
No.5 " Lethbridge, Alta.	No.13 " St. Eugene, Ont.
No.6 " Prince Albert, Sask.	No.14 " Portage la Prairie, Man.
No.7 " Windsor, Ont.	No.15 " Regina, Sask.
No.8 " Vancouver, B.C.	No.16 " Edmonton, Alta.
No.1 A.O.S. Malton, Ont.	No.3 A.O.S. Regina, Sask.
No.2 " Edmonton, Alta.	No.4 " London, Ont.
No.1 B. & G.S. Jarvis, Ont.	No.2 B. & G.S. Moss Bank, Sask.
No.1 A.N.S. Rivers, Man.	

Transferred Schools

No.31 S.F.T.S. (Peter) Kingston, Ont.	(planned as No.10 Empire Scheme S.F.T.S.)
No.32 " (Tern) Moose Jaw, Sask.	(planned as No.11 Empire Scheme S.F.T.S.)
No.33 " (Grant) Carberry, Man.	(planned as No.13 Empire Scheme S.F.T.S.)
No.31 A.N.S. (Card) Port Albert, Ont.	(Planned as No.1 Empire Scheme (A.N.S.))

was very rapid, but at the end of the year it was still less than half its ultimate planned size, and its output in 1940 was small.<sup>(1)</sup> The accelerated programme aimed at bringing forward the date of completion for the whole Empire Scheme in Canada from mid-1942 (as planned by the Riverdale Agreement) to the summer of 1941. The scheduled opening dates of schools were advanced by anything from three months to a year, while the number of schools was increased as a result of the policy of scattering half-size E.F.T.Ss<sup>(2)</sup> (two of which were needed to supply the intake to one S.F.T.S) widely throughout the Dominion (the Riverdale Agreement had planned a smaller number of full-size E.F.T.Ss). This multiplicity of small E.F.T.Ss proved of considerable help in speeding up the Empire Scheme, because the organisation was elastic enough to respond quickly to a sudden demand for larger output.

Shortage of aircraft was not the only handicap under which the accelerated programme was carried out. There was a serious lack of spares, especially for Cheetah engines, which considerably aggravated the shortage of aircraft. Too little allowance was made by the United Kingdom for the quantity of spares required in a large country where long distances and transit time were an important factor in supply; Canada made errors in demanding the spares that were needed; and there were mistakes, as well as difficulty, /in shipping.

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(1) 47 pilots, 114 observers, 149 W.Op.A.Gs, and 19 A.Gs were sent from Canadian Empire Scheme Schools to reinforce the R.A.F. before the end of 1940. 37 of the pilots were Australian, the rest being Canadians. Most of the schools opened too late in the year to produce any output before 1941. In addition, 165 pilots were retained in Canada for service as instructors. The first arrivals from the Empire Scheme reached the United Kingdom at Liverpool on 24th November, 1940.

(2) The Empire Scheme E.F.T.Ss and A.O.Ss were civilian operated schools

in shipping. Careful attention had to be paid to this matter, since lack of spares could easily be interpreted as a failure on the part of the United Kingdom to honour her obligations and back up Canada's efforts. When A/V/M Breadner visited Britain at the end of 1940 a special effort was made to show him that Canadian schools were no worse off for spares than schools in the United Kingdom.

E.T.S.  
166(41)

During the summer and autumn of 1940 courses in Canada were shortened in conformity with United Kingdom changes. When No.1 S.F.T.S. began work in July the period of S.F.T.S. training was 14 weeks<sup>(1)</sup> and the syllabus included practical armament training. Canada was kept informed of the various changes debated during August, and was asked in September to introduce the Third Revise. There were good reasons for caution and avoiding undue haste over shortening courses in Canadian schools: teething troubles were inevitable in newly opened units and most of the instructors were inexperienced. Nevertheless, Canada agreed with the best of spirit to introduce the Third Revise, and the Empire Scheme S.F.T.S.'s began to train on 72-day courses in October,<sup>(2)</sup> though without the 25% overbearing which was brought into force in the United Kingdom. The change made little difference to the immediate output of pilots in 1940, but produced a rapidly mounting schedule for 1941.

E.T.S.  
76(40)

147  
October

E.T.S.  
93(40)  
94(40)

E.T.S.  
94(40)

Further Plans

By the end of 1940 Canadian training had made notable  
/progress.

S.58474

(1) It was at first thought that reduction of the S.F.T.S. course to 10 weeks would be practicable in Canadian and other overseas schools earlier than in the United Kingdom. The Third Revise, however, made considerable extra demands for flying hours: whereas a 16 week course called for 4320 hrs. from an S.F.T.S. with 160 pupils, the Third Revise required 4960 hrs. for the same number of pupils, or 6192 hrs. with 25% overbearing. The Canadian schools were working with a lower establishment of aircraft and were hampered by the spares difficulty.  
(2) The E.F.T.S. course became 48 days. S.F.T.S. intakes of 56 pupils, were made at 24-day intervals.

progress. The Empire Scheme had been accelerated, transferred schools from the United Kingdom had been received, and the Third Revise had been introduced, in spite of scarcity of aircraft, lack of spares, and Britain's inability to provide more than a handful of instructors. Canada was well aware of the effort she was putting into training, and set considerable store by its success. Much still remained to be done: over half the Empire Scheme schools had yet to begin work and ten more transferred schools had to be set up: but Canada began to display ~~conscious~~ pride in what was being done. Well satisfied with what had already been achieved, she became anxious to undertake whatever further training might be wanted and concerned to have Canadian training acknowledged excellent in quality as well as quantity.

Plans for further training, however, were almost entirely dependent on the supply of trainer aircraft. More schools were wanted to back the planned ultimate first line force, but the United States was the only promising source of aircraft for use in them. When, in November 1940, Canada offered to expand her training organisation over and above the Empire Scheme and the fourteen transferred schools that had been agreed, the United Kingdom suggested tentatively that six more S.F.T.S's might be started in Canada if Canadian production of trainers were developed. The possibility of training in the United States was being considered at this time, and the question of whether the S.F.T.S's should be in Canada or the United States was a balance between ability to obtain the necessary aircraft, close collaboration with the United States, and Canada's tendency to regard the placing of any training outside Canada as an affront to the efficiency and success of

/Canadian

E.T.S.  
120(40)

November  
1940

E.T.S.  
127(40)

E.T.S.  
137(40)

January  
1941

Canadian schools<sup>(1)</sup>

As one way of meeting Canadian wishes for more training to be done in the Dominion the possibility of putting E.F.T.Ss in Canada to feed the transferred S.F.T.Ss was reconsidered. When the first transfers were made it had been decided to keep the E.F.T.Ss in the United Kingdom. The pros and cons were fairly evenly balanced: if the E.F.T.Ss were in Canada there would be no break in training before the S.F.T.S. course began, and no hitches over intakes could be caused by shipping difficulties or delays in the United Kingdom. On the other hand, E.F.T.Ss in the United Kingdom were less hampered by war conditions than other types of school, doing ab initio training in Britain meant that no larger number of pupils than the exact S.F.T.S. intake need be shipped across the Atlantic, and it was not easy to uproot and transfer civilian-operated schools.

E.T.S.  
69(40)

In August 1940 the balance of advantage had seemed to lie with keeping the E.F.T.Ss in the United Kingdom, but in November Canada's wish to have more schools made it advisable to "transfer" some United Kingdom E.F.T.Ss to Canada. The matter was discussed with A/V/M Breadner at the end of 1940, and in February 1941, it was decided to form two transferred E.F.T.Ss in Canada.

E.T.S.  
120(40)

February  
1941

Early in 1941 it became apparent that Canada was very confident of her ability to deal successfully and efficiently with training, and that she wanted complete control over the transferred as well as the Empire Scheme schools

E.T.S.  
210(41)  
E.T.S.  
227(41)

/together with

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(1) Appendix 51. Aide Memoire handed to Colonel Ralston (Canadian Minister of Defence) on 7th January, 1941, a note on this Aide-Memoire by Mr. F.R. Howard, and Part IV of the Minutes of a Meeting held under the chairmanship of Sir Archibald Sinclair (Secretary of State) on 7th January, 1941. (E.T.S.156(41) and E.T.S.168(41).

together with virtual unification of the two organisations. There were differences between the transferred and Empire Scheme schools which might be held to reflect adversely on Canadian efficiency. Transferred schools (with only slightly more aircraft) had 204 pupils against 160 in Empire Scheme schools. The R.C.A.F. believed their methods better than those of the transferred schools. Inability to move instructors and staff from one type of school to the other was clearly a disadvantage, though there would equally clearly be drawbacks in loss of a school's identity or in excessive mixing of R.A.F. and R.C.A.F. staff. Different maintenance and equipment services for the two types of school were undesirable.

March  
1941

As Canada made it clear that she wanted more S.F.T.Ss and a unified training organisation, the possibility of training in the United States, using American-built aircraft supplied under Lend-Lease, became a reality. The practical and political advantages of using American aircraft, instructors, and facilities made training in the United States overwhelmingly advisable, but Canada's anxiety for any expansion of training to take place in the Dominion and her tendency to regard the use of American schools as a slur on the efficiency of Canadian training had to be taken into account. The difficulty increased when the United States offered further training facilities in April.

E.T.S.  
215(41)

April  
1941

E.T.S.  
227(41)  
E.T.S.  
227(41)

Canadian goodwill towards schemes for training in the United States was closely bound up with the future development of the Canadian training organisation. In May A/C Johnson (Canadian D.C.A.S.) proposed that United Kingdom and Empire Scheme schools in Canada should work on the same basis and be interchangeable, and that payment for the transferred schools should be made (to simplify accounting) in fixed sums at regular intervals. The proposals were

May  
1941

E.T.S.  
270(41)

E.T.S.  
262(41)

/agreed

agreed with provisos that transferred schools were to retain their United Kingdom character and that all schools were to produce the maximum output from the facilities they had available.

S.5614  
May  
1941

At much the same time it was decided to put six more S.F.T.Ss in Canada: stock taking<sup>(1)</sup> showed that there would be enough backing for the ultimate first-line force only if both the transferred schools in Canada and their counterparts still at work in the United Kingdom were taken into account. The six additional S.F.T.Ss were to replace United Kingdom schools,<sup>(2)</sup> and would therefore be "transferred" - though that word had now completely lost its original meaning: the six schools would really be new S.F.T.Ss in the Canadian organisation, but staffed by the R.A.F. and handling R.A.F. pupils. Two of them were to open in the winter of 1941-42, and the remaining four in the summer of 1942. These six S.F.T.Ss, like the two E.F.T.Ss whose establishment in Canada had been agreed in February, were over and above the fourteen schools of the original (July 1940) transfer plan.

December 1940-  
January 1941.  
E.T.S.  
166(41)

Canada's desire to do more training extended to other types of school as well and particularly to O.T.Us, for which Col. Ralston and A/V/M Breadner pressed during a visit to the United Kingdom at the end of 1940. The general policy over O.T.Us was that they should be in the operational areas which they served, for the sake of close liaison with the

/first line

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(1) The total S.F.T.S. target was now 58 schools (56 backing the R.A.F. and Dominion Air Forces and two the Fleet Air Arm). Existing plans provided twelve in the United Kingdom, 25 under the Empire Scheme, eight "transferred" in Canada, five in South Africa, and four in Southern Rhodesia. United States training was reckoned as the equivalent of four S.F.T.Ss.

(2) Some of the United Kingdom S.F.T.Ss would then close. It had, of course, been intended that United Kingdom schools should close after the first "transferred" schools opened in Canada, but in fact they continued to work through 1941, so that Nos. 33-39 S.F.T.Ss became additional, rather than transferred, schools.

E.T.S.  
198(41)

March-  
May 1941.

first line and final training under operational weather conditions, but the fact that operational aircraft were to be built in the United States and Canada and would have to be delivered across the Atlantic gave grounds for modifying the policy. The matter was left unsettled for some time, until it was agreed in March to set up a Hudson O.T.U. in Canada, and in May to start Hampden, Hurricane, and Boston O.T.U's as well. (1) In addition, it was agreed in May to set up a second School of G.R. in Canada. Thus by the middle of 1941 it was planned that Canada should have a unified training organisation consisting of the Empire Scheme schools plus 27 R.A.F. training units, (2) and that this ultimate size should be reached some time in 1942.

Canadian Development: January-July 1941.

The actual immediate development in the first half of 1941 was the accelerated programme of the Empire Scheme (bringing the numbers in operation up to 13 S.F.T.Ss, 20 E.F.T.Ss, 7 A.O.Ss, 7 B. and G.S.'s and 1 A.N.S) and the opening of five more R.A.F. schools and one O.T.U., so that 58 flying training units in all were working in Canada at the end of June 1941. (3)

This expansion from the 34 schools in operation at the beginning of the year took place under considerable difficulties through shortage of aircraft and spares and at a time when there was great pressure for the maximum possible pilot output. Overbearing at Empire Scheme S.F.T.Ss was already desirable, and was urged by the United

/Kingdom,

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(1) The Torpedo Training School included in the original fourteen transfers developed into a Beaufort O.T.U.

(2) 5 O.T.U's, 14 S.F.T.Ss, 2 E.F.T.Ss, 3 navigation schools, 2 schools of G.R., and 1 B. and G.S.

(3) See next page.

- (3) No.1 S.F.T.S. Camp Borden, Ont.(S.E.) No.12 S.F.T.S. Brandon, Man (T.E.)  
No.2 S.F.T.S. Ottawa, Ont (S.E.) No.15 S.F.T.S. Claresholm, Alta.  
No.3 S.F.T.S. Calgary, Alta (T.E.)  
No.4 S.F.T.S. Saskatoon, Sask (T.E.)  
No.5 S.F.T.S. Brantford, Ont.(T.E.) \* No.31 S.F.T.S. Kingston, Ont.(F.A.A.)  
No.6 S.F.T.S. Dunnville, Ont.(S.E.) \* No.32 S.F.T.S. Moose Jaw Sask.(S.E.)  
No.7 S.F.T.S. McLeod, Alta (T.E.) \* No.33 Carberry, Man (T.E.)  
No.8 S.F.T.S. Moncton, N.B.(T.E.) \* No.34 S.F.T.S. Medicine Hat, Alta(T.E.)  
No.9 S.F.T.S. Summerside, P.E.I.(S.E.)  
No.10 S.F.T.S. Dauphin, Man.(T.E.)  
No.11 S.F.T.S. Yorkton, Sask (T.E.)

- No.1 E.F.T.S. Malton, Ont. No.13 E.F.T.S. St Eugene Ont.  
No.2 E.F.T.S. Fort William, Ont No.14 E.F.T.S. Portage la Prairie, Man.  
No.3 E.F.T.S. London, Ont. No.15 E.F.T.S. Regina, Sask.  
No.4 E.F.T.S. Windsor Mills, P.Q. No.16 E.F.T.S. Edmonton, Alta.  
No.5 E.F.T.S. High River, Alta. No.17 E.F.T.S. Stanley, N.S.  
No.6 E.F.T.S. Prince Albert, Sask No.18 E.F.T.S. Boundary Bay, B.C.  
No.7 E.F.T.S. Windsor, Ont. No.19 E.F.T.S. Virden, Man.  
No.8 E.F.T.S. Vancouver, B.C. No.20 E.F.T.S. Cahawa, Ont.  
No.9 E.F.T.S. St. Catherine's, Ont.  
No.10 E.F.T.S. Hamilton (Mt. Hope) \* No.31 E.F.T.S. Calgary, Alta. (temp.)  
No.11 E.F.T.S. Cap de la Madeleine, P.Q.  
No.12 E.F.T.S. Goderich, Ont.

- No.1 A.O.S. Malton, Ont. No.5 A.O.S. Winnipeg, Man.  
No.2 A.O.S. Edmonton, Alta. No.6 " Prince Albert, Sask.  
No.3 A.O.S. Regina, Sask. No.7 " Portage la Prairie, Man.  
No.4 A.O.S. London, Ont.

- No.1 B. & G.S. Jarvis, Ont.  
No.2 " Moss Bank, Sask. No.5 B. & G.S. Dafoe, Sask.  
No.3 " Macdonald, Man. No.6 " Mountain View, Ont.  
No.4 " Fingal, Ont. No.7 " Paulson, Man.  
\*No.31 " Picton, Ont.

- No.1 A.N.S. Rivers, Man. \*No.31 A.N.S. Port Albert, Ont.  
\*No.33 " Hamilton (Mt. Hope) Ont.

\* No.31 S. of G.R. Charlottetown, P.E.I.

\* No.31 O.T.U. Debert, N.S.

\* United Kingdom "transferred" schools.

Kingdon, but was not possible until more aircraft were available for the schools and better serviceability was ensured by an adequate flow of spares. Comparisons between the Empire Scheme schools, each with 160 pupils, and the transferred schools (also short of aircraft) with 204 contributed a good deal to Canada's pressure for unified control and the power to equalise aircraft, instructors, and spares between schools.

E.T.S.  
174(41)

The shortage of aircraft was most severe in Ansons.

E.T.S.  
198(41)

Empire Scheme T.E. schools<sup>(1)</sup> had to work with less than 50% of their establishment, while the transferred schools had no more than 65%. Shipments of Ansons were six weeks behind schedule, and the shortage of Cheetah spares was still acute. Canadian production of Ansons could not begin at the most optimistic estimate earlier than July 1941, and the lack of Ansons could not be made good by using Oxfords because Canada had repeatedly made it clear that Oxfords were unsuitable and unsuccessful in Canada. To make matters more difficult, Canada was to some extent in the dark about the reasons for a shortage of T.E. trainers.

E.T.S.  
71(40)  
81(40)

E.T.S.  
222(41)

E.T.S.  
174(41)

Canada concentrated, during this difficult period in the winter and spring of 1941, on maintaining the planned output of pilots, and successfully completed the syllabus with practically every course turned out. In some cases, however, intakes had to be cut down or courses extended, with a consequent extension of E.T.S. training, according to the aircraft available for S.F.T.S. use.

E.T.S.  
222(41)  
225(41)

E.T.S.  
296(41)

There was also a shortage of Battles, which handicapped the B. and G. schools and one transferred school.<sup>(2)</sup>

Matters improved, however, as the year went on. More

/trainers

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(1) Empire Scheme S.F.T.S.s specialised on T.E. or S.E. training when the Third Revise was introduced.

(2) No.31 S.F.T.S.

E.T.S.  
277(41)

More trainers began to arrive from the United Kingdom in spite of shipping difficulties. The shortage of Cheetahs was overcome by fitting Jacobs engines in the Anson II.

E.T.S.  
222(41)

While the shortage of aircraft kept Empire Scheme S.F.T.Ss down to a pupil population of 160, it was found that they could operate successfully with only one of their two R.L.Gs, and it was thought that the spare aerodromes available for this reason could be used to house additional schools. The United Kingdom, however, urged that the S.F.T.Ss should be expanded and both R.L.Gs brought into use.

E.T.S.  
272(41)

E.T.S.  
236(41)

A plan for working S.F.T.Ss much more intensively and to getting a greater pilot output from the existing number of schools and aircraft was devised by G/C Banting and put to A/M Garrod in April 1941. It was not urged on the R.C.A.F. direct from the I.K.Liaison Mission in Ottawa (where it was invented) because "overbearing" and the expansion of schools was a sore point with Canada at the time. Its consideration in London led to the Little Rissington experiment, by which it was hoped to convince Canada through practical demonstration rather than theoretical argument that S.F.T.Ss could be worked harder.

E.T.S.  
205(41)  
214(41)  
232(41)

S.70631

Canada's anxiety to have the merits of Canadian training recognised and acknowledged caused her to press for publicity to be given to what was being achieved and to ask for a full appraisal by the United Kingdom of the quality of Canadian training. Publicity, however, was unwise: full justice to Canada's effort would have meant disclosing more facts and figures than security allowed. Canada did not see eye to eye with the United Kingdom on the relative importance of publicity and security, and a booklet was published in the Dominion and reproduced in the press which was considered in London to make indiscreet

E.T.S.  
408(42)

revelations about the amount of training going on.

Appraisal of the quality of Canadian training was difficult: an exact estimate of the standard at which Canadian schools turned out their pilots and aircrew could not be made in the United Kingdom,<sup>(1)</sup> and in spite of strong requests from A/C Leckie and A/V/M Breadner in February, April, and June for full and frank criticism of the instruction being given, only vague and general remarks, hedged about by explanations that whatever defects existed were not the fault of Canada, were offered in reply. First impressions of the Canadian output formed by United Kingdom O.T.U.s were not favourable, and Canadian training came to have a bad name among O.T.U. staffs, mainly because of a few noticeable defects due to Canada's lack of equipment and to the easier flying conditions in the Dominion. No solid justification for this poor reputation could, however, be found and put to Canada, and Canada naturally gained the impression that there was some lack of frankness on the matter.

There were divergences of opinion between Canada and the United Kingdom on a few matters concerned more with the existence of a training organisation in Canada than with the actual giving of instruction. Strong feeling in the Dominion, and discontent among the men concerned, were aroused by the United Kingdom's inability to move the families of R.A.F. personnel serving in Canada and by anomalies in granting family passages across the Atlantic. Feeling and discontent also came from discrepancies between United Kingdom and Canadian rates of pay and the incidence of income tax. Canada consistently pressed for a higher proportion of men to be commissioned at the training stage

/(i.e., on

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(1). See later section "Overseas Training Liaison".

E.T.S.  
153(41)  
185(41)  
214(41)  
257(41)

E.T.S.  
162(41)

(i.e., on passing out from schools) than the United Kingdom allowed.

E.T.S.  
166(41)  
214(41)

It was found that Canadian pupils had a marked preference for training as pilots, and a distinct distaste for becoming other members of aircrew. Selection of men for training as observers, however, was done more by scientific, reasoned, distinction between those with pilot aptitude and those with navigation aptitude than by taking the best material for pilot training irrespective of other considerations.

Canadian Empire Scheme schools handled a certain number of pupils from other parts of the Empire, and these pupils were distributed among all the schools and not concentrated (as had at first been proposed) in schools earmarked for Australians or New Zealanders. The first Australian pupils arrived in Canada in September, 1940, and the first New Zealanders in February 1941. The supply of Newfoundland pupils dried up at the end of 1940, after 114 had entered initial training, and part of the United Kingdom's 10% quota of places in the Empire Scheme was temporarily handed over to Canada. In March, 1941, however, it was agreed that in future the United Kingdom would fill 10% of the Empire Scheme places.

E.T.S.  
74(40)  
E.T.S.  
159(41)

E.T.S.  
207(41)

E.T.S.  
214(41)

The reception of Canadian-trained crews on their arrival in the United Kingdom was frequently so matter-of-fact and undemonstrative as to be distinctly discouraging to men who came with considerable enthusiasm and anticipation to the operational area. In May 1941 a party of 275 reached Glasgow after spending part of the voyage "practising songs, coo-ees, and other forms of greeting" only to find no reception arranged, no food provided, and no trains to take them away after disembarkation. Matters were tightened up to prevent a repetition of these deplorable mistakes, and

E.T.S.  
274(41)

E.T.S.  
279(41)

an Air Commodore put in charge of the reception of Dominion air crew.

E.T.S.  
258(41)

In May, Canada undertook transit arrangements for United Kingdom pupils on their way to schools in the United States, and set up a transit centre at Dartmouth, N.S. (1)

Article 15

E.T.S.  
81(40)

Article 15 of the Riverdale Agreement, and the question of Dominion aircrews' operational employment, remained in abeyance until the end of 1940. Captain Harold Balfour found in August 1940 that Canada regarded the matter as one which it was inappropriate to discuss at such a time of stress and action. It was reopened in December with Colonel Ralston

December  
1940

(Canadian Minister of Defence) in London. The possible allocations of R.C.A.F. squadrons, varying from 42 (based on the output of Canadian aircrew) through 30 (based on Canada's total man-power contribution) to 15 (based on Canada's financial contribution) were reviewed. Other factors were taken into account: first line squadrons had to be backed by O.T.Us, and Canadian senior officers and ground staff would not be available for the R.C.A.F. first line squadrons because they were needed by the Canadian training organisation.

E.T.S.  
157(40)

January  
1941

On 7th January an agreement about the interpretation of Article 15 was signed. Canadian pilots and aircrew trained under the Empire Scheme were to be incorporated in R.C.A.F. squadrons up to a total of 25<sup>(2)</sup> and these squadrons were to be formed by May 1942. R.A.F. senior officers and ground staff would be provided for the squadrons and replaced

/later when

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(1) Moved in October 1941 to Moncton, N.B.

(2) These 25 squadrons were in addition to three R.C.A.F. squadrons already serving in the first line. Calculations on a similar basis gave 18 Australian and 6 New Zealand squadrons over and above those already in existence.

later when men could be released from the Canadian training organisation. Central, part-Canadian, record and posting organisations were to be set up, and an R.C.A.F. Overseas H.Q. in London would keep close touch with Canadians' operational employment. In May 1941 it was agreed that R.C.A.F. squadrons in the United Kingdom were to be under R.A.F. control and administration - an agreement which accompanied the decision that all schools in Canada should be part of a unified organisation under R.C.A.F. control.

May  
1941

E.T.S.  
270(41)

Plans and Development: July - December. 1941.

During the second half of 1941 the ultimate size of the Canadian training organisation was increased when it was agreed in August to set up 6 more United Kingdom E.F.T.Ss in Canada. Some changes in the other R.A.F. schools were proposed: the only way to provide a suitable home for the second school of G.R. would be to put it with No.31 S. of G.R. at Charlottetown, and disband No.32 A.N.S.: to make up for the navigation training capacity lost by closing No. 32 A.N.S. Nos. 31 and 33 A.N.S. were to be made larger.

S.5614

The actual development of the Canadian training organisation went according to plan, and the last Empire Scheme schools opened during the autumn. (2) Four more

/R.A.F.

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(1) Each with 180 pupils.  
(2) The last S.F.T.S. (No.13) opened at St.Hubert, P.Q., on 1st September 1941, the last E.F.T.S. (No.22) and the last A.O.S. (No.8) at Quebec on 29th September, and the last B.& G. School (No.9) at Mont Joli, P.Q., on 15th December 1941. The total output of trained men from Canadian Empire Scheme schools up to the end of 1941 was 7,756 pilots, 2,533 observers, 3,850 wireless operator air gunners, and 606 "straight" air gunners. Of the pilots, 1,416 were retained as instructors or staff pilots. The effect of the accelerated programme may be seen by comparing the actual output of 7,756 pilots with the output of 3,196 which was planned, for the same period, before the accelerated programme was introduced. 6,014 of the pilots were Canadian, 1062 Australian, 418 New Zealand, and 262 from the United Kingdom. All the 1,416 instructors retained were Canadian. The average wastage rates up to the end of 1941 were:- I.T.S. 7.9%, E.F.T.S. 24%, S.F.T.S. 9.7%, A.O.S. 11.6%, B. & G.S. 1.2-2.1%

E.T.S.  
431(42)

R.A.F. S.F.T.Ss and one A.N.S. (completing the original 14 transferred schools), as well as a second E.F.T.S.,<sup>(1)</sup> began work before the end of 1941. At the beginning of 1942 there were 75 flying training units in Canada, as well as the C.F.S. at Trenton. 58 of them (16 S.F.T.Ss, 21 E.F.T.S's, 10 A.O.S's, 2 A.N.S's and 9 B. & G.S's) were Empire Scheme schools,<sup>(2)</sup> 15 were R.A.F. schools, and 2 were O.T.U.s.<sup>(3)</sup>

/Sixteen

(1) The schools completing the "original fourteen" were:-

- No.35 S.F.T.S. North Battleford, Sask (T.E.-opened 4th Sept.)
- No.36 " Penhold, Alta (T.E.-opened 28th Sept.)
- No.37 " Calgary, Alta (T.E.-opened 22nd Oct.)
- No.39 " Swift Current, Sask (S.E.- " 15th Dec.)
- No.32 A.N.S. Charlottetown, P.E.I. (opened 18th August)

The E.F.T.S. was No.32, which opened on 12th July, and used the aerodrome at Swift Current, Sask (planned for No.38 S.F.T.S.) until December 1941, when it moved to Lowden, Sask.

(2) This was more than the 51 scheduled in the Riverdale Agreement, because the 13 full-size E.F.T.Ss originally planned were replaced by 18 half-size E.F.T.Ss and 4 full-size.

On the other hand, only 9 B. & G.Ss were necessary instead of the 10 it had been intended to open, and the half-size E.F.T.S. at Vancouver (No.8) was closed in December 1941 because the aerodrome was needed for operational purposes.

(3) The Canadian Flying Training organisation on 31st December 1941 was:-

- |  |  |
|--|--|
| No.1 E.F.T.S. Malton, Ont.                 | No.14 E.F.T.S. Portage la Prairie, Man.    |
| No.2 " Fort William, Ont.                  | " Regina, Sask.                            |
| No.3 " London, Ont.                        | No.15 " Edmonton, Alta.                    |
| No.4 " Windsor Mills, P.Q.                 | No.16 " Stanley, N.S.                      |
| No.5 " High River, Alta                    | No.17 " Boundary Bay, B.C.                 |
| No.6 " Prince Albert, Sask.                | No.18 " Virden, Man (f)                    |
| No.7 " Windsor, Ont.                       | No.19 " Oshawa, Ont. (f)                   |
| No.9 " St. Catherine's, Ont.               | No.20 " Chatham, N.B.                      |
| No.10 " Hamilton (Mt. Hope), Ont.          | No.21 " Quebec City, P.Q.                  |
| No.11 " Cap de la Madeleine, P.Q.          | No.22 " De Winton Alta (t)                 |
| No.12 " Goderich, Ont.                     | No.31 " Bowden, Sask (t)                   |
| No.13 " St. Eugene, Ont.                   | No.32 " St. Hubert, P.Q.                   |
| No.1 S.F.T.S. Camp Borden, Ont.            | No.13 " Aylmer, Ont.                       |
| No.2 " Ottawa, Ont.                        | No.14 " Claresham, Alta                    |
| No.3 " Calgary, Alta                       | No.15 " Hagersville, Ont.                  |
| No.4 " Saskatoon, Sask.                    | No.16 " Kingston, Ont (t)                  |
| No.5 " Brantford, Ont.                     | No.31 " Moose Jaw, Sask (t)                |
| No.6 " Dunville, Ont.                      | No.32 " Carberry, Man (t)                  |
| No.7 " Macleod, Alta                       | No.33 " Medicine Hat Alta (t)              |
| No.8 " Moncton, N.B.                       | No.34 " North Battleford Sask. (t)         |
| No.9 " Summerside, P.E.I.                  | No.35 " Penhold, Alta (t)                  |
| No.10 " Dauphin, Man.                      | No.36 " Calgary, Alta (t)                  |
| No.11 " Yorkton, Sask                      | No.37 " Swift Current, Sask (t)            |
| No.12 " Brandon, Man.                      | No.39 " Prince Albert, Sask                |
| No.1 A.O.S. Malton, Ont.                   | No.6 A.O.S. Portage la Prairie, Man.       |
| No.2 " Edmonton, Alta                      | No.7 " Quebec City, P.Q.                   |
| No.3 " Regina, Sask                        | No.8 " St. John's, P.Q.                    |
| No.4 " London, Ont.                        | No.9 " Chatham, N.B.                       |
| No.5 " Winnipeg, Man.                      | No.10 " Charlottetown, P.E.I. (t)          |
| No.1 A.N.S. Rivers, Man.                   | No.32 A.N.S. Hamilton (Mt. Hope), Ont. (t) |
| No.2 " Pennington, N.B.                    | No.33 " " " "                              |
| No.31 " Port Albert, Ont.                  |  |
| No.1 B.&G.S. Jarvis, Ont.                  | No.6 B.&G.S. Mountain View, Ont.           |
| No.2 " Mossbank, Sask                      | No.7 " Paulson, Man.                       |
| No.3 " Macdonald, Man                      | No.8 " Lettbridge, Alta                    |
| No.4 " Hazel, Ont.                         | No.9 " Mont Joli, P.Q.                     |
| No.5 " Darbc, Sask.                        | No.31 " Pictou, Ont. (t)                   |
| No.31 O.T.U. Debert, N.S. (t)              | No.32 O.T.U. Patricia Bay, B.C. (t)        |
| No.31 S. of G.R. Charlottetown, P.E.I. (t) |  |

(f) full size E.F.T.S.

(t) R.A.F. "transferred" school

Sixteen more schools (6 R.A.F. S.F.T.Ss, 6 R.A.F. E.F.T.Ss, and 4 O.T.Us) were scheduled to start during 1942, and of these 4 E.F.T.Ss and 1 S.F.T.S. were opened before the end of March. (1)

During the autumn of 1941 the aircraft situation became easier, partly because the later R.A.F. S.F.T.Ss (Nos. 35, 36 and 37) were equipped with Oxfords in spite of Canada's strong objection to this aircraft, and partly because of slowly increasing production of T.E. trainers in Canada and the United States. Two Empire Scheme S.F.T.Ss (NOS.10 and 11) which had been training on S.E. aircraft although scheduled for T.E. work began to use T.E. trainers in August and October. Spares, however, still remained a serious problem, particularly in the case of Cheetah engines for Ansons.

E.T.S.  
313(41)

E.T.S.  
388(41)  
408(41)  
457(42)

October  
1941

E.T.S.  
388(41)

S.69934

The urgent pressure for pilot output began to disappear, and courses were lengthened. In October the S.F.T.S. duration was increased to 12 weeks, (2) though this change had as much connection with "overbearing", more intensive work, and the results of the Little Rissington experiment as it had with improving the quality of training: the size of the Empire Scheme S.F.T.Ss went up from 168 pupils to 204 at the same time, (3) so that the pilot output was virtually unchanged. The E.F.T.S. course was also lengthened to 8 weeks, (4) and the I.T.S. course (which had gone up from 36 days to 7 weeks in June) was increased to 8 weeks. The

E.T.S.  
313(41)

/change in

(1) No.33 E.F.T.S., Caron, Sask, No.34 E.F.T.S., Assiniboia, Sask, No.35 E.F.T.S., Neepawa, Man, No.36 E.F.T.S. Pearce, Alta, and No.41 S.F.T.S., Wayburn, Sask.  
(2) The flying hours were set at a minimum of 90, 12 of them by night.  
(3) At schools equipped with Harvards and Cessna Cranes. Anson schools could not take more pupils because there were not enough spares to meet the requirements of intensified flying.  
(4) The flying hours were set at 60, with a maximum of 75. Three hours were to be done by night.

E.T.S.  
388(41)

The change in I.T.S. duration was made to take much of the load of ground instruction off the E.F.T.S. and S.F.T.S. and put it on the preliminary stage of training.

December  
1941

In December Air Marshal Garrod's New Deal proposals<sup>(1)</sup> provided for S.F.T.Ss courses in Canada to be extended to 15 weeks, but Canada decided to increase them to 16 weeks. The E.F.T.S. duration remained unchanged at 8 weeks. Night flying at E.F.T.Ss was introduced during the second half of 1941, and the amount of Link Trainer instruction at all stages increased. Cloud flying was begun at S.F.T.Ss in August.

E.T.S.  
390(41)  
431(42)

E.T.S.  
371(41)  
E.T.S.  
349(41)  
E.T.S.  
313(41)

The navigation training of observers was also increased. It was decided that the observer's B.& G. course should remain at 6 weeks, and not be reduced to 4. As a result, two weeks of the A.O.S. course, which it had previously been intended to devote to armament, became available for navigation instruction.

E.T.S.  
332(41)  
E.T.S.  
410(42)

Gunnery training was improved by teaching the use of turrets. Battles were to be fitted with turrets, but in November Bolingbrokes were brought into use at the B. & G. Schools because of the shortage of Battles.

A.M.T's Visit.

E.T.S.  
379(41)

September-  
November  
1941.

During the autumn Air Marshal Garrod visited Canada and the United States, and found Canadian training of a high standard.<sup>(2)</sup> He was much impressed by the excellence of the senior officers in Empire Scheme schools: they were young and energetic, with a remarkable grasp of what they were doing, eager, enthusiastic, and anxious to take on additional work. Some of them, when there had been a shortage of  
/instructors,

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(1) See Appendix 43.

