

Chief Instructor,
No. 33 S.F.T.S., R.A.F.

20

O.C. C Staff

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ROYAL CANADIAN AIR FORCE
SERVICE FLYING TRAINING SCHOOL
SINGLE AND TWIN ENGINE
• SYLLABUS

Duration of Course: 16 Weeks

No. of Flying Hrs: 130

THIS SYLLABUS IS TO BE READ AND FULLY
UNDERSTOOD BY ALL INSTRUCTORS

Issued on authority
of the Chief of the Air Staff
by the Air Member for Training.

Edition No. 7
Dated: March, 1944.

(Supersedes all previous Editions)

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The amendments promulgated in the undermentioned Amendment Lists have been made in this publication.

| Amendment List | | Amendments made by | Date |
|----------------|--------------|--------------------|-------------|
| Number | Date | | |
| A.L. 1. | 18 June/1944 | <i>Amendg</i> | 19 Aug/44. |
| A.L. 2. | 5 Aug/1944 | <i>Amendg</i> | 19 Sept/44. |

The Service Flying Training School

1. The pupil has learnt the elements of flying, can control an elementary aircraft correctly, and has a grounding in Service subjects and procedure.
2. He must now adapt his flying to the handling of a Service type trainer, develop his skill and learn to use the aircraft for a purpose. At this School the pupil's training as a potential officer or N.C.O. should be continued. No opportunity must be missed to give experience in the methods of controlling men as well as aircraft. The standard of drill, deportment and behaviour attained in previous schools must be maintained and the tuition in Service subjects completed.
3. Flying during this stage may be divided into two phases:-
 - (a) The Tuition Phase: Learning to fly the advanced trainer; how to use the aircraft and equipment.
 - (b) The Advanced Phase: Applying and developing the knowledge acquired in the Tuition Phase, by carrying out composite exercises. These will develop the pupil's training along lines that will ultimately enable him to use his aircraft for a purpose and also provide more effective use of the available flying hours.

During the S.F.T.S. training it must be fully realized by Chief Instructors that pupils trained at single or twin engine schools will not necessarily be employed later on the equivalent type. The requirements of the Service will frequently demand the posting of single engine trained pilots to multi-engined aircraft and vice versa. Throughout the S.F.T.S. stage the ultimate object of a war time pilot's training must be emphasized.

Organization of the S.F.T.S.

4. The organization of the school must obviously vary according to the facilities available, type of aircraft in use and so on. Anything in this chapter must be flexible and treated only as a guide.
 - (a) Aircraft:- The training at this stage involves the use of a considerable amount of equipment over and above that fitted as standard to the training aircraft, e.g. radio, bombsights, camera guns, drift recorders, beam approach equipment etc.; it will, therefore, doubtless be necessary to fit up certain aircraft for special duties, the allocation being determined by the stage of training reached by different Flights. To avoid interruption of training, Flight Commanders must prepare their programmes in advance and keep in constant touch with the Maintenance Wing.
 - (b) Pupils:- A Course, on arrival, may be allotted to Flights in several different ways. The system recommended (where local circumstances permit) is briefly:- Each Squadron handles two Courses, each Course being divided into two Flights. The Flights are in turn broken into two, so that one half will be flying whilst the other is in Ground School. During the Application Phase all pupils will be available for flying, but those not in the air should be engaged in special ground work. The pupil should remain in the same Flight and if possible with the same instructor throughout both Phases of his S.F.T.S. training. This system will ensure control and assessment of pupils by the minimum number of officers; an important factor when results are being judged.

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The Service Flying Training School
(Cont'd)

- (c) Instructors:- Chief Instructors must at all times appreciate the vital necessity for maintaining a high standard of enthusiasm, as well as ability and discipline, on the part of the Instructors. Repetition is largely unavoidable in an Instructor's work, but this can be eased and his work made more interesting if one Instructor carried a pupil through both the Tuition and Advanced Phases. It may be argued that a little better instruction may result from appointing a special staff to handle each Phase, rather on the principle of the earlier I.T.S./A.T.S. system, but it is suggested that the added enthusiasm of the Instructor, and the fact that all Instructors are kept in practice and up to date on armament, navigation, formation and beam approach is more than adequate compensation and will actually produce a better pilot.
- (d) General:- The availability of a satellite or relief field and its accommodation must largely control the details of any plan that can be put into operation. If sufficient accommodation can be provided at the satellite the Course on commencing the Advanced Phase should be moved to that location and remain there for the final weeks. If accommodation is out of the question the crew-room at the home airfield will offer good facilities. A suggested lay-out for the handling of the Application Phase is included under that heading, as part of the Air Exercises.
5. Conclusion:- On graduating from their S.F.T.S., pupils should not only be good pilots capable of flying their aircraft in all weather, but should also be self reliant, capable officers and N.C.O.'s able to take charge of detached units and imbued with the fighting spirit necessary to the Service.
6. All Service pilots must be capable of supervising the daily inspection and care of the aircraft, including re-arming and bombing up. In an emergency they must be able to do such work themselves and deal with any problems that may arise when operating aircraft in the field. They should have developed a spirit of initiative and leadership; they must appreciate the need to set an example at all times, and they must be able to give guidance in overcoming the problems of operating aircraft under adverse conditions.

Ground Instructional School

1. The Chief Ground Instructor will normally be responsible for organizing and supervising the ground training of the pupils. When preparing any programme he must bear in mind the following factors:-

- (a) The class must progress at the speed at which the average pupil can absorb the knowledge. No value will result from any attempt to pack too much instruction into a given period. Progress checks should be made at intervals to ensure that all pupils are fully conversant with the work covered.
- (b) Chief Ground Instructors must check any tendency on the part of the specialist instructors to introduce unnecessary detail into their lectures. It cannot be too strongly emphasized that the object of pilot training is to instil into the pupils only such knowledge as may be essential to the Service pilot and not to fill their heads with superfluous information that they are unlikely to use.
- (c) Lecture periods should normally be restricted to 45 minutes, a break being allowed between each period. During extreme weather conditions, unless ideal conditions exist in the lecture rooms, even more frequent breaks are essential. In too many cases has time and effort been wasted due to pupils being unable to concentrate because they are so hot that they cannot keep awake or so cold that they cannot work.

2. A guide to the G.I.S. Schedule is set out in detail on the following pages. Periods of instruction are allotted to each subject, each period representing 45 minutes of actual instruction.

3. It will be seen from the 'Guide to periods of Instruction' that the Ground Instruction is divided into two parts, namely:-

- (a) Lectures in Class Room:- Under this heading are placed those subjects or parts of subjects that can be handled as a class. In addition, therefore, to the normal lectures can be considered Films, Navigation-Plotting, Buzzer, etc.
- (b) Synthetic or Practical:- Under this heading are placed those subjects or parts of subjects that require personal instruction, or tuition that can be given only to a few pupils at one time. They include the Link Trainer, A.M.B.T., Hunt Trainer, R/T Trainer, etc., etc.

4. Synthetic training has now developed to a stage where it must be treated as an integral part of the pilot's training. It is no longer practicable to rely upon the Flights to detail pupils for such training during scheduled flying periods.

5. It is not the policy or aim of the syllabus to lay down the detailed manner in which the provisions of the syllabus will be applied, but is strongly recommended that the Chief Ground Instructor should allot certain periods in his programme to synthetic training. A separate synthetic programme for each allotted period must then be prepared; this programme will detail individual pupils to their respective trainer. No difficulty should be experienced in accommodating an entire class on synthetic training.

6. The periods allotted to synthetics on page 5 of this syllabus are intended to be flexible. Certain equipment may not be available or individual items may be added to or withdrawn from time to time. Chief Ground Instructors must treat this section of training in a broad sense and allot periods between lectures and synthetics accordingly.

7. Link trainer has been included under the heading 'Synthetics' so that C.G.I.'s may have the complete picture when arranging their programmes, but this does not necessarily imply that

Ground Instructional School
(Cont'd)

the O.C. Link Trainer is subordinate to the Chief Ground Instructor, or responsible to him for such training. As the proportion of Link to other forms of synthetic training is high, it will not be practicable to complete the entire requirements of this training under the above arrangements, but it is anticipated that approximately half of the total of 25 hours may be accomplished. (Units without S.B.A. will be required to complete only 20 hours Link Trainer.)

8. It is essential that proper attention be paid to physical fitness and to drill throughout the Course. The Chief Ground Instructor is to ensure that the provision of the syllabus are carried out in full.

SERVICE FLYING TRAINING SCHOOLEXAMINATIONS

| SERIAL NUMBER | SUBJECT | TYPE | TIME | MARKS |
|---------------|----------------------|--|--------------------|--------------------|
| 1 | Airmanship | Written | 2 hours | 200 |
| 2 | Armament | Practical | N.A. | 200 |
| 3 | Signals | Visual Morse Aural Morse Written Exam. | 1 hour | 50) 50) 100) |
| 4 | Aircraft Recognition | Visual | $\frac{1}{2}$ hour | 100 |
| 5 | Meteorology | Written | 1 hour | 100 |
| 6 | Navigation | Written | 3 hours | 200 |
| 7 | Progress of War | | N.A. | N.A. |
| 8 | Photography | | N.A. | N.A. |
| TOTAL MARKS | | | | 1,000 |

AIRMANSHIPOBJECT OF TEACHING

- (a) To continue the training of pupils in matters pertaining to flying and the operation of aeroplanes.

All lectures to be given by an experienced flying instructor, and not by tradesmen.

| SERIAL NUMBER | TITLE AND DETAIL OF LECTURE | REFERENCES |
|---------------|--|--|
| 1 | Airmanship: | |
| | (a) Importance of flying discipline. (b) High standard expected in pilots of some ability. (c) Review of flying regulations and restrictions. (d) Aerodrome signals. | C.A.P.100. C.A.P.12, Part III |
| 2 | Avoidable flying accidents. Cause and why they must be reduced. | Quarterly Analysis of Flying Accidents |
| 3 | Forced Landings: | |
| | (a) Action to be taken after a forced or precautionary landing. (b) Action to be taken after a forced landing where communication is not available. (c) Action to be taken after a forced landing - conditions of snow and extreme cold. (d) Action to be taken during and after forced landing on water. | A.F.129 Station Flying Orders |
| 4 | Night Flying: | |
| | (a) Resume of Standing Orders. (b) Use of Equipment. (c) Night flying, safety devices and emergency signals. (d) Short talk on Night Flying organization in war. | A.P.129 Chap.2 Paras. 116-131 Chap.3 Para.335 |
| 5 | Emergency Equipment: | |
| | (a) Care and use of rations, water, etc. (b) Safety apparatus, care and use of floatation jackets, dinghies, etc. (c) Signals - distress; type and when used. | C.A.F.12 Part III Written Notes |
| 6 | Physiological Aspects of Service Flying: | |
| | (a) Anoxia. (b) Black-out. (c) Exposure. (d) Discomfort in accommodation. (e) Glare and noise. | A.F.129 App.VI Oxygen Film |
| 7 | Theory of Flight - General Discussions. | A.P.2095 Sec.19 Flight without Formulae Mechanics of Flight by A.C. Kermode. |
| 8 | Flight Instruments: | |
| | (a) Limitations. (b) Errors. (c) Checking - care and maintenance. | A.F.1920 A.P.1751 A.P.2095, Sec.5 |