(2) Appendix 52. Part of a letter from A/M Garrod to A/C Cochrane dated 4th October 1941 and part of a Report by A/M Garrod dated 19th November 1941. (E.T.S. 365(41) and 379(41)).

instructors, had done as much as 140 hours flying per month. On his tour of Canada Air Marshal Garrod laid great emphasis on extracting the maximum from every school, with the object of increasing schools' capacity and so making it possible to lengthen courses and raise the standard of training. He found that the shortage of aircraft in Canada had compelled schools to obtain maximum flying hours by adopting an organisation similar to that tried at Little Rissington, and that the lack of spares was causing inefficient use of a great deal of valuable equipment. Air Marshal Garrod's visit left a strong impression of close co-operation between Canada, the United States, and the United Kingdom on training matters, and shortly after his return to London an Empire Training Conference at the Air Ministry early in 1942 was proposed and agreed.

E.T.S.  
390(41)

Publicity.

Considerable attention was given to publicity for the Empire Scheme, but the difficulty - which eventually proved insuperable - was that any account of the "broad lines" of the scheme, without the facts and figures which considerations would not allow to be published,<sup>(1)</sup> was a poor, dull, and uninteresting story without any noticeable propaganda value. Nevertheless it was agreed that there was general ignorance about the Empire Scheme which ought to be remedied, and Mr. Sandford (S.8) considered that something good might be made out of the "human story" aspect even if practically all the facts and figures were left out. Various writers were approached, and in December 1941 Mr. F.S. Smythe was selected

E.T.S.  
336(41)  
338(41)

E.T.S.  
363(41)  
372(41)  
384(41)

/to write

E.T.S.  
359(41)

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(1) It was laid down in October that the number of schools by types, the number of pupils being trained, the ratio of output, the flying hours; the casualties, and the ratio of synthetic training to flying training must all be kept secret. Particular stress was laid on the importance of concealing the advantages of synthetic training, and on the likelihood that any writing up of success in training or in building up reserves would cause the enemy to exert himself similarly.

to write the publicity that was wanted. The difficulty of working on broad lines was too much, however, and the MS produced by Mr. Symthe was not published.

### Shipping

Shipping difficulties occurred from time to time. The trans-Pacific journey for pupils going from New Zealand to Canada had to be considered when it was decided in July to take British ships off the run from Auckland to Vancouver and again in January 1942 when Japan's entry into the war made it essential for ships to be escorted. The technicality, before Japan's entry, of New Zealand pupils travelling in American ships to America escorted by British warships seemed to worry the British more than the Americans, who cheerfully pointed out that if a British warship chose to sail in company with an American liner there was little that the American liner could do or would want to do about it.

There was some trouble over the conditions in ships on which men trained in Canada had to travel. On 15th September, 1941, 268 Canadians, Australians and New Zealanders refused to embark on the "Empress of Asia" because the ship was filthy and infected with vermin, its ventilation and sanitation were either unusable or non-existent, its food was bad, and the crew inefficient and undisciplined. Their objection to the ship was found to be justified, and further cases of "slight bug infection" in the "Britannic" and of "unpleasantness" in the "Duchess of Atholl" were quoted. R.A.F. pupils had travelled on the "Duchess of Atholl" with a number of merchant seamen, who insisted on singing in the pupils' hearing until they were paid to stop, removed the bathroom taps and charged the R.A.F. men for replacing them, and stole the ship's supply of towels in order to provide a towel and admission to a bathroom at a cost of sixpence or more per man.

E.T.S.  
311(41)  
E.T.S.  
408(42)

E.T.S.  
350(41)  
E.T.S.  
367(41)

E.T.S.  
367(41)

A U S T R A L I A

E.T.S.294/41.

The nucleus from which Australian training developed was the original R.A.A.F. Flying Training School at Point Cook. Expansion began in 1939-1940 with the training there of instructors<sup>(1)</sup>, elementary flying training<sup>(2)</sup> being moved to civil schools in order to make room at Point Cook. Experienced pilots were taken direct from civil life, but it became necessary during 1940 to lower the acceptance standard and give instructor pupils enough flying experience to bring them up to a total of 125 hours before the instructor course proper began. Many of the civil pilots were found to have too little experience for instructing on service types, so that separate courses for instructing on elementary (8 weeks) and service (12 weeks) aircraft had to be introduced. A C.F.S. was started at Point Cook at the end of April 1940, and moved to its permanent home<sup>(3)</sup> at Camden, N.S.W. in May.

E.F.T.S. training was at first done in close association with flying clubs and civil schools at five places<sup>(4)</sup>. Ground instruction was service controlled, but flying was done by civil contractors and paid for on an hourly basis. The financial arrangements gave considerable difficulty, while neither the flying instruction nor the airworthiness of the aircraft was found satisfactory.

Accordingly it was decided in April 1940 to replace the civil schools by half sized service operated schools (60 pupils)<sup>(5)</sup>.

After instructor training had been transferred from Point Cook to the C.F.S. at Camden, Point Cook was converted

/to No.1

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- (1) See footnote on page 556.
  - (2) Point Cook had previously done ab initio as well as service training.
  - (3) The Australian C.F.S. aerodrome at Camden was constructed during one of the worst droughts known in New South Wales, and was at first notable for dust. The C.O. was said to have invited a visiting engineer to inspect it by standing at the window and watching it blow past.
  - (4) Parafield, S.A.; Archerfield, Queensland; Essendon, Vic; Mascot, N.S.W.; and Maylands, W.A.
  - (5) At Parafield, Essendon, Mascot and Archerfield.

to No.1 S.F.T.S.: This S.F.T.S. was outside the Empire Scheme: Australia did not draw air crew for home defence purposes from the Empire Scheme output (as Canada did), but maintained an additional training organisation for domestic needs. Seven more S.F.T.S.'s had therefore to be opened to fulfil Australia's commitments. Two started in 1940, at Wagga and Amberley. The first A.O.S. began at Cootanundra in May 1940, and the first B and G. School, at Evans Head, N.S.W. in August 1940. The S.F.T.S.'s began by training on both S.E. and T.E. types, and were not converted into specialised schools until the early part of 1941. Point Cook, with its special domestic training commitment, remained a mixed school.

The urgent need for greater pilot output towards the end of 1940 was met in Australia by an increase in schools' pupil population. An overbearing of 25%<sup>(1)</sup> was introduced, S.F.T.S. courses becoming 50 instead of 40, and the total population of each S.F.T.S. 200. The length of the course, however, remained at 16 weeks: shortage of aircraft made it impossible to shorten courses as well as increase the number of pupils<sup>(2)</sup>.

By the end of 1940 the Australian training organisation consisted of 9 E.F.T.S.'s, 3 S.F.T.S.'s, 1 A.O.S., 1 B. & G.S., 1 A.N.S., 1 S. of G.R. and the C.F.S.<sup>(3)</sup>. At  
December 1940. /this

(1) Overbearing of 25% at wireless schools, and of 10% at A.O.S.'s were also introduced at the same time.

(2) This Australian solution contrasted with the Canadian, which shortened courses to 10 weeks but had no increase of pupil population. As a result, the Australian output of pilots received practical armament training, while the Canadian did not.

(3) (h) No.1 E.F.T.S. Parafield, S.A. (h) No.6 E.F.T.S. Tamworth, N.S.W.  
 (h) No.2 " Archerfield, Queensland (h) No.7 " Western  
 (h) No.3 " Essendon, Vic. Junction, Tas.,  
 (h) No.4 " Mascot, N.S.W. No.8 " Narrandera, N.S.W.  
 No.5 " Narromine, N.S.W. No.9 " Cunderdin, W.A.  
 (h) half size  
 (a) No.1 S.F.T.S. Point Cook, Vic. No.3 S.F.T.S. Amberley,  
 No.2 " Wagga, N.S.W. Queensland.  
 No.1 A.O.S. Cootanundra, N.S.W.  
 No.1 B. & G.S. Evans Head, N.S.W.  
 No.1 A.N.S. Parkes, N.S.W.  
 C.F.S. Camden, N.S.W.

(a) Training for the R.A.A.F. in Australia.

this stage of development it had an output capacity of some 1660 pilots (of whom just over 1100 were for service with the R.A.F.), 550 observers, and 580 W. Op. A.G.'s per year. Australia had undertaken to send 1,040 E.F.T.S.-trained pupil pilots<sup>(1)</sup>, 546 initial-trained pupil observers, and 936 initial-trained pupil W. Op. A.G.'s per year to Canada, and in the autumn of 1940 these commitments were increased: the introduction of the Third Revise in Canada put the number of E.F.T.S. trained pupils required from Australia up to some 1,450 per year, while Australia undertook to supply Southern Rhodesia with nearly 600 initial-trained pupils per year. Supplying the full number called for by the Third Revise in Canada was, however, beyond Australia's immediate capacity, and the rate of flow to S.F.T.S.'s in Canada was increased to only 1,300 per year. The effect of these changes, and of increases in Australia's home defence air force, was to add more than 20% to the man-power which the Commonwealth had agreed at Ottawa to provide for air crew training<sup>(2)</sup>.

E.T.S. 342/41.

At the beginning of 1941 Australia agreed to a suggestion from the United Kingdom that part of the Empire Scheme output from Australia (some 390 pilots, 390 observers, and 585 W. Op. A.G.'s per year) should go direct to the Middle East for service there<sup>(3)</sup>.

E.T.S. 294/41.

Training in Australia was planned, because of long distances and sparse population, on a regional basis. The aim was for recruits to be enlisted, trained, and eventually embarked for overseas as far as possible in their own status.

- 
- /Initial
- (1) Pilots for S.F.T.S. training in Canada were given elementary training at No.5 E.F.T.S., Narronine and No.8 E.F.T.S. Narrandera.
  - (2) Recruiting kept well ahead of requirements. There was a waiting list for aircrew training of nearly 7,700 at the end of 1940.
  - (3) The first draft from Australia to the Middle East sailed on 12th January, 1941. The first Empire Scheme outputs from Australia were made on 18th November, 1940, (pilots, 19th December, 1940, (observers), and 16th December, 1940, (W.Op. A.G.'s), and went to the United Kingdom.

Initial training was given particular attention, and five Initial Training Schools<sup>(1)</sup>, working to the 8-week R.A.F. syllabus for pilots and observers, and a 4-week syllabus for W. Op. A.G.'s, were opened before the end of 1940.

E.T.S. 342/41

Selection during initial training was given attention during

E.T.S. 374/41

the early part of 1941: intelligence tests, plus aptitude tests (for reaction speed, eye-muscle co-ordination, and night vision) were used, and only men with an I.Q. of more than 110 were sent forward for pilot training. As a result,

the failure rate at E.F.T.S.'s dropped sharply from 15% to 5%<sup>(2)</sup>. As was usually the case, the lowest classification at the initial schools was sent forward for W. Op. A.G.

training, with the inevitable result of lowering the standard of W. Op. A.G.'s and producing a high failure rate. Rejects

E.T.S. 294/41.

from the initial schools, as well as recruits awaiting their turn to enter initial training, were given pre-entry education under a scheme by which some 1,300 voluntary tutors, working at 313 centres and supervised by R.A.A.F. education officers, gave lessons in mathematics and physics to a syllabus which New Zealand had worked out.

Australia was handicapped throughout 1940 by shortage of aircraft, spares, and instructional equipment. The shortage of aircraft chiefly concerned Ansons and Battles, which came from the United Kingdom. Elementary trainers

E.T.S. 294/41.

(Moths and Wacketts) and S.E. service trainers (Wirraways) were made in Australia. These handicaps were overcome in

various ways: civil types were impressed to take the

place of Ansons for navigation training, ten Douglas D.C.2's /were bought

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(1) No.1 I.T.S. Somers, Vic.      No.4 I.T.S. Victor Harbour S.A.  
No.2 " Bradfield Park, N.S.W.      No.5 " Pearce, W.A.  
No.3 " Sandgate, Queensland.

(2) The accident rate during training in Australia also showed a less marked increase than the accident rates in the United Kingdom and Canada.

E.T.S. 400/41. were bought from the United States for W. Op. A.G. training, some spares were produced in the Commonwealth, while bomb sights, wireless equipment, bomb carriers, etc., were also  
E.T.S. 294/41. made in Australia.

In the spring of 1941 Australian schools had, in January-June '41. general, only their I.E. strength of aircraft (i.e. 2/3 of full establishment), but the syllabus requirements were achieved and the standard of training was good except in  
E.T.S. 419/41. armament, where the shortage of Battles and lack of spares for their Merlin engines was a serious obstacle that could not be overcome. Night flying was begun at the E.F.T.S.'s  
E.T.S. 374/41. in May 1941, after some delay because the Moths were not equipped for night flying, and the amount of night flying at S.F.T.S.'s increased in accordance with the United Kingdom's request.

In the first half of 1941, the Australian training organisation was increased by only three more schools<sup>(1)</sup>, but a considerable and rapid expansion took place in the December 1941. second half of the year, when two new E.F.T.S.'s were opened, two half E.F.T.S.'s expanded to full size, and four new S.F.T.S.'s and one A.O.S., one A.N.S., and one B. & G.S.

/started

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(1) No.10 E.F.T.S. Temora opened in May, No.4 S.F.T.S., Geraldton in March, and No.2 A.O.S. Nr. Gambier in March.

started work<sup>(1)</sup>.

At the end of 1941, the start of the Japanese war brought in a number of new factors. There was strong feeling against man-power leaving Australia when the Dominion was in danger of being attacked, and the sending of pupils to Canada and Rhodesia stopped in December<sup>(2)</sup>. Expansion of the air force available in Australia was urgently necessary, squadrons were improvised from trainer aircraft and school staffs and Australia prepared to become an operational base. For a short time it seemed that Australia would be called on to supply reinforcements and operational training for Singapore and the Far East. There were arguments in favour of making Australia as self-contained as possible. At the same time, expansion of the air forces in Australia could not absorb all the pilots and air crew the Dominion had undertaken to provide, and the United Kingdom was anxious that the rest should continue to be available for service with the R.A.F.

/The

(1) The Australian Schools at the end of 1941 were:-

No.1 E.F.T.S. Parafield, S.A.	(h) No.7 E.F.T.S. Western Junction, Tas.
No.2 " Archerfield, Queensland	No.8 " Narrandera, N.S.W.
(h) No.3 " Essendon, Vic.	No.9 " Cunderdin, W.A.
(h) No.4 " Mascot, N.S.W.	No.10 " Temora, N.S.W.
No.5 " Narrourmine, N.S.W.	No.11 " Benalla, Vic.
(h) No.6 " Tamworth, N.S.W.	No.12 " Bundaberg, Queensland
(h) half size (i.e. 60 pupils)	(temp.)
No.1 S.F.T.S. Point Cook Vic. (mixed)	No.5 " Uranquinty, N.S.W. (T.E.)
No.2 " Wagga N.S.W. (Mixed)	No.6 " Mallala, S.A. (T.E.)
(a) No.3 " Kingaroy, Queensland (T.E.)	No.7 " Deniliquin, N.S.W. (S.E.)
No.4 " Geraldton, W.A. (T.E.)	No.8 " Bundaberg (T.E.)
(a) Originally at Amberley	
No.1 A.O.S. Cootamundra, N.S.W.	No.2 A.O.S. Mount Gambier, S.A.
No.3 A.O.S. Amberley, Queensland	No.2 A.N.S. Nhill, Vic. (First formed at Mount Gambier in July 1941)
No.1 A.N.S. Parkes, N.S.W.	No.2 B. & G.S. Port Pirie, S.A. (first formed at Mount Gambier).
No.1 B. & G.S. Evans Head, N.S.W.	
C.F.S. Camden, N.S.W.	

Up to the end of 1941, 1,142 pilots, 678 observers, 1,001 wireless operator air gunners, and 253 'Straight' air gunners had been trained under the Empire Scheme in Australian schools. Some of these men were kept in Australia to staff schools. Of the rest, 64% of the pilots, 31% of the observers, 40% of the wireless operators, and 98% of the 'straight' air gunners went to the United Kingdom. The others (except for a very few to the Far East) went to the Middle East. In addition, 1,441 pupil pilots, 589 pupil observers, and 1,081 pupil wireless operator air gunners had been sent for training in Canada, and 676 pupil pilots for training in Southern Rhodesia.

(2) Increased danger during the voyages was a contributory consideration.

E.T.S. 448(42)

The possibility of making Australia completely self-contained by doing all the flying training of Australians in the Dominion was considered. The difficulties were lack of aircraft<sup>(1)</sup> and lack of aerodromes. In fact, the need of Australian aerodromes for operational purposes was expected

E.T.S. 445(42)

to be so great that it was also suggested that all Australian Empire Scheme training should be transferred to the United States. Lack of aircraft and lack of aerodrome space in

February 1942.

America made this idea equally impracticable. In the end

E.T.S. 499(42)

the Australian War Cabinet decided, late in February, to make the self-contained training of Australians in Australia an ultimate aim for planning, but to resume the sending of Australian pupils to Canada in the immediate future. The sending of pupils to Rhodesia was however, not resumed.

E.T.S. 499(42)

The air forces in Australia were to be expanded from 32 to 73 squadrons in the following year (up to March 1943), and the supply of men for them was to be a first call on Australian flying training. Experienced Australians who had been serving with the R.A.F. were to go back to the Dominion to give the expansion a stiffening, and Australia was to start O.T.U.'s to back its expanding air strength. Pupils over and above those needed for Australia's own forces would go, as before, for training in Canada, and the numbers (1,300 pilots, 676 observers, and 936 wireless operator air gunners per year) remained substantially unchanged.

The immediate pressure for Australia to rely entirely on her own resources was relieved by United States help, and it became necessary to make changes at some schools in order to provide aerodromes for the U.S.A.A.F.<sup>(2)</sup> By

/the end

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- (1) Most of the aircraft needed would have to come from the United Kingdom or the United States, and neither country could spare any.  
(2) Towards the end of March No.2 E.F.T.S. Lowood, No.2 S.F.T.S. Wagga, and No.3 S.F.T.S. Kingaroy began to disband, their pupils and aircraft being distributed among the other schools.

the end of March one O.T.U. (training on Beauforts, and originally improvised to provide Far East reinforcements) was in existence.

E.T.S. 494(42) All courses in Australian schools were extended by two weeks in December 1941, and by a further two weeks in January 1942. The reduction of output caused by the outbreak of the Pacific war was 254 pilots, 87 observers, and 123 wireless operator air gunners. In addition, the numbers which went on to complete their training in Canada were reduced by 400 pupil pilots, 188 pupil observers, and 288 pupil wireless operator air gunners.

NEW ZEALAND

New Zealand's contribution in man-power was considerably larger than her contribution in flying training. Of the 3,350 recruits whom the Dominion undertook to provide annually (by the Ottawa agreement of 1939) rather less than half were to be trained in New Zealand. All the observers and W. Op. A.G.'s, as well as one third of the pilots, were to have their flying training in Canada. As a result, schools handling only 1,872 E.F.T.S. and 1,040 S.F.T.S. pupils per year were needed in New Zealand.

There was a good nucleus from which to expand. Plans had been made before the outbreak of war for supplying the R.A.F. with 650 fully-trained pilots per year<sup>(1)</sup>, and New Zealand's schools were able to reach the full size scheduled for them under the Empire Scheme as early as the end of 1940. Three S.F.T.S.'s and four E.F.T.S.'s were then in operation<sup>(2)</sup>, the fourth E.F.T.S. (which completed the Dominion's undertaking) starting work at the end of December. These schools, which varied in size, were all smaller than standard R.A.F. schools of the same types: aerodromes and buildings already in existence were used for the sake of economy, and in any case some of the aerodromes could not be enlarged. Together, these schools were equivalent to two standard S.F.T.S.'s and three standard E.F.T.S.'s.

E.T.S. 155(41)

During the autumn of 1940 the output from these schools was increased by introducing the Second Revised (i.e. 12-week S.F.T.S. and 6-week E.F.T.S. courses), to 2540 E.F.T.S.-trained and 1,150 S.F.T.S.-trained men per  
/year

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- (1) These plans were superseded by the Empire Scheme, but the first Empire Scheme intakes of recruits were not made until April 29th, 1940. A considerable number of New Zealand pilots trained under the earlier scheme reinforced the R.A.F. during 1940, before Empire Scheme outputs were ready.
- (2) No.1 E.F.T.S. Taieri                      No.3 E.F.T.S. Harewood  
No.2        "        New Plymouth                      No.4        "        Whenupai  
No.1 S.F.T.S. Wigram                      No.3 S.F.T.S. Ohakea  
No.2        "        Blenheim

year<sup>(1)</sup>. The S.F.T.S. output was stepped up again, to 1,420 pilots per year, by increasing the size of the S.F.T.S.'s early in 1941<sup>(2)</sup>.

New Zealand did not go beyond the Second Revise because the inexperience of instructors and a lack of equipment meant that a high standard of output could not be maintained if the further shortening of the Third Revise were made. A few experienced instructors were lent by the United Kingdom, but it was necessary to rely mainly on men newly trained at the Flying Instructor's School at Hobsonville.

For some time unsuitable aircraft were a handicap. At first the S.F.T.S.'s used Gordons and Vincents, but the full agreed number of ~~Or~~ford's was sent (unaffected by the embargo) during 1940, and Harvards arrived early in 1941, so that by the middle of 1941 two of the S.F.T.S.'s were using Harvards and ~~Ox~~ford's, while the third used Hinds and Oxford's until more Harvards arrived at the end of 1941. As the Vincents went out of use, instruction in instrument flying improved. Night flying at the E.F.T.S.'s was begun in the middle of 1941. Flying training in New Zealand was occasionally difficult, not because of weather, but as a result of the bumpy conditions produced by mountains and the prevalent high winds.

Initial training was given in New Zealand to all recruits from the Dominion, whether they were to be given their flying training in New Zealand or in Canada. The Initial Training School<sup>(3)</sup> course in 1940 was ~~six~~ weeks for pilots and four weeks for other air crew. Considerable

- /care and
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- (1) The number of E.F.T.S.-trained pupils required by Canada went up to 900 per year after the Third Revise was applied in Canadian schools.  
(2) During 1941 most of New Zealand's output of trained men went to the United Kingdom. A few were sent to the Far East.  
(3) At Weraroa, near Levin.

care and attention were given to pre-entry training, and a thorough scheme of basic education, lasting 4-6 months according to recruits' educational standard, was brought into operation. Cadet (A.T.C.) training was however strongly opposed, both by the secondary schools and on political grounds, and was dropped.

The outbreak of war with Japan in December 1941 set the same problem - reconciling operational readiness with continued training - in New Zealand as it did in Australia.

E.T.S. 430(42)

New Zealand, however, continued to send her full quota of pupils to Canada for training - even though they had to

E.T.S. 461(42)

cross the Pacific in penny packets in all kinds of ships - and enquired whether the training of all New Zealand pupils

could be undertaken in Canada in order to set every New Zealand aerodrome free for operational work or operational

training. Sixteen operational squadrons were improvised in the early part of 1942, using almost every type of aircraft

in the Dominion from Vincents to Moths<sup>(1)</sup>. Five of these

improvised squadrons were 'auxiliary' part-time units made up of school staff using school aircraft, but the training

programme went on unaltered.

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(1) The only monoplane type in these squadrons was the Harvard.

SOUTHERN RHODESIA, KENYA, AND IRAQ

Flying training in Southern Rhodesia had wholehearted backing from the Government and people of the Colony. Executive control was in the hands of the Rhodesian officer, A/C. Meredith, who had played a large part in bringing the scheme into existence. Development was quick, energetic, and sound.

Whereas schools in Canada, Australia, New Zealand, and South Africa were, in the main, Dominion establishments more or less reinforced by the R.A.F., Rhodesian schools were very largely R.A.F. establishments in a Rhodesian setting. The United Kingdom provided all the aircraft and equipment, and most of the staff and pupils,<sup>(1)</sup> while Southern Rhodesia supplied the stations, accommodation, and administration, and made a substantial contribution<sup>(2)</sup> to the cost. The Rhodesian schools were controlled by a Rhodesian Air Training Group answerable to the Southern Rhodesian Government through its Minister for Air, but working for all practical purposes direct with the Air Ministry in London.

May 1940.

The Rhodesian Group was originally planned as three E.F.T.S.'s and three S.F.T.S.'s, to produce some 1,300 trained pilots per year. Its first E.F.T.S. was opened on 24th May 1940, and its first S.F.T.S. on 19th July. As the scheme was coming into operation in May, however, Southern Rhodesia offered to undertake more training and to accommodate another E.F.T.S. and S.F.T.S. The offer was accepted, and Rhodesia's target became four E.F.T.S.'s and four S.F.T.S.'s. The second E.F.T.S. (which was ready only twelve weeks after construction began) opened in August, and the second S.F.T.S. in October.

/The schools

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(1) The staff and pupils of Southern Rhodesian schools amounted to no less than one sixth of the Colony's white population.

(2) £800,000 per year.

The schools were equipped with Oxfords and Harvards, and began working as mixed (i.e. S.E. and T.E.) schools. The S.F.T.S. course at first lasted 16 weeks, but was reduced without any change of syllabus to 14 weeks in the autumn of 1940. The output of pilots was further increased by 25% overbearing, making the pupil population 200 at each S.F.T.S. The Rhodesian Training Group at the end of 1940<sup>(1)</sup> was thus capable of a theoretical output of some 1,260 pilots per year, trained on the 'old' (i.e. I.T.S. - A.T.S.) syllabus.

Pupils for these schools came at first from the United Kingdom and Southern Rhodesia - mostly from the United Kingdom because of the Colony's small population - but towards the end of 1940 Australia agreed to provide some 600 pupils per year, or a little less than one sixth of the number which the Rhodesian Group would require when all its schools were in operation. To begin with, all pupils from the United Kingdom or Australia were given I.T.W. training before being sent to Rhodesia, and the Rhodesian I.T.W. dealt only with Rhodesian pupils<sup>(2)</sup>. It was found, however, that the break between I.T.W. and flying training caused by the long journeys to Rhodesia was a serious defect, and also that shipping irregularities and delays made it necessary for Rhodesia to hold a pool of pupils awaiting flying training. It was then decided to give United Kingdom and Australian pupils their initial ground training in Rhodesia and to combine the pool and the Initial Training

E.F.S. 326(41)

August 1941.

/Wing.

(1) The Rhodesian Group in December 1940 was:-

I.T.W.		Hillside	Bulawayo
No.25	E.F.T.S.	Belvedere	Salisbury
No.26	E.F.T.S.	Guinea Fowl	Gwelo
No.20	S.F.T.S.	Cranborne	Salisbury
No.21	S.F.T.S.	Kunalo	Bulawayo

N.B. These Rhodesian schools were numbered consecutively with the R.A.F. schools in existence, or planned, in the summer of 1940.

(2) A Rhodesian I.T.W. was started in December 1940 because Rhodesian pupils were found to be at a disadvantage in comparison with I.T.W.-trained United Kingdom pupils.

Wing. The Rhodesian I.T.W., in the buildings of the Bulawayo Agricultural Show, grew rapidly, and to an apparently disproportionate size, in the first half of 1941.

Chiefly to cater for the training as other air crew of men eliminated at the various stages of pilot training in Rhodesia it was decided to open a Combined Air Observers School (for navigation and armament training). At the end of 1941 an Elementary Air Observers School stage was added for the same reasons - avoiding a break in training and holding a pool of pupils - as had dictated I.T.W. expansion.

60755

The instructors and staff for Rhodesian schools came mainly from the United Kingdom<sup>(1)</sup>, and when it became difficult in June 1940 to spare experienced men from Britain two South African schools and one in Kenya (later moved to South Africa) were given priority over the third pair of Rhodesian schools. Accordingly, the third

February-May 1941. Rhodesian E.F.T.S. did not open until February 1941, but the third S.F.T.S. and fourth E.F.T.S. began work in May, and the fourth S.F.T.S. in June. By the middle of 1941 the Rhodesian Group<sup>(2)</sup> had reached its full planned size, with the exception of the C.A.O.S., which was delayed partly through shortage of Ansons and partly because Rhodesia was somewhat in the dark about what kind of station should be built for it. The S.F.T.S.'s remained on 14 week I.T.S.-A.T.S. courses, but were specialised on S.E. or T.E. training.

/Most of

1) Rhodesian schools were thus similar to the "transferred" schools in Canada.

(2) I.T.W. Hillside, Bulawayo.	No.27 E.F.T.S. Induna, Bulawayo
No.25 E.F.T.S. Belvedere, Salisbury.	No.28 E.F.T.S. Mount Hampden.
No.26 E.F.T.S. Guinea Fowl, Gwelo.	No.22 S.F.T.S. Thornhill, Gwelo
No.20 S.F.T.S. Cranborne, Salisbury	(S.E.)
No.21 S.F.T.S. Kumalo, Bulawayo (T.E.)	No.23 S.F.T.S. Heany, Nr. Bulawayo
	(T.E.)

The C.A.O.S. was opened at Moffat, Gwelo, in August 1941. A Rhodesian C.F.S. was opened at Belvedere in September 1941, and later moved to Glenluce, near Salisbury.

Most of the output from Rhodesian schools went to the Middle East. This was convenient not only geographically but also because the I.T.S.-A.T.S. training given in Rhodesia was well suited to an area in which there were few O.T.U.'s.

E.T.S. 204(41)  
205(e1)  
213(41)

February-March  
1941.

An offer which Southern Rhodesia made, early in 1941, to expand the Group to six E.F.T.S.'s and six S.F.T.S.'s was eventually declined after a period of uncertainty and contradictory decisions. The offer was made at a time when the United Kingdom was anxious to plan more schools but had to reckon with the possibility of United States training (with all its political, industrial, and man-power advantages) and with Canada's confidence that she could undertake all the training that was needed. Southern Rhodesia was a sterling area, and was capable of getting schools quickly into operation, but the overwhelming arguments in favour of United States schools and the steady pressure for a larger Canadian organisation turned the scale.

E.T.S. 161(41)

E.T.S. 175(41)

The Rhodesian schools did not escape difficulties when they began to work. Though they were free from the major troubles of finding aircraft and instructors - since the schools were sent out almost complete from the United Kingdom - they were handicapped by lack of spares, lack of equipment, and lack of target towing aircraft. It had been agreed as early as November 1939 that schools in Rhodesia would need 18 months' supply of spares, but none the less the initial supplies sent out for them were based on United Kingdom experience, and made no allowance for the special conditions of distance and enforced self-sufficiency. No spares at all arrived for the first E.F.T.S. until more than a month after it had begun work, and the school was able to operate only because the Southern Rhodesian Government had bought up all the de Havilland spares in /the country.

the country.

Troubles over spares and equipment persisted through 1940 and 1941, and were aggravated as time went on by the limited amount of shipping space available and by unexpected losses caused through sinkings. Rhodesia, however, considered that an amazing and infuriating lack of common-sense was being shown in making up the consignments. Aircraft general stores such as split pins were sent in exiguous quantities that barely covered the initial issues to flight stores, while only one set of tools was supplied for a school with 48 aircraft. On the other hand some hundreds of empty parachute boxes (which were not needed) arrived at a time when the Rhodesian Group was seriously short of parachutes, and the C.A.O.S. Ansons were thoughtfully provided with dinghies even though they were destined to fly consistently over land. It took considerable time to set those matters right, partly because of distance and shipping difficulties, and partly because the details of what Rhodesia wanted and what the Air Ministry was proposing to send had to be reconciled before anything was shipped. Unexpected factors also came in. The consumption of Oxford and Harvard tail wheel tyres and tubes was surprisingly heavy. The effect of dust, especially on Oxfords, set an awkward problem.

Southern Rhodesia tackled this state of affairs with energy and enterprise. Local purchase, local manufacture of spares, local design of air cleaners, cannibalism of un-serviceable aircraft - any means of providing the flying hours need for the planned pilot output - were used. Due attention was paid to considerations of safety, but little regard to established procedure and precedent. Further difficulty came later, when Southern Rhodesia had bought up all the raw materials such as duralumins, fabric, /and plywood

and plywood in the Colony and in South Africa, and when Air Ministry auditors arrived with queries, criticisms, and deprecations of what had been done to keep the schools at work.

Training was for some time handicapped by lack of bomb sights, blind flying hoods, intercommunication, wireless gear, cameras, and camera guns. In spite of these handicaps, however, the syllabus was covered thoroughly, and the only weakness in instruction was air firing, which was impossible because of the lack of target towers.<sup>(1)</sup> Special attention was given to Link Trainer and instrument flying instruction, partly because there was no bad weather in which to fly and night flying was extremely simple. Cockpit drill was thoroughly taught.

Instructors in Southern Rhodesia<sup>(2)</sup> had consistently arduous work. When aircraft were delivered they had to be ferried from South African ports, and instructors were the only available ferry pilots. The consistent fine weather made flying training constant and unremitting, while the heat and altitude made it trying. Regular leave and rest were essential, but the schools were below establishment and there were no replacements apart from pilots from operations in the Middle East who had received no training as instructors. Rhodesia made some use of the South African C.F.S., and pressed for an instructor training school. For a time the Air Ministry regarded the proposal with disfavour, but finally agreed, and a Rhodesian C.F.S. was started in September 1941.

/The chief

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- (1) There was no difficulty in finding ranges, which were marked by lines on the ground in deserted places. The lack of target towers persisted into 1942.
- (2) A few of the instructors sent to Rhodesia were not happily chosen, and the results were unfortunate in a country where the smallness of the white population put every misdemeanour under the microscope of public knowledge.

The chief features about Rhodesian training conditions were the excellent climate and the high altitude of the aerodromes. The climate made it possible to cover a full syllabus in a short time, but it meant hard work for instructors, caused erosion and dust troubles, and gave no opportunity of training in bad weather or poor visibility. High altitude did not suit Oxfords, increased the accident rate, and made it inadvisable to do much night training at the E.F.T.S.'s.

A high proportion of the staff in Rhodesian schools came from the United Kingdom, and the possibility of moving their families to Southern Rhodesia was discussed in 1941. The Rhodesian Government was willing to build married quarters, but shortage of shipping prevented any moves. The scheme was dropped, but there was considerable discontent among the R.A.F. staff in Rhodesia.

Kenya. Early in 1940 it was planned to start an E.F.T.S., based on the Kenya Auxiliary Air Force training flight, to draw pupils from Kenya and Northern Rhodesia and feed the projected S.F.T.S. at Nakuru. With Italy's entry into the war, however, Kenya became too near a scene of operations (Somaliland and Abyssinia) to be suitable for schools. Nakuru was used by South African squadrons, and later became a South African O.T.U. The S.F.T.S. (No.16) intended for Nakuru was eventually set up in South Africa, and the projected E.F.T.S. (No.30) was also started there<sup>(1)</sup>. Recruits from Kenya, however, were trained in Southern Rhodesia, and were not sent to No.30 E.F.T.S. and No.16 S.F.T.S.

/Iraq

(1) Both were R.A.F. schools, with aircraft, instructors, and staff from the United Kingdom. The S.F.T.S. was regarded for some time as a "transferred" school, under the code name of Cowslip.

E.T.S. 377(41)

S.60755

Iraq. No.4 S.F.T.S. at Habbaniya remained rather a backwater of training. Some Oxforōs were added to its establishment, and it taught a miscellaneous intake of pupils on the old I.T.S.-A.T.S. syllabus. South Africa was offered a few vacancies there when the Union had a surplus of E.F.T.S. trained pilots and little S.F.T.S. capacity to continue their training. The school's output went to the Middle East.

Habbaniya was not an ideal location for a school. The full syllabus could not be given in hot weather; it was a long way from any E.F.T.S. to feed it with pupils; and its size was strictly limited<sup>(1)</sup>. No.4 S.F.T.S. went on working there until Rashid Ali's ~~revolt~~ in May 1941 compelled it to become an improvised operational unit. After the 1st July 1941. revolt had been brought to an end the victorious school was S.D.155 487(41). closed and its instructors went from Habbaniya to reinforce the Rhodesian Group.

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(1) Early in 1940 it was decided not to expand No.4 S.F.T.S. while it was in Iraq, but to move it to South Africa as soon as accommodation was available.

SOUTH AFRICA

Until April 1940 flying training in South Africa was primarily intended to produce a pilot reserve, and was chiefly concerned with ab initio instruction. This was done under S.A.A.F. supervision at a number of civil schools, but there was comparatively little provision for advanced or service training, which was concentrated, with instructor training, at one station (Zwartkop).

April-May 1940.

In April and May, just before A/C/M. Brooke-Popham's mission began work, there was a re-organisation which brought the South African training system more into line with the standard R.A.F. layout of schools. The numerous civil schools were amalgamated and concentrated into two, at Baragwanath and Randfontein; Zwartkop was devoted entirely to service flying training by moving its instructor-training element, as the South African C.R.S., to Kimberley; an Armament Training Camp was set up at East London; and nuclei of armament and navigation schools were created at Young's Field. Of these only the two civil ab initio schools were in good working order: the others were in an early and imperfect stage of development.