AIRMANSHIP
(Cont'd)

| SERIAL NUMBER | TITLE AND DETAIL OF LECTURE | REFERENCES |
|------------------|--|--|
| | <u>Aeroplane Operation:-</u> (Serial Nos.9-13 inclusive to be considered from "user" viewpoint only.) | |
| 9 | Supercharging: (a) Rough outline of object, principles involved. | |
| 10 | Boost Control: (a) Automatic boost, operation and use. (b) Effect of design and fuel used. (c) Indications of detonation. | A.P.129, Ch.3 A.P.2095, Secs.1,2,3 Engine Film A.M.P.136 Engine Sense C.A.P.43A Vol.I |
| 11 | The Carburettor: (a) Effect of temperature. (b) Use of oil coolant heat to assist vaporization. (c) Controlled hot and cold air intake. (d) Ice formation, indicators and preventive devices. | |
| 12 | Propellers: (a) Brief outline of advantages and operation of: (i) Fixed Pitch. (ii) Variable Pitch. (iii) Constant Speed. (iv) Electric. (v) Hydromatic. (b) Avoidance of excessive stresses on engine components. (c) Reasons for feathering. | Propellor Film A.M.P.153 Propellor Sense C.A.P.43A Vol.I A.P.2095 Secs.1,2,3, and 11. |
| 13 | Operation of Ancillary Controls: (a) Brief description of methods in use: (i) Mechanical. (ii) Air. (iii) Hydraulic. (iv) Electrical | C.A.P.12, Part III C.A.P.43B Vol.I. |
| 14 | Exploitation of Performance: (a) Maximum endurance considerations. (b) Maximum range considerations. (c) Maximum rate turns. (d) Maximum rate of sustained climb. (e) Flying with maximum load. (f) Service and absolute ceiling. (g) Conservation of fuel in training. | A.P.2095 Sec.13 C.A.P.12 Part III |
| 15 | High Altitude Flying: (a) Effect of altitude on aircrew. (b) Care and use of oxygen equipment. (c) Practical effects on Lift and Drag. (d) On Airspeed indicator. | |

AIRMANSHIP
(Cont'd)

| SERIAL NUMBER | TITLE AND DETAIL OF LECTURE | REFERENCES |
|---------------|---|-----------------------------------|
| 16 | Aircraft Maintenance: | |
| | (a) Unit Maintenance Orders. | C.A.P.12 |
| | (b) Inspections required - daily, periodic, etc. | Part III |
| | (c) Maintenance Record Form L:14 | |
| | (d) Flight Testing aircraft. | |
| 17 | Engine Handling: | |
| | (a) Operation for fuel economy - high boost and low r.p.m. within engine limitations. | A.M.P.136 Engine Sense |
| | (b) Starting up radial engines - why turned over by hand etc. | A.P.2095 Secs.1,2,3, 4,7,15 |
| | (c) Warming up - Oil temperature and pressure-gills - radiators. | |
| | (d) Running up - Testing magnetos, super-charger - propellers - air intake - generators. | |
| | (e) Knowledge of engine limitations - temperatures - oil-cylinder head - boost and r.p.m. limits - mixture control etc. | |

- 18 Synthetic Training - Dummy Fuselage. (when available)

During the initial stages of S.F.T.S. training, the pupil should be thoroughly instructed in cockpit-drill and the handling of ancillary controls. Frequent short periods should then be spent in the dummy fuselage throughout the Course, particularly, immediately prior to night flying or when other new sequences are to be introduced.

Note:- When Dummy Fuselage is not available use should be made of a jacked up aircraft with side panels removed so that brake, fuel and undercarriage systems, etc., can be explained.

Examination: 200 Marks

Duration: 2 Hours

AIRCRAFT RECOGNITION
(10 Hours)

OBJECT OF TEACHING

1. The aims of Aircraft Recognition training are twofold:
 - (a) Instant and accurate recognition of all important allied and enemy aircraft.
 - (b) To train aircrew in the principles of recognition so that new types may be learned quickly.

| SERIAL NUMBER | TITLE AND DETAIL OF LECTURE | REFERENCES |
|------------------|---|---|
| 1 | For types to be taught, Lectures Sequences and other information required to carry out training see the 'Aircrew Consolidated Aircraft Recognition Training Syllabus. | A.P.1480 C.A.P.29 Aircrew Consolidated Aircraft Recognition Training Syllabus |

Examination:

Visual Test - 100 Marks
Duration - 30 Minutes

ARMAMENT

(Single and Twin Engine)

INTRODUCTIONOBJECT OF TRAINING

1. At the end of the S.F.T.S. stage pupils must be suitable for posting to a single or twin-engined O.T.U. irrespective of the type of aircraft on which they have been trained. This syllabus is designed to fit them for specialized training on specialized equipment at any type of O.T.U. Ground instruction at S.E. or T.E., S.F.T.S. will therefore be similar.

2. The major aims of training on the ground and in the air are to make pupils competent in:-

- (a) Flying for accurate bombing.
- (b) Shooting with a front gun.

Subsidiary aims are to enable pupils to:-

- (i) Use pyrotechnics in general use.
- (ii) Supervise armourers working on their aircraft and check the loading of guns and bombs and the harmonization of sights.
- (iii) Appreciate the lethal nature of the equipment they may use and understand the safety regulations which are laid down.

Limitations imposed by aircraft equipment may prevent the complete fulfilment in the air of (a) and (b) above, but ground training must be common to S.E. and T.E. Schools. A bias of ground training towards the type of air training which is possible is, however, unavoidable.

METHOD

3. All instruction is to be given strictly from the "user" aspect. Mathematical and geometrical explanations are to be avoided as much as possible and technicalities which are of no value to a pilot are to be omitted.

4. Ground training must be closely linked with air work, and ground and air instructors should study C.A.P.I, Vol. II with this aim in view.

5. Instruction is given in the bomb aimer's work only to familiarize the pilot with the necessity for accurate flying and with a view to improving the final team work essential to successful operations, and is not in any way intended to train the pilot as a bomb aimer. Fixed gun firing is a requirement for the fighter pilot and must be viewed from this angle.

ARMAMENT
(Cont'd)

| SERIAL NUMBER | TITLE AND DETAIL OF LECTURE | REFERENCES | HOURS |
|------------------|--|---|----------------------------|
| | | "Bombing Errors" Part II Jan.1943 | |
| | | "Bombing Errors" Part III A.P.1243 Chap.14 | |
| 6 | <u>Bombs & Bomb Components</u> General introduction to main types of bombs in service, use and typical components to give pilot ability to: (a) Choose alternative target suited to bomb load. (b) Appreciate safety devices incorporated and controlled. (c) Understand how bombs are fused and be able to render them safe. (d) Load own aircraft with practice bomb. | A.F.P.32 & Instructions as issued by A.F.H.Q. Bomber Command Paper No.45 A.P.1661 B A.P.1661 C | 2 |
| 7 | <u>Bomb Carriers and Gear</u> Simple description of bomb carriers, bomb release gear, distributor jettison switches and electrical circuit involved, use of master switch which may be operated by bomb doors. Loading and testing of L.S.E.M. carrier selective fusing. Light tests before and after bombing. | A.P.1664 | 2 |
| 8 | <u>Pyrotechnics</u> Instruction from the user aspect of the Pyrotechnics which may be met and handled by all types of aircrew. Details of construction and composition are not to be taught. Instruction to be confined to (i) use; (ii) how to recognize; (iii) how to use; (iv) safety precautions; (v) signal produced. Practical demonstrations if pyros available. | A.F.P.32 & Instructions as issued by A.F.H.Q. A.P.1661 E | 4 |
| B | <u>GUNNERY</u> | | |
| 1 | <u>Fixed Gun Air Sighting</u> (a) Role of Fighter Aircraft simple problem of gun aiming. Pilots reflector sight. (b) Characteristics of machine gun fire, cone of fire, bullet group, bullet pattern, bullet density. Effect of air resistance, gravity drop, harmonization. (c) Range estimation, necessity and methods range bars, ring comparison and observation of detail. (d) Deflection shooting meaning principles and importance of deflection shooting. (e) The angle off method of aiming. Explanation and method of use. (f) Application of aiming methods. The curve of pursuit. Importance of close range and small angle under 300 yards & 30°. | "Fixed Gun Air Firing-Notes for Instructors at SFTS & OTU" A.P.1730 | 1 2 1 1 1 1 |

ARMAMENT
(Cont'd)

| SERIAL NUMBER | TITLE AND DETAIL OF LECTURE | REFERENCES | HOURS |
|------------------|---|--|-------------------------------------|
| 2 | <u>Flying for Fixed Gun Air Firing</u> | | |
| | (a) Positioning. | C.A.P.I, Vol.II | 1 |
| | (b) Curve of pursuit and common faults, skidding, rate of turn and effect of G. | "Fighting Talk" | |
| | (c) Sighting and common faults. Importance of follow through | | |
| 3 | <u>Cine Camera Gun</u> | | |
| | (a) How to load and use the type of camera gun in use at schools. | | 1 |
| | (b) Film assessment emphasis on line, range and deflection in this order. | | |
| 4 | <u>20MM Gun</u> | | |
| | (a) Description of action so that pupil can load, unload and clear stoppages on the ground. | A.P.1641 F | 2 |
| | (b) Magazine and belt feed. Loading of magazine. | | |
| 5 | Firing Systems. | A.P.1641 E | 1 |
| | Types in use, outline of mechanism and likely faults. | | |
| | Review and examination | | 6 |
| | Synthetic Training | See below | 8 |
| | | | 43 Hrs. |
| | <u>SYNTHETIC TRAINING FOR T.E. SCHOOLS</u> | | |
| 1 | <u>A.M.B.T.</u> | | 8 |
| | (a) Method of using C.S.B.S. for 3 course wind finding. Purpose to give pilots practice in sight manipulation and impress necessity for accurate flying. | 4 hours per pupil over the bomb- sight. | |
| | (b) Bombing grouping exercises and multi- directional attack with wind given. | | |
| 2 | Range Estimation Trainer | Syn. Trng. Paper No.5 | 4 hours per pupil on trainer. |
| 3 | A.P. 2580A - "Bag the Hun" | | |
| 4 | A.P.2305A - "Pictorial Trainer for Fixed Gun Air Firing" | | |
| 5 | Elementary Deflection Teacher | | |

ARMAMENT
(Cont'd)

| SERIAL NUMBER | TITLE AND DETAIL OF LECTURE | REFERENCES | HOURS |
|------------------|--|--|-------|
| | <u>SYNTHETIC TRAINING FOR S.E. SCHOOLS</u> | | 8 |
| 1 | Range Estimation Trainer. | Syn. Training Paper No. 5 4 hours per pupil on trainer | |
| 2 | Elementary Deflection Teacher. | | |
| 3 | Gun Sighting Trainer (Link). | Syn. Training Paper No. 24 | |
| 4 | A.P. 2580 "Bag the Hun". | | |
| 5 | A.P. 2305 - "Pictorial Trainer for Fixed Gun Air Firing". | | |
| 6 | <u>20MM Gun</u> Firing on range 50 rounds per class. Loading, unloading and clearing of stoppages using dummy rounds. | | |
| 7 | Showing of combat films. | | |
| 8 | Cockpit trainer. Bombing and Air Firing Cockpit Drill. | Syn. Training Paper No. 15 | |

Practical Examination

200 Marks.

METEOROLOGYOBJECT OF TEACHING

- (a) To ensure that the success of operational flights and the safety of the aircraft are not jeopardized by a lack of weather knowledge on the part of the captain.
- (b) To enable pilots to read intelligently the weather map and anticipate any changes or developments.
- (c) Meteorology is to be kept as far as possible on a practical basis; and when pupils are learning the character of a depression or similar subject constant reference should be made to a typical weather map. The Meteorological officer will discuss the probable weather conditions for the day at a meeting of Instructors and pupils each morning prior to the start of flying.