The South African Air Force at this time contained a considerable number of pilots who had received ab initio instruction at civil schools, but few who had been given service training. A high proportion of the few service-trained pilots, however, had also been trained as instructors. The S.A.A.F. had very few skilled technical ground staff, because of its limited amount of advanced training and reliance on civil schools.

Plans for Expansion.

May 1940.

When the Brooke-Popham mission began to discuss the expansion of South African training it soon became clear

/that the

S.61525

that the first step must be to create a sound S.F.T.S. nucleus, working on well-organised lines and to a good standard. The possibility of sending a complete, or nearly complete, S.F.T.S. from the United Kingdom to serve a this nucleus was investigated, but on 17th May the Air Ministry informed A/C/M. Brooke-Popham that a complete school could not be supplied because of the loss of pilot output which would be involved. The only alternative was to create the nucleus S.F.T.S. from what was available at Zwartkop, with such R.A.F. reinforcement<sup>(1)</sup> from the United Kingdom as would be necessary to bring it up to full standard size - though this would swallow up all South Africa's resources and make it impossible to start a second S.F.T.S. until either the United Kingdom could supply the staff or South Africa could train the instructors and mechanics.

Towards the end of May, Lt. Col. Tasker (South African Director of Air Training) outlined a scheme for expanding South African training by first creating a nucleus of two S.F.T.S.'s, two E.F.T.S.'s, and one combined (i.e. navigation and armament) Air Observers School, and then opening additional schools as the output from the nucleus provided the staff for them until 6 S.F.T.S.'s, 6 E.F.T.S.'s, and 4 A.O.S.'s were at work.

June 1940.

This scheme was embodied in the agreement<sup>(53)</sup> signed by A/C/M. Brooke-Popham and Major Gen. van Ryneveld on 1st June 1940. Aircraft and equipment were to be supplied by the United Kingdom, as well as such instructors and staff as were needed - particularly for the second S.F.T.S. of the nucleus. No dates could be set for the completion  
/of the

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(1) 6 officers and 123 airmen.

(53) Appendix 53. Letter from A/C/M. Brooke-Popham to the Air Ministry dated 3rd June 1940, Memorandum on the Expansion of Training Facilities in South Africa dated 1st June 1940, and certain Amendments to the Memorandum dated 7th August 1940. (C.S.12664).

of the scheme, since it was dependent on the uncertain dates by which the United Kingdom could supply aircraft, equipment, and men, but it was hoped to have Stage I (the creation of the nucleus) finished by the end of 1940. First call on the output from this training organisation would be to meet the needs of the S.A.A.F., and it seemed improbable that there would be any room for R.A.F. pupils until at least the second S.F.T.S. was in working order. Ultimately, when Stage II of the expansion was finished, the South African organisation would be able to train 2,600 pilots and 700 observers per year for the R.A.F. It was to work to 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 - so much per United Kingdom pupil trained - but the details were left to be worked out by Sir James Ross, who remained in South Africa when the rest of the mission returned to England on 3rd June.

The training organisation which South Africa undertook to create was large. In proportion to 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 the repair organisation. South Africans, in general, could produce good ideas and well-conceived plans, but disliked the drudgery of detail and the facing of unpleasant facts. The Union's political make-up contained strongly anti-British and pro-German elements: sabotage in practical matters and administrative affairs had to be guarded against: high officers were under surveillance and government officials were sometimes interned: schools had to be located where they were unlikely to be damaged by unfriendly people.

/These

These difficulties in the way of South Africa's training expansion were recognised before the Brooke-Popham mission returned to England, but no experienced R.A.F. officers remained in South Africa, or were sent out, to help and advise the Union on carrying out what had been undertaken. It was thought at the time that R.A.F. officers in South Africa would be able to do no more than "elaborate academic details", since bringing into operation the schools that had been planned was very largely dependent on the supply of men and material from the United Kingdom - a supply which in May 1940, when the Germans were overrunning France and Belgium, seemed likely to be fairly long deferred.

July 1940.

In July, seven weeks after the Van-Brookham<sup>(1)</sup> agreement was signed, the Union agreed to accept four transferred schools from the United Kingdom, and the size of the training organisation which had to be planned went up<sup>(2)</sup>. South Africa was left to her own devices over this planning, and had to deal unaided with:-

"inevitable serious handicaps: shortage of staff officers with experience of organisation and problems of the scale involved: a shortage of air service experience and skilled trades, building

(3) artisans, steel and manufactured products generally.

The organisation of aerodromes, auxiliary units, technical training, conditions of service, staff and manuals of procedure and administration had to

/be

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- (1) The agreement of 1st June 1940 was generally, and conveniently, referred to as the "Van-Brookham" agreement.
  - (2) The number of Air Observers Schools to be formed was increased to five, and the first A.O.S. at East London included in Stage I, at the beginning of August. See Appendix 51.
  - (3) From a report made in June 1942 by W/Cdr. S.E. Mackenzie (Air Ministry, O.S.).

be developed on a new and more complete scale. Lay-out and establishment details were lacking. Furthermore there was the impending arrival of R.A.F. units and considerable numbers of personnel with all the problems of combined operations between two air forces of basically different organisation which this portended. These difficulties could not have been avoided. The R.A.F. were in fact responsible for them."

September 1940.

Eventually it was decided to send a British Air Liaison Mission to South Africa, and the Mission, headed by A/C. M.B. Frew, arrived in the Union in October 1940.

Actual Development.

Meanwhile the first steps in Stage I of the agreed programme had been taken. The E.F.T.S.'s at Baragwanath and Randfontein were militarised on 8th August, when training<sup>(1)</sup> under the Van-Brookham agreement may be said to have begun. The first nucleus S.F.T.S., which had moved from Zwartkop to Kimberley early in June (the C.F.S. moving from Kimberley to Bloenfontein), received its reinforcement of R.A.F. staff on 6th September. By the end of the year it was in working order, using Harts and Oxfords, but the remaining schools of the nucleus - the second S.F.T.S. and the A.O.S. - had not started, chiefly for lack of aircraft. Rather unexpectedly, the first S.F.T.S. was able to train for the R.A.F. and one third of its pupils came from the United Kingdom.

December 1940.

Two transferred navigation schools, at Queenstown and Oudtshoorn, and a transferred school of G.R. at George were starting work at the end of 1940, so that the South

/African

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(1) The arrangements made by the agreement of 1st June gradually came to be known as the Joint Air Training Scheme (J.A.T.S.).

African training organisation<sup>(1)</sup> than consisted of two E.F.T.S.'s and one S.F.T.S., plus three transferred schools. In addition, there were various small nuclei for future schools: a B. & G. School core for the Air Observer School existed at East London (where a new aerodrome, Collendale, was being built), and there were elements of navigation and armament schools at Young's Field.

January 1941.

E.T.S. 193(41)

E.T.S. 245(41)

The training commitments for which South Africa had to plan were increased early in January 1941 when Major Gen. van Ryneveld agreed with A/M. Longmore (C.-in-C., M.E.) that the Union would accommodate the R.A.F. E.F.T.S. and S.F.T.S. which had previously been destined for Kenya. There were many difficulties, however, in putting the plans into practice. Shortage of aircraft and equipment was severe, and there was a particular lack of aircraft appropriate to the training that was scheduled. Air firing could not be done. There were no turrets, no A.M.L. teachers, and no synthetic trainers. Publications were extremely scarce. There was a crippling shortage of spares. Skilled tradesmen were rare, and it was a long business to train the numbers needed. One of the results was that the S.F.T.S. at Kimberley, even though it had its full complement of aircraft, found it hard to produce the flying hours required for 16-week courses with a pupil population of 160, and the E.F.T.S. course was increased to 75 hours (instead of 50) to make up for shortcomings in S.F.T.S. flying.

These difficulties went on through most of 1941, when the development of South African training was largely

/dictated

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(1) South African schools in operation at the end of 1940 were:-

No.1 E.F.T.S.	Baragwanath
No.2 E.F.T.S.	Randfontein
No.1 S.F.T.S.	Kimberley
Prest (A.O.N.S.)	Queenstown
Mare ((A.O.N.S.)	Oudtshoorn
Squire (S. of G.R.)	George
C.F.S.	Bloemfontein

dictated by the availability of aircraft and spares. There was, of course, a severe general shortage of training aircraft, and it was far from easy for the United Kingdom to find them for South Africa. Shipping difficulties and sinkings<sup>(1)</sup> accentuated the trouble.

Five new schools were opened during the first half of 1941. Stage I of the Van-Brookham expansion was completed in January 1941 by opening the second S.F.T.S. at Vereeniging and the A.O.S. at East London. The R.A.F. ex-Kenya schools were started - the E.F.T.S. (No.30) at Wonderboom in February and the S.F.T.S. (No.16) at Waterkloof in June. Another A.O.S. began at Port Elizabeth in February. In all cases, however, the opening dates were largely nominal.

E.T.S. 261(41) Port Elizabeth, for instance, could do no flying before May.

Wonderboom could work at only a quarter of its proper size

E.T.S. 315(41) because of lack of aircraft. Vereeniging had to use Harts because the aerodrome was unsuitable for Oxfords, but could not have a full S.F.T.S. complement of Harts because they were also wanted by the A.O.S.'s. Apart from the transferred schools, there were only 12 Ansons in the Union. They were at Young's Field, which was therefore the only school able to give navigation training. East London and Port Elizabeth had to confine themselves to armament instruction, but there were not enough Battles to equip them for the work, and they had to use Wapitis and Northrops, plus a very few Oxfords and Battles, as well as Harts. Except for a few Harts, there were no aircraft to equip the ex-Kenya S.F.T.S. at Waterkloof. By the middle of 1941 the South African training organisation had only one school over and above Stage I of the Van-Brookham plan and the various R.A.F.

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E.T.S. 325(41) (1) Up to July 1941 some 15% of the aircraft shipped to South Africa were lost.

units that had been transferred<sup>(1)</sup>, while all the schools were seriously hampered by shortage of aircraft, equipment, and spares.

While this difficult process of growth and development was going on the standard of South African training was low. The instructors were generally poor, particularly the R.A.F. instructors sent out from the United Kingdom<sup>(2)</sup>, who found difficulty in getting used to the temperature and altitude, and had to be given refresher courses at the South African C.F.S. Instrument flying was hardly taught at all;

there were no link trainers, and the instruments on the Harts at the S.F.T.S.'s were unsatisfactory, so that instrument flying could be taught only at the E.F.T.S.'s. Night flying was almost completely neglected, and armament training was scanty. The accident rate was high. The S.F.T.S. output

E.T.S. 369/41

E.T.S. 284/41

E.T.S. 339/41

was too small to provide additional instructors, and newly-trained pilots had to be obtained from Southern Rhodesia for C.F.S. training at Bloemfontein. The wastage at the E.F.T.S.'s was high, the waiting time for recruits before their flying training began was long because of the training schemes's slow development, and by the middle of 1941 an atmosphere of defeatism became noticeable in the elementary schools.

/Financial

(1) Early in 1941 all schools in South Africa were given the general title of "Air School". The organisation at the end of June 1941 was:-

No.1 Air School	(E.F.T.S.)	Baragwanath
No.2 Air School	(E.F.T.S.)	Randfontein
No.3 Air School	(E.F.T.S.)	Wonderboom
No.21 Air School	(S.F.T.S.)	Kimberley
No.22 Air School	(S.F.T.S.)	Vereeniging
No.23 Air School	(S.F.T.S.)	Waterkloof
No.41 Air School	(Combined A.O.N.S. & B. & G.S.)	East London
No.42 Air School	(Combined A.O.N.S. & B. & G.S.)	Port Elizabeth
No.45 Air School	(Combined A.O.N.S. & B. & G.S.)	Oudtshoorn (Maro)
No.47 Air School	(Combined A.O.N.S. & B. & G.S.)	Queenstown (Prest.)
No.65/66 Air School	(Combined A.O.N.S. & B. & G.S.)	Young's Field
No.62 Air School	(C.F.S.)	Bloemfontein
No.61 Air School	(S. of G.R.)	George (Squire)

N.B. Nos.41 & 42 were doing no navigation training, Nos. 45 & 47 no armament training.  
(2) In a number of cases the instructors and staff sent out from the United Kingdom were not well chosen. Their conduct and behaviour were bad, and caused friction as well as inefficiency.

Financial Negotiations.

While the Joint Air Training Scheme was making this slow, difficult and badly-handicapped progress towards Stage I of the Van-Brookham plan, negotiations on the financial side of the arrangement went on continuously between the Union Government and Sir James Ross. These negotiations were full of surprises and changes. Though the matters being negotiated concerned the South African defence authorities, the defence side had little contact or co-ordination with the South African financial side: while the financial side, in its turn, preferred to negotiate without keeping the Finance Minister in the picture. There was no anxiety on the part of the Union authorities to reach a final agreement, and it seemed that they preferred to work without being bound by a written contract. All the time they appeared to hope that South Africa might be able to do a better deal and to suspect Sir James Ross of possessing an astute and crafty mind.

These protracted and somewhat fantastic discussions were inevitably a bad background for the Joint Air Training Scheme. The expansion of South African training urgently needed aircraft and equipment, but payment for them and their use became the subject of lengthy and tortuous negotiation. At first it was intended that the South African Government should pay for the schools, aircraft, and equipment and be paid at so much per head of output, but the basis changed, through a proposal that the capital costs should be shared between the Union and the United Kingdom (with consequent other modifications), to a suggestion made by Sir Pierre van Ryneveld in September 1940 that the Union should supply the buildings, land, and locally-produced requirements that the United Kingdom should supply the aircraft and other requirements, and that each country should pay its own men  
/working

E.T.S. 247/41.

C.S. 12664

September 1940

working in the joint training organisation. Under this arrangement South Africa would have first call on the output to feed the S.A.A.F. first line, and the rest would be at the United Kingdom's disposal.

This plan had a general similarity to the division of cost for the Empire Scheme, and was to cover the transferred as well as the van Brookham schools. Detailed discussion, however, of how many schools it was to embrace, whether the original S.A.A.F. schools were to be on the old or the new basis, and of the allocation of equipment to Union or United Kingdom responsibility dragged on until June 1941, when an agreement on the Joint Air Training Scheme in South Africa was signed<sup>(54)</sup>.

June 1941.

The scheme defined by this agreement was for seven E.F.T.S.'s, seven S.F.T.S.'s, six combined A.O.S.'s (the S.A.A.F. armament and navigation schools being re-organised and fused to form one of these schools), two more combined A.O.S.'s (the transferred Mare and Prest), one School of G.R. (the transferred Squire), the S.A.A.F. C.F.S., and a unit for assembling and testing aircraft<sup>(1)</sup>. The United Kingdom had the right, if it wished, to transfer the fourth school which South Africa had originally agreed to receive. South Africa was to bear the cost of the stations, administration, fuel, and oil: the United Kingdom was to pay for aircraft, spares and replacements: responsibility for equipment was divided. The arrangements were retrospective from 1st August 1940, and the agreement was for the duration of the war.

/The output

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(54) Appendix 54, Joint Air Training Scheme in South Africa: Memorandum of Agreement dated 23rd June 1941 (C.S.126 64).

(1) The standard sizes of schools were laid down as:- E.F.T.S. 96 pupils, S.F.T.S. 160 pupils, combined A.O.S. (J.A.T.S.) 240 pupils, combined A.O.S. (transferred) 200 pupils, S. of G.R. 96 pupils, C.F.S. 92 pupils.

The output and intake arrangements were not precisely defined. The schools were to be available for both S.A.A.F. and R.A.F. pupils: first call was to be for supplying the S.A.A.F., and the remainder of the output (which was not expected to be less than the 2,600 pilots and 700 observers per year of the Van Brookham agreement) was to be at the R.A.F.'s disposal: all air gunners turned out, however, were to be for the S.A.A.F. It was agreed that South Africans might be trained in lieu of R.A.F. pupils if the Africans were available for service with the R.A.F.

Service with the R.A.F.

Late in 1940, when the United Kingdom was in urgent need of pilots, South Africa could do nothing to increase the output. Only one S.F.T.S. was in operation, and it was quite impossible either to reduce the course below 16 weeks or to increase the number of pupils. The Union, however, offered to lend or transfer trained pilots to the R.A.F. and also to provide South African pupils to be trained, in the Union or in Southern Rhodesia, for service with the R.A.F. In any case the men would have to be volunteers for service outside Africa: there was strong feeling in the Union against using the S.A.A.F. to help the United Kingdom.

A number of trained pilots volunteered, and were prepared for service in the United Kingdom. The Air Ministry, however, sent them to the Middle East, presumably because South Africa's official attitude was that the S.A.A.F. should not serve outside Africa. The men concerned did not agree with this official attitude, had volunteered to avoid the restriction of their service to Africa, and were keen to fight in the United Kingdom. As a result, the Air Ministry's intendedly tactful posting to the Middle East caused despondency, which was consider-

/ably

ably intensified when these South African pilots discovered that there were so many R.A.F. pilots in the Middle East that they could barely be kept in flying practice.

South African pupils were invited to volunteer for service with the R.A.F. before their flying training began, and were transferred to the R.A.F. when they left Africa after it was finished. No publicity, either in South Africa or in the United Kingdom, was given to the volunteers, and South Africans trained in Rhodesia were allowed not to return to the Union as instructors.

Difficulties and Criticisms.

The development of South African training was not free from friction and misunderstanding. Some of the officers and men sent out from the United Kingdom made a poor impression. Anti-British feeling gave rise to a certain amount of unpleasantness<sup>(1)</sup>. Accommodation at schools was often improvised and uncomfortable. There was R.A.F. criticism of the S.A.A.F. organisation because it was under army control. South African maintenance was criticised for inefficiency and for resorting to local manufacture of spares - though the shortage of spares was crippling. South African powers of administration and detailed organisation were considered poor.

The higher organisation of South African training also received a good deal of attention and criticism, and considerable thought was given in London to schemes for improving it. These schemes were uninvited by South Africa, and when eventually the Air Ministry proposed in June 1941 to appoint a Head to the British Air Liaison Mission who would deal with administration, and leave A/C. Frew to deal with the training side, South Africa took the view that such an appointment would indicate lack of trust in the Chief of the South

E.T.S. 280 (41)

E.T.S. 302(41)

E.T.S. 306(41)

African General Staff (Major-General van Ryneveld), and the

/proposal

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1.S. 245(41) (1) Demonstrations of hostility at Oudtshoorn became noticeably less after Mare's fire tender had put out a fire in the town.

proposal was regretfully dropped for the sake of South African goodwill.

E.T.S. 397(41)

A/C. Frew recognised the defects in South African organisation and administration to arise chiefly from inexperience of what a large organisation required and from a naturally casual outlook. He preferred to deal cautiously and gradually with the problem, and at first concentrated on maintaining good relations with the South Africans and winning their confidence. In June he was made S.A.A.F. Director of Training and A.O.C. Training Headquarters, and combined these functions with his duties as Head of the British Mission.

E.T.S. 280(41)

E.T.S. 344(41)

The Air Ministry considered South African training unsatisfactory, and in September proposed that A/C. Frew should be replaced. Major-General van Ryneveld, however, refused to accept any replacement. It was then agreed that

E.T.S. 345(41)

specialists in organisation and navigation should be sent out.<sup>(1)</sup>

Further Development.

Delays in building were largely responsible for lateness in Stage II of South Africa's training development. Stations and their equipment were seldom ready less than six months after the date scheduled for opening, and it was found that the only way of speeding up construction was to move the pupils in and start work. Thus, as more aircraft became available, schools were consistently and habitually opened long before they were really ready to start, and a good deal of criticism was caused. In August it was decided to get more schools opened and working by sharing what aircraft were available between them. This meant that E.F.T.S.'s would have 36 aircraft each (instead of 48) and S.F.T.S.'s 64 (instead of 108) and would have correspondingly smaller pupil populations, but it would get the whole organisation into operation, though at less than its full

E.T.S. 351(41)

August 1941.

E.T.S. 369(41) (1) /strength  
A/C. Croke and G/C. Harrison arrived in South Africa in December.

strength, as soon as possible. Schools would be brought up to full strength later, as more aircraft became available.

Four E.F.T.S.'s were opened in the second half of 1941, and two S.F.T.S.'s<sup>(1)</sup>. The S.F.T.S.'s were equipped with Masters, but the Masters immediately developed an extremely low serviceability (about 20%) because of structural failure and shrinkage, the effects of bad packing for the voyage from the United Kingdom, and lack of spares<sup>(2)</sup>. The two new S.F.T.S.'s were given more aircraft, but it was impossible for them to keep up to schedule, and their intakes of pupils had to be cancelled in November. South Africa's S.F.T.S. capacity was then too small for its E.F.T.S. output, and two of the E.F.T.S.'s<sup>(3)</sup> had to be turned over to advanced elementary instruction in December.

The navigation element of Young's Field was separated from the armament element, and became an A.O.S.<sup>(4)</sup> in August 1941. Development of the other Van-Brookham A.O.S.'s<sup>(5)</sup> depended on the availability of Ansons, and it was not until January 1942 that two more<sup>(6)</sup> were opened.

/The South

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- (1) The E.F.T.S.'s were No.6 Air School, Potchefstroom (opened in August), No.4 Air School, Benoni (opened in September), No.5 Air School, Witbank (opened in October), and No.7 Air School, Kroonstad (opened in December). The opening of Witbank was delayed a month by the sinking of a cargo of Tiger Moths on their way to it from the United Kingdom. The S.F.T.S.'s were No.24 Air School, Nigel, and No.25 Air School, Standerton: both were opened in October.
  - (2) The Master troubles grew worse, and for a short time it was impossible to use them for front gun firing. In March 1942 it was decided to replace South African Masters and Harts with Harvards, but the replacement could not be immediate, and Masters and Harts remained in use until the end of 1942.
  - (3) Benoni and Kroonstad.
  - (4) As No.66 Air School. The armament part of Young's Field was No.65 Air School.
  - (5) The two transferred A.O.S.'s, Mare and Prest, had Ansons sent out with them from the United Kingdom.
  - (6) No.44 Air School, Grahamstown and No.43 Air School, Port Alfred (Kowie). No.43 dealt with gunnery training only.

The South African A.O.S.'s had all been planned as combined schools, giving navigation and armament training. Lack of aircraft, however, had prevented Oudtshoorn and Queenstown from dealing with armament, or East London and Port Elizabeth from dealing with navigation. As a result, there had to be considerable fusion of S.A.A.F. and R.A.F. training. Throughout 1941 South Africans had gone to the "transferred" schools for navigation instruction, while the R.A.F. and S.A.A.F. output from the "transferred" schools had gone to East London, Port Elizabeth, or Young's Field for armament training<sup>(1)</sup>. At the beginning of 1942 East London, Port Elizabeth, Young's Field, and Grahamstown were able to do combined training<sup>(2)</sup>, but Oudtshoorn (Mare) and Queenstown (Prest) could still deal only with navigation and bombing training, and Kowie gave gunnery instruction to their pupils<sup>(3)</sup>.

Changes of course length, and increases of pupil population, did not affect South African S.F.T.S.'s during 1941. They continued to work to the 16-week I.T.S.-A.T.S. syllabus with a pupil population of 160, through shortage of aircraft often cut their pupil population down. In March 1942, as part of the "New Deal" re-organisation, the S.F.T.S. course was lengthened to 24 weeks, and it was decided to use the extra eight weeks for converting Hart-trained pupils to Masters and Oxfords.

#### Group and Zone Organisation.

In October 1941, a Group organisation was introduced

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- T.T.S.402(41) (1) Queenstown and Oudtshoorn began bombing training in November 1941.  
(2) Oxfords were used temporarily until Ansons arrived.  
(3) There was still a shortage of attack and towing aircraft. Kowie had to start with Oxfords for attacking and Northrops for target towing: T.T. Battles had not yet reached South Africa.

duced; the E.F.T.S.'s and S.F.T.S.'s forming No.24 Group, and the A.O.S.'s No.25 Group<sup>(1)</sup>. In December 1941 the E.F.T.S.'s and S.F.T.S.'s were zoned geographically, so that the S.F.T.S.'s could be fed by E.F.T.S.'s near them and so that the E.F.T.S. output could conveniently be sent to either S.E. or T.E. S.F.T.S.'s. The southern zone consisted of the E.F.T.S.'s at Randfontein, Potchefstroom, and Kroonstad with the S.F.T.S.'s at Kimberley, Vereeniging, and Bloemspruit (opened in March 1942). The northern zone had E.F.T.S.'s at Baragwanath, Wonderboom, Benoni and Witbank, with S.F.T.S.'s at Waterkloof, Nigel, Standerton, and Pietersburg (planned for opening later in 1942).

By the end of March 1942 the South African training organisation<sup>(2)</sup> had almost reached the full number of schools planned by the agreement of June 1941. Only one S.F.T.S. and one A.O.S. remained to be opened. Its effective size, however, was considerably less than the number of schools

/suggested:

(1) No.24 Group was at Zwartkop, No.25 Group at Port Elizabeth and a third Group, No.21 dealing with technical and ground training at Johannesburg.

(2) The Joint Air Training Scheme Schools at the end of March 1942 were:-

No.1	Air School (E.F.T.S.)	Baragwanath
No.2	" "	Randfontein
No.3	" "	Wonderboom
No.4	" "	Benoni
No.5	" "	Witbank
No.6	" "	Potchefstroom
No.7	" "	Kroonstad
No.21	" (S.F.T.S.)	Kimberley (Oxfords)
No.22	" "	Vereeniging (Harts)
No.23	" "	Waterkloof (Harts)
No.24	" "	Nigel (Masters)
No.25	" "	Standerton (Masters)
No.27	" "	Bloemspruit (Masters)
No.41	" (A.O.S.)	East London
No.42	" "	Port Elizabeth
No.43	" "	Kowie
No.44	" "	Grahamstown
No.45	" "	Oudtshoorn
No.47	" "	Queenstown
No.66	" "	Young's Field

N.B. Nos. 45 and 47 taught navigation only. No.43 gunnery only. The others were combined.

No.61	Air School (S. of G.R.)	George
No.62	" (C.F.S.)	Bloemfontein
No.66	" (Air Armament School)	Young's Field
No.100	" (Recruit Training)	Zwartkop

suggested: shortage of aircraft, unsuitable or unsatisfactory aircraft, and delays in building limited both the number of pupils and the efficiency with which they could be taught.

THE UNITED STATES

The possibility of help from the U.S.A., in one form or another, was constantly in mind both before and after the outbreak of war. American production resources, American man-power, and American strength as a guarantee against disturbance were all put forward as arguments in favour of training in Canada. America as a source of supply for aircraft (both operational and training types) was a major factor in planning. The possibility that America might become a theatre for non-military pilot training was mentioned from time to time after the outbreak of war.

Early Discussions.

S.61719

In May 1940, when a shortage of pilots at the end of the year seemed likely, A/M. Gossage (A.M.P.) suggested that the elementary and intermediate stages of pilot training might be done in the United States with the pupils' military (A.T.S.) training in Canada. The suggestion, as well as a hint that the United States might perhaps not be disposed to consider it unneutral, was put to A/M. Gossage by A/C. Critchley, who had discussed it with Col. Scanlon of the U.S. Embassy. On 22nd May, Sir Archibald Sinclair asked Lord Halifax (S. of S. for Foreign Affairs) to raise the matter with the United States Ambassador (Mr. Kennedy), bringing forward an additional argument that the embargo on export of aircraft from the United Kingdom would retard the Empire Scheme and so make "ready-made" United States training capacity more than ever desirable.

The United States Ambassador received the proposal favourably, and a plan was worked out for the United States to turn a blind eye to the training of R.A.F. pilots as private pupils (in contrast with instruction en bloc as organised courses) in American schools. This scheme was

/to be

to be investigated unofficially: the British Ambassador in Washington (Lord Lothian) would discuss it with Mr. Sumner Welles (who would be told of Mr. Kennedy's benevolence towards the plan), and A/V/M. McKean would examine the adequacy and suitability of training facilities in the U.S.A. Lord Lothian was not, however, to move until Canada agreed to the scheme.

Though it was an awkward time to ask for Canada's assent<sup>(1)</sup>, the Canadian Government agreed that the scheme should be raised with the U.S.A., and Lord Lothian put it to Mr. Sumner Wells on 27th May. On 5th June Mr. Sumner Welles replied that the U.S. Government could not take British or Canadian pupils, except in a few special cases, because there were shortages of instructors and equipment, and the United States' own training was expanding. Lord Lothian then suggested that the United States might make two or three aerodromes available, so that the United Kingdom could undertake training on civil aircraft, with civilian instructors and civilian pupils<sup>(2)</sup>. Mr. Sumner Welles looked into the suggestion, but told Lord Lothian on 23rd June that it would be better for British or Canadian pupils to be trained in Canada, where it would be possible to employ American instructors and use American aircraft rented or purchased from private interests. The answer was the President's, though Mr. Roosevelt "did not mean that the training of British or Canadian civil pilots should not be done in the U.S.A. but merely advised that in his judgment it would be better if it were done in Canada". This was a definite check, but the idea of training in the United States was by no means abandoned. (American instructors and staff pilots were employed, to some extent, in Canada, and

S.61719

June 1940.

E.T.S. 104(40)

/American

- (1) Mr. Mackenzie King was being assailed by a growing number of critics about delays in getting the Empire Scheme under way, and the political situation was tense. For Britain to use training facilities in the U.S.A. would throw Canada's apparently slow progress with the Empire Training Scheme into sharper relief.
- (2) This idea was put forward by A/C. Pirie, the U.K. Air Attaché in Washington.

American aircraft used there<sup>(1)</sup> as Mr. Sumner Welles, had suggested).

In August 1940 Captain Harold Balfour re-opened the whole question of United States training for the R.A.F. in August 1940. discussion with Mr. Roosevelt and Mr. Harry Hopkins in Washington. This time the idea was given a cordial and welcoming reception. The background to the discussions was the Battle of Britain at its height, and Mr. Roosevelt considered that a bold and dramatic request from the United Kingdom for help would meet with a sympathetic and generous response from the United States. Flying training would be an appropriate form of help, provided it avoided acute political questions and any need for the administration's official sanction by being cloaked as a civilian commercial venture. A practical scheme was sketched for using three or four of the leading civil schools already training for the U.S. Army to turn out about 2,000 pilots per year. The chief difficulty would be the provision of advanced trainers, which were as scarce in the United States as elsewhere<sup>(2)</sup>, and the only possible solutions were for the United Kingdom to supply them or for the President to divert them to British use from the U.S. Army or Navy. An outline of this scheme was cabled from Washington on 24th August by Captain Harold Balfour with an enquiry whether the advanced trainers could be provided.

S.61719

Mr. Roosevelt had observed that the United Kingdom did not seem to appreciate the need for a bold theatrical move to get American help. On 28th August the Air Ministry warned Captain Balfour, in a telephone conversation, of the heavy cost (in dollars and training aircraft) which such a scheme would involve, and of the danger of anything more

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- (1) Most of these aircraft however were from contracts placed some time before either by Britain or France. The United States' own requirements greatly reduced the likelihood of future deliveries.
- (2) Elementary trainers, as elsewhere, presented no difficulty.

than exploratory conversations. These exploratory conversations worked out a plan whereby the civil school operators already training for the U.S. Army would set up new schools to train for the R.A.F. The chief requirements were capital to build the schools and advanced trainers to use them: payment would be on the basis of so much an hour for the training done.

Shortage of Aircraft

When Captain Harold Balfour came back to London the plan was discussed, and it was decided to go ahead through Mr. Morgenthau, who was entrusted with the supervision of American help for Britain. It was, however, far from easy to go ahead. Advanced trainers were the inevitable snag: the United States could not find enough for its own growing training, and at the beginning of October even tried to borrow some of these scarce and precious aircraft from Britain. It seemed likely to be several months before the United States could build enough to supply the projected R.A.F. schools. At the end of October, in an endeavour to find some way of making American trainers available, A/V/M. McKean went to Washington to see whether some more economical method of using their trainer aircraft could be suggested to the United States authorities. This attempt to induce the American Army and Navy to release aircraft failed: there was no doubt that they had far too few for their own needs - in fact the Navy was being compelled to use a new and untried type - and that they would be unable to spare any for the United Kingdom until June 1941. The fact of this shortage of trainers was known in Congress, and any attempt to help Britain at the expense of the United States would be likely to bring a Congressional investigation. Finally, the Presidential election was impending, and no diversion of aircraft from the U.S. Army

A.C.39(40)

October 1940.

/and

and Navy to Britain by Mr. Roosevelt could be hoped for until it was over: the opposition was concerned and nervous about the possibility of secret war commitments.

The supply of advanced trainers was left in abeyance for some months. It was less easy to keep pressing for the aircraft after Lord Lothian died, and was succeeded as Ambassador by Lord Halifax. Again, A/V/M. Slossor was negotiating in Washington on the wider question of the supply of U.S. aircraft to Britain. Finally, the possibility of replacing cash and carry by Lease Lend began to appear. In the meantime, while the setting up of new civil schools<sup>(1)</sup> to train for the R.A.F. was blocked by inability to get advanced training aircraft, plans went ahead for a smaller scheme of giving refresher courses<sup>(2)</sup> to United States citizens who volunteered for service with the R.A.F.<sup>(3)</sup>.

November 1940. This refresher scheme was advocated by A/C. Pirie as the "thin end of the wedge", and came into operation at existing civil schools with such second-hand aircraft as could be obtained. Americans who volunteered and were qualified pilots with more than 80 hours experience were given some 150 hours training at certain United States civil schools and then, after being tested in Canada, went to the United Kingdom for operational training. Three civil schools<sup>(4)</sup> started on this scheme at the end of November 1940, but the output was small because few advanced trainers could be found, the neutrality laws prevented any publicity being given to the scheme and enforced camouflage of it as a plan for

E.T.S.213(41)

/training

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- (1) For which of course, the United Kingdom paid.  
(2) Discussions in London after Captain Balfour's return enlarged the scheme to eight schools, with an annual output of 3,900 pilots, and needing 528 advanced trainers.  
(3) Mainly in the Eagle squadron.  
(4) Sparton School (Captain Balfour) Tulsa, Okla.  
Dallas School (Major Long) Dallas, Tex.  
Cal-aero School (Major Moseley) Los Angeles, Cal.

training civilian ferry pilots, and it was difficult to make sure that pilots would be allowed to leave the U.S.A. after their training was finished.

March 1941.

Another small-scale use of United States training facilities came in the form of navigation courses (of 12 weeks duration) at the Pan-American Airways School at Miami, Florida. The first course, of only ten United Kingdom pupils, began in March 1941.

#### The Six Schools.

The scheme to use U.S. civil schools for training R.A.F. pupils came back into the picture on 5th March, when Gen. Arnold suddenly informed A/C. Pirie<sup>(55)</sup> that as soon as the Lease Lend Bill was passed the U.S. Army proposed to offer 260 elementary and 285 advanced trainers to the United Kingdom, for use in U.S.A. civilian schools<sup>(1)</sup>. Six civil school operators were nominated for the work, and Gen. Arnold had them present at his meeting with A/C. Pirie, so that no time need be lost in getting the scheme in operation. This offer of American aircraft and schools in the United States was the result of an order from the President following various talks on the subject of immediate help to Britain over training, particularly between A/C/M. Portal and Mr. Harry Hopkins. The manner in which it was made was notably open-handed and helpful.

S.61719

In spite of the manifest advantages of this All-Through<sup>(2)</sup> or Six Schools scheme, it had its disadvantages. Though it provided advanced trainers, they were all S.E. aircraft (at this time even the U.S. Army themselves had no T.E. trainers). Though the schools would be built and in

/operation

(55) Appendix 55. Extracts from letters dated 13th March 1941 and 2nd April 1941 from A/C. Pirie to A/M. Gerrod (E.T.S.219(41) and E.T.S.237(41)).

(1) The Air Ministry instructed A/C. Pirie on 6th March to re-open the civil schools scheme, but the United States acted before his instructions arrived.