Reference: C.A.F.12, Part III

| SERIAL NUMBER | TITLE AND DETAIL OF LECTURE |
|---------------|---|
| 1 | <p>Meteorological information available to aircrews:</p> <ul style="list-style-type: none"> (a) Forecast and report - definition, vital need to appreciate the difference. (b) Standard information given in forecasts; brief discussion of their preparation by meteorological staffs. (c) Standard information given in weather reports; brief explanation of purpose and use of standard codes. (d) Wartime restrictions on distribution of meteorological information. (e) Purpose and use of Form T.57 (A.S.F.2330) with emphasis on value of observations by aircrews. |
| 2 | <p>The weather map:</p> <ul style="list-style-type: none"> (a) Information used in the preparation of weather maps; brief discussion of the information required from each reporting station. (b) Collection of data and plotting on weather map. |
| 3 | <p>Elementary description of the following:</p> <ul style="list-style-type: none"> (a) Character of depressions. (b) Intimate relation between pressures and fronts. (c) Warm and cold fronts and flying conditions in their vicinity. (d) Wind changes with fronts. (e) Character and weather associated with the occlusion. |
| 4 | <p>Other types of pressure distribution:</p> <ul style="list-style-type: none"> (a) Anticyclone. (b) Secondary depressions. (c) Trough of low pressure. (d) Wedge or ridge of high pressure. (e) The col. |
| 5 | <p>Clouds and precipitation:</p> <ul style="list-style-type: none"> (a) Orographic cloud and precipitation. (b) Convictional cloud and precipitation. |
| 6 | <p>Visibility and how measured.</p> |

METEOROLOGY
(Cont'd)

| SERIAL NUMBER | TITLE AND DETAIL OF LECTURE |
|------------------|---|
| 7 | Thunderstorms and line squalls: (a) Conditions necessary for formation of thunderstorms. (b) Flying in storms; vertical currents, hail, lightning and ice considered. (c) Flying advice when storms lie across intended track. (d) The Line Squall. |
| 8 | Cloud Flying: (a) Operational value of clouds. (b) Suitability of cloud for flying. (c) Formation cloud flying. |
| 9 | Ice Accretion: (a) Types of ice accretion. (b) Conditions under which ice may form on aircraft. (c) Rate of ice formation and why different types of ice form. (d) Effects of different types of ice on aircraft. |
| 10 | Wind. (a) Gusts and bumps. (b) How cliffs and ridge cause vertical currents. (c) Thermal up-currents; where met and effects on flying. (d) How wind velocity varies with height. (e) Finding the most favourable flying level. |
| 11 | Meteorology and operational flying: (a) Operational importance of meteorology. (b) Importance of meteorological knowledge to aircrews. (c) Hints on flying in difficult conditions. |

EXAMINATION

Written - 100 Marks.

Duration - 1 Hour.

PROGRESS OF WAR STUDY
(9 Lectures)

OBJECT OF TEACHING

- (a) To promote in Service personnel an understanding of our objectives in the war.
- (b) To provide Service personnel with information concerning the background, history and progress of the War.
- (c) To encourage Service personnel to ascertain the facts, and to assist in providing these facts, so that sound opinions may be formed.
- (d) To encourage intelligent discussion.

USE OF FILMS

Four hours of films are to be shown. Their purpose is to provide a background for the lectures and discussions. Information about available and suitable films is obtained through Command Headquarters.

CURRENT AFFAIRS

The lecture material contained in the "Battle of Brains" is basic information as a means of explaining Canada, what we are fighting against and what we are fighting for. Personnel must, however, be kept informed with regard to Current Affairs and the general progress of the war. Useful material for this purpose will be found in newspapers, magazines, and supplementary material which is made available through Commands. The A.B.C.A. pamphlets, Facts Figures Weekly, Canada at War, Reference Papers, Talking Points, etc. are of special value as source material.

Every session in Progress of War Study should include questions and class discussion. The manual "Let's Discuss" is a useful reference.

| SERIAL NUMBER | TITLE AND DETAIL OF LECTURES AND FILMS | REFERENCES |
|------------------|--|---|
| 1 | Japan; Totalitarian Techniques. Size, population, religion, form of government. Comparison of Nazi and Japanese theories of government. Japanese record of aggression. The "New Order" as defined by Japan. Funda- mentals of the science and art of force. | <u>Battle of Brains</u> Chaps. IX & X |
| 2 | Our Precious Freedom; The fight for freedom in Greece and England. The struggle for Christianity. How democratic govern- ment was won in Canada. The home as a training ground in democratic living. The balance between authority and freedom. | Chap. XI |
| 3 | Democracy; Popular meaning. Characteristics of a democracy. The machinery through which it functions. Democracy as a way of life. The spirit of living democracy illustrated in The Battle of Britain, The Jarvis Bay, The Commando Raid on St. Nazaire. | Chaps. XII & XIII |
| 4 | It Is Up To You and Me; The contributions that are required of every civilian - financial - wartime restrictions - surrender of peacetime privileges. The spirit of the fighting services. The spirit that must animate a free people. | Chap. XIV |
| 5 | The United Nations; The United Nations' Agreement. The Atlantic Charter. Peace aims. The post-war world. | Chap. XV |
| 6 | Background Films (4 hours). | |

No Examinations

NAVIGATIONOBJECT OF TEACHING

- (a) To continue the training of the pupil in the art of pilot navigation.
- (b) To develop a sense of mental D.R. that will enable him to check the correctness of his navigator's work and to understand what the navigator is doing and why.

1. It must be clearly understood by instructors that it is not the intention to train the pilot to navigator standards; as desirable as it may be for the pilot to have a thorough and complete knowledge of navigation such is not practicable under war-time conditions. The pilot training is designed to bring the pupil up to a good standard in pilot navigation and mental D.R. but it does not go beyond this.