(2) The Scheme was called "All-Through" because the training went through elementary, intermediate, and advanced stages at the same school.

operation quickly (the estimate was 45-90 days), their capital cost would have to be met by the United Kingdom, and the United States insisted they should have amenities on the same generous scale as American schools. The scheme used a fresh, previously untapped, source of instructors and facilities, but the price was high: the American civil operators proposed to charge \$25 per hour for primary instruction and \$35 per hour for advanced. Though 285 advanced trainers would be made available, they would be in substitution for, and not additional to, 200 which the United Kingdom had been trying to buy for use in Britain and the Empire. Though the scheme promised a means of training American volunteers for service with the R.A.F. (it was thought that two out of the six schools might be devoted to training these volunteers) there was no legal way of giving publicity in the United States to attract the volunteers.

S.61719

Nevertheless, the "All-Through" offer was considered at the Air Ministry on 7th March, and was, in effect, accepted the next day. Various details of the acceptance were worked out during the rest of the month. Pupils were to have I.T.W. training in the United Kingdom before going to America, the schools' C.F.I.'s were to be informed about R.A.F. methods of instruction by courses at the Canadian C.F.S. at Trenton, night flying instruction was to be given, armament and S.B.A. training were not practicable,<sup>(1)</sup> the amount which could be financed under Lease Lend was worked out, and the unlikelihood of attracting enough American volunteers to fill two schools became apparent. The attitude of Canada, and her probable resentment of the United Kingdom's acceptance of American

<sup>(1)</sup> Giving armament instruction was thought inconsistent with U.S. neutrality, and likely to provoke American public criticism. No S.B.A. system existed in America. /training

training when a recent offer to enlarge Canadian training had been virtually declined, had to be taken into account.

The S.F.T.S. Programme.

E.T.S. 204(41)

February 1941.

E.T.S. 205(41)

S. 61719

The All-Through scheme was regarded as additional to the planned programme of R.A.F. and Empire S.F.T.S.'s, so that the Six Schools caused no reduction in the number of S.F.T.S.'s needed. At the beginning of February 1941 there remained nine<sup>(1)</sup> for which homes were being sought; Canada was of course anxious to have them, and Southern Rhodesia offered to take two more S.F.T.S.'s and two more E.F.T.S.'s: but the Air Ministry was anxious to make them, if possible, "transferred" schools in the U.S.A. Canada was considered to be fully stretched by her existing commitments (i.e. the Empire Scheme, the original eight "transferred" S.F.T.S.'s, six other "transferred" schools, and E.F.T.S.'s to match the S.F.T.S.'s) and although Canada did not agree that she was fully extended, and pointed to the fact that the Empire Scheme was ahead of schedule in proof, the Air Ministry at first decided that two S.F.T.S.'s should go to Southern Rhodesia and the remaining seven to the United States. Early in March, however, it was not politic to put forward this further request for American help.

March 1941.

E.T.S. 213(41)

A week or so later A/C/M. Portal pressed for more training in the U.S.A. A/C. Critchley was enthusiastically advocating it, and the C.A.S. felt that the various difficulties could be overcome if they were properly handled. On 21st March a minute from him to Sir Archibald Sinclair, advocating the large-scale establishment of S.F.T.S.'s in America, led to a complete review of R.A.F. training in the U.S.A.

/Apart

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(1) Three "new" (i.e. additional) schools, and six "transferred" (i.e. new schools which it was intended should ultimately take the place of schools in the United Kingdom).

Apart from bringing out the familiar difficulties of shortage of advanced trainers and of armament training, this review<sup>(56)</sup> made clear the distinction between civilianised R.A.F. schools (which was what R.A.F. S.F.T.S.'s established in the U.S.A. would have to be) and American civil schools working for the R.A.F. The All-Through scheme could be justified to Canada on the ground that ready-made training facilities were being used, but it would be difficult to justify civilianised R.A.F. schools on that or any other ground. Putting R.A.F. schools in the United States would mean the use of British aircraft in the U.S.A., would involve heavy dollar expenditure, and might prejudice matters if it came quickly on the heels of the refresher and All Through schemes. These arguments, however, were not conclusive: either American or Canadian dollars would in any case have to be found, and the U.S.A. would be cheaper because of Lease Lend. The plan of putting S.F.T.S.'s in the United States was attractive, and Sir Archibald Sinclair decided on 25th March that it should be pursued by unofficial conversations. A statement of Britain's need for more training facilities was handed to the U.S. Ambassador (Mr. Winant) and also sent to the United States for consideration by the "Big Five" (Mr. Cordell Hull, Mr. Morgenthau, Mr. Harry Hopkins, Col. Stimson and Col. Knox).

E.T.S. 225(41)

In April General Arnold visited the United Kingdom and discussed training with A/M. Garrod, who summed up Britain's difficulties:-

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(56) Appendix 56. Minutes on Flying Training in the United States dated 22nd, 23rd and 25th March 1941, and a Note on Training Pilots in the U.S.A. dated 24th March 1941 (later sent to Washington). (E.T.S. 213(41)).

April 1941.

- (i) expansion of the training organisation and expansion of the first line were going on at the same time;
- (ii) manning the training organisation called for numbers of men who could ill be spared from the first line;
- (iii) there was a shortage of advanced trainers, partly caused by German bombing;
- (iv) there was difficulty in giving instruction, especially at night, in an operational area.

In general, A/M. Garrod said, Britain wanted short-term help to increase the R.A.F.'s 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 her newly expanding training organisation. The particular directions in which Britain asked for assistance were ferry pilots (for the Atlantic and Takoradi routes, as well as for the internal movement of aircraft), instructors (experienced men, to avoid the danger of using too many ex-pupils for teaching), and fully trained pilots ready for operational work. Navigation training aircraft and Radar Mechanics were also needed.

#### The Arnold Scheme.

This straightforward statement of need was met by a response from General Arnold which A/M. Garrod described as magnificent. Ferry pilots could and would, be provided: so would maintenance crews for ferrying work. One third of the United States Army's training capacity would be put at Britain's disposal - i.e. capacity capable by the end of 1941 of turning out trained pilots at a minimum rate of 3,000 per year<sup>(1)</sup> - and the first intakes of pupils could start in June. The whole cost of this training, except the elementary stage at civil schools, the board and maintenance of pupils, and the fuel and oil used, would be borne

(1) The agreed output of R.A.F. pilots from U.S. Army Schools was later raised to 4,000 per year.

by the United States. So far as navigation training was concerned, the R.A.F. might have full use of the Pan American Airways School at Miami, while General Arnold would see whether 100 observer-training aircraft could be provided.

This "Arnold Scheme" offer to train R.A.F. pilots in U.S. Army Air Corps Schools<sup>(57)</sup> was made on 13th April, and was accepted at once. It reduced the number of S.F.T.S.'s still to be placed to six.

E.T.S. 230(41)

The Towers Scheme.

The Arnold Scheme was not the end of American offers of help in training: on 29th May, Admiral Towers said that if an official request were made to the U.S. Navy he would agree to train pilots for flying boats and carrier-borne aircraft at the rate of 1,200 per year. The request was made and agreed, and the "Towers Scheme" came into existence.

E.T.S. 276(41)

There were thus five separate schemes for R.A.F. training in the United States. Taken in order of their arrangement, they were:-

- (i) The Refresher Schools (civil) for training United States citizens who volunteered for service with a mythical civil company called British Aviation, but who were invariably accepted for service with the R.A.F. when they reached British territory. (End of November, 1940).
- (ii) The Pan American Airways navigation courses at Miami, which trained observers. (March 1941).
- (iii) The All-Through scheme for six civilian operated schools training for the R.A.F., financed largely by Lease Lend, and turning out about 3,000 pilots per year. (5th March, 1941).

//(iii) The

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(57) Appendix 57. Offer by General Arnold of Training Facilities in the U.S.A. Notes of a Meeting on 24th April 1941. (E.T.S. 240(41)).

(iv) The Arnold Scheme for using United States Army Air Corps schools (both civil and service) to train R.A.F. pupils, financed largely by Lease Lend, and turning out about 7,800 pilots per year. (13th April 1941).

(v) The Towers Scheme for using United States Navy schools to train R.A.F. pupils, financed largely by Lease Lend, and turning out about 1,200 pilots per year. (29th May 1941).

The idea of asking for R.A.F. schools to be "transferred" to the United States was dropped, and in May Canada was invited to take six more S.F.T.S.'s.

Development.

It was not all plain sailing, however, after the various United States offers had been made and accepted<sup>(1)</sup>. On the British side there were doubts and uncertainties about the American syllabus and methods of instruction. On the American side there were legal difficulties in the way of putting the schemes into operation. The United States authorities went ahead without waiting for the legal side to be cleared, and were determined that the legal position should not stop the schemes, but the legal hurdles had none the less to be negotiated.

The All-Through schools were originally intended to start work on 17th May, but their organisation and the details of Lease Lend took longer than was expected. At the end of April A/C. Pirie asked the United States War Department to speed them up, and a plan was devised for the U.S. Army to buy the sites, arrange the construction,

E.T.S. 263(41)

S.61719

/lease

E.T.S. (1) There was at this time some danger of misunderstanding about the way Britain was dealing with American aircraft: a great many different branches of the Air Ministry seemed to be concerned with them, American experience and information seemed to be totally ignored, and the result was that although Britain had been supplied with American operational types (mainly Tomahawks and Fortresses) Americans considered that they were not being put to any real use.

lease the schools to Britain, and make the contracts with the civilian operators. This plan developed into a proposal that the U.S. Army should take over the Six Schools and give the United Kingdom equivalent capacity in U.S. Army Schools (i.e. effectively replace the Six Schools by an extension of the Arnold Scheme). Difficulties over the interpretation of Lease Lend however compelled both this plan for unifying the All-Through and Arnold schemes, and also a good deal of the U.S. Army's proposed help in speeding up the All-Through scheme, to be abandoned in the first days of May. There were some further delays, and it was not possible to sign the contracts and go ahead with siting the schools and starting construction until the end of May<sup>(1)</sup>. By the middle of June all six schools had been located<sup>(58)</sup>, and they were due to be ready in July and August. They were officially named British Flying Training Schools (B.F.T.S.'s)<sup>(2)</sup>.

May 1941.

When it became apparent in April that the All-Through schools would not be able to start until considerably later than the planned date (17th May) the United States War Department offered to allow All-Through pupils to be trained in the primary schools working for the U.S. Army (which were

/run by

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E.T.S. (1) The civilian operators were responsible for putting up the schools, 292(41) 60% of the cost of building being advanced by the United Kingdom, and the schools were to be finished and in operation in about 2½ months.

(58) Appendix 58. Extracts from a letter dated 12th June 1941, from G/Capt. Carnegie to Air Commodore Cochrane (E.T.S. 292(41)).

(2) The British Flying Training Schools were:-

- No.1 B.F.T.S. built at Terrell, Texas, and operated by Major Long.
- No.2 B.F.T.S. built at Lancaster, Calif., and operated by Major Moseley.
- No.3 B.F.T.S. built at Miami, Okla., and operated by Captain Balfour.
- No.4 B.F.T.S. built at Mesa, Arizona, and operated by Mr. Connelly.
- No.5 B.F.T.S. built at Clewiston, Fla., and operated by Mr. Riddle.
- No.6 B.F.T.S. built at Ponca City, Okla., and operated by Mr. Darr.

Each school had a capacity of 200 pupils.

No.4 B.F.T.S. had originally been intended for operation by Mr. Ryan, and was taken over by Mr. Connelly because Mr. Ryan was not willing to take the financial risk involved at Mesa.

E.T.S. 244(41)

June 1941.

run by the same civilian operators) until the Six Schools were ready. The offer was confirmed and accepted, and the first All-Through pupils began training in primary schools normally used by the United States Army Air Corps<sup>(1)</sup>, transferring to the B.F.T.S.'s as and when they were ready.

S.61719

The Arnold scheme also had some vicissitudes before training actually started. The primary stage of instruction (in civilian schools) was settled, and the contracts signed, by the middle of May; but the later stages of training (in the U.S. Army Schools) were ruled illegal by the Attorney General. Mr. Harry Hopkins at once went to work to get the ruling reversed, but in the meantime plans were made to do all British primary training in army civil schools and change the All-Through schools over to concentration on intermediate and advanced training. A few days later the U.S. Department of Justice pronounced the training of British pupils in U.S. Army schools to be legal, and the proposed re-organisation of the All-Through schools was dropped. The first pupils began work, in six civil primary schools<sup>(2)</sup>, on 7th June and the total intake was 550. From the primary schools they went on to three U.S. Army Basic Schools<sup>(3)</sup> and then to three U.S. Army Advanced Schools<sup>(4)</sup> (two T.E. and one S.E.).

June 1941.

E.T.S. 331(41)

The Towers scheme provided for an intake of pupils to the elimination (elementary) stage of training at Grosse Ile, Detroit, Mich. After the elimination stage pilots went on to Pensacola, Fla., for flying boat training, or to Miami for carrier-borne aircraft training. The scheme included training for observers at Pensacola, and for

/W.O. A.G.'s

- (1) Fifty pupils started training at each of six schools: at Dallas for No.1 B.F.T.S., at Glendale for No.2 B.F.T.S., at Tulsa for No.3 B.F.T.S., at Thunderbird Field for No.4 B.F.T.S., at Arcadia for No.5 B.F.T.S., and at Albany, Ga. for No.6 B.F.T.S. The B.F.T.S.'s themselves were built with impressive speed: a cornfield near Miami, Okla., was in use as No.3 B.F.T.S. three weeks after work began.
- (2) At:- Tuscaloosa, Ala., (The Alabama Institute of Aeronautics, Inc.)  
Arcadia, Fla., (The Embry-Riddle Company)  
Lakeland, Fla., (The Lincoln Flying School).  
Albany, Ga. (Darr Aero Technical Inc.)  
Americus, Ga. (The Graham Aviation Company)  
Camden, S.C. (The Southern Aviation School).
- (3) At:- Macon, Ga., Montgomery, Ala., and Augusta, Ga.
- (4) At:- Selma, Ala., (S.E. Alban, Ga.(T.E.), and Berksdale, La. (T.E.

W. Op. A.G.'s at Jacksonville and Pensacola.

The refresher courses were carried on at four schools.<sup>(1)</sup> They were for experienced pilots (80-100 hours being required for acceptance) and averaged 11 weeks on length. The output was at the rate of some 660 per year, and the pilots went either to the Eagle squadrons serving with the R.A.F. or to ferrying duties with Air Transport Auxiliary. The standard of instruction given at the schools varied considerably, and in some cases was at first far from satisfactory. At Dallas, for instance, the instructors were poor, no organised working to a syllabus was done, and pupils passed out with only 30 hours' flying: as some compensation, however, they wore bright blue uniforms. At Los Angeles organised training according to a syllabus was practically non-existent, and a good deal of the instruction was incorrect. At Tulsa, on the other hand, thorough instruction was well given. In March 1941 refresher course training was re-organised, pupils began to be sent in courses instead of as individuals, and the quality of instruction slowly improved.

E.T.S. 219(41)

Navigation training in the P.A.A. school at Miami was a continuous worry. Pan American Airways had undertaken navigation teaching only as a matter of public duty, first to the United States and then to Britain. The school had definite ideas, sincerely and strongly held, on how it should be taught, but was obdurately slow to realise how great a difference existed between peace time commercial navigation in America and operational service navigation in war time Europe. In March 1941 Britain wanted more observer training capacity and A/C Pirie asked for the number of pupils per course to be increased from 10 to 50: in April 60 vacancies were offered, but doubts about the value of the training were

E.T.S. 223(41)

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(1)The Aero Centre, California, was added to the original three. /raised

E.T.S. 225(41) raised by the Air Ministry. In April Gen. Arnold offered the  
E.T.S. 235(41) whole training capacity of the P.A.A. School (380 pupils) to  
the United Kingdom (the United States Army having decided it  
would be better to do navigation training elsewhere).

A/C. Pirie visited the school, which was in the co-educational  
University of Miami at Coral Gables, and was impressed by its  
general efficiency. The British pupils were treated in  
exactly the same way as the U.S. Army pupils, which was good  
in avoiding the possibility of isolationist criticism that  
military subjects were being taught, but not very promising  
for their instruction in R.A.F. methods of navigating.

G/C. Mackworth did not think much of the training.

E.T.S. 290(41) In June 1941, Miami was resolute in maintaining its  
own conception of how navigation should be taught, and would  
rather have closed the school than modify it to suit R.A.F.  
ideas. At the same time, the staff was strongly pro-British.  
The ground instruction given was very thorough, but the  
amount of flying was extremely small (only 4 hours per pupil  
at first navigator) and could not be increased because P.A.A.  
had few aircraft. It was agreed that to make the training  
more useful to the R.A.F. a British instructor should be  
added to the staff and that instruction should be given with  
British instruments, maps and publications, and in British  
terms. It was also agreed that the chief instructor at  
E.T.S. 305(41) the school should visit the United Kingdom to get first-hand  
E.T.S. 307(41) knowledge of what navigation under war conditions required.  
The pupils turned out from Miami were good on wireless aids and  
astro, but weak in D.R. navigation and, of course, lacking  
in flying experience. The course was lengthened to 15  
weeks, and by the end of 1942 was handling observer pupils  
at the rate of 1,040 per year.

Pilot Training: Syllabus and Sequence.

The various schemes of training in the United States

/worked

worked to different syllabuses. In general the R.A.F. were anxious to make instruction conform to British requirements and British methods; while the Americans preferred to stick to their own ideas and standards. There were some inevitable difficulties because Americans found it hard to understand the reasons for some of the R.A.F.'s requirements, and because different equipment or instruments had to be used.

S.61719

The All-Through schools were planned in March to work on a 20-week pilot-training course, divided into 10 weeks on elementary instruction and 10 weeks on advanced. The aim was 70 hours flying on elementary types (Stearman or Fairchild) and 80 hours on advanced (Harvard or Yale), and pupils were to be turned out at O.T.U. entry standard. The

E.T.S. 271(41)

drawbacks were some doubt about night and instrument flying instruction, a probable difficulty about armament training, and a total absence of T.E. trainers and S.B.A. equipment.

E.T.S. 279(41)

At the end of May, however, it became possible to include some armament instruction in the All-Through syllabus, and arrangements were made to provide an R.A.F. armament instructor at each of the six schools.

The elementary syllabus presented few problems, except over night flying (for which few of the aircraft were fitted) and instrument flying<sup>(1)</sup> (because Link trainers were not used at the primary stage in the United States). The advanced stage promised to be less satisfactory, mainly because the instructors, although generally good, were not all qualified to teach on the types to be used.

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(1) Representations to the U.S. Army by G/C. Carnegie about the value of Link Training at the elementary stage were so successful that the United States promptly bought up the whole output before the United Kingdom had made sure of the supply needed for R.A.F. schools. /The

The pupils under the Arnold Scheme were trained to the syllabus and standard of the U.S. Army Air Corps. The sequence of instruction was 10 weeks primary training, 10 weeks **basic training**, and 10 weeks advanced training, and the division of instruction between the three stages corresponded roughly with the pre-war division of R.A.F. training between E.F.T.S., I.T.S., and A.T.S. The total flying time in the three stages was, however, 240 hours, and the aircraft used were Stearmans or Fairchilds at the primary stage, Vultee N.A.T. at the basic stage, and Beachcraft (T.E.) or Harvard (S.E.) at the advanced stage. At first there were ideas in London that the course might be shortened and brought into line with R.A.F. training, especially in view of Gen. Arnold's expressed intention of organising United States training in the light of British methods and British war experience, but Gen. Johnson (U.S. Director of Training) made it clear that America had no intention of lowering the standard of training and was perturbed by the comparative heaviness of the British accident rate during training. The United States agreed to accept the British system of elementary flying training (which was in fact little different from the American system) and to teach instrument flying in the primary stage (in spite of a shortage of Link trainers), but could not deal with night flying because the elementary aircraft were not equipped for night work. The standard of instruction given in the basic and advanced schools was excellent, but bad weather flying was almost completely neglected. Great emphasis was laid on precision flying by the Americans, but it was agreed that the standard should be relaxed somewhat for British pupils.

From June 1941 onwards British training in the United States became preponderantly a matter of training R.A.F. pupils to be pilots. There were two main large-

/scale

E.T.S. 225(41)

E.T.S. 292(41)

scale schemes - the Arnold and the B.F.T.S. - with marked differences between the two. The Arnold schools were under United States Army discipline, and taught by United States Army methods and standards. The B.F.T.S.s had only the self-evolved discipline of the R.A.F. pupils<sup>(1)</sup> and taught to R.A.F. requirements as interpreted by American civilian instructors.

Elimination.

August 1941

E.T.S. 317(41)  
370(41)

The first marked difference appeared in August, when the pupils completed the primary stage of instruction. The elimination rate at the Arnold schools was extremely high, varying from 30% to 55% of the total number being trained, while the rate of the B.F.T.S.s was low, averaging only 10%<sup>(2)</sup>. The causes were sought, and found in the "toughness" of American instruction and the American Army's ruthless weeding out of all but the best on the one hand, and in the civilian operators' enthusiastic determination to make B.F.T.S. training an outstanding success on the other. American instructors had no standardised training in how to teach, and were not persuasive enough in their methods to get the best out of British pupils. The United States Army could afford to reject all but the most naturally suitable men because it had an abundance of high grade man-power from which to select. British pupils needed time to become acclimatised to American conditions<sup>(3)</sup>, and in any case compared badly with American pupils in simple mechanical common-sense over the use of engines and brakes. The civilian operators, however, added to the financial

/incentive

- (1) There was one R.A.F. officer at each B.F.T.S. Under his guidance the pupils themselves had to organise all the non-instructional running of the school. The results were distinctly successful.
- (2) The wastage, or elimination, rate at E.F.T.S.s in the United Kingdom and Canada was about 20%.
- (3) Those who arrived for the first courses in June went almost direct from travelling across the Atlantic to rapid and intensive work in strange conditions.

incentive of having few failures a sincere anxiety to help Britain by making the most of British man-power. One of them<sup>(1)</sup> went so far as to make almost every pupil successful by paying out of his own pocket for whatever extra tuition was wanted.

The disquietingly high elimination rate in Arnold schools had several consequences. It set an awkward problem in disposing of the rejected pupils to other forms of air crew training, it wasted passages across the Atlantic at a time of marked shipping difficulty, and it lowered the morale of pupils on their way to later courses in the Arnold schools. Arrangements were made for British pupils to have an acclimatisation period of three weeks in the United States, at a U.S. Army Pre-Flight School<sup>(2)</sup>, before starting flying training, and to get some familiarity with the handling of a motor car during this time. In October the weeding out of unsuitable pupils before they left the United Kingdom, by means of grading at E.F.T.S.s, was begun.

October 1941.

Another marked difference between Arnold and B.F.T.S. training appeared when the Arnold pupils went on to the basic stage and came fully under U.S. Army discipline. The American Army schools had a custom of reducing new pupils to order and putting them in their place by a rigid system of "cadet rules" calculated to produce a rather juvenile sense of deference<sup>(3)</sup>, and the "hazing" of this process infuriated the British pupils to whom it was applied. The custom was largely relaxed when its unfortunate effects on R.A.F. pupils were realised. By contrast, B.F.T.S. pupils carried on with the basic stage of training at the same "all-through" school, and there was no disturbance caused by a sudden tightening

/up of

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- (1) Major Moseley, who operated No. 2 B.F.T.S. at Lancaster, California.
  - (2) Pre-Flight Schools (corresponding to I.T.W.s) were started by the U.S. Army in August 1941. British pupils went to the school at Montgomery, Ala.
  - (3) Junior pupils, for instance, were supposed to sit on only three inches of the seat at meals and look straight to the front. They had to rise and recite a concise autobiography when called on by a senior pupil, and so on.

up of discipline in an uncongenial way.

General.

The higher elimination rate at Arnold schools persisted. Over the whole course (i.e. to the end of advanced training) it was nearly 50%, whereas the B.F.T.S. rate was about 20%. Nevertheless, it was considered that the pilots turned out from the Arnold Schools were not materially better than those from the H.F.T.S.'s: they had greater natural aptitude for flying and more manual dexterity, but the B.F.T.S. methods of instruction made up for these basic differences.

December 1941.

In December 1941, the length of B.F.T.S. courses was increased to 28 weeks (i.e. 14 weeks primary, with 91 hours' E.F.T.S. 395(41) flying, and 14 weeks basic, with 109 hours flying), and the schools' pupil population put up from 200 to 240. At about the same time the length of Arnold courses was reduced from 30 weeks to 27 (i.e. 9 weeks primary, 9 weeks basic, and 9 weeks advanced).

E.T.S. 357(41) During the autumn of 1941, the United Kingdom was anxious to have more training capacity in Arnold Schools<sup>(1)</sup>, chiefly to ease the general pressure on pilot training schools and so make it possible to raise the standard of instruction. E.T.S. 408(42) The proposal, however, was dropped after Pearl Harbour and America's entry into the war. In the early months of 1942 it was suggested that the B.F.T.S.s might be taken over by the U.S. Army, and assimilated to the Arnold scheme, but this idea, too, was dropped.

From the first arrival of British pupils in June 1941 there was no doubt about the wholehearted welcome they were given by the American people. Some of the B.F.T.S.s were in areas which were reputedly isolationist, but the British were received with impressive cordiality and good will

/everywhere

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(1) See Appendix 52.

everywhere. The U.S. Army schools training R.A.F. pupils asked for permission (which was promptly given) to fly the R.A.F. ensign beside the Stars and Stripes. This enthusiastic popular acceptance of British training in the United States had considerable importance. It completely negated any possibility of awkward questions about the training having been undertaken without the full knowledge and approval of Congress.

Canadian sensitiveness about training in the United States was allayed before the flow of pupils began, and the Dominion provided a transit camp, first at Dartmouth and then at Moncton. At this transit camp the first courses changed from blue uniforms into grey flannel civilian clothes and were issued with khaki uniforms (the khaki uniforms were worn while at work in American schools, and the grey flannels outside the schools). The khaki uniform proved unsatisfactory, and later courses were given blue uniforms. These in turn were unsatisfactory, and eventually British pupils were kitted with American clothes.

E.T.S. 370(41)

E.T.S. 370(41)

At the end of July 1941 Sir Archibald Sinclair asked Mr. Harry Hopkins for help over operational training.

American operational aircraft were being supplied to Britain by the United States, and if crews for these aircraft could be given O.T.U. training in America it would not only reduce the demands on United Kingdom training, but would also help in ferrying them across the Atlantic. The aim was to have operational training in the United States, beginning in November 1941 and building up through the winter. It was hoped that America would supply the aircraft needed for this O.T.U. work over and above the agreed allocation to Britain, but the United States considered that part of the British allocation should be used for it.

E.T.S. 329(41)

E.T.S. 432(42)  
433(42)

Several more difficulties arose. Neither the United States, after Pearl Harbour, nor the United Kingdom could readily find the staff for the O.T.U.s. There was also difficulty in finding aerodromes, and discussions went slowly.

OVERSEAS TRAINING: CO-ORDINATION AND LIAISON

Little of the training done overseas was directly controlled by the United Kingdom. Empire Scheme schools in Canada, Australia, and New Zealand were organised and run by the Dominions. The Joint Air Training Scheme in South Africa was part of S.A.A.F. expansion. The Arnold and Towers Schemes in America were carried out in United States Army and Navy schools. Transferred schools were fused into the Canadian and South African organisations. Only the American B.F.T.S.s and the Rhodesian Group came under United Kingdom control - and that control had to be tempered by the need for harmony with the American and Rhodesian Governments.

All overseas training, however, concerned the United Kingdom greatly. The whole purpose of every scheme was to turn out men for service in, or in conjunction with, the R.A.F. Except in Australia and New Zealand, many of the pupils came from the United Kingdom. Except in the United States, most of the aircraft and much of the equipment came from the United Kingdom. The United Kingdom (helped by Lend Lease from the United States) made heavy financial contributions in cash and kind. Only the United Kingdom was in a position to judge the success of the training and its fitness for operational needs.

Executive control overseas had to be reconciled with the United Kingdom's dominant central concern in all training, and the reconciliation involved questions of policy, planning, supply, training standards, training technique, and the results achieved. At the start of every scheme it was agreed<sup>(1)</sup> that the United Kingdom syllabus of instruction should be used, while schedules of output and supply were generally laid down. But

/syllabuses

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(1) Except in the Arnold and Towers Schemes.

syllabuses had to be altered, supply and output were subject to the vicissitudes of war, and local conditions had to be taken into account. Co-ordination and thorough liaison became more and more essential as the overseas training organisations grew and a higher and higher proportion of training was done outside the United Kingdom.

In the United Kingdom, questions of policy and major matters of planning and supply were dealt with by the Empire Air Training Scheme Committee<sup>(1)</sup>. This Committee had no controlling or supervisory status outside the Air Ministry: its decisions were carried out by the Air Ministry's departments, or conveyed as proposals to overseas training authorities. Only a few matters became the subject of formal communication between the United Kingdom and overseas Governments, but there were a great many questions on which information and opinions had to be exchanged if overseas training were to develop quickly, smoothly, and efficiently. Most of these questions concerned details of departmental action in the United Kingdom or overseas, but some were preliminary discussions on subjects of major inter-governmental importance. Again, overseas training authorities had need of the United Kingdom's experience and advice while their organisations were being built up<sup>(2)</sup>, but later, when their schools were running, became anxious to develop in the light of their own experience and ideas.

R.C.A.F. Headquarters had executive control of Canadian training, and was kept in touch with the Air Ministry through the United Kingdom Liaison Mission in

/Ottawa.

- (1) The E.A.T.S. Committee's scope was enlarged to cover additional schemes for overseas training as they arose. The Air Member for Training became a member of it as soon as his post was created. Its terms of reference were:-  
"To keep in touch with the developments of the Dominion Air Training Scheme, and in particular, with the progress and execution of the measures falling to the Air Ministry under the Scheme; and, subject to confirmation by the Air Council where necessary, to determine any question of principle or policy arising on the scheme."
- (2) Many details of what had been done in the United Kingdom during the pre-war expansion of training were closely relevant to similar expansions of training overseas.

Ottawa<sup>(1)</sup>. R.A.F. experience and advice was available to the R.C.A.F. from the Liaison Mission and from the R.A.F. officers on the staffs of the Canadian Training Commands and schools<sup>(2)</sup>. The advisory and intermediary status of the U.K. Liaison Mission in Canada was made quite clear as early as February 1940, when Canada had it formally agreed that the Liaison Mission should exercise no pressure on the R.C.A.F. except through the Supervisory Board.

E.T.S. 22(40)

In Australia the controlling authority was the R.A.A.F. It was kept informed by the Air Ministry through the R.A.A.F. Liaison Officer in London<sup>(3)</sup>, and had no need of special arrangements for United Kingdom experience and advice since the Australian C.A.S., A/C/M. Burnett, was an R.A.F. officer and a former C.-in-C., of Training Command.

The R.N.Z.A.F. in New Zealand was also kept informed through its Liaison Officer in London, and again the C.A.S., G/Capt. Spunders, was an R.A.F. officer.

The Rhodesian Air Training Group, working directly under the Air Ministry, was kept informed, and corresponded, in the same way as a Command of the R.A.F. There was no intermediary or liaison stage.

For the first few months after the Van Broekham agreement was signed South Africa had no effective means of liaison with the Air Ministry. There was no S.A.A.F. officer on the staff of the South African High Commissioner in London, and there was no United Kingdom Mission in the Union. In October 1940 a British Air Liaison Mission was

/set up

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- (1) This method of keeping contact with development in Canada was entirely satisfactory. When, in the middle of 1941, some question arose about E.T.S. communication between London and the R.C.A.F. the Air Ministry officially 303(41) expressed itself completely content with A.V.M. McKean's handling and manner of presentation.
- (2) The Head of the Liaison Mission, A.V.M. McKean, had been S.A.S.O. of Training Command before he went to Canada. Several of the other R.A.F. officers sent out to Canada also had wide experience of United Kingdom training.
- (3) In December 1941 the R.A.A.F. Liaison Officer was merged into R.A.A.F. E.T.S. Overseas H.Q. in London.

Office Memo  
218 (40)

set up in Pretoria<sup>(1)</sup>, and in February 1941 a South African Air Liaison Officer in London was appointed<sup>(2)</sup>. The British Air Liaison Mission in South Africa, however, did not remain wholly divorced (as the Liaison Mission in Canada did) from executive control of training: in June 1941 the Head of the Mission also became the South African Director of Training and A.O.C. the South African Training Command.

In the United States training questions were dealt with by the Air Attaché, A/C. Pirie, until a training staff under G/C. D.V. Carnegie was set up in Washington at the beginning of May 1940.

During the first half of 1940 all communications from the Air Ministry to overseas training authorities passed through the Directorate of Organisation, but when the Air Member for Training was created and charged with primary responsibility for the supervision of the Empire Air Training Scheme<sup>(3)</sup> responsibility for communication on training matters passed gradually to his department.

August-October,  
1940.

E.T.S. 94(40)

The Dominions were not kept closely in touch with the discussions and developments during July and August which led to the introduction of the Third Revise. A.V.M. McKean pointed out in September that he was in ignorance of a number of important matters<sup>(4)</sup>. Australia first heard about the Third Revise when Canada asked for more Australian pupils to train<sup>(5)</sup>. The Australian Prime Minister cabled a strong request<sup>(59)</sup> that such changes should be communicated direct

E.T.S. 101(40)

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- (1) The Head of the Mission was A/C. M.B. Frew, who had previously been S.A.S.O. of No.23 Group.
- (2) Col. W.T.B. Tasker who had previously been South African Director of Air Training.
- (3) Appendix 24.
- (4) A/M. Garrod gave instructions that A/V/M. McKean was to be supplied with copies of all important minutes written by Directors in A.M.T.'s department.
- (5) Information about the Third Revise had, however, been sent to the R.A.A.F. Liaison Officer and to the Australian C.A.S.
- (59) Appendix 59. Telegram dated 7th October 1940, from the Prime Minister of Australia to the Australian High Commissioner in London, and a note dated 30th October, 1940, by the Secretary of the E.A.T.S. Committee (E.T.S.101 (40)).

to the Commonwealth, and it was necessary to express the  
E.T.S. 106(40) United Kingdom's regrets.

In October A/M. Garrod laid down the procedure:<sup>(60)</sup>  
communications on training policy, programmes, syllabuses,  
and reports were to go to the Liaison Missions in Canada and  
South Africa, to the Australian and New Zealand Liaison  
Officers in London, and direct to the Rhodesian Air Training  
Group: A.M.T.'s department was to notify all changes, and  
be responsible for informing other departments of the Air  
Ministry: there would be personal liaison between A.M.T.  
and the Heads of the Liaison Missions, the C.A.S.'s in  
Australia and New Zealand, and the A.O.C., Rhodesian Group:  
while the various elements of the Empire Scheme, it was  
thought, would best continue to be co-ordinated in Ottawa<sup>(1)</sup>.

October 1940. Australia's protest about lack of information, and  
the success of the Liaison Mission in Canada<sup>(2)</sup>, gave rise  
at the end of October to a suggestion<sup>(61)</sup> that a Liaison  
Officer or Mission should be sent to Australia to keep the  
Air Ministry in close touch with Australian and New Zealand  
training. The proposal, however, was deferred and then  
dropped.

E.T.S. 170(41) January 1941. In January 1941, a meeting of the E.A.T.S.  
Committee was attended by Canadian representatives, and  
A/M. Garrod proposed shortly after that the Committee should  
be enlarged by the inclusion of Dominions members. The  
object was to keep the Dominions better informed and so  
secure closer liaison, but it was pointed out<sup>(62)</sup> that the

/Committee

(60) Appendix 60. Note on Communication with Dominions on Training Questions  
by A/M. Garrod dated 23rd October 1940. (E.T.S. 97(40)).

(1) The original Empire Scheme arrangements provided for the whole joint  
enterprise to be directed by a Supervisory Board in Ottawa, and there was  
no reason to suggest any alteration.

(2) Captain Harold Balfour, when visiting Canada in August 1940, had found  
E.T.S. A/V/M. McKean outstandingly successful.

81(40)

(61) Appendix 61. Note on Liaison with Australia and New Zealand by  
Mr. F.R. Howard dated 31st October 1940. (E.T.S. 103(40)).

(62) Appendix 62. Note on Dominion Representation on Empire Air Training  
Scheme Committee by Mr. F.R. Howard dated 23rd January 1941. (E.T.S. 173  
(41)).

E.T.S. 173(41)

Committee dealt with matters which were primarily the concern of the United Kingdom, that the Committee frequently went outside its strict "Empire Scheme" terms of reference, and that the presence of Dominions representatives might easily be embarrassing. It was also made clear that the E.A.T.S. Committee did not correspond to the Supervisory Board of the Empire Scheme in Ottawa. It was decided not to add Dominion representatives to the E.A.T.S. Committee, but visitors from overseas were from time to time invited to attend its meetings. The agenda for such meetings, however, was seeded, and they were more contributions to goodwill than to thoroughness of liaison.

A.M.T.'s personal liaison developed into a more or less regular letter describing the main facts and trends of training. Letters dealing generally with the state of training affairs were sent to A.M.T. from time to time by the responsible officers in Australia, New Zealand, Southern Rhodesia, and South Africa. There was little need for similar letters from Canada, since the R.C.A.F. monthly progress report to the Empire Scheme Supervisory Board was sent to the United Kingdom. Formal monthly reports to the Air Ministry from the Liaison Mission in South Africa began in February 1941. In September they were replaced by reports from the S.A.A.F. to the S.A.A.F. Liaison Officer in London, of which a copy was passed on to the Air Ministry, but in November 1941 reports from the Liaison Mission in South Africa to the Air Ministry were resumed. Monthly reports also came from the Air Board in Australia after March 1941. Information about training in the United States reached the Air Ministry in letters from the R.A.F. officers concerned with it.

E.T.S. 342(41)

Visits to or from overseas training theatres were in 1940 and 1941 almost entirely confined to a high

July 1941.

E.T.S. 297(41)

level<sup>(1)</sup>. In June, however, W/C. Heath (T. Arm. 1.) visited Canada. Shortly after, it was considered essential that there should be more interchange of specialists between Canada and the United Kingdom, and it was agreed that there should be no need for Canadian assent before United Kingdom representatives visited Canada.

As overseas training developed during 1941, it became increasingly necessary to maintain satisfactory liaison on output standards and results and hence on training methods and development, as well as on policy and planning. As the men they trained reached the United Kingdom, overseas training authorities began to enquire, tentatively at first, and then more and more insistently, how good they were. In these enquiries there was a natural mixture of diffidence and pride in the results of schools' work, an anxiety to learn of shortcomings so that improvements could be made, and a reasonable hope that the output would compare favourably with that from other theatres. To these enquiries the United Kingdom was however able to give no adequate or satisfactory reply.

Theoretically, statements about the proficiency of men from overseas were based on reports from O.T.U.s and signalled out to the various training theatres, but this theory was not carried into practice. By the middle of 1941 the Air Ministry had sent a few reports to Canada, but none to Australia, New Zealand, Southern Rhodesia, or South Africa<sup>(2)</sup>.

/One

(1) Captain Harold Balfour (U.S. of S.) visited Canada and the United States in August 1940 and again in August 1941. A/M. Garrod (A.M.T.) visited Canada and the United States in September and October 1941. A/V/M. Breadner and A/C. Stedman (Canada) visited the United Kingdom in January 1941 and again in July. A/C. Johnson (Canada) visited the United Kingdom in May 1941. Général Arnold and some of his staff (United States) visited the United Kingdom in April 1941. A/C. Meredith (S. Rhodesia) visited the United Kingdom in December 1941.

(2) There had, however, been some reference in A.M.T.'s liaison letter to the standard of outputs from New Zealand and Rhodesia. An officer on the R.A.A.F. Liaison Officer's staff was keeping himself informed on the results of Australian training.

S.68683

One of the difficulties was that reports from O.T.U.s, although numerous, gave no clear idea of the standard reached by overseas-trained men. Most of the reports indicated satisfaction, but a minority said that pilots and observers were not so well trained as in the United Kingdom. This minority criticism, however, turned out to be based on such trivial matters as map-reading and the use of technical terms. Allowance had to be made for such facts as the general inadequacy of observer training (whether done in the United Kingdom or overseas) and the effects of travelling. Men trained outside the United Kingdom had to spend a long time at embarkation camps and on voyages, and inevitably forgot many of the things they had been taught during their short period of rapid training. Again, it had to be remembered that the first outputs from overseas schools had been produced by inexperienced instructors and staffs, working without a good deal of the necessary equipment. O.T.U. reports, in fact, needed considerable qualification before they could be presented as the Air Ministry's opinion of what overseas schools were turning out<sup>(1)</sup>. The United Kingdom's inability to provide all the equipment and facilities which these schools needed had also to be remembered, and reports sent to Canada included a saving clause that the R.C.A.F. were not responsible for any defects in training because those defects were caused by a lack of modern equipment which was not Canada's fault.

S.70631

Another difficulty was that critical reports, even if they could justifiably be made, would inevitably have a damping effect on overseas training authorities<sup>(2)</sup>. Again, criticisms on general aspects often raised questions of

- /training
- (1) A further factor of considerable importance was that the quality of men being trained overseas was high. Their keenness and enthusiasm made up for many deficiencies.
  - (2) It was necessary to comment very adversely on the standard of Canadian-trained wireless operator air gunners during the first half of 1941, and it was felt that any further criticisms might easily have unfortunate results in Canada.

training policy which were not the concern of any single training theatre.

In June 1941, Canada and South Africa pressed for reports on the standard of their training, and the factors which made it inadvisable to give them the frank statements for which they asked<sup>(1)</sup> were reviewed by A/C. Cochrane. Methods of maintaining satisfactory liaison on training standards and results - which involved a thorough interchange of information at lower levels than hitherto - were discussed during the next three months, and three possible ways were considered. The first was to continue the system of reports from O.T.U.s., but to make it more definite by laying down a questionnaire to be answered and by having the reports co-ordinated by the O.T.U. Groups. The second was to ask the Dominion Liaison Officers to visit O.T.U.s, investigate the standard at which men trained overseas arrived, and report to the overseas training authorities. The third was to make assessing the standard of overseas training a full-time job for a selected officer - preferably one who knew overseas training conditions in detail - in A.M.T.s department of the Air Ministry.

This question of assessing the results of overseas training was far from simple. Three categories of air crew (pilot, observer, and wireless operator air gunner) were concerned, coming from six overseas training theatres (Canada, Australia, New Zealand, Southern Rhodesia, South Africa, and the United States). Overseas-trained men spread over a large number of O.T.U.s, and each O.T.U. might at any one time be dealing with men trained in different theatres, under different schemes, and at different

/schools.

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(1) Canada was given in July, not a detailed report, but a conversational statement by Sir Archibald Sinclair that the arrival of men trained under the Empire Scheme had produced a heartening effect and that there was general satisfaction with their quality.

schools. The Dominion Liaison Officers were brought into the discussions, and it was agreed towards the end of September 1941 that Dominion representatives should carry out a programme of visits to O.T.U.s. Matters of detail and method arising from these visits would be reported to the overseas training authorities by the Dominion Liaison Officers, while the Air Ministry would deal with any questions of policy that came up. This, however, remained a purely theoretical solution: no Dominion Liaison Officer made any visit to O.T.U.s before the end of 1941, while in 1942 men trained overseas began to go to A.F.U.s<sup>(1)</sup> and not O.T.U.s, on arrival in the United Kingdom.

Another way of ensuring the thorough interchange of training information at lower levels was put forward by A/C. Stevenson (A.O.C., R.C.A.F., in U.K.) in October 1941. He suggested that officers from the various types of school in Canada should make regular visits to the United Kingdom, assess the standard of output from Canadian schools, and confer in London before going back to Canada. The desirability of close co-operation on training details became clear during A/M. Garrod's visit to Canada, and an Aircrew Training Conference<sup>(2)</sup> was held in London in January 1942.

January 1942.

S.D. 349

At this conference the operational Commands' requirements from training were described in detail<sup>(3)</sup>, so that overseas training authorities might be fully informed of how tactical ideas were developing and what influence they had on training standards, and the working of each part of the training organisation was thoroughly discussed.<sup>(4)</sup>

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- (1) i.e. Advanced Flying Units - a refresher and acclimatisation stage of training set up to deal with men trained overseas.
  - (2) Attended by representatives from Canada, Australia, New Zealand, and South Africa. The United States Army and Navy had observers present.
  - (3) The Conference visited the H.Q. of Bomber, Fighter and Coastal Commands, and was addressed by A/V.M. Drummond (Deputy A.O.C.-in-C., Middle East).
  - (4) The discussions and proceedings of the Conference lasted from 23rd January to 18th February, 1942, and included visits to a number of training units in the United Kingdom.

The result was a body of conclusions and recommendations on the technique and practice of instruction which was agreed between the various training authorities and which each training authority undertook to try to carry into practice.

March 1942.

In March 1942, A/V/M. Cochrane proposed<sup>(63)</sup> that A.M.T.'s liaison letter overseas, which had dropped into the background for some time, should be developed into a monthly Air Crew Training Bulletin. This would deal with the technique and practice of instruction, and keep overseas training fully informed of developments. Its purpose was, in fact, to foster the common thoughts about flying instruction which had been formulated by the Aircrew Training Conference. The proposal was agreed, and the Aircrew Training Bulletin, prepared in London, came into existence.

At the beginning of April 1942, an important step, proposed in the "New Deal" and endorsed by the Aircrew Training Conference, towards the development of a common instructional doctrine in pilot training was taken by the setting up of an Empire Central Flying School<sup>(1)</sup>.

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(63) Appendix 63. Minute to A.M.T. dated 23rd March 1942, and a paper on the Air Ministry Monthly Aircrew Training Bulletin by Air Vice Marshal Cochrane (S.78948).

(1) See page 559.

Fighter O.T.U.s.

The urgent need for fighter pilots which suddenly appeared in May and June of 1940 could not be met by the two existing O.T.U.s. Aston Down and Sutton Bridge were then capable, at their exiguous "interim" strength, of turning out a maximum of 80 trained men per month, whereas Fighter Command wanted over 200 for immediate casualty replacements and nearly 300 more for raising squadrons' pilot establishments. Though all the O.T.U.s' output went to Fighter Command after the German conquest of France<sup>(1)</sup>, it still remained necessary for first line squadrons to take considerable numbers of pilots direct from S.F.T.S.s, convert them to the operational type, and give them operational training<sup>(2)</sup>.

S.1924

May 1940.

On 14th May a conference recommended that the fighter O.T.U. output should be increased to cover the wastage from fighter squadrons in France<sup>(3)</sup>. By 24th May it had become a matter of urgency to speed up the production of fighter pilots. On 29th May Air Chief Marshal Newall decided that the fighter O.T.U. organisation must forthwith be made capable of replacing "sustained effort" wastage. On 1st June it was planned to expand the fighter O.T.U.s until they could turn out 3,000 trained fighter pilots per year. They were eventually to have 73 more aircraft<sup>(4)</sup>. A third O.T.U. was to be opened at Llandow, and No.6 was to move from Sutton Bridge to Hawarden.

S.1928

S.D.155 469/40.

This plan, however, could not be carried out at once. Llandow was not ready for use, the full establish-

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- (1) Most of the pilots trained at Aston Down and Sutton Bridge had previously gone to the fighter squadrons in France.
- (2) Each squadron had a trainer aircraft for this work. A fair proportion of the pilots coming forward from the S.F.T.S.s at this time had been trained on Harts.
- (3) It was inadequate even for this purpose.
- (4) Making their total "ultimate" establishment 153 operational aircraft and 51 trainers.

ment of operational aircraft could not be supplied, and trainers could not be found<sup>(1)</sup>. No.6 O.T.U. therefore stayed at Sutton Bridge, while the third (No.7) opened at Hawarden on 15th June. Their "interim" strength of aircraft was slightly increased<sup>(2)</sup>.

Shorter Courses.

S.1924

June 1940.

S.99458

S.1924.

The interim fighter O.T.U. organisation was however made to yield a theoretical output rate of some 2,300 pilots per year by cutting the course down from four weeks to a fortnight<sup>(3)</sup>. The reduction, which was intended to be temporary, made fighter O.T.U. training little more than conversion to the operational type. The Air Ministry was trying to frame a minimum syllabus and arrange for the O.T.U.s work to be supervised and co-ordinated, but little could be done after the course was shortened, and while there was great urgency for pilot output. Each O.T.U. in practice, trained according to its own ideas and discretion<sup>(4)</sup>.

During the lull between Dunkirk and the start of the Battle of Britain the three fighter O.T.U.s worked intensively with two objects - maximum output of pilots and minimum waste of the invaluable single seater fighters. Maximum output was helped by the keenness of the pupils: some New Zealanders who had been trained on Gordons and Vincents<sup>(5)</sup> reached Hawarden one evening, spent the night on Spitfire cockpit drill by the light of torches, and began

/flying

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- (1) Trainers were urgently needed by the S.P.T.S.s, and first-line fighter squadrons could not give any up when they were still receiving pilots direct from the S.P.T.S.s. The squadrons at this time held 12 Hinds, 23 Battles, 5 Harvards and 9 Masters.
  - (2) The "interim" (Actual) strength of fighter O.T.U.s in June 1940 was 114 operational aircraft and 29 trainers:-
 

No.5 O.T.U. Aston Down	20 Spitfires, 20 Blenheims, 6 trainers.
No.6 O.T.U. Sutton Bridge	34 Hurricanes, 6 trainers.
No.7 O.T.U. Hawarden	20 Hurricanes, 20 Spitfires, 17 trainers.
  - (3) Earlier fighter O.T.U. placing had been based on four-week courses. The reduction to a fortnight came into effect during the last week in May. The actual output in June (119 pilots) and July (137 pilots) was well below the theoretical figure.
  - (4) All three O.T.U.s were put under No.10 Group when that Group was formed in June, but No.10 Group exercised no active control over the instruction given.
  - (5) In New Zealand, before the Empire Scheme began.

flying the following morning. Salvage of aircraft was imperative: if a Spitfire from Hawarden made a forced landing near the Dee every available man from the station was rushed to the spot to drag it out of reach of the tide. When the Battle of Britain began, Hawarden added some private<sup>(1)</sup> operational sorties to its other duties, and shot down a few German raiders.

S.1924

July 1940.

Meanwhile, the problems of fighter operational training were considered. Early in July a conference stressed the need for standardising the O.T.U. syllabus. Defects in pilots' navigation training would have to be made good at the O.T.U.s. Night flying training was urgently needed, though the O.T.U.s could not possibly cover it during the 14-day course, and a special night flying school for pilots who had gained some day experience after going to squadrons was suggested. Cloud flying training was also needed, though Air Chief Marshal Dending had earlier insisted strongly that it was properly instruction for S.F.T.S.s and not for O.T.U.s.

The organisation of fighter O.T.U.s was discussed, also in July, in a paper<sup>(64)</sup> by A.D.W.T. The 14-day course was most unsatisfactory because it gave inadequate training, but it was not possible to go back to four-week courses while Fighter Command's first-line squadrons were short of pilots<sup>(2)</sup>. When it eventually became possible to go back to four-week courses three O.T.U.s would not be enough: their output would not cover Fighter Command's estimated rate of wastage, and a fourth O.T.U. would be needed.

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(1) Fighter Command had not bargained for O.T.U. aircraft to take part in the fighting, and at first frowned on the practice. Hawarden relied for its interceptions on unofficial information from the local Observer Corps.

(64) Appendix 64. Paper on Fighter O.T.U. Organisation dated 22nd July, 1940. (S.1924).

(2) The deficiency in the middle of July was some 115 pilots, but 144 more might be wanted to raise Squadron establishments from 22 to 26.

S.1924

At the beginning of August the O.T.U.s' "interim" strength of aircraft had slightly increased<sup>(1)</sup>. So had their training capacity and the number of instructors (drawn from first-line pilots in need of a rest). It was decided to lengthen the course to four weeks on 10th August, to re-arrange the O.T.U.s so that each instructed on one main type<sup>(2)</sup>, to make a gradual increase in their strength of aircraft<sup>(3)</sup>, and to pass all pilots through an O.T.U. course before they went to first-line squadrons. Fighter Command assented to these decisions. Air Chief Marshal Dowding, after preferring pilots to be trained in squadrons, appeared to Air Marshal Garrod to have swung round to the opposite view.

August 1940.

S.1924

The Battle of Britain, however, made it impossible to lengthen the course. On 16th August, Fighter Command was given discretion to keep the course at 14 days, but the first line's need for pilots became so urgent that course duration had little meaning. Men were passed out as and when the O.T.U.s considered them fit, and training was completely ad hoc. Pilots were raked up from every possible source - experienced pilots, pilots straight from S.F.T.S., and Allied pilots who could speak little or no English - pushed through the O.T.U.s, and turned out after periods varying from 10 days to three weeks barely converted to the operational type and with no tactical training<sup>(4)</sup>. The O.T.U.s gradually became crowded: about half the pupils sent to Hawarden, for example, were not passed out at the end of the nominal 14 days, but were kept for further instruction.

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- (1) To 153 aircraft.
  - (2) Hawarden trained on Spitfires; Sutton Bridge on Hurricanes, and Aston Down on Hurricanes and Blenheims. (The previous practice of having several types at each O.T.U. was a relic of the Group Pools and the idea that each Pool would train for all the requirements of a Group.)
  - (3) Bringing them up to 218 aircraft (140 operational types, 50 trainers, and 18 target towers.
  - (4) It was accepted that the average pilot from S.F.T.S. required three weeks' training and 30 hours' flying, but the better pupils were passed out with considerably less. The average in August and September 1940 was 10-20 hours and no ground instruction was given. The nominal output from the three O.T.U.s was 261 in August and 300 in September, but there were also some experienced pilots to whom short refresher courses were given. Twelve experienced Battle pilots went direct to squadrons without passing through the O.T.U. stage.

The Stabilisation Scheme.

A.H.B. II HL/18. The O.T.U.s, although working at very high pressure and handling practically the whole flow of replacements to the first line, could not deal with all the training that the replacements needed. Air Chief Marshal Dowding therefore devised the Stabilisation Scheme, and divided Fighter Command's squadrons into three categories, A, B, and C. The A squadrons were those, chiefly in No.11 Group, which were constantly in action. The B squadrons were capable of being brought into action when required. The C squadrons were unlikely to be needed in the battle: they gave practically their whole attention to finishing the training of pilots fresh from the O.T.U.s. They dealt mainly with tactical instruction, and passed the pilots on to the A and B squadrons.

S.1924 In essence the Stabilisation Scheme reinforced Fighter Command's operational training resources by adding some 330 aircraft in the C squadrons<sup>(1)</sup> to the 200 in the O.T.U.s. Together, the C squadrons and the O.T.U.s could produce pilots, trained to operational standard, at the rate of about 6,000 per year. This was enough to cover first line wastage during the Battle of Britain and also go some way towards clearing off the deficiency of pilots in the first line<sup>(2)</sup>. The standard of output, however, was not particularly high: the C squadrons were not well equipped for instructional work.

S.6899 When the demand for a flow of casualty replacements to the A and B squadrons fell off at the end of the Battle of Britain, the flow from O.T.U.s to the C squadrons still went on. The C squadrons steadily became more congested until by the beginning of November they held 230 operational

/and

- (1) By the middle of September there were 19½ C squadrons, with about 312 operational aircraft, 20 trainers, and 100 instructors. They were capable of operating in emergency, and of intercepting occasional raids, but they were not capable of sustained effort.
- (2) On 18th September the rate of casualty replacement was put at 100 pilots per week. The squadrons of Fighter Command were 198 pilots below their establishment of 22 per squadron.

November 1940. and 320 non-operational pilots - an average of 12 operational and 17 non-operational pilots per squadron. Their corporate entity and unit morale, already badly affected by the constant flow of pilots through them to the first line, suffered seriously. The flow of men from O.T.U.s was cut down and the standard at which they came forward raised, by lengthening the O.T.U. course to four weeks. The formidable number of non-operational pilots whom the C squadrons held for training was reduced by transferring 90 of them to the Middle East, and the St bilication Scheme nomenclature of A, B, and C squadrons was abandoned at the beginning of December.

S.1924

Longer Courses.

November 1940. Lengthening the fighter O.T.U. course to its originally-planned duration of four weeks was no solution to the problem of providing an adequate flow of fully trained reinforcements. The three O.T.U.s could not turn out enough pilots from four-week courses; the Battle of Britain had shown that 62 first-line squadrons needed to be backed by an organisation capable of producing 108 operationally trained men per week. The standard of proficiency at the end of a four-week O.T.U. course would be too low: the Third Revise was being introduced, and the Third Revise increased the output of pilots by transferring a fortnight's training from the S.F.T.S. to the O.T.U.: the fighter O.T.U. course in future would have to be six weeks.

S.1924

Instead of three O.T.U.s working on four-week courses, Fighter Command now had to plan nine O.T.U.s working on six week courses. There was no immediate need, however, to provide all nine. The C squadrons would not be able to accept any newly trained men for a long time to come: their hands were full with training the pilots they already had and making themselves operationally fit again. The S.F.T.S.

/output

output was not large enough to supply the flow of pilots<sup>(1)</sup> which would be required by nine fighter O.T.U.s and also meet the other demands on it. The target for fighter O.T.U. expansion was set in the autumn of 1940 at six O.T.U.s (i.e. three more) by the spring of 1941. In November it was decided to form the fourth, and create the nucleus of the fifth, at once. It was also decided to form a specialist training Group to control the fighter O.T.U.s.

Night Fighters.

When Germany began night attacks on Britain early in September 1940, night defence became an urgent problem.

Sir John Salmond's committee on Night Air Defence recommended that a Night Fighter Training Unit, combined with a tactical development section, should be formed at once, and the recommendation was endorsed. It was planned that a night

fighter O.T.U. should start at Grangemouth on 21st October with the Blenheim and Defiant flights from Aston Down forming its nucleus, but there were difficulties over buildings and aerodrome construction, Grangemouth was not suitable for the work, and the night fighter O.T.U. there had little more than a paper existence.

Ordinary O.T.U. night flying training - apart from any question of specialised instruction in night fighting - had gone by the board during the summer of 1940. There was no time for night flying in the 14-day course, and the proposal of a special night flying school had not been pursued. Night training was not restarted at fighter O.T.U.s until November, when Sutton Bridge's Hurricanes began to work from an operational station's satellite<sup>(2)</sup>.

In the middle of December the night fighter O.T.U. (No. 54) was started at Church Fenton with the Blenheim and Defiant

(1) About 5,600 per year.

(2) Sutton Bridge used one of Digby's satellites. It had been agreed at the beginning of September that each fighter O.T.U. should have a night flying satellite of its own.

Defiant nucleus from Aston Down<sup>(1)</sup>. At the end of December No.81 Group was formed to deal with fighter operational training, and took over Church Fenton and the three older O.T.U.s.

Difficulties: Continued Squadron Training.

S.1924.

The older O.T.U.s were working under difficulties. The aerodrome at Aston Down became unserviceable, and No.55 O.T.U. had to use Moreton-in-the-Marsh (which was being built for a bomber O.T.U.). Sutton Bridge, like Aston Down, had no satellite of its own. Hawarden, which had used tents during the summer, found accommodation troubles in the winter.

Two more day fighter O.T.U.s were struggling into existence. Grangemouth, after being found unsuitable for night fighter training, had been opened as a half-size day O.T.U. (No.58) in December, but could not start work, because of aerodrome construction and lack of accommodation, until January 1941. Another day O.T.U. (No.59) was held up for lack of an aerodrome: it could not be put at Turnhouse (as was at first intended) and had to wait until a suitable station was available.

With all these difficulties and the lengthening of the course - to four weeks in November and to six weeks in December - the output from fighter O.T.U.s was small during the winter of 1940-1941<sup>(2)</sup>. The demand for fighter pilots was still heavy: additional first line squadrons were being formed and over 100 experienced pilots had to be taken from the first line to serve as instructors in the expanding O.T.U.

/organisation.

(1) To which it was intended that Sutton Bridge's night flying Hurricanes should be added later.

(2) The fighter O.T.U.s at the end of 1940 were:-

No.54	O.T.U. Church Fenton	(Blenheims and Defiants)	(night)
No.55	" Aston Down	(Hurricanes)	(day)
No.56	" Sutton Bridge	(Hurricanes)	(day)
No.57	" Hawarden	(Spitfires)	(day)

Nos. 5, 6 and 7 O.T.U.s were renumbered 55, 56 and 57 in October 1940.

organisation. The demand was also urgent: a renewal of the Battle of Britain, and possibly invasion, was expected in the spring of 1941; and Germany was making sustained night attacks which had to be countered.

The output from fighter O.T.U.s was not only small but also inadequately trained. To ensure even the small numbers of which the O.T.U.s were capable Fighter Command maintained the flow of pupils at the expense of their flying time. The result was that pilots still, during the winter of 1940-1941, went forward to squadrons after only 10-20 hours flying at the O.T.U.<sup>(1)</sup>, and Fighter Command found at the end of January that some 300 of the 1461 pilots in the first line were not fit for operational work.

S.1924

February 1941.

Squadron training was the only solution, and a system by which training squadrons fed first-line squadrons began in February 1941. This effective re-introduction of the Stabilisation Scheme was distasteful to A/M. Sholto Douglas (C.-in-C., Fighter Command), but it was the only way in which he could bring the expanded first line into readiness by the spring. He agreed with A/M. Garrod that the objects to be achieved were:-

- (a) to build up a sufficient strength of O.T.U.s to maintain Fighter Command at operational strength, even when casualties were heavy.
- (b) to ensure that pilots left O.T.U.s with adequate flying experience and an adequate standard of training (though for the time being only a minimum of 20 hours flying at O.T.U.s could be insisted on).

#### O.T.U. Development.

In January 1941 a fresh target was set for fighter O.T.U. expansion. Nine (seven day and two night) were to

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(1) It was estimated in February 1941 that Third Reserve pilots needed 50 hours' flying after leaving S.F.T.S. before they were fit for operations. /be

be in operation by April. Grangemouth was enlarged to a February-May 1940 full-size in February. In March No.59 at last found a home at Crosby-on-Eden, while two new day O.T.U.s were opened at Heston (No. 53) and Debden (No.52). By the beginning of April all seven day O.T.U.s<sup>(1)</sup> were in operation, and the full fighter O.T.U. target was achieved when the second night O.T.U. (No.60) started at Leconfield in May. By May the average O.T.U. flying time per pilot had gone up to 43 hours and by June the rate of output was over 5,000 pilots per year. The number of men turned out and the standard to which they were trained were at last satisfactory. The need for training squadrons disappeared, and the last relics of the Stabilisation Scheme vanished.

During all this period of growth and development the fighter O.T.U. syllabus remained, to some extent at least, ad hoc and unstandardised. In December 1940 Fighter Command drew up a detailed syllabus for four-week and six-week courses<sup>(2)</sup>, which made special provision for pilots who had been trained on Harts at their S.F.T.S., and was criticised by the Air Ministry for too much repetition of S.F.T.S. instruction. This syllabus was not put fully into practice because of the O.T.U.s difficulties during the winter, but was amended after trial at the O.T.U.s and issued as a standardised syllabus of instruction in March 1941. Even so, it was not fully taught until considerably later: the O.T.U.s had to give a certain amount of ad hoc training because Hart-trained pupils were still coming

/forward

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- (1) No.55 O.T.U. moved to Usworth (from Aston Down and Moreton-in-the Marsh) in March. The fighter O.T.U.s in April were:-
- |       |        |                                      |         |
|-------|--------|--------------------------------------|---------|
| No.52 | O.T.U. | Debden (Hurricane)                   | (day)   |
| No.53 | "      | Heston (Spitfire)                    | (day)   |
| No.54 | "      | Church Fenton (Blenheim and Defiant) | (night) |
| No.55 | "      | Usworth (Hurricane)                  | (day)   |
| No.56 | "      | Sutton Bridge (Hurricane)            | (day)   |
| No.57 | "      | Hawarden (Spitfire)                  | (day)   |
| No.58 | "      | Grangemouth (Spitfire)               | (day)   |
| No.59 | "      | Crosby-on-Eden (Hurricane)           | (day)   |
- (2) The four-week syllabus called for 40 hours flying, and the six-week for 60 hours. Night flying was included only in the six-week course.

81G/S.9201

Autumn 1941.

forward and because men trained overseas arrived "rusty" after the voyage. Throughout 1941 there was considerable variation between O.T.U.s in their interpretation of the syllabus, and particularly in the balance between flying, ground instruction, and synthetic training. During the autumn first-line squadrons asked for better O.T.U. teaching of formation flying, high fighter tactics, and gunnery<sup>(1)</sup>. Emphasis began to be laid on the need for instruction in engine handling.

Night fighter training remained for some time a matter for the ideas and discretion of the night O.T.U.s. It called for instruction not only in instrument and night flying, but also in navigation, night fighter tactics, and the newly-developing techniques of A.I. and G.C.I. The final stages of training had to be done in the first line squadrons<sup>(2)</sup>. A detailed syllabus was laid down in August 1941, which expressly stated that the instruction required would be given partly in O.T.U.s and partly in squadrons. Radio observers (trained in airborne radar and navigation), as well as pilots, were taught at the night O.T.U.s.

S.59813

Some of the fighter O.T.U.s opened in the spring of 1941 were at temporary, makeshift, aerodromes. It was intended to move from Debden, Heston, and Leconfield as soon as permanent locations were ready. By May it became clear that a total of nine fighter O.T.U.s would not be enough; the existing seven day O.T.U.s could only back the first line, and not provide for expansion as well; two night O.T.U.s were not enough to back the increasing number of night fighter squadrons. One more day and one more night

/O.T.U.

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- (1) O.T.U. pupils, in general, were doing very little air firing practice.  
(2) Partly because only first line squadrons had operational types of aircraft (Beaufighters and Havocs), and partly because operational technique was developing rapidly.

O.T.U. were wanted<sup>(1)</sup>, and they were opened in July and August<sup>(2)</sup>.

There were thus eleven fighter O.T.U.s at work in the autumn of 1941. Each day O.T.U. (with 68 aircraft) had a pupil population of 90 pilots, and worked on a six-week course until November, when the duration was increased to seven weeks (and later to eight) because of the winter. Each night O.T.U. had a pupil population of 60 crews, and took some 8-10 weeks to complete their training. The output was at the rate of about 4,500 day pilots and 800 night crews per year, and the average overall wastage during O.T.U. training was 10%.

In January 1942 the organisation of day O.T.U.s was standardised on the model of Hawarden, which had an efficient and successful system. The object of standardisation was to get rid of undesirable local variation in carrying out the syllabus<sup>(3)</sup>, and the method was to subdivide courses into squads working to a planned programme which put a comparatively steady load on each of the flying, ground, and synthetic sides of instruction. The duration of the course was

/increased

(1) The possibility of making the day O.T.U. a Hurricane O.T.U. in Canada was discussed. Middle East requirements of fighter pilots were not catered for: they were to be supplied by O.T.U.s in the Middle East.

(2) At the beginning of July No.53 O.T.U. moved from Heston to Llandow, but half its staff and pupils remained at Heston to form a nucleus for the additional day O.T.U. (No.61). In August No.52 O.T.U. moved from Debden to Aston Down.

At the beginning of June the night O.T.U.s were reorganised so that Church Fenton dealt solely with T.E. (Blenheim) training while No.60 concentrated on S.E. (Defiants). At the same time No.60 O.T.U. moved from Leconfield to East Fortune. The additional night O.T.U. (No.51) was opened at Cranfield in August, for T.E. training on Blenheims. The fighter O.T.U.s were then:-

- No.51 O.T.U. Cranfield (Blenheim) (night)
- No.52 " Aston Down (Spitfire) (day)
- No.53 " Llandow (Spitfire) (day)
- No.54 " Church Fenton (Blenheim) (night)
- No.55 " Usworth (Hurricane) (day)
- No.56 " Sutton Bridge (Hurricane) (day)
- No.57 " Hawarden (Spitfire) (day)
- No.58 " Grangemouth (Spitfire) (day)
- No.59 " Crosby (Hurricane) (day)
- No.60 " East Fortune (Defiant) (night)
- No.61 " Heston (Spitfire) (day)

This organisation remained unchanged (except for the rearing of No.52 O.T.U. with Spitfires) until the end of 1941. In March 1942 No.56 O.T.U. moved from Sutton Bridge to Tealing. The night O.T.U. at East Fortune (No. 60) changed from S.E. (Defiants) to T.E. (Blenheims) because Defiants ceased to be used as night fighters.

(3) At some O.T.U.s ground instruction and synthetic training had been sacrificed to flying whenever the weather was good. The results were unbalanced teaching and wasteful dislocation of programmes.

increased to nine weeks, with fresh intakes of pupils every three weeks. Three-weekly intakes suited the standardised organisation, which divided fighter O.T.U. instruction into three progressive phases, and helped to spread the work evenly.

Air firing improved as target towing arrangements became more satisfactory, and satcllites (one for each O.T.U.) were opened in the spring of 1942. The provision of enough good instructors remained a problem.

Maritime O.T.U.s

In May 1940 the operational training organisation backing Coastal Command's first line consisted of one O.T.U. at Silloth, the Torpedo Training School<sup>(1)</sup> at Abbotsinch, and the Flying Boat Training Flight at Calshot. Abbotsinch dealt only with torpedo training, and Calshot only with the conversion of pilots to flying boats. All other operational training, for all the types of aircraft which Coastal Command had in its first line, fell to Silloth. Practically every operational crew contained two pilots, and all pilots had passed through a course at the School of G.R. before their operational training began.<sup>(2)</sup>

Coastal Command's first line was constantly on operational work, and needed a steady flow of replacements. At the same time no effective training or conversion could be done in its squadrons. The Inspector-General, after visiting a Coastal Command squadron<sup>(3)</sup> in June 1940, observed:-

I.G. Report 29(40) "In war time operational squadrons definitely cannot undertake training, especially when they are located in places where training flights are prohibited. The consequence is that it is impossible to get on with the training of the half-trained pilots and crews who arrive on the station, and instead of quickly qualifying for operational crews, these men waste a great deal of their time and many weeks pass before they are fit for operations. Meanwhile a double load falls on the operational crews available who not only have to do all the operational work shorthanded but also have to try to find time to train the new crews".  
June 1940.

S.5668 In the spring and summer of 1940 Coastal Command's first line was rearming from Ansons to Hudsons and Beauforts. Squadrons found it difficult to convert all their pilots to the new types, and the O.T.U. at Silloth was largely employed on this work. At the same time Silloth was handicapped by lack of buildings and an unfinished aero-

/drome.

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- (1) At this time the Torpedo Training School trained for the Fleet Air Arm as well as Coastal Command.  
(2) Operational training, at Silloth and the Flying Boat Training School, was largely confined to pilots. Wireless operators and air gunners were trained as opportunity served, but there was no organised crew training.  
(3) No.500 (Ansons) at Detling.

S.1887

drome. As a result, few replacement crews were turned out, and by the beginning of June the first line was disturbingly short of crews.

It was then decided that Silloth should concentrate on June-July 1940. training replacements. The course (which nominally lasted six weeks) was shortened to produce the numbers required, until Hudson crews were being turned out in three weeks and Beaufort crews in a fortnight. Silloth had also, in July, to undertake the training of Blenheim crews for long range fighter work<sup>(1)</sup>, and this course as well was shortened to the minimum for the sake of output.

With this shortening of courses crews were inadequately trained for operational work. Pilots' O.T.U. instruction amounted to little more than conversion to the operational type, while there was no proper teaching for wireless operators. To make matters worse, the number of pilots wanted was considerably greater than the output from G.R. training<sup>(2)</sup>, and half Silloth's intake of pilots had therefore to be accepted direct from S.F.T.S.s without G.R. training.

August 1940. At the beginning of August Air Commodore Capel reviewed Coastal Command's operational training<sup>(65)</sup>. He pointed out that all replacements should be given proper training before reaching the first line<sup>(3)</sup> and that a much larger output from G.R. training was needed, and recommended a 5-6 week course for G.R. (Hudson and Beaufort) crews and a 4-5 week course for long range fighter (Blenheim) crews.

/At

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- (1) Responsibility for training these Blenheim crews was transferred from Fighter to Coastal Command in June. Each crew consisted of a pilot, an observer, and a wireless operator air gunner.
- (2) Nos.1 and 2 Schools of G.R. were both at Squires Gate at this time, and their combined output was at the rate of 600 pilots per year, whereas the total requirement of the first line was 1,700 per year.
- (65) Appendix 65. Paper on Training Requirements for Coastal Command dated 4th August 1940, and part of a minute dated 14th August 1940 by Air Commodore Capel. (S.1887).
- (3) Some pilots were going direct from S.F.T.S.s to squadrons and being slowly brought up to operational standard while employed as second pilots.