References - A.P. 1234

| SERIAL NUMBER | TITLE AND DETAIL OF LECTURE | REFERENCES |
|---------------|--|--|
| | Pilot Navigation | |
| 1 | Map reading by day and night - Systems of lights, landmarks and seamarks. Value and use of time-marks. Practice in the use of navigational computer. | A.F.P. 31 Ch.III, paras. 18-20, 29-36. |
| 2 | D.R. Navigation Finding the position by D.R. The air plot. | Ch.V, paras. 60-63, Ch.XII, para. 49. |
| 3 | Example of air plot on plotting map involving reporting position by all methods using variable winds. Finding W/V by air plot method and by drift and bearing of wind lanes. Examples to be plotted. | Ch.V paras. 20-22 Ch.V paras. 25-26 Ch.I para. 31. |
| 4 | Estimation of W/V General effects of change in wind velocity. Summary of wind finding methods and their operational application. | Ch.V para. 54-59 Ch.XII paras. 39-43 |
| 5 | Time. Brief explanation of difference between Local Mean Time and Greenwich Mean Time. | Ch.IV para. 18-24 |
| 6 | The Navigational Log. 433.A. (Pilot). | Ch.XII paras. 15-19, 84-110, Appendix I. |
| 7 | Compasses. Why compasses are swung. Elimination of deviation. Practical compass swinging. Preparation and use of deviation cards. Compass Log Book. | Ch.VIII paras. 25-34, 36-47, 58, 59 |

NAVIGATION (CONT'D)

| SERIAL NUMBER | TITLE AND DETAIL OF LECTURE | REFERENCES |
|---------------|--|---|
| 8 | <p>Aids to Navigation</p> <p>The necessity for accurate flying at all times. How this helps the Navigator. Particularly required when:-</p> <p>(a) Taking loop bearings. (b) Sextant observations. (c) Checks with astro compass. (d) Compass swinging in the air.</p> | A.M.C.O. A.24/42 |
| 9 | The use of wireless beams in navigation. | A.F.P. 27 |
| 10 | Brief outline of navigational aids available when lost. | Signals Lecture Notes for Aircrew (SB (C) 019) |
| 11 | Square Search. Examples | Ch.X, paras. 4-8. |
| 12 | <p>Flight Routine.</p> <p>Planning and preparation for flight</p> <p>Navigation at various heights above ground, and on the climb and descent.</p> <p>Common causes of navigational failure.</p> | Ch.XII, paras. 9-13, 47, 49-62. Ch.XII, para. 80. |
| 13 | Use and setting of Kollsman Altimeter. | A.P. 1275 |
| 14 | Brief outline of U.K. and European geography, stressing - Mountain ranges - Industrial areas and principal cities. | Notes |
| <u>NOTES:</u> | <p>In order to familiarize pupils with European geography, maps covering U.K. and Europe should be used as far as possible during instruction. Considerable practice must be given in use of navigational computer. Pupils to be kept in good practice at plotting exercises which involve elementary triangles of velocity and kindred subjects essential as a basis for mental D.R. Advanced plotting is not required.</p> | |
| 15 | <p>Reconnaissance</p> <p>The objects of reconnaissance. Sources of information, value of photography.</p> <p>Hints on report writing.</p> | |
| 16 | <p>Synthetic Training</p> <p>(a) D.R. Trainer. (Exercises to follow actual operational routes). (Minimum 3 periods of approximately 2 hours each including briefing).</p> <p>(b) Compass check. Each pupil must be capable of swinging an aircraft compass without technical aid.</p> | |

Written Examination: 200 marks

Duration: 3 hours

PHOTOGRAPHYOBJECT OF TEACHING

- (a) To explain the method of flying for photography and to describe the operation of the aircraft camera.

Lecture 1 hour
 Practical demonstration 1 hour
2 hours

| SERIAL NUMBER | TITLE AND DETAIL OF LECTURE | REFERENCES |
|------------------|--|--------------------------|
| 1 | Photography: (a) Purpose & Types. (b) Flying considerations - 4 constants. (c) Simple practical calculations. | Printed Lecture Notes |
| 2 | Practical Demonstration: (a) Camera operation - drift & level. (b) Type 35 control. (c) Running faults as they apply to the type 35 control. | |

No Examination

SIGNALSOBJECT OF TEACHING

- (a) To give the pupil an understanding of the wireless aids at his disposal.
- (b) To accustom the pupil to the use of accurate procedure and speech on the R/T. Synthetic equipment should be used in G.I.S. It is easier to check and correct faults in speech or procedure here than when air exercises are in progress.
- (c) To maintain a standard of 6 w.p.m. buzzer and lamp.
- (d) Instruction is to be confined to the use of signals equipment and not to include technical description.

| SERIAL NUMBER | TITLE AND DETAIL OF LECTURE | REFERENCES |
|---------------|-----------------------------|------------|
|---------------|-----------------------------|------------|

GROUND SIGNALS (21 Hours)Section I - Aural and Visual Signalling (10 Hours)

- 1 Trainees are required to maintain their standard of lamp and buzzer signalling at 6 w.p.m. as a minimum requirement.
- 2 Tests are to be conducted and marked in accordance with A.F.A.O. A.51/3.
- 3 Practice to be given in 30 minute periods.

Section II - Wireless Communication (3 Hours)

- 4 Advantages and disadvantages of W/T and R/T communication. Limitations in range of communication due to power available, height, distance and frequency. General description of different radio facilities available in bomber, coastal and fighter aircraft - modes of operation, average range and by whom used. A.P.1083
Ch.2, Paras. 10,11,28
A.P.1186,
Vol.1
C.A.P.12
Part III
- 5 Description and demonstration of R/T equipment used at school (ATR5, ATR11 or TR9D). Explain function and correct use of each control. C.A.P.63
A.P.1186
Vol.1
- 6 Description and demonstration of electrical intercommunication equipment used at school. Explain function and correct use of each control. Correct use and care of microphones and telephones, including pre-flight check and test by station signals section. C.A.P.63
C.A.P.307

Section III - Radio Aids to Navigation (3 Hours)

- 7 Simple explanation of directional properties of loop with demonstration in classroom showing maximum, minimum and sense positions. Homing and fixer bearings. G.F.D.7
- 8 Outline all M/F-H/F and VHF D/F -- average range and reliability of M/F-H/F and VHF D/F stations. Use of beacon stations and the aircraft rotatable loop - outline of Flying Control facilities available in U.K. SB(c) 019

SIGNALS (Cont'd)

| SERIAL NUMBER | TITLE AND DETAIL OF LECTURE | REFERENCES |
|---|--|-------------------------------|
| <u>Section IV - R/T Training (4 hours)</u> | | |
| 9 | Enunciation and microphone technique. Phonetic alphabet and pronunciation of numerals (1 hour). | |
| 10 | Component parts of an R/T message (2 hours). Call - subject matter - ending. Testing - acknowledgements - repetitions. Corrections - difficult communication procedure. | C.C.H.P. 3 (U.S.F. M.24-9) |
| 11 | Practice in R/T trainers on the ground using TR9D or other available equipment and correct procedure (2 hours). | |
| <u>NOTE:</u> Section IV to precede signals air exercise. | | |
| <u>Section V - Signals Responsibility of Aircrew (1 hour)</u> | | |
| 12 | The signals duties of the various members of aircrew in navigating, direction finding, communications, beacon identification and supplying information to the pilot and navigator. Importance of pilot knowing what signals facilities are available to him for general operations and for emergency or distress purposes. Serviceability of signals and all other aircraft equipment is final responsibility of pilot who must check that D.I.'s and pre-flight inspections have been completed. Testing of intercommunication equipment before take-off. | |

Examinations

- Written (1 hour) - 100 marks
- Lamp Signalling - 50 marks maximum.
- Aural - 50 marks maximum.

S.F.T.S. LINK TRAINER EXERCISES

1. The Link Trainer Syllabus to be completed by students at S.F.T.S.s is divided into the following three stages. Pupils will complete 20 hours Link Trainer - 25 hours when S.B.A. is carried out at the unit:-

Stage I

A review of the pupils E.F.T.S. Link Training. Each pupil should show reasonable proficiency at once and within two hours of revision covering the following items should be able to proceed without difficulty to the next training stage:

Note 1: If any pupil's standard of ability is unduly low, steps should be taken to bring this to the attention of his E.F.T.S. through the appropriate channels.

- (a) Straight and level flight.
- (b) Turns on to courses.
- (c) Co-ordination of throttle and elevators.
- (d) Recoveries from steep turns and spirals by reference to the Turn and Bank Indicator.

Stage II

Advancement to a complete knowledge of flying by the full panel or elementary instruments. Complete proficiency in rough air with "bumpers" full "on" must be attained by every pupil. Approximately 12 hours' instruction should be allowed and the following items covered:-

Note 2: The time of advancement of pupils from one stage of training to the next will depend on the individual's ability and should be varied at the discretion of the instructor to suit the progress of each pupil.

- (e) Familiarization with Artificial Horizon and Directional Gyro.
- (f) Straight and level flight.
- (g) Changing AIRSPEED while maintaining level flight.
- (h) Climbing and descending with and without D.G. and A.H. Masked.
- (i) Turns with and without A.H. and D.G. Masked.
- (j) Changing from right-hand turns to left-hand turns.
- (k) Turns to magnetic or compass course D.G. Masked (Timing).
- (l) Climbing and descending turns.
- (m) Recovery from full rate and spiral turns, using Primary Instruments.
- (n) Emergency pull-up.
- (o) Changing altitude "U" Track.

Stage III - Instrument Flying Exercises

- (p)(i) Night Flying Circuit - using Overshoot Procedure (all instruments).
- (ii) Night Flying Circuit - using Overshoot Procedure (Elementary instruments).
- (q) Standard Beam Approach.
- (r) Department of Transport - Radio Aids and Control. (Flying Training Circulars 9 and 10).
- (s) Final Cross-Country Test.

A quadrilateral cross-country (bumpers full on); four 7 minute courses, air speed to be cut off for 4 minutes on the second course, wind to change on the third course, and a Beam Approach to be completed at the end of the fourth course, orientation procedure to be used. Height must be maintained within plus or minus 100 ft. during flight.

Note 3: All Link Trainer exercises are to be completed before the pupil commences Beam Approach Training.

Note: 50 marks are awarded (out of 1000 for Ability as Pilot) for proficiency on Link Trainer.

PHYSICAL TRAINING - DUTY FITNESS
(1 hr. per day, 5 days per week)

1. OBJECT OF TEACHING

To condition men physically in order that they may cope with the rigors of combat flying and the arduous duties of ground crew. To develop in the airmen those essential qualities of endurance, strength, co-ordination, and the desire to win.

2. METHOD - A.F.P. 19 Vol. 1 & 2; A.F.P. 34; Athletic Handbook - National Council, Y.M.C.A., Toronto.

To obtain the maximum results all physical drills and games should be based on three points each interwoven with the other.

(a) Running

Stops and starts, dashes, distance runs, relays, jumping, hurdling, zig-zagging, obstacle courses, etc.

(b) Bodily Contact

Tumbling, falling, bumping, blocking, charging, conditioning drills of all types.

(c) Competitions

- (i) Individual, unit and team contests.
- (ii) Formation of leagues.
- (iii) Recognition to be given to winners in the form of prizes, passes, etc.

3. Duty Fitness Periods

(a) Duty Fitness periods for aircrew are to be held for an hour daily. It is suggested that various combinations of a mixed programme be used. Particular effort should be made to use all the play space and facilities available by dividing the men into squads. Classes should be scheduled throughout the day in order that smaller groups will report for training and more individual attention can be given.