September 1940. At the beginning of September he proposed that the maritime O.T.U. organisation should be expanded and made capable of dealing with the full flow of men to the first line and giving them adequate training. It was then decided to separate long range fighter training from the rest of Silloth's commitments and give it to a specialised O.T.U., and also to develop the Torpedo Training School and the Flying Boat Training Squadron<sup>(1)</sup> into O.T.U.s teaching crews as well as pilots.

Long range fighter training had already moved away from Silloth. Congestion there had compelled its transfer, by an unofficial temporary arrangement, to Prestwick, and it moved from Prestwick to Catfoss<sup>(2)</sup>, where it became No.2 O.T.U., in October. Later in the Year Chivenor was allotted to Coastal Command for operational training, and in December No.3 O.T.U. began training there on Ansons and Beauforts<sup>(3)</sup>. Silloth was then able to concentrate on turning out Hudson crews, since by this time the Botha had been rejected as an operational aircraft<sup>(4)</sup>.

The Torpedo Training School<sup>(5)</sup> was planned to develop into No.5 O.T.U. At Abbotsinch, however, it could deal with nothing more than torpedo training, and the rest of Beaufort T.B. crews' operational training had therefore to be given at Chivenor.

/Whitleys

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- (1) The Flying Boat Training Flight had moved from Calshot to Stranraer, and become a Squadron, in June 1940. After October 1940 it began to train crews as well as convert pilots, but made slow progress towards becoming a full O.T.U., mainly because there were not enough flying boats for its work. It was renamed No.4 O.T.U. in March 1941, and moved from Stranraer to Invergordon in June.
  - (2) There was some doubt about the suitability of Catfoss for the work.
  - (3) There was delay over the use of Beauforts, all aircraft being grounded for some months, and the Anson continued in first line service.
  - (4) Until Nos.2 and 3 O.T.U.s were opened, and the Botha rejected, Silloth had been training on Ansons, Hudsons, Beauforts, Blenheims and Bothas.
  - (5) From October 1940, Abbotsinch trained only for the R.A.F. The Fleet Air Arm side of torpedo training was moved to Crail.

Whitleys began to be used by Coastal Command during the autumn of 1940, and the first squadron equipped with them (No.502) detached a flight to Kinloss for the conversion of pilots. This flight remained at Kinloss for some time, as a Training Detachment, to convert the pilots of other squadrons, and then moved to Silloth in May 1941. There was a Wellington Training Flight at Silloth, Wellingtons having also come into use by Coastal Command, and the Whitleys joined this Wellington flight. The combined Whitley - Wellington element<sup>(1)</sup> was regarded as part of No.3 O.T.U.

Inadequate Capacity.

There was no material increase in the output rate of the maritime O.T.U. organisation during the first half of 1941. It was about 600 crews per year<sup>(2)</sup> at the beginning of the year, and the gradual development of flying boat and Whitley-Wellington training made little difference to the figure. The output from G.R. training, however, increased greatly<sup>(3)</sup>, and maritime O.T.U. capacity was soon too small to deal with the numbers turned out. It was also too small to supply the flow of replacements needed by squadrons, which increased considerably when calls for instructors, Middle East reinforcement, and tour-expiry were added to wastage requirements as 1941 on. The first line, which had enough crews at the beginning of the year<sup>(4)</sup> began to find an uncomfortable shortage by June.

/More

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(1) Working at No.1 O.T.U.'s satellite, Kirkbride.

(2) The output rate was affected by the increase of course length to 8 weeks as a consequence of the Third Revise.

(3) Nos.1 and 2 Schools of G.R. moved overseas, while No.3 School of G.R. formed at Squire Gate to cover the loss of output involved by transfer, and then continued as an additional G.R. training unit.

(4) Many of the crews, however, were only part trained because of the short O.T.U. courses and small O.T.U. capacity in 1940. The possibility of sending these crews from squadrons to O.T.U.s was considered, but was ruled out by the limited capacity of the O.T.U.s in 1941.

More O.T.U.s were needed, but the main difficulty in the way of expansion was finding the necessary aerodromes. Whitley-Wellington training was destined for Chivenor, but Chivenor had to train Beaufort crews until an O.T.U. could be opened within easy reach of torpedo ranges. For some time it was thought that the torpedo O.T.U. might be put at Prestwick, but Coastal Command had objections to Prestwick which eventually prevailed. Beaufort training had then to go on, divided between Chivenor and Abbotsinch, until Turnberry<sup>(1)</sup> was ready some time in 1942.

During the spring of 1941 two Blenheim squadrons (Nos. 53 and 59) were transferred from Army Co-operation to Coastal work, and became G.R. squadrons. They had previously been backed by replacements from Army Co-operation training at Andover and in June, Andover became a maritime O.T.U. (No. 6) training Blenheim G.R. crews. This additional O.T.U. brought another problem, however. The Blenheim squadrons were to be rearmed with Hudsons, and Andover was not considered suitable for Hudson training.

Changes: Increased Output.

At the end of July 1941, the output from the maritime O.T.U.s was greatly increased by some changes which put the planned figures up to a little over 1,500 crews per year. The crewing of medium range Hudsons<sup>(2)</sup> was changed from two pilots to one pilot and an observer, No. 6 O.T.U. moved from Andover to Thornaby and began training on Hudsons, and the Whitley-Wellington element at Kirkbride moved to Cranwell and became No. 3 O.T.U.<sup>(3)</sup>. These moves were intended to be temporary<sup>(4)</sup>, but there was no further change until well into 1942.

Changing

- (1) At Turnberry it would be possible to combine the training previously done at Chivenor and the torpedo training done at Abbotsinch in one unit.
- (2) Some Hudsons were being used as long range fighters to meet attacks on shipping by four-engined Focke Wulfs.
- (3) Chivenor was then No. 5 O.T.U. No. 3 was the O.T.U. dealing with long range G.R. training (which it had been intended to put at Chivenor), while No. 5 was the torpedo O.T.U.
- (4) No. 3 O.T.U. was to move to Chivenor as soon as No. 5 O.T.U. Moved to Turnberry. No. 6 O.T.U. was to move to Millfield.

Changing the Hudson crew to one pilot and an observer depended on the supply of G.R. trained observers. An observer's G.R. course could be considerably shorter than a pilot's (12 weeks) because his navigation training had already covered a good deal of the ground, and was fixed at 4 weeks.

October 1941. The flow of G.R. trained observers began to come forward, and the Hudson O.T.U.s to train one pilot crews, at the end of October.

The output of Hudson crews was then reasonably adequate, but the O.T.U. backing for Beauforts, long range fighters, flying boats, and the heavy bomber types was still too small. (1) Shortage of aircraft (2) prevented any increase in the size of the O.T.U.s, and a serious deficiency of crews appeared again at the beginning of 1942. Coastal Command's figures - 158 crews short on an establishment of 747 - were not agreed, mainly because there was a variety of opinions about what basis of calculation was valid.

January 1942.

At the beginning of 1942, the outbreak of war with Japan made it imperative to have far more G.R. and torpedo aircraft in the Eastern Mediterranean and Far East, and an expansion of maritime O.T.U.s was planned as a matter of the first importance. No additional O.T.U.s, however, came into operation during the first three months of the year, and the immediate need for more crews was met by changing the crew of long-range G.R. aircraft and flying boats from two O.T.U.-trained pilots to one O.T.U.-trained pilot and one pilot direct from the School of G.R. (3) Fully trained and

/experienced

- (1) Two pilots were still being trained for flying boats and heavy bomber types, although the Whitley-Wellington O.T.U. could give each pilot only 40 hours flying instead of the 72 considered necessary for a satisfactory standard.
- (2) In September 1941 the O.T.U.s had only some 40% of their establishment of Beauforts and Beaufighters.
- (3) The second pilots who sent to squadrons direct from the School of G.R. subsequently went to O.T.U.s for training as captains of aircraft. For this reason the change was not applied to squadrons overseas, in whose case it would have been impracticable to send second pilots back for an O.T.U. course.

experienced pilots for additional crews were then drawn from existing crews, and a rapid increase became possible. This change in crewing, which was intended to be temporary, put the output from the existing O.T.U.s<sup>(1)</sup> up to nearly 2,000 crews per year.

Syllabus and Training Sequence.

All through 1941 there were considerable local variations in the work of maritime O.T.U.s. Although a general syllabus had been drawn up early in the year, it had to be modified considerably to suit the various requirements of the O.T.U.s, and as a result each O.T.U. worked largely according to its own ideas. The general syllabus was drawn up at a time when many of the intakes to O.T.U.s had not been to a School of G.R., and so included a good deal of G.R. instruction which became unnecessary later in the year. The syllabus was revised, and much of the G.R. training cut out, in November.

Drastic alterations in the training sequence were proposed by Coastal Command during the autumn of 1941. Pilots were arriving at O.T.U.s with indifferent flying ability, and many accidents were happening. Lack of flying practice during the G.R. course was blamed, and Coastal Command put forward a scheme for October 1941. combined G.R. and O.T.U. training during a 12-week course at the O.T.U.s. In spite of the economies which the scheme promised, Air Commodore Cochrane (Acting A.M.T.) considered that the right remedy was to improve /pilots'

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- (1) No.1 O.T.U. Silloth (Hudsons)  
No.2 O.T.U. Catfoss (Blenheims and Beaufighters)  
No.3 O.T.U. Cranwell (Whitleys and Wellingtons)  
No.4 O.T.U. Invergordon (Flying Boats)  
No.5 O.T.U. Chivenor (Beauforts and Hampdens)  
No.6 O.T.U. Thornaby (Hudsons)

No.3 O.T.U. trained Liberator crews, who were converted in squadrons. No.5 O.T.U. had Hampdens added to Beauforts for torpedo work: operational training was completed by a subsequent torpedo course at Abbotsinch. Photographic reconnaissance pilots were converted to Spitfires during their G.R. training at Squires Gate.

pilots' basic training, and that the principle of giving pilots a navigation course (training at the School of G.R. being only a particular case of the accepted policy, which could not be carried out in other instances, of training all pilots in navigation) should be maintained. No change in the sequence was made. Basic training was improved by the "New Deal", and the possibility of keeping pilots in flying practice at the School of G.R. was investigated.

Coastal Command also proposed to start armament training flights because the standard of air gunners reaching O.T.U.s was low, but once again the Air Ministry decided that the right remedy was to improve basic instruction.

Throughout the second half of 1941 it was hoped that the flow of crews from maritime O.T.U.s would be supplemented by a flow from Canada. A Hudson O.T.U. (No.31) began work at Debert in the summer, but its output was small for some time. A torpedo O.T.U. was also planned in Canada, but was delayed in starting.

July 1941.

O.T.U.s Overseas.

S.46938

The establishment of O.T.U.s overseas, to avoid the difficulty of finding all the room needed for operational training in the United Kingdom, was suggested by A/C/M.

S.4663

Ludlow-Hewitt in February 1940. It was again suggested in April, and for the same reason, by A/M. Portal. In June A/V/M. Sholto Douglas (D.C.M.S.) ruled that it was preferable

June 1940

for O.T.U.s to be in the United Kingdom if accommodation could be found for them. The reasons were that operational training should be done in the same climatic conditions as first-line work, that it should be possible for tactical lessons to be applied quickly, that navigation and signals training should be carried on under first-line limitations and difficulties, and that O.T.U.s should be at hand for augmenting the first-line if necessary. These considerations, though they were applied at first only to the United Kingdom, amounted to a general policy of doing operational training in the operational theatre served, and this policy, in the main, governed the subsequent development of O.T.U.s.

S.4663

July-September 1940.

Middle East. In July and August 1940 A/C. Capel proposed that O.T.U.s should be set up in the Middle East and pointed out that the whole training organisation seemed to have been planned up to that time with only the European theatre of operations in mind. The expected flow of reinforcements to the Middle East in 1941 would be enough to keep three O.T.U.s fully occupied, and he suggested that two might be put in India and one in Africa.

October 1940.

The E.R.P. Committee, however, decided to expand and rearm the Middle East first-line, and to defer the question of O.T.U.s because all the available aircraft and equipment would be needed for the first-line. Expansion and rearming would, inevitably, increase the need for operational training, but it seemed possible that Italian opposition

/might

might be sporadic and casual enough to allow squadrons to undertake the training, at least for a time.

Nevertheless, it was intended that O.T.U.s should ultimately be started in the Middle East, and in November 1940 the Middle East Training Unit Reserve Pool at Ismailia (a miscellaneous collection of aircraft, instructors, and pilots awaiting employment) was renamed No.70 (M.E.) O.T.U. and regarded as a nucleus for future development.

At much the same time (the autumn of 1940) operational training was beginning in Kenya. Some South African squadrons went to Nakuru to take part in the East African campaign, and a small improvised O.T.U.<sup>(1)</sup> came into existence there.

At the beginning of 1941 a number of fighter pilots and crews for Wellingtons and Blenheims were reaching the Middle East after O.T.U. training in the United Kingdom, but the majority of Middle East pilot replacements were coming direct from S.F.T.S.s in Iraq, Africa or Australia. These pilots, though they had been trained on the old I.T.S.-A.T.S. syllabus, had in many cases flown only Hart variants, and needed considerably more than simple conversion before they were fit for operational work.

There was more training to be done than Ismailia could handle,<sup>(2)</sup> and a mixed O.T.U. was found to be neither economical nor satisfactory. In January the fighter element from Ismailia was moved to Asariya (near Alexandria) when that aerodrome became vacant through the move of No.112 Squadron to Greece. In January, too, a Wellington training flight was started at Kabrit.

/In

(1) Known as No.1 (S.A.) O.T.U.

(2) Ismailia was also converting a small number of pilots for work on the Takoradi ferry route.

February-March  
1941.

In February and March 1941 Amriya and Nakuru were recognised as additional nuclei for O.T.U. development, and were numbered 71 and 72. (1) They were however severely limited, as Ismailia was, by shortage of aircraft, instructors, and staff, and could deal with nothing more than bare conversion to operational types.

April 1941.

The Wellington Flight at Kabrit was not recognised as an O.T.U. nucleus. Heavy bombers were delivered by air from the United Kingdom, and it was clearly economical to use replacement crews for ferrying. At first these crews were drawn from Bomber Command's first-line, but the Middle East considered, in spite of Bomber Command's denials, that they arrived tired and in need of a rest after heavy and prolonged operations in Europe, and that it was therefore necessary to train Wellington crews in the Middle East. In April it was decided that Wellington crews for Middle East ferrying and reinforcement should come fresh from a United Kingdom O.T.U. (No.15 Harwell) allotted exclusively to their training. The need for Wellington operational training in the Middle East then disappeared, and it was decided in May that the Middle East should be self-sufficient in O.T.U.s for all other types except flying boats and G.R. aircraft.

June 1941.

S.4663.

By the beginning of June there was a serious deficiency of pilots in the Middle East first line because of heavy losses. It became necessary to build up the O.T.U.s quickly, even at the expense of the first line. Fresh aerodromes had also to be found for operational training: the fighter O.T.U. nucleus had returned from Amriya to Ismailia, while Ismailia was being harassed by bombing.

/Major-Gen.

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(1) No.72 O.T.U., Nakuru, was planned to train on fighters and medium bombers for East Africa. No.71, Amriya, was to train on fighters for the Mediterranean.

Major-Gen. van Ryneveld (South African C.G.S.) then suggested that Nakuru should be developed into a joint S.A.A.F. and R.A.F., O.T.U. capable of handling the flow of men from South Africa to the Middle East. A/M. Tedder (C.-in-C., Middle East) agreed, and decided to move No.70 O.T.U. there from Ismailia.<sup>(1)</sup> The small South African O.T.U. at Nakuru was then merged into No.70.

The Middle East O.T.U.s now began to develop. Some 75% of the ground staff for two of them had left the United Kingdom at the end of April. A few advanced trainers were obtained from South Africa and a few Ansons (originally intended for Australia) sent out from the United Kingdom<sup>(2)</sup>. Operational types of aircraft were allotted according to what was available in the Middle East, the balance between first-line and training being decided by the C.-in-C. Instructors and air crew for staffing the O.T.U.s were drawn from Middle East resources.

July 1941.

At the end of July a conference in London increased the target figure for Middle East O.T.U.s to four. Two were to train on medium bombers, and two on fighters<sup>(3)</sup>. One of the fighter O.T.U.s (No.71) was also to train in army co-operation work. In September it was decided to increase the number of G.R. squadrons in the Middle East, but to supply the Hudson crews required from maritime O.T.U.s (No.6, Thornaby, and No.1 Silloth) in the United Kingdom.

September 1941

Beaufighter crews were also supplied from the United Kingdom.

/The Middle

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- (1) When No.70 O.T.U. moved, the fighter O.T.U. nucleus (No.71) remained at Ismailia, though until No.70 O.T.U. could deal fully with medium bomber training it did preliminary instruction of fighter pilots for No.71. Nakuru had previously been earmarked for No.72 O.T.U. and so No.72 had now to be given a fresh nucleus at Gazouza, where a reserve Blenheim squadron (No.211) was set to work on training.
- (2) The possibility of using Oxfords from No.4 S.F.T.S. at Habbaniya (which was closing) was considered. The Middle East, however, insisted that Ansons were needed.
- (3) The additional fighter O.T.U. was to reduce the drain on Fighter Command, which had been steadily supplying reinforcements to the Middle East.

S.4663

October 1941.

The Middle East O.T.U.s were working at considerably less than their full planned size, and were handicapped by shortage of instructors, trainer aircraft, target towers, equipment, and ground staff. By October No.70, at Nakuru, was up to three quarters of its proper size, but No.71, which moved to Gordon's Tree because of bombing at Ismailia, was no more than half strength, while No.72, which was now at Carthago, consisted only of No.211 Squadron and was roughly equivalent to one third of a full O.T.U. The second fighter O.T.U., No.73, was not yet in existence, but a Maryland squadron (No.223) had been withdrawn from the first-line to train crews on the American types with which the Middle East was rearming.

Altogether, this did not amount to much operational training capacity, and a large pool of men awaiting O.T.U. courses accumulated. The output was inadequate, and considerable numbers of fighter pilots and medium bomber crews<sup>(1)</sup> had to be sent out from the United Kingdom to reinforce the first-line. Some instructors were also sent from the United Kingdom, and the possibility of shortening Middle East O.T.U. courses<sup>(2)</sup> to increase output, was considered.

October 1941.

The army co-operation element of No.71 O.T.U. moved from Gordon's Tree to Aqir (Lydda) and became No.74, thus putting the number of Middle East O.T.U.s up to five, but the change made no material difference to the size of the organisation. The Inspector General did not consider the organisation large enough, and recommended eight O.T.U.s in all - two of them for training on heavy bombers delivered direct from America to the Middle East. He also recommended

/O.T.U.

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(1) 175 fighter pilots were sent in October, 100 in November, and 100 in December. 30 Blenheim crews per month were ferrying out aircraft by way of Gibraltar and Malta.

(2) The courses were 4 weeks for fighters and 6 weeks for army co-operation and medium bombers.

O.T.U. development in Kenya. The general policy of having operational training in the operational area served was however being modified about this time, because of supply difficulties, to a policy of training crews in the area of aircraft manufacture for types which the replacement crews could ferry to the operational area, and Middle East heavy bomber O.T.U.s were not pursued. Another O.T.U. was sited in Kenya, at Makindu, in November.

S.4663

It was planned to have all the Middle East O.T.U.s in full operation by the spring of 1942, but they did not expand during the winter as had been intended. Aircraft destined for them were diverted to India and the Far East, and their output was lower in March 1942 than in the previous October. Operationally trained air crews still had to be sent in large numbers from the United Kingdom, while there were so many men waiting for O.T.U. training in the Middle East that the suspension of the flow from Australia, because of Japan's entry into the war, caused little immediate difficulty. The Middle East O.T.U. organisation in the spring of 1942<sup>(1)</sup> could turn out trained men at the rate of only 420 fighter pilots and 430 medium bomber crews per year. The rest of the first line's requirements had to come from operational training elsewhere.

March 1942.

Far East. When A/C. Capel pointed out in the

S.4663

summer of 1940 that the training organisation appeared to have been designed exclusively for a European theatre of operations he proposed that O.T.U.s should be set up to serve the Far East as well as the Middle East. At the

August 1940.

/time,

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(1) No.70 O.T.U. Nakuru (Medium Bombers)  
No.71 O.T.U. Gordon's Tree (Fighters)  
No.72 O.T.U. Carthago (Medium Bombers)  
No.74 O.T.U. Aqir (Army Co-operation)  
Because of distance and transport difficulties a holding pool for trained men was started at Gilgil in Kenya.

time, however, nothing could be spared to start operational training there, and it was decided in November 1940 to shelve the question of Far East O.T.U.s and rely on squadron training.

Replacements continued to be drawn from S.F.T.S.s training on the "old" I.T.S.-A.T.S. syllabus<sup>(1)</sup> and brought up to operational standard in the squadrons, with the exception of G.R. crews, who were sent out after operational training at maritime O.T.U.s in the United Kingdom.

In November 1941 A/C. Goodwin considered that some kind of O.T.U., even if only a small and sketchy one, should be started to serve the Far East. It was agreed that an operational training organisation would be needed if war broke out, and that Australia would be the best place for it. Australia then began to investigate the formation of a small O.T.U.

When the Japanese war began Australia was asked to undertake the operational training of Beaufort crews, and agreed. The pupils were to be partly R.A.F. men from the Far East who had not had O.T.U. training, and partly Australians from Empire Scheme schools.

Canada. Canada's ambition to undertake further training, at the end of 1940, extended to operational training. When Col. Ralston and A/V/M. Breadner visited the United Kingdom in December they suggested that O.T.U.s should be established in the Dominion to match the S.F.T.S.s there. This suggestion was directly counter to the policy of keeping operational training in operational areas, and was not accepted. Canada's wishes were however met to some extent by a prospect that O.T.U.s might be needed later to train for transatlantic ferrying.

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(1) The need for supplying Far East squadrons was a minor factor in keeping the longer I.T.S.-A.T.S. course at Australian and New Zealand schools. /The

The manufacture and delivery of aircraft were becoming important factors in the location of operational training. Shipping difficulties were making it essential to deliver aircraft by air whenever it was practicable. Ferry crews for the work of delivery were hard to find, and could ill be spared from the first line<sup>(1)</sup>. O.T.U.s in the area of manufacture would have a good supply of aircraft and spares, and could train crews for ferrying as well as operations, whereas O.T.U.s in the operational area added considerably to the number of aircraft which had to be delivered. These factors had a good deal of weight when aircraft were built as far away from the operational area as North America.

S.69934

March 1941

In March 1941 it was decided to set up an O.T.U. in Canada to train crews for American aircraft<sup>(2)</sup> which would have to be flown across the Atlantic in increasing numbers as the year went on. The plan was soon changed because responsibility for providing most of the ferry crews passed to a M.A.P. organisation called Afero. The O.T.U.<sup>(3)</sup> then became concerned only with Hudson crews: it was scheduled to open in the summer of 1941 and draw its pupils from the Empire Scheme output. Some of the men turned out were to be given full operational training, while others were only to be converted to Hudsons so that they could fly aircraft across the Atlantic<sup>(4)</sup>, and were to have their operational training completed later, after they had done a period on ferry work. Instructors and staff were to be sent from the United Kingdom.

/The

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- (1) Some were provided by Coastal Command.
  - (2) Liberators, Fortresses, Marylands, Hudsons and Venturas.
  - (3) Which was located at Debert, N.S., and numbered 80.
  - (4) More aircraft than operationally trained crews were needed.

May 1941

The programme of "transferred" R.A.F. units agreed in May 1941 included three more O.T.U.s, planned to open in 1942 and train on Hurricanes, Hampdens, and Bostons<sup>(1)</sup>. In the meantime the torpedo training school of the original "14 schools" transfer plan had developed into a Beaufort O.T.U. scheduled to start<sup>(2)</sup>, later in 1941, so that the Canadian training organisation was now due to have five O.T.U.s<sup>(3)</sup>.

S.74134  
June-July 1941.

The staff of the Hudson O.T.U. began to arrive at Debent in June, but it was impossible to start training at once. None of the Officers sent out knew anything about Coastal O.T.U. instruction, and there was a total lack of equipment. For a time the O.T.U.'s ground staff erected Oxfords for the new transferred S.F.T.S.s, and then training started gradually, but with unsuitable instructors. A number of accidents happened at the end of the first course, and Canada<sup>(4)</sup> decided that a considerably longer period of training was essential. The short "conversion" courses for transatlantic ferrying were dropped, and a 12-week course introduced.<sup>(5)</sup> Debent continued to suffer from lack of facilities and an unsatisfactory staff, and its output remained small and incompletely trained until well into 1942.

The Beaufort O.T.U. was delayed by an unfinished station and lack of equipment. Its staff arrived in August 1941, but training could not begin until December. By then the Japanese war had started, and No.32 O.T.U. was /converted

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- (1) Hurricane and Hampden airframes were made in Canada. Bostons were built in the United States.
  - (2) At Patricia Bay, B.C.
  - (3) The Hudson O.T.U. at Debent was renumbered 31, and the Beaufort O.T.U. became No.32, the others being Nos. 33, 34 and 35.
  - (4) No.31 O.T.U. was a "transferred" R.A.F. unit, but Canada was closely concerned because the pupils were drawn from Empire Scheme schools, and because setting them to fly the Atlantic without adequate preparation might well have had very unfortunate consequences.
  - (5) This was later modified to a normal Hudson O.T.U. course plus a period of Ferry Training.

converted for a time into an operational unit called No.32 Operational Squadron, and no training was completed. Its theoretical function was changed in January 1942, to instruction on Hampdens as well as Beauforts<sup>(1)</sup>.

E.T.S. 316(41).            The United States.    America was asked in July 1941  
July 1941.            to allow British crews to be given operational training in the  
United States on American-built types of aircraft. Behind  
E.T.S. 329(41)            the request was a hope that the United States would provide  
432(42)            additional aircraft and the staff for the O.T.U.s. America,  
however, had no operational aircraft to spare, and the  
proposed O.T.U.s could therefore be equipped only from  
Britain's existing allotment. Discussions went on, but the  
E.T.S. 432(42)            United States found difficulty, after Pearl Harbour, in  
undertaking to provide the aerodromes, instructors, and staff.  
The R.A.F. also found it difficult to provide the instructors  
and staff (some 17,000 men) needed for the Group of eleven  
O.T.U.s which had been envisaged, and the project shrank to a  
smaller plan for units to be run jointly, with the R.A.F.  
March 1942            responsible for instruction and the U.S.A.A.F. responsible  
E.T.S. 444(42)            for the rest of the undertaking. In March it was agreed that  
446(42)            the first O.T.U. on these lines should be set up in the  
Bahamas.

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(1) Nos.33, 34 and 35 O.T.U.s did not start work in the early months of 1942, but an additional Hudson O.T.U., No.36, opened at Greenwood, N.S., in March.

Armament.

In May 1940 all the limited resources of Bombing and Gunnery Schools were beginning to be devoted to observers and air gunners<sup>(1)</sup>, and the training of pilots at B. & G. Schools was coming to an end<sup>(2)</sup>. In June a considerable number of wireless operators were awaiting gunnery training. They were given priority over observers in air firing, and gunnery courses were temporarily cut down from four to three weeks in length.

S.56488

June 1940.

The B. & G. Schools' capacity was limited by shortage of aircraft and shortage of instructors, while the quality of training they could give was affected by shortcomings in their equipment and instructors.

The shortage of aircraft was overcome slowly. Battles, Blenheims, and a few Witleys and Hampdens gradually came into use as attack aircraft. Bothas began to appear in 1941, after they had been rejected for operational work. Henleys and Battles replaced older and slower types for target towing. Few of the aircraft had turrets, and the majority of pupils did air firing with hand held guns. Brownings were scarce, and a good deal of instruction was given on obsolescent guns seldom used in the first line.

Teaching was done by Senior Armament Instructors, but these S.A.I.'s had a far better knowledge of the mechanism of weapons than of their use in war, and there were not enough of them<sup>(3)</sup>. Armament instruction, generally, paid inadequate attention to tactics and fighting technique.

/To

- (1) The increasing capacity of O.T.U.s, and the increased output of pilots, called for an increased output of crews, and the flow of men from navigation and signals schools (at this time practically all air gunners were wireless operators) had to pass through the B. & G. Schools for armament training.
- (2) Visits from S.F.T.S.s ended when the training was transferred to O.T.U.s or became self-contained at S.F.T.S.s through specialisation. Visits from O.T.U.s stopped a little later. At the S.F.T.S.s overseas, which continued training on the "old" I.T.S.-A.T.S. syllabus, a practical armament training visit, or period, was retained.
- (3) Civilian instructors were also employed. Senior Armament Instructors were experienced armament tradesmen who had been given a course at the Air Armament School.

S.65438

October 1940.

To remedy these defects, and overcome the shortage of instructors, it was proposed in October 1940, that air crew (i.e. observers) should be employed as armament instructors. Flying Training Command suggested that Gunnery and Bombing<sup>(1)</sup> Leaders should be used for teaching (thus reviving one of the ideas behind the original conception of the Central Gunnery School), but there were not enough

December 1940.

Leaders available. In December it was agreed that observers and air gunners should be trained as instructors (after a preliminary period of assessment) and employed at schools. It was intended that "war-weary" observers and air gunners should be chosen for the work, but very few war-weary men were available, and most of the Air Observer Instructors and Air Gunner Instructors were taken from men who had just finished their own basic training<sup>(2)</sup>. These "ploughed back" instructors had naturally no more operational knowledge and experience than the S.A.I.s, and there was thus little improvement in the standard of training. During 1941, however, each school was given a Gunnery Leader and a Bombing Leader to supervise instruction.

June 1941.

Gunnery courses were again cut down to three weeks in the summer of 1941 in order to produce the crews needed by the planned expansions of Bomber and Coastal Commands. The result of this short period of instruction, coupled with shortcomings in instruction and the lack of suitable aircraft and equipment, was a poorly trained product which the operational Commands criticised adversely. Considerable improvement was essential, and the "New Deal" planned basic courses of 6 weeks for "straight" and 4 weeks for wireless operator air gunners.

December 1941.

/Bombing

- (1) Bombing Leaders were introduced, and their training begun, in June 1940.  
(2) A.O.I. (bombing) and A.G.I. (gunnery) courses started at Manby early in 1941. At first they lasted 4 weeks, but were later increased to 6. Many of the air gunners selected were wireless operators, and had no occasion or opportunity while employed as A.G.I.s to use their knowledge of signals.

Bombing training suffered from much the same handicaps of instructors and equipment. Selected observers were trained as Bombing Leaders<sup>(1)</sup> from June 1940 onwards, but, like Gunnery Leaders, they were needed for training and supervision in the first line, and had little influence on instruction in schools until well on in 1941. Night bombing practice was proposed at the end of 1941, but could not be started until nearly a year later because of difficulties over lighting the targets.

S.76843

July 1940.

Schools. There was little change in the organisation of schools until the middle of 1941. In July 1940 the B. & G.S. at Warnwell had to leave the south coast and move to Dumfries, while the school at Aldergrove had to close because the aerodrome was wanted for operational work.

S.D.155 625/40.

There was no change in the total armament training capacity, however, because the other schools were enlarged.<sup>(2)</sup>

February 1941.

At the beginning of 1941 a new B. & G. School opened at Millom, but it was turned over almost at once to the experimental combined training of observers in navigation and armament. When combined training became the standard practice, in the summer of 1941, all the B. & G. Schools from which navigation flying could reasonably be done were converted into Air Observers Schools. These A.O.S.s continued to teach bombing and gunnery, but were fully occupied with observers, and had no room for air gunners.

June-September, 1941.

Specialised Air Gunners Schools had therefore to be started. The two B. & G. Schools (Stormy Down and Evanton)

/which

(1) Bombing Leaders were trained at Manby. The course at first lasted 2 weeks, but was extended to 3 in January 1941. Their duties were analogous to those of Gunnery Leaders, but (also like Gunnery Leaders) they soon became confined to instruction and the supervision of technical efficiency, because night bombing gave little occasion for leadership on operations.

(2) The armament training schools at the end of 1940 were:-

No.1 A.A.S., Manby	No.8 B. & G.S., Evanton
No.4 B. & G.S., West Freugh	No.9 B. & G.S., Penrhos
No.5 B. & G.S., Jurby	No.10 B. & G.S., Dumfries
No.7 B. & G.S., Stormy Down (Porthcawl)	

June-July 1941. which were unsuitable for navigation work, Pembrey (which was no longer wanted by Fighter Command), Dalcross (which had been built for a S.F.T.S.), Llandwrog, and Castle Kennedy became Air Gunners Schools in June and July 1941. Castle Kennedy, however, was an unfinished station which could do little flying, and did not make much contribution to air gunner training. Its aerodrome became completely unserviceable in November, when the station closed and a new A.C.S.

November 1941. was opened at Barrow (Walney Island<sup>(1)</sup>). Defiants began to come into use as attack aircraft, and Lysanders as target towers.

The Penrhos Experiment.

The number of "straight" air gunners required increased considerably during 1941<sup>(2)</sup>, and only two of the A.G.S.s were wholly engaged on training wireless operators. The total gunnery training capacity available towards the end of 1941 caused some anxiety, particularly when the possibility of renewed pressure for output in 1942 and another enforced curtailment of courses to three weeks was borne in mind, and towards the end of September an experiment in using A.O.S. gunnery facilities to increase the output of air gunners was begun at Penrhos. A small number of wireless operators were given a 9-week course covering air operating and air gunnery, and the results were successful from both the signals and gunnery aspects. The accommodation at Air Observers' Schools was however taxed almost to the limit by the number of observer pupils under training, there was little room for wireless operator air gunners, and the output from this "Penrhos Scheme" could at best be only a trickle. Several

A.550825/42

A.508201/41

September 1941.

/courses

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- (1) The Air Gunners Schools at the end of 1941 were:-
- |                          |                        |
|--------------------------|------------------------|
| No.1 A.G.S., Pembrey     | No.8 A.G.S., Evanton   |
| No.2 A.G.S., Dalcross    | No.9 A.G.S., Llandwrog |
| No.7 A.G.S., Stormy Down | No.10 A.G.S., Barrow.  |
- (2) Changes in crewing were responsible. "Straight" air gunner pupils were at this time either drawn from non eliminated from other air crew (i.e. pilot, observer, or wireless operator) training, or were volunteers from among serving airmen.

courses were run at Penrhos, while the other Air Observer Schools started similar training to produce wireless operator air.gunners for their own staffs<sup>(1)</sup>, but no permanent increase of air gunner capacity resulted from the Penrhos Scheme<sup>(2)</sup>.

#### Air Gunners and Maintenance.

During the Empire Aircrew Training Conference in January-February, January and February 1942, 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 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, and 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 the time would be given useful employment instead of passing the time, in demoralising idleness<sup>(3)</sup>. There was difficulty, however, in finding room for them at a 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.<sup>(4)</sup> course of 12 weeks duration.

#### Central Gunnery School.

The Central Gunnery School developed slowly during 1940 and 1941. It remained at Warmwell when No.10 B. & G. School moved to Dumfries in July 1940, and the number of pupils was increased slightly at the end of the year. It was given its own establishment of aircraft (replacing those originally lent by Bomber Command), including Spitfires and

/Hurricanes

- (1) Trained W. Op. A.G.s went forward to O.T.U.s only from Penrhos. The other A.O.S.s absorbed their output into their own establishment.
- (2) A very considerable increase in signals training facilities, however, followed directly from it.
- (3) The men awaiting training were rejects from other forms of aircrew training, or volunteers from serving airmen, and it was only possible for some of the latter to be usefully employed. The waiting list was somewhat reduced by raising the standard of acceptance for air gunners slightly.
- (4) It was also called an Elementary Air Gunners School course.

S.56180

Hurricanes for fighter attacks, and was provided with some of the latest first line equipment. In February 1941, the Admiralty asked for vacancies on Gunnery Leader courses for the Fleet Air Arm.

In July 1941, the C.G.S. moved to Castle Kennedy, and again increased slightly in size. Work at Castle Kennedy was however carried on under considerable difficulties, which increased as the winter came on. At the beginning of December the school moved temporarily to Chelveston, and went on to Sutton Bridge when No.56 O.T.U. moved out in March.

At the beginning of 1942 it was decided to expand the Central Gunnery School 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 organisation for training Gunnery Leaders became the Bomber Wing, and the two wings worked together in air exercises. These changes came into effect when the school moved to Sutton Bridge.

Gunnery Leader training remained substantially unchanged in 1940-1941. The object was to turn out men capable of instructing and supervising the gunners in squadrons, and the course remained unchanged at four weeks' duration (five weeks in winter). In the autumn of 1941 there was difficulty in getting enough suitable pupils with operational experience, and it was agreed that a small number of commissioned air gunners might be sent direct to the C.G.S. 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, and there was difficulty in

/getting

getting equipment. A special problem was set by the bombing and gunnery training required for observers trained at Miami, and the first course was given its armament training at an Empire Scheme school in Canada, while later courses had it included in a substantial refresher course which had to be given after they arrived in the United Kingdom.

Preliminary Training.

The increasing numbers of men who passed into air crew training during 1940 and 1941 required a corresponding increase in the I.T.W. organisation. In May 1940 there were four I.T.W.s, each dealing with reception as well as preliminary training. By the end of the year there were two Air Crew Receiving Centres (at first called Receiving Wings) and eight Initial Training Wings<sup>(1)</sup>. There was a general move away from Hastings, St. Leonards, and Bexhill after the German conquest of France, but the organisation went on using requisitioned premises in suitable towns.

Recruits (who were scrupulously called "cadets" for reasons of morale) went first to a Receiving Centre for two weeks, and then passed on to an Initial Training Wing for eight weeks. Each Wing and Receiving Centre dealt with 800 cadets and only men selected for service as pilots or observers were sent to them. From May onwards the I.T.W.s took in direct entries from civil life, and the I.T.W. period went down temporarily to 6 weeks when the demand for E.F.T.S. pupils increased suddenly in July.

The instruction given consisted of disciplinary training and a general introduction to service life, coupled with elementary work on certain technical subjects, such as mathematics, navigation, armament, and signals, of basic importance in later flying training. The amount of elementary technical instruction tended to increase, in order to relieve the pressure at later stages of training, and the I.T.W. syllabus was revised in November 1940 to give more /time

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(1) The I.T.W. organisation at the end of 1940 was:-

- |                                 |   |
|---------------------------------|---|
| No.1 Air Crew Receiving Centre, | Babbacombe (opened in July)               |
| No.2 Initial Training Wing,     | Cambridge (renumbered from No.1)          |
| No.3 Initial Training Wing,     | Torquay (moved from St. Leonards in June) |
| No.4 Initial Training Wing,     | Paignton (moved from Bexhill in July)     |
| No.5 Initial Training Wing,     | Torquay (moved from Hastings in June)     |
| No.6 Initial Training Wing,     | Aberystwyth (opened in July)              |
| No.7 Initial Training Wing,     | Newquay (opened in October)               |
| No.8 Initial Training Wing,     | Newquay (opened in November)              |
| No.9 Air Crew Receiving Centre, | Stratford-on-Avon (opened in November)    |
| No.10 Initial Training Wing,    | Scarborough (opened in December)          |

time to navigation, signals, and armament. At the same time visual Link Trainer instruction, which had not proved of value, was dropped. This increased attention to technical subjects<sup>(1)</sup> was not uniformly successful. Navigation was covered satisfactorily, some of the education officers on the staff of I.T.W.s being given navigation courses at Cranage, but there was great difficulty in finding enough instructors for signals (mostly elementary Morse) and armament.

University Air Squadrons.

University Air Squadrons (which had closed at the outbreak of war) were restarted during the autumn of 1940 because the War Office, by offering various courses, was attracting many university students to the Army. Membership of the squadrons was drawn from men who went to the university in the ordinary way, and the scheme was extended to twenty universities and colleges over and above the original three (Oxford, Cambridge and London) which had had squadrons before the war<sup>(2)</sup>. Training was to I.T.W. standard and S.D. 155 273/41. arrangements were made for a little flying experience to be given on elementary aircraft. Members of University Air Squadrons went direct to E.F.T.S.s without passing through Initial Training Wings<sup>(3)</sup>.

/Another

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- (1) The number of hours allotted to navigation during the 8 week course went up from 40 to 52, signals went up from 40 to 56 hours, and armament from 12 to 24.
- (2) University Air Squadrons were formed at:-
- |                             |                                 |
|-----------------------------|---------------------------------|
| Oxford                      | St. Andrews (February 1941)     |
| Cambridge                   | Sheffield (February 1941)       |
| London (April 1941)         | Southampton (February 1941)     |
| Glasgow (January 1941)      | Cardiff (February 1941)         |
| Edinburgh (January 1941)    | Bristol (February 1941)         |
| Aberdeen (January 1941)     | Swansea (February 1941)         |
| Belfast (January 1941)      | Reading (March 1941)            |
| Manchester (January 1941)   | Durham & Newcastle (March 1941) |
| Leeds (January 1941)        | Birmingham (May 1941)           |
| Liverpool (February 1941)   | Nottingham (May 1941)           |
| Aberystwyth (February 1941) | Exeter (July 1941)              |
- (3) Some of the earlier courses at the B.F.T.S.s in the United States were drawn from the University Air Squadrons, and helped considerably in making this new and unconventional type of school a success. The university men were not at first regarded with much favour by their American instructors, but were held in high regard at the end of the course.

Another university scheme for preliminary training was started early in 1941, when selected recruits with suitable educational qualifications were sent for short courses (lasting 6-10 months) to certain universities at the expense of the Air Ministry. These short courses combined I.T.W. training in the University Air Squadron with normal university reading, and were intended to produce men well fitted to hold commissions because of their time at the university. It was found that this object was achieved only at residential universities, and short courses were therefore ended in March 1942 at three non-resident universities. Men trained on these short courses went direct to E.F.T.S.s without passing through I.T.W.s.

Air Crew Reception Centre.

The main current of recruits continued to pass through I.T.W.s, and the number of Wings went on increasing in 1941<sup>(1)</sup>, seven more being opened as the flying training organisation expanded. The increase did not, however, keep pace with the numbers accepted for air crew service, and in the spring of 1941 there were some 10,000 potential pilots waiting to begin initial ground training<sup>(2)</sup>. The waiting period promised to be anything up to five months, and there was danger of publicity in the press, an outcry, and bad effect on public morale. The solution adopted was to bring

/larger

(1) At the end of 1941 there were:-

- |                                |   |
|--------------------------------|---|
| No. 1 I.T.W. Babbacombe        | No. 11 I.T.W. Scarborough (opened January 1941)   |
| No. 2 I.T.W. Cambridge         |   |
| No. 3 I.T.W. Torquay           | No. 12 I.T.W. St. Andrews (opened May 1941)       |
| No. 4 I.T.W. Paignton          |   |
| No. 5 I.T.W. Torquay           | No. 13 I.T.W. Torquay (opened June 1941)          |
| No. 6 I.T.W. Aberystwyth       |   |
| No. 7 I.T.W. Newquay           | No. 14 I.T.W. Hastings (opened September 1941)    |
| No. 8 I.T.W. Newquay           |   |
| No. 9 I.T.W. Stratford-on-Avon |   |
| No. 10 I.T.W. Scarborough      | No. 17 I.T.W. Scarborough (opened September 1941) |
- No. 14 I.T.W. moved to Bridlington in January 1942 because accommodation at Hastings was wanted for P.R.C. purposes.

(2) Men were encouraged to volunteer for air crew when conscripted, but then, after being selected and earmarked, either had their calling up deferred until there was room for them in I.T.W.s or were taken into the service and put on ground defence duties until their training could begin. The purpose was to make sure that the most suitable men were put on flying duties. In April 1941 about 7,500 were waiting for deferred call-up, and about 2,500 were employed on ground defence.

June 1941.

larger numbers into the service, and then sift and select them so that the most promising men went forward first for training. An Air Crew Reception Centre for some 5,000 recruits was opened at Regents Park, London, in June 1941, and replaced the A.C.R.C.s at Babbacombe and Stratford-on-Avon, which were then converted into Initial Training Wings. The new A.C.R.C. had the functions of reception, categorisation<sup>(1)</sup>, and elementary training. If recruits, on being tested, were found below the I.T.W. entrance standard in mathematics, they were given special teaching until they were good enough to go forward.

The sifting and selecting done at the A.C.R.C. was also used to deal with men who had been rejected from pilot or observer training and who were to be trained as other air crew (i.e. air gunners or wireless operator air gunners). The A.C.R.C. also gave any special training which might be required by men from I.T.W.s or University Air Squadrons.

Other Special Units.

S.D. 155 990/41  
October 1941.

In October remustering and special training were transferred from Regents Park to an Air Crew Disposal Wing opened at Brighton. This A.C.D.W. had capacity for 2,000 men, and handled remustering to other air crew, revision training for men not up to I.T.W. standard, and disciplinary training for those who needed it.

August 1941.

The transference overseas of a steadily increasing proportion of the flying training of cadets who passed through I.T.W.s in the United Kingdom brought with it the need for an assembly centre at which initial training could

/continue

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(1) Selection of cadets for pilots or observers, and assessment of pilots for fighters or bombers, was done at I.T.W.s in 1940, and at the beginning of 1941 it was proposed that sensori-motor apparatus tests for reaction and co-ordination, carried out by medical pre-selection teams, should be taken into account at certain I.T.W.s in addition to I.T.W. officers' opinion of men's capabilities. Strong opposition to the selection of men by tests rather than by personal opinion was aroused, and, since there was considerable difficulty and delay in getting the testing apparatus manufactured, only experimental work at No.2 I.T.W. Cambridge was done, before responsibility for categorisation passed to Regents Park.

continue while men were waiting for the voyage overseas, and S.D. 155 950/41. so an Air Crew Dispatch Centre, with capacity for 2,000, was formed at Heaton Park in August 1941.

Air Training Corps.

February 1941. Early in 1941 a pre-entry stage of training came into existence when the Air Training Corps was formed<sup>(1)</sup>. This was a voluntary organisation, developed from the Air League of the British Empire's Air Defence Cadet Corps, for giving instruction, in evenings and week-ends, to boys during the three years (from 15½) before they were old enough to join the R.A.F. The object of the A.T.C. was to give disciplinary and elementary service training and to widen the field of selection for air crew by improving the educational standard and physique of potential recruits for air crew.

September 1941. The A.C.R.C., A.C.D.W., and A.T.C. all tended to raise the standard at which men entered the Initial Training Wings. It became possible to extend the I.T.W. syllabus in September 1941 by including Principles of Flight and Engines at I.T.W.s handling pilot cadets. The increased flow of men, the A.C.R.C. and the larger number of I.T.W.s, made it possible to specialise I.T.W.s so that ten of them trained pilot cadets, four observer cadets, and one "straight" air gunner cadets<sup>(2)</sup>. The course for "straight" air gunners was shorter than that for pilots and observers - six weeks compared with eight.

/Overseas.

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(1) On 1st February 1941.

(2) Wireless operator air gunners were given initial air crew training during their signals instruction. The I.T.W.s dealing with pilots were at Babbacombe, Cambridge, Aberystwyth, Newquay, Stratford-on-Avon, Scarborough and St. Andrews. Observer I.T.W.s were at Torquay and Paignton. The air gunner I.T.W. was at Hastings.

Overseas.

Initial training overseas<sup>(1)</sup> underwent much the same development as in the United Kingdom. The period was lengthened from 4 weeks to 8, though there were variations for different types of air crew and for aircrew who had undergone a thorough system of pre-entry training, as in New Zealand. Initial training was done, as a rule, in the country where men were recruited, but pupils given their flying training in Rhodesia were exceptions. Men from the United Kingdom and Australia, if destined for Rhodesian schools, were given their initial training (after the early part of 1941) in the Rhodesian I.T.W. Pupils going to the United States for Arnold Scheme training went through a pre-flight course at Montgomery, Ala. (Maxwell Field) in addition to the British I.T.W. Canada had a preliminary Manning Depot stage which corresponded roughly to the A.C.R.C., and made considerable use of the initial training period to select men for training according to their aptitude.

The "New Deal" re-organisation<sup>(2)</sup> increased the periods of preliminary training considerably. The I.T.W. course for pilots and observers went up from 8 weeks to 12, and 8 weeks I.T.W. training was allowed for "straight" air gunners. In addition, observers were to have an 8-weeks E.A.O.S. preliminary period of ground instruction in  
/navigation

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(1) The overseas initial training organisations at the end of 1941 were:-

Canada.

Manning Depots at Toronto, Ont., Brandon, Man., (4-5 weeks)  
Initial Training Schools for pilots and observers (8 weeks):-  
No.1 I.T.S. Toronto, Ont.                      No.4 I.T.S. Edmonton, Alta.  
No.2 I.T.S. Regina, Sask.                      No.5 I.T.S. Belleville.  
No.3 I.T.S. Victoriaville, P.Q.                No.6 I.T.S. Toronto, Ont.

Australia.

Initial Training Schools (pilots and observers, 8 weeks:  
wireless operator air gunners 4 weeks):-  
No.1 I.T.S. Somers                              No.4 I.T.S. Victor Harbour  
No.2 I.T.S. Bradfield Park                    No.5 I.T.S. Pearce  
No.3 I.T.S. Sandgate.

New Zealand.

Pre-Entry Training (4-6 months)  
Initial Training Wing (pilots 6 weeks, observers 8 weeks, wireless operator  
air gunners 4 weeks)  
I.T.W. Weraroa, nr. Levin.

South Africa

Initial Training Wing (8 weeks)  
No.75 Air School Lyttleton.

/Contd.

S.D.349

navigation. The recommendations of the Empire Aircrew Training Conference endorsed these plans, but preferred to call the initial training of air gunners an "Elementary Gunnery School" stage.

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Southern Rhodesia

Initial Training Wing (8 weeks)

I.T.W. Saverdale, Bulawayo.

United States

Pre-Flight Training (4-5 weeks)

Maxwell Field, Montgomery, Ala.

(2) Appendix 45.

Pre-O.T.U. Stages.

When men trained overseas first arrived in the United Kingdom, from 1940 onwards, they went direct to O.T.U.s after reception at the Uxbridge Depot. There was no refresher flying practice between the end of basic training overseas and the start of operational training in the United Kingdom, and a good deal of skill was lost during the voyage and the inevitable waiting periods. O.T.U.s consequently had to give overseas-trained pupils a considerable amount of basic training and revision, over and above what they had to do generally, because of the barely-adequate standard at which Third Revise courses turned men out.

The flow from overseas increased during 1941, and S.D. 155 113/41. in February No.3 Personnel Reception Centre, with a capacity of 750, was set up at Uxbridge to deal with reception (i.e. February 1941. documentation, kitting, etc.) and hold air crew until there was room for them at O.T.U.s. S.D.155. 668/41. No.3 P.R.C. moved to June 1941. Bournemouth in June, and an elastic programme of ground instruction was gradually begun to occupy the waiting period.

At the end of 1941 and beginning of 1942 the number of overseas-trained men arriving in the United Kingdom mounted rapidly. In December No.3 P.R.C. expanded at short notice to a capacity of 3,000, while in January it overflowed from Bournemouth and sent a detachment to Hastings. In December 1941- March 1942. In March 1942 another P.R.C. (No.7), with an eventual capacity of 2,500, began to form at Harrogate.

Advanced Flying Units.

To reduce the undesirable load of basic training on O.T.U.s, an advanced stage of flying training at Advanced Flying Units, through which pilots passed between the P.R.C. and the O.T.U.s, was started at the beginning of November 1941. S.75860 November 1941. As the pressure for turning out air crew at the maximum rate of which schools were capable began to relax,

it became possible to make basic training courses longer and also turn over some training capacity in the United Kingdom to refresher and acclimatisation courses for men from overseas.

Three S.F.T.S.s began Advanced Flying Training Unit work on 1st November 1941, two more started at the end of the month or in December, and three more in January 1942<sup>(1)</sup>.

The advanced training course was at first intended to be quite short: three weeks were to cover conversion to the operational type, night flying, instrument flying, aerobatics (for S.E. pilots), navigation and S.B.A.<sup>(2)</sup> (for T.E. pilots).

In December, however, Flying Training Command reported that six weeks were wanted to bring overseas-trained pilots up to the S.F.T.S. passing out standard, and it was decided that A.F.U. courses should be 8 weeks for pilots destined for Bomber Command, and 4 weeks for those going to Fighter, Coastal, or Army Co-operation work.

More A.F.U. capacity for pilots was needed, and three new units<sup>(3)</sup> began training at the beginning of 1942. The difficulty about increasing A.F.U. capacity was lack of aerodromes, and Air Vice-Marshal Cochrane suggested that a large number of small "penny packet" A.F.U.s might be started at operational aerodromes. The suggestion was approved by the Air Council, but met with a cool reception

January 1942

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- /from
- (1) No.2 S.F.T.S., Brize Norton, No.3 S.F.T.S., South Cerney, and No.9 S.F.T.S., Hullavington started A.F.U. work on 1st November 1941. The College S.F.T.S. Cranwell began at the end of November and No.12 S.F.T.S., Grantham, in December. No.5 S.F.T.S., Ternhill, No.6 S.F.T.S., Little Rissington, and No.11 S.F.T.S., Shawbury, started in January. The change was gradual: schools finished training S.F.T.S. courses and then replaced them with A.F.U. pupils. The names of schools were changed to (P) A.F.U. when the last S.F.T.S. courses ended in the spring of 1942. Cranwell reverted to S.F.T.S. work in January 1942.
  - (2) Since S.B.A. training could not be done at schools, the T.E. course was to be only two weeks.
  - (3) No.14 (P) A.F.U. at Ossington began in January with the staff and aircraft from No.14 S.F.T.S. at Lyneham. No.15 (P) A.F.U. began at Leconfield in February with the staff and aircraft from No.15 S.F.T.S. at Kidlington. No.17 (P) A.F.U. began in February on an aerodrome at Watton lent by Bomber Command and with a staff that was largely lent by Bomber Command. The units were named (Pilot) Advanced Flying Units when it was decided they should train pilots only.

from Fighter and Coastal Commands. At the end of March 1942 there were ten large units, but no "penny packets", doing the A.F.U. training of pilots<sup>(1)</sup>. The A.F.U. course was set by the New Deal as 8 weeks (60 hours flying) for T.E. pilots and 4 weeks (30 hours flying) for S.E. pilots. (Observer) Advanced Flying Units.

It was at first intended to develop the twin-engine A.F.U.s so that crews would be trained with pilots, the aircraft carrying an observer and a wireless operator, and being fitted with wireless and S.B.A. This scheme could not however be carried out because the aircraft were not equipped for the work<sup>(2)</sup> and the flying needed by the pilots was not suitable for training observers and wireless operators<sup>(3)</sup>. Advanced training (i.e. a refresher acclimatisation course) for observers was then provided by converting some Air Observers Schools to (O) A.F.U.s<sup>(4)</sup>. The course lasted 4 weeks, and included a much greater proportion of night flying than the basic navigation course which these schools had previously been teaching. The proficiency of staff pilots in day and night navigation flying became an important factor in (O) A.F.U. development<sup>(5)</sup>, and so did the provision of a considerably larger number of staff wireless operators. The staff pilots were at first given (P) A.F.U. training, particularly in night flying, at Lynham and /Ossington.

January 1942.

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- (1) Pilot A.F.U. training was being done in March 1942 at:-
    - No.2 (P) A.F.U. Brize Norton
    - No.3 " South Cerney
    - No.5 S.F.T.S. Ternhill (later No.5 (P) A.F.U.)
    - No.6 " Little Rissington (later No.6 (P) A.F.U.)
    - No.9 (P) A.F.U. Hullavington
    - No.11 S.F.T.S. Shawbury (later No.11 (P) A.F.U.)
    - No.12 " Grantham (later No.12 (P) A.F.U.)
    - No.14 (P) A.F.U. Ossington
    - No.15 (P) A.F.U. Leconfield
    - No.17 (P) A.F.U. Watton
  - (2) S.F.T.S. or (P) A.F.U. aircraft had only R/T sets (T.R.9) of limited range.
  - (3) Practically all the flying done was local and short-distance.
  - (4) The name Advanced Flying Unit was now qualified as (Pilot) or (Observer) i.e. (P) A.F.U. or (O) A.F.U. No.2 A.O.S. Millom and No.1 A.O.S. Wigtown began the A.F.U. training of observers in January 1942, and were renamed Nos.1 and 2 (O) A.F.U.
  - (5) With the change to (O) A.F.U. work, the bulk of these schools' flying became three-hour cross country and overseas flights by day and night.

Ossington. Then, in March, a special Staff Pilot Training Unit began to form at Cark. Staff wireless operators were trained by the schools themselves in the same way that wireless operators had been trained since the B. & G. Schools were converted to navigation work.

Signals training at navigation schools developed rapidly as the schools were converted to (O) A.F.U.s. The crewing of the aircraft used <sup>(1)</sup> allowed a pupil wireless operator to be carried as well as the staff pilot, staff wireless operator, and observer pupils, and this flying capacity began to be used in March 1942 to give advanced (refresher and acclimatisation) training to wireless operators. The instructors and ground organisation which had been brought into existence for training schools' own staff operators or for the "Penrhos Scheme" were turned over to A.F.U. work, and the (O) A.F.U.s now handled the advanced training of wireless operators (on a 4-week course) as well as observers <sup>(2)</sup>. Signals training was, however, somewhat handicapped by the equipment of A.F.U. aircraft with the old G.P. set (T.1082 R.1083) at a time when operational and O.T.U. aircraft were practically all using Marconi sets (T.1155 R.1154).

March 1942.

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- (1) A.F.U. training for observers was given on Ansons. The other types in use at the schools were not suitable for night work, and were gradually replaced. The Anson carried a crew of five:- staff pilot, staff wireless operator, two observer pupils, and one wireless operator pupil.
- (2) The schools had also to continue the training of their increasing number of staff wireless operators. The schools on (O) A.F.U. work in March 1942 were:-
- No.1 (O) A.F.U. Wigtown.
  - No.2 (O) A.F.U. Millom.

Instructors.

In 1940 and 1941 a large number of instructors had to be found. All schools were growing larger, and new training units were constantly coming into operation<sup>(1)</sup>. The E.F.T.S.s and S.F.T.S.s had to be staffed with qualified flying instructors, the O.T.U.s with experienced air crew, and the navigation and armament schools with appropriate specialists. Ground instructors were needed at all, and staff pilots at most, training units<sup>(2)</sup>. Providing instructors involved two problems - finding suitably qualified men, and training them for the work of teaching.

In May 1940 the chief, and virtually the only, qualification required was knowledge and experience of the subject to be taught: flying instructors were drawn from experienced pilots, navigation instructors from men who had been given s.n. training, armament instructors from experienced tradesmen, and so on. Except in the case of flying instructors, who were given a C.F.S. course in the art of teaching the handling of aircraft, knowledge of his subject was regarded as practically all the equipment required by an instructor. Such specialised instructor courses as existed were almost entirely concerned with technical information: S.A.I.s were taught armament theory and equipment at Manby, navigation instructors learned how to navigate on s.n. or s.n. instructors courses at the School of Air Navigation, master mariners from civil A.O.N.S.s were taught the service doctrine of air navigation. As new instructor courses - A.O.I., A.G.I., - were introduced they too concentrated very largely on making men personally proficient in technical knowledge.

Finding

- (1) The whole training expansion, except for the Empire Scheme, the United States schools, and a proportion of the South African and Rhodesian schools, was staffed by the R.A.F.
- (2) The Third Revise cut out the need for staff pilots at S.F.T.S.s, but increased their requirement of flying instructors. Reliance on O.T.U.s for conversion and some basic training made it necessary for them to have flying instructors and staff pilots.

Finding instructors for the expansion of training thus meant making experienced men available, and experienced men had in general to be drawn from the first line. There was a conflict between the interests of training and future expansion and the fighting efficiency of the first line. Inexperienced or inefficient instructors would lower the standard at which pupils were turned out from basic training, while taking experienced men away from squadrons would inevitably weaken the operational effort.

S.64591

August 1940

In August 1940 the flow of pilots required for C.F.S. training as flying instructors was estimated at 1,800 per year. If they were all to be experienced men the bulk of them would have to be drawn, at the rate of 150 per month, from a first line pilot strength of some 3,000. But this was not the only requirement threatening first line dilution. Experienced pilots were also wanted for teaching navigation, at the rate of about 300 per year. The growing O.T.U. organisation had to be staffed - and men with first line experience were clearly essential for efficient operational training - at a rate which, though uncertain, was likely to be about 1,000 pilots per year. In addition, a considerable number of staff pilots were wanted for various types of school, though experienced men were not so necessary for this work.

S.64591

The difficulty was met by a compromise. Half the flying instructors required were to come from the output of S.F.T.S.s, suitable men being selected and trained as instructors immediately after finishing their basic training, thus leaving only half the full number of 1,800 per year to come from the operational Commands. Other instructors were drawn as far as possible from non-pilots. It was then laid down that the first line had to provide its quota of instructors "notwithstanding the effect this may have on

/the

the operational effort".

First Line versus Training.

October 1940.

The operational Commands protested against the heavy number of experienced men that would be drained from the first line, but the decision was reaffirmed in October:-

S.64591

"The object which the (Air) Council have in view is the strengthening without delay of the training organisation upon which depends the expansion of the operational force. The only practicable means of effecting this is ..... experienced pilots and observers withdrawn from squadrons being replaced by fresh blood from the training organisation. The Council realise the effect which these withdrawals will have upon the operational effort. They have no alternative, however, and they are perforce prepared to accept a temporary lowering of the standard of experience in squadrons through the break-up of operational crews ..... The operational commands will appreciate that only through the personnel provided at their expense for the training organisation will a dividend in the form of increased operational effort be available later".

November 1940.

This was by no means the end of the matter. The call for instructors pressed heavily on Bomber Command, and in November Air Vice-Marshal Harris (D.C.A.S.) challenged the need for men with first line experience anywhere except at O.T.U.s and in a few key posts. He protested against "dissipation of bomber crews outside the bomber circle", argued that men withdrawn from the first line were frequently employed in ways which made no use of their operational experience, and urged that crews should not leave operational Commands until war weariness made it unavoidable. Air Marshal Freeman (V.C.A.S.) was not entirely convinced but agreed, and in December the withdrawal of pilots from Bomber Command was stopped.

December 1940.

The operational Commands' reluctance to let men leave the first line for instructor work was accompanied by a strong dislike of withdrawal to training duties on the part

/of the

of the pilots themselves. In January 1941 it was necessary to stress the vital importance of having good instructors:-

S.64591

January 1941.

"The Air Council have reason to believe that pilots in operational units are often reluctant to be withdrawn from those units for employment as flying instructors, staff pilots or even as instructors in operational training units. This reluctance appears to exist even among pilots who are overdue for a rest from operational flying and to be derived from a mistaken feeling that withdrawal from operational duties is a reflection upon their capacity and keeness.

The Air Council earnestly desire the co-operation of all Commanding Officers in combating this point of view both by precept and by their example in releasing for duty as instructors (when called on to do so) personnel of really good quality.

The preservation of high standards at all stages of flying training depends eventually on the presence within the framework of the training organisation of adequate numbers of instructors with good and up-to-date operational experience, and the only source from which they can be provided is the operational squadron. After a relatively short time, the finished products of the training organisation pass to the operational units and the co-operation of Commanding Officers in this matter is therefore an important contribution to the maintenance and expansion of the war effort of the Royal Air Force."

#### The Operational Tour.

All this time the question of who was withdrawn from the first line, whether because of war-weariness or in response to a call for instructors, was left to Commanding Officers. The advisability of having a system of regular relief for tired crews had been put forward as early as February 1940 by Air Vice-Marshal Sholto Douglas and Air Marshal Freeman<sup>(1)</sup>, but it was decided to leave withdrawal for war-weariness to the Commanding Officers' judgment in each individual case<sup>(2)</sup>. The disposal of men whom C.O.s considered should be withdrawn was left, after a protest by Air Vice-Marshal Harris (then A.O.C. No.5 Group) against

S.61140

- /their
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- (1) The proposal was based on experience in 1914-18, when men were sent home for a rest and a change after 6-8 months in France. Men relieved under the proposed scheme were to be employed at O.T.U.s and schools.
- (2) The reasons were that individuals varied greatly in susceptibility to war strain, that it would be wrong to give the impression that crews were expected to show signs of war-weariness, and that a regular system of relief would be wasteful in not getting the maximum work out of each man.

July 1940.

their employment being decided by the Air Ministry, to the operational Groups, and practically all of them went to the staffs of O.T.U.s. A proposal in July 1940 that war-weary men from Bomber Command should be exchanged with experienced instructors from schools came to nothing because the pressure on schools at that time and the need for experienced men in new schools made it impossible to release the replacements.

November 1940.

By November 1940, it had become clear that some arbitrary withdrawal from operational work was desirable to ensure that the willing horse was not overworked and also that training and experience were not wasted by too short a spell of operational duty. It was equally clear that the

S.7729

experience and knowledge of the fighter pilots who had survived the Battle of Britain should be turned to good purpose in O.T.U.s and schools. The "operational tour" was devised, assessed for the appropriate length, and introduced in March 1941. Tour expired crews, however, provided no

S.61140

March 1941.

immediate source of instructors for schools. Air Vice-Marshal Harris was emphatic that "every effort must be made to keep the fingers of the training side of the service away from the invaluable and irreplaceable crews who have done a first tour", and O.T.U.s were given first claim on the men relieved from operational work. All the tour-expired crews that became available were swallowed up by the expanding O.T.U. organisation, and extremely few were left over to instruct at schools. Not until some time ahead, when they had finished a second tour after at least six months on O.T.U. work, would men with first line experience be released to the basic training organisation.

S.7729

#### Inexperienced Instructors.

This difficulty in obtaining experienced men not only made it hard to find the number of instructors required, but also compelled schools to rely very largely on newly-trained

/men

men "ploughed back" into teaching immediately after their basic courses. The C.F.S. drew most of its pupils from the "cream" of the S.F.T.S. output; observers became navigation instructors; A.O.I. and A.G.I. courses were filled with pupils direct from the B. & G. Schools; and staff pilots came from that part of the S.F.T.S. output which was unwanted for any other work.

The inexperience and shortage<sup>(1)</sup> of flying instructors had their effect. The standard of training went down in the spring and summer of 1941 and the accident rate increased. At the same time some of the men "press-ganged" into instructing resented the diversion from operational duties, with bad effects on their teaching<sup>(2)</sup>.

Towards the end of 1941 efforts were made to raise the general level of experience among instructors by starting a system of exchange. Men from the first line were to be replaced, on a man for man basis, by the most experienced instructors from basic training<sup>(3)</sup>. It was intended that half the flow of fresh instructors - just over 1,000 per year - should be provided in this way, but the operational Commands, although agreeing that teaching by men with first line experience was desirable, found it hard to release such men. Each operational Command was in difficulties about experienced men in squadrons: Bomber Command was largely hamstrung by the high number of part-trained crews in the

/first

- (1) The difficulty of finding enough pilots for instructor work was aggravated in the early part of 1941 by the reduction in S.F.T.S. output (from which most of the men had to be taken) caused by winter conditions. O.T.U. requirements of pupils were met in full, and the surplus available for C.F.S. courses was small. In addition, C.F.S. training was delayed by the weather.
- (2) In May 1941 it was decided to reject men as instructors if they showed marked temperamental unsuitability for teaching.
- (3) A similar system of interchange between basic training and Fighter and Coastal Commands had provided a small number of operationally experienced instructors up to July 1941, when it was discontinued because all the experienced instructors who could be spared from schools were needed in new schools overseas. The exchange system did little to relieve the dilution of instructional staff, since it only replaced one experienced man by another.

first line, Fighter Command had supplied large numbers of pilots to the Middle East, and Coastal Command was faced by a sudden and urgent expansion. Only a trickle of experienced men from the first line was available for exchange at the beginning of 1942, and so most of the instructors in basic training had either to be replaced by men "ploughed back" at the end of basic courses or else to remain, in increasing restiveness and discontent, on training duties.

#### O.T.U. Instructors.

S.46938

The O.T.U.s were far better off than basic training for men with operational experience. Even so, the flow of "war-weary" was at first not enough to meet all their requirements, and they were staffed to some extent by men held back from the first line after the end of the O.T.U. course. It was agreed in November 1940 that 25% of the staff pilots at O.T.U.s should be trained flying instructors, but the proportion remained far below this figure for a long time because practically the whole output from C.F.S. training was required for the basic school organisation. By August 1941 only 11% of the Fighter O.T.U. staff, 6.5% of the Coastal, and under 4% of the Bomber were qualified flying instructors. A good many of the pilots on O.T.U. staffs were however wanted only for cross country flying to give pupils navigation and wireless practice, and it was pointed out in February 1941 that there was no real need to have men with first line experience for this work. Pilots straight from S.F.T.S.s could do it if they were given a suitable staff pilot course. Resources could not, however, be spared at that time for a staff pilot school, and the idea was dropped.

#### Central Flying Schools and Flying Instructors Schools.

In May 1940 the C.F.S. at Upavon was the only United Kingdom unit for training flying instructors. It

/had

A.72863/40

had been decided that instructors for E.F.T.S.s should be trained elsewhere<sup>(1)</sup>, and that the C.F.S. should concentrate on turning out fully qualified men to teach at S.F.T.S.s, but for a time there was no change because few pilots were available<sup>(2)</sup> for training instructors. Then, at the beginning of July 1940 No.4 (Supplementary) Flying Instructors School started at Cambridge on the training of E.F.T.S. instructors<sup>(3)</sup>. The length of the elementary instructors' course was 4 weeks, and the length of the C.F.S. course 5. Part of the C.F.S. output was trained to teach on S.E. aircraft, and the rest for T.E. work.

The need for more C.F.S. capacity, and for the opening of a second C.F.S., to provide the required flow of S.F.T.S. instructors, was agreed in July 1940<sup>(4)</sup>. The second S.D.155 863/40. school was opened in September, as No.2 F.I.S., at Cranwell, and a third F.I.S. was planned since the C.F.S. and September- Cranwell could not turn out the full 1,800 per year that were October 1940. wanted. However, Cranwell's instructor training capacity S.D. 155 988/40. was increased at the end of October, and the idea of a third school was dropped. In November 1940 it was decided to call S.D. 155 1079/40. units which trained S.F.T.S. instructors "Central Flying Schools", and leave the name "Flying Instructors School" for November 1940. units training elementary instructors. No.2 F.I.S. at Cranwell was then renamed No.2 C.F.S. At this time three T.E. instructors were being trained for one S.E.: Cranwell turned out all T.E. instructors, and Upavon half T.E. and half S.E. Upavon and Cranwell together were capable of producing 1,800 instructors per year.

/While

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- (1) See page 153.
  - (2) The first line's demand for pilots was urgent and heavy.
  - (3) No.4 (S) F.I.S. was located with No.22 E.F.T.S. Its pupils were drawn as far as possible from pilots in the 28-48 age range, i.e. men too old for operational work.
  - (4) See Appendices 25 and 26.

While this growth of C.F.S. capacity was going on, a second elementary instructor school, No.5 (S) F.I.S.<sup>(1)</sup>, was opened in October at Perth, so that there were four units<sup>(2)</sup> training flying instructors in the United Kingdom at the end of 1940.

April 1941. April 1941 the capacity for training S.F.T.S. instructors was increased ("temporarily" because of the shortage of instructors at that time) by transferring two flights at Cranwell from S.F.T.S. to C.F.S. work and taking in an extra 50 pupils. No.2 C.F.S. moved from Cranwell to Church Lawford in June 1941, but the two flights remained at Cranwell, still training instructors.

May 1941. When the flow of instructor pupils from Bomber Command came to an end in December 1940 it was impossible to keep up the correct ratio of three T.E. pilots to one S.E. in the intake to the C.F.S.s, and a number of S.E. pilots had to be trained as T.E. instructors. As C.F.S. pupils came to be drawn more and more from the S.F.T.S. output special attention became necessary to ensure that when instructors were turned out they had done more than 200 hours flying and had sound night experience. Pilots selected for C.F.S. training were given as much flying as possible while still at S.F.T.S., and also had their C.F.S. course extended if necessary<sup>(3)</sup>. In May 1941 courses were begun at Upavon to train operationally-experienced men as flying instructors for O.T.U.s. These pilots came from the operational

/Commands

(1) No.5 (S) F.I.S. was located with No.11 E.F.T.S. By this time men for training as elementary instructors were being taken at the end of E.F.T.S. courses, and trained without having gone through the S.F.T.S., because of the pressure on S.F.T.S.s. This was begun in July 1940, and the men selected as instructors were given special training at No.22 E.F.T.S. with emphasis on instrument flying and navigation, before the (S) F.I.S. course began.

(2) C.F.S. Upavon (S.E. and T.E. instructors, output about 900 per year)  
No.2 C.F.S. Cranwell (T.E. instructors, output about 900 per year)  
No.4 (S) F.I.S. Cambridge (elementary instructors, output about 200 per year)  
No.5 (S) F.I.S. Perth (elementary instructors, output about 200 per year)

(3) The course lasted 6 weeks in 1941.

Commands to the C.F.S. and went back to O.T.U.s at the end of the course. This C.F.S. training lasted three weeks, and the rate of output was about 430 per year<sup>(1)</sup>. Three weeks was found to be rather too short, but there was not enough C.F.S. capacity to lengthen the period without cutting down the output.

IIM/a9/1.

In October 1941 the two instructor-training flights at Cranwell were moved to Dalcross. In November another school for E.F.T.S. instructors, No.6 (S) F.I.S., was formed at Worcester by converting No.2 E.F.T.S. (which closed) from ab initio to instructor training. In January 1942 a new instructor training unit, No.2 F.I.S., at Montrose, began to train flying instructors for (P) A.F.U.s on 8-week courses.

IIM/a9/1.

January 1942.

The name "Central Flying School" was then confined to the original unit<sup>(2)</sup> at Upavon, and the other instructor-producing establishments named "Flying Instructors Schools". No.2 C.F.S. at Church Lawford became No.1 F.I.S., and the qualification "(Supplementary)" was dropped from the names of the E.F.T.S. instructor schools.<sup>(3)</sup>

Navigation and Armament Instructors. Staff Pilots.

There was little change in the training of other instructors during 1940 and 1941. Navigation instructors were given a 6-week "s.n.i." course, developed from the "s.n." course, at the School of Air Navigation. Education officers who taught navigation at I.T.W.s had special

/courses

(1) 48% for Bomber Command, 36% for Fighter; and 16% for Coastal. The capacity for S.F.T.S. instructors was reduced to make room for these O.T.U. pupils.

(2) Which was now to be raised to a higher level than routine instructor training by being converted into the Empire Central Flying School.

(3) The United Kingdom organisation for training flying instructors in March 1942 was:-

C.F.S.	Upavon	No.4 F.I.S.	Cambridge
No.1 F.I.S.	Church Lawford	No.5 F.I.S.	Perth
No.2 F.I.S.	Montrose	No.6 F.I.S.	Worcester
F.I. Flights,	Dalcross		

Note:- differentiation of name between schools training elementary (F.I.S. (E)) and those training advanced instructors (F.I.S.(A)) was introduced in April 1942.

courses in the subject, also at the S. of A.M. Armament instructors passed through S.A.I., A.O.I., or A.G.I. courses at Manby. Staff pilots for navigation schools began to receive special instruction in staff pilot work, first at No.14 (P) A.F.U., and then at the Staff Pilot Training Unit at Cark<sup>(1)</sup>. Otherwise, instructors in general, and ground instructors in particular, were left with no more preparation for teaching than their personal experience afforded until No.1 Ground Instructors School at Shawbury began in March 1942, to train instructors in the technique of instruction. The courses lasted 2 weeks, and the capacity of the school was small. The difficulty of obtaining men with first line experience applied to all other instructors as strongly as it did to pilots, and consequently teaching generally was to a considerable extent in the hands of inexperienced men or "ploughed back" ex-pupils.

IDM/a9/1

Instructors Overseas.

In overseas training theatres where instructors were not supplied by the R.A.F.<sup>(2)</sup> men with first line experience were not available during 1940 and 1941. The embargo imposed in May 1940 applied to the sending of experienced pilots, as well as aircraft, out of the United Kingdom, and after it was lifted hopes that "war-weary" men could be spared went unfulfilled because of the R.A.F.'s pressing needs. Almost from the start, these training theatres had to rely entirely on a limited number of experienced pilots, plus men "ploughed back" at the end of basic courses, for their flying instructors<sup>(3)</sup>.

E.T.S. 78(40)  
81(40)

/found

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- (1) The S.P.T.U. began to form in March 1942.
  - (2) Canadian Empire Scheme Schools, Australia, New Zealand, and the United States.
  - (3) The magnitude of the instructor-training problem can be seen from the fact that Australia, for instance, started in 1940 with only 16 flying instructors but had to produce 650 before all her schools could be fully staffed.

found from their own resources.

In Canada, to start the Empire Scheme, suitable  
E.T.S. 5(40) experienced civil pilots were trained as instructors at Camp  
January-May 1940. Borden<sup>(1)</sup>, and given refresher courses when necessary. By  
June 1940 the supply of civilians was becoming exhausted, and  
service (R.C.A.F.) pilots with not less than 150 hours'  
flying were accepted for training as instructors<sup>(2)</sup>. In  
July instructor training was moved to Trenton<sup>(3)</sup>, which be-  
came the Canadian C.F.S. There was a flow of experienced  
July-September, 1940. civil pilots from the United States to become instructors in  
Canada, and in September 1940 seven-week refresher courses<sup>(4)</sup>  
at Camp Borden were started for these American pilots before  
they went on to C.F.S. training at Trenton. In November  
November 1940. 1940 about two-thirds of the first output from Empire Scheme  
S.F.T.S. training went to Trenton for C.F.S. training, and  
thereafter practically all Canada's flying instructors were  
provided by creating S.F.T.S. courses. Armament instructors  
were taught armament theory and equipment, also at Trenton.  
Navigation instructors were at first recruited from men with  
high academic qualification, and trained in air navigation  
at Trenton<sup>(5)</sup>. Later, navigation and armament instructors  
were largely provided by "ploughing back".

In Australia the provision of instructors followed  
similar general lines. The R.A.A.F. Flying Training School  
E.T.S. 294(41) at Point Cook began training flying instructors. An  
Australian C.F.S. started at Point Cook in April 1940, and  
April-May 1940. moved to Camden, N.S.W., in May. At first, civil pilots

/were

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- (1) Camp Borden was previously the I.T.S. of the R.C.A.F. Flying Training School.  
(2) If these R.C.A.F. instructors were sent to teach at civil-operated E.F.T.S.s they were given unpaid leave so that they could be employed by the civilian operating companies.  
(3) Trenton was previously the A.T.S. of the R.C.A.F. Flying Training School.  
(4) These refresher courses were to the I.T.S. part of the S.F.T.S. syllabus.  
(5) When the first A.N.S. opened, the training of navigation instructors was transferred there.

were given C.F.S. training, but it was soon found that many of them had too little flying experience to teach at S.F.T.S.s, and so a shorter elementary instructors' course was introduced in addition to the full service instructors' course<sup>(1)</sup>. When the supply of civil pilots gave out, service (R.A.A.F.) pilots were trained, and then "creamed-off" pupils from S.F.T.S. courses.

New Zealand also had to rely largely on her own resources, and set up a Flying Instructors School at Hobsonville.

In the United States the supply of instructors presented no problem. At the B.F.T.S.s they were provided by the American operators of the schools, and under the Arnold and Towers schemes by the United States Army and Navy. Some of the B.F.T.S. instructors went to Trenton to make themselves familiar with R.A.F. methods of teaching.

In overseas training theatres where the R.A.F. supplied all, or a high proportion, of the instructors<sup>(2)</sup>, there was no **initial** problem of instructor training. The provision of replacement flying instructors, however, came up during 1941. South Africa, which had always paid special attention to instructor training, had a C.F.S. at Bloemfontein. Southern Rhodesia received a small flow of men with first line experience from the Middle East, and, after using the South African C.F.S. for a short time, set up its own C.F.S. at Belvedere to train these ex-operational pilots, as well as ex-pupils, to be flying instructors.

Thus, towards the end of 1941, there were C.F.S.s at work in practically every training theatre - at Trenton, Camden, Hobsonville, Bloemfontein, and Belvedere - as well as in the United Kingdom. Each tended to develop in its

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<sup>/own</sup>  
(1) The elementary instructors' course lasted 8 weeks, and the service instructors' 12.

(2) Southern Rhodesia, South Africa, and the transferred schools in Canada.

own way<sup>(1)</sup>, particularly because the existing R.A.F. manual of flying instruction<sup>(2)</sup> gave little guidance on training with the monoplane types which had come into almost universal use. Considerable variation in the technique of basic instruction became apparent as pilots from the different overseas training organisations reached the United Kingdom, and it was generally agreed that co-ordination and a common doctrine between C.F.S.s ought to be established. It was decided that the means of co-ordination should be an Empire Central Flying School<sup>(3)</sup>, developed from the original Central Flying School in the United Kingdom, and attended by men from the instructor-training schools overseas. As its main function the E.C.F.S. was to debate, develop, and unify the technique of flying instruction, taking the requirements of first line types fully into account. As a necessary corollary for the dissemination of the technique, it had to take a large part in preparing the new manuals that were needed.

December 1941-  
January 1942.

S.D.349

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(1) Each C.F.S. trained instructors for a comparatively limited group of schools and, in the main, drew its pupils from the same group of schools. There was practically no liaison between the C.F.S.s overseas and operational work or the flying of operational types. Practices grew up which, while satisfactory on the trainer types used in schools, were undesirable on the first line aircraft which the schools' output had to fly later.

(2) A.P. 1732.

(3) The Empire Central Flying School opened at Hullavington (Upavon was not entirely suitable for the purpose) on 1st April 1942. No.9 (P) A.F.U. (at Hullavington) was reduced in size, and Upavon became No.7 F.I.S.

Synthetic Training

Before the war a few special devices for teaching air crew, such as the Link Trainer and the Air Ministry Bombing Teacher, were used. In general, however, there was a marked preference for giving as much instruction as possible in the air: the Link Trainer, for instance, being introduced only to give practice in instrument flying because there were special difficulties over teaching instrument flying in aircraft. Films were used to a limited extent for teaching technical subjects, but were little applied to the combatant or operational aspects of instruction.

January  
1940.

In January 1940 Air Marshal Joubert and Air Commodore Willock suggested using a Link Trainer in conjunction with films for teaching gunnery to pilots. Experiments were being made unofficially<sup>(1)</sup> in the preparation of instructional films for giving air gunners practice in using stand-mounted turrets. Several types of spot-light trainers for teaching turretry were under development. Air Vice-Marshal Harris was urging the making of films for operational training, and was setting up a Crew Training School in No.5 Group. This school, at Fimingley, was planned to relieve first line squadrons of their training load: Education Officers<sup>(2)</sup> were used for teaching at it, and crew practice was given in a dissected Hampden fuselage  
/combined with

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(1) By the Air Fighting Development Unit and the Group Pool at Abingdon.

(2) A/V/M Harris considered that "the School Master type has the inborn ability and qualities to apply and instil knowledge and that this type of instruction cannot be done by the ordinary R.A.F. personnel who has little or no knowledge in the art of teaching".

combined with a Link Trainer. (1)

February  
1940

A discussion at Bomber Command in February 1940 showed that the whole question of simulating air training on the ground was "much more comprehensive than was at first supposed and embraced many other questions than the production of films". Air Chief-Marshal Ludlow-Hewitt invented the name "synthetic training" for what was wanted, and advocated setting up a special branch of the Air Ministry to foster it. At first, however, nothing more than a committee for ascertaining and co-ordinating requirements was formed, and this - the "Committee to Consider the Simulation of Air Training on the Ground" - held its first meeting in March 1940. After the second meeting in April it was renamed the "Synthetic Training Committee". Its work quickly gained considerable importance because there was difficulty during 1940 and 1941 in finding enough aircraft and flying hours for training and it consequently became necessary to replace air practice as far as possible by synthetic instruction. (2)

#### Finningley

The Crew Training School at Finningley developed synthetic methods with considerable success, but it became clear in the summer of 1940 that synthetic training should be done at O.T.Us and not by a special stage between the O.T.U. and the squadron. (3)

Synthetic crew training was then introduced at O.T.Us, with an important modification in the manner of carrying it

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(1) Another trainer combining an instructional fuselage with a Link Trainer - for Hudsons - was being developed by the Coastal Group Pool at Sillloth about this time.

(2) The committee was at first largely concerned with applying synthetic methods to operational training, and worked through T.W.I. and, later, T.O.I. A branch specifically concerned with synthetic training, T.O.5, was started in January 1941.

(3) Finningley had the Reserve Hampden squadron (No.106) through which crews passed after they left the O.T.Us.

out: fuselages were used only for cockpit and crew drill, operational exercises being carried out in cubicles instead of the fuselage positions (as had been done at Finningley). The change enabled larger numbers of pupils to be handled, and had the advantages of smaller space and greater convenience. The cubicles were fitted with full equipment for the crew, and an epidiascope was used to project pictures. The exercises carried out represented operational flights, and the cubicle trainer at O.T.U.s came to be known as a "Grove".

It was suggested that Finningley should become a central school for synthetic training, but the suggestion was not approved. When the other Reserve squadrons were discontinued in August 1940, however, Finningley went on with special training, and itself became an O.T.U. in March 1941.

S.D.155  
741/40

#### Expansion of Synthetic Training

The scope of the Synthetic Training Committee's agenda widened rapidly. By May 1940 it ranged from the synthetic wireless operator training device of a Harwell Box<sup>(1)</sup> to the establishment of a school for training Fighter Command's Sector Controllers<sup>(2)</sup> and the fitting of a motor van as an astro navigation trainer. In September 1940 synthetic methods of night training (day-night flying) began to be considered.

The diversity of suggestions, ideas, and methods increased steadily. Simpler types of apparatus were described in Synthetic Training Papers so that units could make them. Research on more complicated devices was done, and

/their development

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(1) This was devised by the Group Pool at Harwell in 1939. It was a cubicle equipped in the same way as the wireless operator's position in an aircraft.

(2) The Controllers Instructional Unit, formed at Uxbridge in July, with the R/T Speech Unit (formerly the Voice Production Unit) attached to it.

S.D.155  
620/40

their development undertaken, by appropriate R.A.F. units. In April 1941 a Navigational Synthetic Training Development Unit was set up at Woodley. Early in 1942 this unit extended its activities to all air crew synthetics except armament, signals, and radar, and was renamed the Synthetic Training Development Unit. By 1942 no less than 200 training devices had been invented and put into use.

It was far from easy, however, to make the devices. Priorities and production difficulties limited the amount that could be turned out, either by R.A.F. units or by manufacturers, and the introduction of synthetic training was in consequence severely handicapped throughout 1940 and 1941.

Higher Organisation

May  
1940.

Training and Reserve Commands were merged and re-divided into Flying Training and Technical Training Commands. on 27th May 1940. Flying Training Command then had two Groups (Nos. 21 and 23) of service flying schools,<sup>(1)</sup> two Groups (Nos. 50 and 51) of civil elementary flying and navigation schools, one Group (No. 25) of armanent schools, and one Group (No. 54) of initial training units. This organisation remained unchanged in its main outline throughout 1940 and 1941, although there were many changes in detail. The S.F.T.Ss of Nos. 21 and 23 Groups changed into (P)A.F.Us. The E.F.T.Ss and A.O.N.Ss of Nos. 50 and 51 Groups were redistributed between the two Groups, on a geographical basis, in July 1940, and the A.O.N.Ss disappeared during 1941. The B. & G. Schools of No. 25 Group developed into A.O.Ss and A.G.Ss, and the A.O.Ss into (O)A.F.Us, as the Group came to deal with navigation and signals, as well as armanent, training. No. 54 Group came to embrace the A.C.R.C., A.C.D.W., and (for a time) the University Air Squadrons<sup>(2)</sup> as well as the I.T.Ws. Broadly, however, No. 54 Group continued to deal with preliminary ground training, Nos. 50 and 51 with the first stages of pilot training, Nos. 21 and 23 with advanced pilot training, and No. 25 with crew training.

Operational training was controlled by specialist Groups under the operational Commands. A second Bomber O.T.U. Group, No. 7, was started in July 1940<sup>(3)</sup> to handle the Hampden and Blenheim O.T.Us, thus leaving No. 6 Group

/to deal with

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(1) Including the School of Air Navigation.

(2) The University Air Squadrons were later, at the beginning of 1942, assimilated to the A.T.C., and put under direct control from the Air Ministry.

(3) At Brampton, near Huntingdon.

to deal with the Whitley and Wellington units. The Fighter O.T.U. Group, No.81, was set up in December 1940,<sup>(1)</sup> and took over the O.T.U.s from No.10 Group. The Coastal O.T.U.s came under No.17 Group<sup>(2)</sup> at Gosport.<sup>(3)</sup>

Office  
Memorandum  
146/40

The Air Member for Training was created on 8th July 1940, and his Department came into existence in the following weeks. The Directorate of War Training and Tactics, from C.A.S.'s Department, became the Directorate of Training (Operational) (D.T.O.) The Directorate of Training, from A.M.P.'s Department, became the Directorate of Training (Flying) (D.T.F.) and the Directorate of Training (Technical) (D.T.T.). There were Deputy Directorates of Flying Training, Ammunition Training, Technical Training, and Signals Training. Navigation training and naval (Fleet Air Arm) training came under D.D.T.F. A new secretariat division, S8, was created.

Office  
Memorandum  
175/40

The Training Progress staff (T.P.) was set up in August 1940. A Directorate of Pre Entry Training (D.P.E.T.) was started at the beginning of 1941. Professors Bott and Myers arrived from Canada, as Advisers on Training Methods, in December 1941.

Outside the United Kingdom, the formation of a specialist Group to control O.T.U.s in the Middle East was recommended by the Inspector-General in September 1941, but

/the Group

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(1) At Sealand. It moved to Worcester in February 1941, and to Avonby, near Stroud, in December 1941.

(2) No.17 Group also controlled the Schools of G.R. in the United Kingdom.

(3) In October 1941 Air Chief Marshal Joubert (C.-in-C., Coastal Command) suggested that No.17 Group should be disbanded, with administrative control of the O.T.U.s passing to convenient operational Groups and supervision of training being exercised by Coastal Command. General experience, however, had shown control by a specialist Group to be essential for efficiency, and it was agreed that extravagant staffing (the main reason for Air Chief Marshal Joubert's suggestion) would be avoided if No.17 Group were moved further north, and nearer its O.T.U.s. The Group was transferred from Gosport to Edinburgh in January 1942.

the Group was not created until nearly two years later.

Summary

Up to May 1940 there had been no increase in the size of the basic training organisation, except by the "War Training" changes of shorter courses and more pupils at each school. The number of schools at work was less than before the war, though the output was somewhat larger.

A considerable programme of additional schools was partly planned and partly being negotiated, but this programme was not due to produce any trained men until the end of 1940, and was then to develop gradually through 1941 and 1942 until an ultimate output of some 20,000 pilots per year, with crews to match, became available about the beginning of 1943.

The first line demand for trained men in large numbers, however, came more quickly than this programme of new schools could turn them out. First the imperative need for fighter pilots before and during the Battle of Britain and then pressure for rapid Bomber and Coastal expansion kept the number of pilots required uncomfortably greater than the number the available schools could produce. Until the autumn of 1941 demand outstripped supply, even though the opening of new schools was speeded up.

The period of basic training had to be shortened and shortened again in order to turn out more air crew in the time. The number of pupils had to be stepped up until some schools had 50% more pupils in the summer of 1941 than they had in the summer of 1940. More schools, and more pupils at each school, called for more instructors and staff.

The first line demand was not only for more men, but for more highly trained men. The standard of output from basic training was not good enough - particularly when

/courses

courses were shortened and instructors diluted with inexperienced men - to feed the first line without a very considerable amount of additional operational training. New operational training units had to be started to deal with the increasing flow of men from basic training, and these new units called for again more instructors and staff.

Aircraft and equipment were essential for the new schools and O.T.U's, but the production of trainer aircraft was inadequate even for the gradual expansion of training that had originally been contemplated. There was much emphasis on the need for building more trainers, but it had little effect on the numbers manufactured, and trainer types were seriously scarce all through 1940 and 1941.

Close attention was given to the use of what trainers there were, and the efficiency with which they were made to yield flying hours went up markedly. Greater efficiency in use, however, meant greater demands for spare parts, and spares were a bugbear until well on in 1942. Distance, in the case of schools overseas, and misunderstandings (probably inevitable in the case of newly developed organisations working thousands of miles away) over what was really wanted accentuated the spares problem.

O.T.U's relied much more on operational than on trainer types of aircraft, and the problem over operational aircraft was more allocation than supply. The demands of operational training made inroads on the number of aircraft available for first line work, as they did on the experienced men in squadrons. Yet instructors and aircraft had to be found for O.T.U's: otherwise there could not be enough well-trained men to expand the operational effort.

Increase in the number of basic schools took place

/mainly outside

mainly outside the United Kingdom. (1) Increase in operational training, on the other hand, happened very largely in the United Kingdom: the agreed policy was for operational training - which constituted a reserve of first line aircraft and skilled crews - to be done in the operational area served. (2)

Accessions of basic training capacity came in two main forms - the Empire Scheme and additional R.A.F. schools. The two tended to merge as time went on, but at first there was a fairly clear distinction between the Empire Scheme organisation, which trained Dominion recruits in Dominion schools for service in Dominion Air Forces reinforcing the R.A.F., and the R.A.F. training organisation, which consisted of R.A.F. schools, R.A.F. instructors, and R.A.F. pupils (mostly from the United Kingdom).

The Empire Scheme did not change in any major respect from what was agreed at Ottawa in December 1939. Its development was greatly accelerated in comparison with the original schedule, however, and by the second half of 1941 the full plan was in operation - New Zealand schools training New Zealanders, Australian schools training Australians, and Canadian schools training Canadians, Australians, and New Zealanders.

The R.A.F. training organisation developed in a much less regular way. In May 1940 it consisted of some schools working in the United Kingdom, and some coming

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(1) Except in the case of air gunner training, which was largely done in Britain.

(2) This policy was later tempered and modified by considerations of where operational aircraft were built and where they had to be ferried.

into operation in Southern Rhodesia.<sup>(1)</sup> The intention to start schools in France vanished in June, but on the other hand a plan for R.A.F. training in South Africa was agreed. This South African scheme was for pooled training of S.A.A.F. and R.A.F. pupils. South African training capacity was to be shared between South Africa and the United Kingdom, roughly in the ratio of two to five.

Next, in July 1940, the pattern of R.A.F. schools was altered by arrangements, under pressure of the imminent German threat to Britain, for transferring schools as going concerns from the United Kingdom to Canada and South Africa. Seven schools were moved overseas, four to Canada and three to South Africa,<sup>(2)</sup> but there was opposition to shifting men and aircraft out of the operational zone. The character of "transfer" then changed, and new schools, staffed by the R.A.F. and training R.A.F. pupils, were opened overseas while the existing R.A.F. schools went on working in the United Kingdom. This development, by the opening of new, additional, R.A.F. schools, took place mostly in Canada, and went on during 1941 and 1942. One new pilot-training school, which had originally been intended for Kenya, was, however, transferred to South Africa in the first half of 1941.

During all this expansion and transfer of R.A.F. training the finding of aircraft and instructors for new schools was a constant difficulty and anxiety. The United States was constantly in mind not only as a source of aircraft but also as a possible training area with ready made schools, instructors, and facilities. The question

/of training

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(1) There was also No.4 S.F.T.S. in Iraq, but it was small and out of the way. It remained in operation, an anomaly in the general trend of training development, until June 1941.

(2) Pilot-training and navigation-training schools went to Canada, and navigation-training schools to South Africa.

of training for the R.A.F. was first raised to the United States Government in May 1940. It was not refused, but was turned aside with the remark that training would be better done in Canada. The question was reopened in August 1940, and a scheme for Britain to hire pilot training at six civilian operated schools in the United States was sketched out. Lack of trainer aircraft prevented any further headway being made at once, and the scheme lay dormant until March 1941, when the United States not only made aircraft available but also financed a good deal of the Six Schools Scheme under Lease-Lend.

The Six Schools Scheme was closely followed by more United States aid. In April the Arnold scheme for training R.A.F. pilots in United States Army schools was offered and accepted. In May the Towers scheme for training R.A.F. and F.A.A. pupils in United States Navy schools was also agreed. These various accessions of training in America began to come into operation from June 1941 onwards.

During 1941 the various schemes of training tended to settle into national contributions from the different Dominions and Colonies to the whole training organisation. This made little difference in Australia, New Zealand and Rhodesia: Australia dealt solely with the Empire Scheme training of Australians, New Zealand with the Empire Scheme training of New Zealanders, and Rhodesia with the R.A.F. training of R.A.F. pupils. (1) In South Africa, however, the S.A.A.F. element of training, the R.A.F. element, and the transferred schools were unified into one Joint Air Training Scheme in June 1941. In Canada, though the

/Empire Scheme

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(1) Rhodesia made as much contribution as her population allowed to both the staff and the pupils in the schools.

Empire Scheme and the transferred schools were not unified into a single organisation, they became more and more closely co-ordinated as 1941 went on.

The name "Empire Scheme" gradually changed its generally understood meaning from the conjoint scheme for training Dominion air crew in Canada, <sup>(1)</sup> Australia and New Zealand to the whole group of overseas training organisations - in Canada, Australia, New Zealand, Southern Rhodesia, and South Africa - producing trained men for service in, or in conjunction with, the R.A.F.

In two cases - Canada and South Africa - the growth of the training organisation was complicated by extraneous factors. Canada, after starting with a lukewarm and somewhat passive attitude towards air training, became enthusiastically energetic about it and then proud of the speed and size of her achievement. At the end of 1940 and beginning of 1941 she was extremely anxious to undertake still bigger training commitments, and consequently somewhat jealous and tender over any schemes to put training elsewhere - particularly in the United States. South Africa undertook a large and ambitious scheme which made heavy demands for organisation and technical development, but was left for the very important early months of planning without the experienced advice and guidance which the United Kingdom could have given. The result was a chequered and obstacle-ridden development during 1941.

Increased training capacity overseas came into use always a little behind the first line demand for trained men, and recourse was made to shorter training periods, or larger numbers of pupils, or both, to provide the numbers required.

/In the United

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(1) In Canada the conjoint scheme was known as the Joint Air Training Plan, or J.A.T.P., from 1940 onwards.

In the United Kingdom, S.F.T.S. courses were reduced to ten weeks and the number of pupils increased: the military flying (A.T.S.) part of the syllabus being largely shifted from the basic to the operational stage of training. In Canada the course was cut to 72 days, but the number of pupils remained unchanged. In Australia the number of pupils was put up, but the course length remained unchanged. In New Zealand the course length was cut slightly, A.T.S. training being retained. In Rhodesia the course was cut more, A.T.S. training again being retained.

Where S.F.T.S. training was cut drastically, pilots went forward from basic to operational training with only about 120 hours' flying all told. At the same time it was impossible to spare, or find, enough experienced men to fill all the instructor posts in the schools, and the standard of instruction suffered through inexperience and a marked and fairly general dislike of instructing. The standard of training declined, and the accident rate went up. Night flying and instrument flying were particularly unsatisfactory, partly because the first line's requirements were becoming increasingly exacting, and partly because the schools were handicapped by lack of equipment and satellite airfields.

Operational training grew under difficulties, mainly because more resources devoted to O.T.U's meant, directly and clearly, less for the first line. Before the Battle of Britain, for example, few single seater fighters could be diverted from squadrons, and so fighter O.T.U's developed slowly and on a small scale. During the Battle it became imperatively urgent to have a flow of properly trained reinforcements, and the Stabilisation Scheme of using squadrons not constantly engaged in the fighting to train and hold replacement pilots had to be devised. After the

/Battle

Battle an adequate O.T.U. organisation was brought into existence as quickly as possible, but even so it was six months before the Stabilisation Scheme use of squadrons could be ended.

Bomber O.T.U.s needed, in relation to the size of the operational force they could support, an enormous provision of aircraft and staff. The reasons were partly that two pilots had to be trained for each of the larger aircraft, partly that the standard of output from basic training in navigation, night flying, instrument flying, and wireless operating was far below what was needed for operational work, and partly that the inherent nature of bomber operations called for careful crew training. The diversion of so much effort to Bomber O.T.U.s was given careful and repeated scrutiny. It was to a large extent responsible for the impossibility of making any material expansion of the bomber first line throughout 1940 and 1941, and for this reason Bomber O.T.U. training was reduced to the barest minimum in the hope that some increase in the weight of attack on Germany would follow. The result, however, was an alarming falling off in Bomber Command's striking power: squadrons became overloaded with part-trained, inexperienced, crews and in consequence were seriously weakened when any of their few skilled and experienced men had to be withdrawn. Germany could be bombed only when conditions were very favourable, and the rate of loss became disturbing.

Coastal O.T.U.s developed slowly, mainly because of difficulty in finding aerodromes and aircraft for them. Their output of fully trained men was never enough to meet the first line's requirements, and the gap between demand and supply was filled by "temporary" expedients - turning out part-trained men, or accepting men in the first line without O.T.U. training for squadrons to bring slowly  
/and painfully

and painfully up to operational standard, or cutting down the amount of operational training by reducing the crews, first of Hudsons and then of long range aircraft, to a one-pilot basis. To some extent, the problems of Coastal operational training were simplified by the School of G.R., which looked after the essentials of navigation and reconnaissance training.

In the middle of 1941 both basic and operational training were thus, in general, working to the minimum periods of instruction and the minimum standard of output, and producing the maximum numbers of men from the schools and training units in existence. With minimum standards and maximum output there came clear signs of danger - a rising accident rate, an enfeebled Bomber force, and a sparsely-manned Coastal first line.

At this stage of development the basic training organisation's capacity for supplying men overtook the demand. Moreover, additional new schools were due to start work almost at once. The pressure for short periods of training and rapid output could be relaxed, and standards raised. These changes, the "New Deal", were decided on at the end of 1941, and began to come into operation early in 1942.

At much the same time, a second of the factors which had made the Bomber O.T.U. problem so formidable disappeared with the decision to crew bombers generally with one pilot. The demand for trained men was reduced, the supply was rising, and it became possible at last to adjust demand and supply by giving more, instead of less, training.

The change was drastic. Whereas pilots had, in general, been going to the first line during 1941 after only 160 hours' flying during their basic and operational training together, the "New Deal" doubled this, and aimed

at 300-350 hours' experience before joining a squadron.

The growth of the training organisation which made this "New Deal" standard possible was remarkable. In May 1940 there had been 12 S.F.T.Ss, all but one in the United Kingdom. In the early part of 1942 there were some 49,<sup>(1)</sup> all but six outside the United Kingdom. These S.F.T.S.s were in practically every case considerably larger than S.F.T.Ss had been in 1940. In addition, there were schools and training schemes in the United States equivalent to another 10 S.F.T.Ss. The number of observer training schools had risen from 9 to 35 in the same period, and again by far the greater number were outside the United Kingdom.

In May 1940 there were 11 O.T.Us, most of them small and scantily equipped. Early in 1942 there were 41, all of them very much larger than the O.T.Us of 1940. Only six O.T.Us were outside the United Kingdom: four in the Middle East operational theatre, and two in Canada.<sup>(2)</sup> The Middle East O.T.Us supplied only part of that area's fighter and light bomber requirements, the bulk of its replacements and reinforcements coming from operational training in the United Kingdom.

This rapid expansion of schools and O.T.Us required a corresponding expansion in the number of instructors. The Empire Scheme schools - 26 out of the total of 49 S.F.T.Ss - and the United States schemes found and trained their own instructors, but the other 23 S.F.T.Ss<sup>(3)</sup> and all

/the O.T.Ss

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(1) This figure can only be approximate. The United Kingdom S.F.T.Ss were changing over from S.F.T.S. to (P) A.F.U. work. These figures do not include schools training for the F.A.A.

(2) Training on aircraft (Hudsons) which had to be ferried across the Atlantic.

(3) Instructors were also wanted for other types of school - E.F.T.Ss, navigation schools, armament schools, and so on.

the O.T.U.s drew practically the whole of their instructors from the R.A.F. It was desirable for instructors to be experienced men, and it was essential for a high proportion of O.T.U. instructors to have operational experience - but the R.A.F. could not provide all the very considerable number of instructors from its comparatively limited body of experienced men and at the same time maintain the combat efficiency of the first line. There had to be dilution by newly-trained men "ploughed back" to teach with no more experience than their own basic training and instructor's course gave them. The dilution was greatest in the earliest and simplest stages of training, and least at the O.T.U.s. Experienced and knowledgeable men outside the service were used as far as possible, but this source of instructors was more productive overseas than in the United Kingdom, where practically all experienced men had either been drawn into R.A.F. expansion before the war or were reservists.

Comparatively little attention was paid to the training of instructors. The emphasis was very much on the importance of general experience and knowledge as the basis for good teaching, and comparatively little on equipping inexperienced men with the technique of teaching. The exception was flying instruction: flying instructors were taught the technique of their work. Even here, though, there was no general authoritative instructional doctrine for teaching on advanced trainers, and local variations grew up between the different training theatres. Early in 1942 the Empire Central Flying School was set up to reconcile these variations and produce an accepted standard world-wide doctrine of instruction.

There was little change or development in either navigation or armament training. Both were handicapped - navigation by restrictions in the United Kingdom, by

/transfer

transfer and settling down overseas, and by lack of aircraft and facilities. Both had to make do with instructors whose technical knowledge was much greater than their practical experience of applying that knowledge in first line (or indeed any other) flying. Both were under pressure to produce the maximum output in the minimum time.

In the summer of 1941 observers' navigation and armament training was combined. As a corollary, air gunners' training became a separate and specialised matter. The civil-operated navigation schools in the United Kingdom disappeared, and service schools had to overcome the difficulties which had handicapped them. The results were a very considerable improvement in the wireless facilities for navigation training in the United Kingdom, a scheme of training staff wireless operators which rapidly began to grow wider in scope, and specific training for staff pilots. The Central Gunnery School went on training Gunnery Leaders, but the results of its work were of more immediate benefit to the first line than to the training organisation.

As the main weight of basic training shifted from the United Kingdom to overseas training theatres a number of new problems arose. Considerable time had to be spent in travelling, shipping space was precious and irregularly available, and men who failed during their courses presented awkward problems of movement and further training.

The length of voyages and waiting periods caused men to grow rusty and lose skill: a refresher stage after arrival in the United Kingdom was needed. Overseas training theatres were vastly different from North West Europe in weather, flying conditions, and topography: an acclimatisation stage was needed. Training space could not be ready and waiting for pupils at the unpredictable times of their arrival in the United Kingdom: a holding, or "pool", stage

/was required

was required.

In the second half of 1941 and early 1942 Personnel Reception Centres for men arriving from schools overseas developed rapidly, and began to undertake a little refresher ground training. Advanced Flying Units, for flying refresher and acclimatisation after arrival, were started, these A.F.U.s for pilots, observers, and wireless operators being formed out of the United Kingdom S.F.T.S.s and A.O.S.s which were being replaced by the growing school capacity overseas.

The problem of dealing with men who failed after being sent overseas for training caused renewed attention to be paid to the selection of men according to their aptitude for air crew work. The system in existence was to eliminate those who were ill-fitted for flying duties as their training progressed - so that training and selection went on at the same time. This meant in practice that only 64% of those who started flying training as pilot pupils were trained as pilots. For the other 36% the elaborate and expensive sequence of pilot training was being used for nothing more than selection. This 36% represented a net waste of some proportion of the pilot training schools, and also set the transportation problem involved in changing the men over from pilot training to other courses of instruction. The wastage varied in particular cases, but the United States Army schools (Arnold Scheme) eliminated over half the first R.A.F. pupils sent them. As a result, a scheme of preliminary "grading" flying was introduced in the autumn of 1941 to sift out pupils so that only the more promising were sent to schools overseas.

All the expansion of training in 1940 and 1941 was

/accompanied

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accompanied by an enforced need for economy in flying hours. Aircraft were scarce, and any instruction which it was not essential to do in the air was dealt with on the ground. Synthetic training was developed as far as shortage of equipment and production facilities allowed, while there was a steady increase in the amount of preliminary ground instruction done before flying began - at Initial Training Wings and Elementary Air Observers Schools. This tendency towards preliminary instruction for the sake of economy was increased by shortcomings in the elementary basic knowledge of many recruits. An organisation of I.T.Ws, University Air Squadrons, Air Training Corps, and Air Crew Receiving Centres grew up to deal with preliminary instruction in air crew subjects and with essential matters of basic general knowledge, as well as a classifying filter (at the A.C.R.C.) to settle what preliminary or basic teaching recruits needed.

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