(b) Obstacle course training should be given daily where facilities and the weather permit.

4. Swimming

Where facilities exist non-swimmers are to be taught to swim.

5. Duty Fitness Test - A.F.R.O. 2621

Trainees are to be tested at least 2 weeks prior to completion of course.

- NOTE:
- (a) Every effort should be made to have training periods scheduled throughout the working day in order that smaller groups may be made available for training.
 - (b) Trainees should be jogged to and from duty fitness classes whenever possible.

DRILL
(One hour per week)

OBJECT OF TRAINING

- (a) To improve smartness and quicken reaction.
- (b) To train potential officers and N.C.O.'s to handle men.
- (c) To teach standard drill movements.

| SERIAL NUMBER | TITLE AND DETAIL OF LECTURES | REFERENCES |
|------------------|---|----------------------------------|
| 1 | Trainees should be given at least one hour drill training per week. Drill tests are to be given up to the rank of Flight Sergeant as laid down in A.F.A.O. A.51/14. Certificates are to be filled out by the P.T. & D. Officer and placed on the individual's file. | |
| 2 | "Aircrew Leadership Training", is to be used wherein trainees are detailed to act as Officers and N.C.O.'s as well as give instruction in drill training under the supervision of the Unit P.T. and Drill Officer and Instructors. | C.A.P. 90 A.F.A.O. A.51/14 |
| 3 | The emphasis is to be placed on mutual instruction in order that trainees will be better qualified to assume the responsibilities of N.C.O.'s and Officers when they graduate at their aircrew training. | |
| | <u>Contents:</u> Squad drill, saluting, knowledge of funeral party duties, knowledge of inspection, rifle exercises (where rifles are available) - slope, order, present, fix, unfix, ground arms, take up arms, flight drill, squadron drill. | |
| | <u>Notes:</u> (a) Pupils are to be marched to and from flying and lectures. (b) Daily inspections of dress are to be carried out and no slackness is to be tolerated. | |

AIR TRAININGGENERAL

1. The schedule of air exercises and tests is to be read in conjunction with the allotment of time on page 28 and used as a guide in the execution of the training of the S.F.T.S. The minimum time at the controls is 130 hours. The times are based on the average time required to raise the pupil to the standard required. There should be no hesitation in giving additional time when the need is indicated.
2. Throughout air training, serious consideration must be given to the pupil's progress and ability to benefit from any exercise. This applies equally to Chief Instructors when preparing their programmes and to individual instructors when detailing a pupil for any exercise. It is, however, essential that each new sequence of training, including navigation, armament, etc., should be started as soon as the pupil is ready to assimilate the additional instruction. It is unnecessary to perfect his basic flying before introducing more advanced sequences as, with proper supervision, his general flying will continue to improve through the increasing demands made upon it.
3. Pre-flight briefing and post-flight discussion constitute an essential part of flying training, and must on no account be neglected merely to get aircraft in the air. Chief Instructors must ensure that instructors pay proper attention to this vital point. For this reason the syllabus has been limited to 150 hours (at the controls); it is considered that time in excess of this can only be accomplished at the expense of pre-flight briefing and discussion. When the course is extended beyond the normal 16 weeks, additional flying may be given.
4. When and where practicable, and time permits, after the training syllabus has been completed, the Chief Instructor should utilize additional time, up to 150 hours, to further improve the pupil's training by the use of combined exercises. In these combined exercises more training practice in armament, navigation, formation and instrument flying can be obtained than under an "hour schedule", whereby, in order to attain a given number of hours on, say armament, it is necessary to climb up, spend probably only a few minutes on the specific practice, and immediately return to the airfield, involving in all a flight of approximately one hour. The flight would be entered as Exercise No. 3, or as the case may be, and no complications need arise as to the distribution of time. Suggestions for carrying out these exercises are detailed on pages 50 to 54 inclusive.

SIXTEEN WEEKS COURSE - SCHEDULE OF FLYING HOURS(a) TWIN-ENGINE PILOTS

| | DUAL | SOLO | 1ST NAV. |
|--------------------|------|------|----------|
| CLEAR HOOD | 20 | 20 | |
| INSTRUMENT | 26 | | |
| FORMATION | 3 | 6 | |
| NAVIGATION (DAY) | 12 | 12 | 8 |
| NAVIGATION (NIGHT) | 4 | 2 | |
| NIGHT (C. & L.) | 4 | 6 | |
| SIGNALS | 1 | | |
| ARMAMENT | 7 | 6 | |
| PHOTOGRAPHY | 1 | | |
| TOTAL | 78 | 52 | 3 |

(b) SINGLE-ENGINE PILOTS

| | DUAL | SOLO | 1ST NAV. |
|--------------------|------|------|----------|
| CLEAR HOOD | 20 | 18 | |
| INSTRUMENT | 26 | | |
| FORMATION | 3 | 6 | |
| NAVIGATION (DAY) | 12 | 11 | 9 |
| NAVIGATION (NIGHT) | 4 | 2 | |
| NIGHT (C. & L.) | 4 | 6 | |
| PHOTOGRAPHY | 1 | | |
| ARMAMENT | 8 | 8 | |
| SIGNALS | 1 | | |
| TOTAL | 79 | 51 | 9 |

- NOTES: (a) The totals indicated above are approximate minimum times.
 (b) Maximum time per student is not to exceed 150 hours.
 (c) At units not equipped with S.B.A. only 20 hours Instrument Flying is required.

SUMMARY OF FLYING PROGRESSTESTS

| TEST NO. | NATURE OF TEST | BY WHOM |
|----------|--|--|
| 1 | Pre-Solo | Pupil's own Instructor if qualified. |
| 2 | Progress Test | Flight Commander or Examining Officer. |
| 3 | Preliminary Instrument Flying | Independent Instructor. |
| 4 | Final Instrument Flying | Flight or Squadron Commander or Examining Officer. |
| 5 | Night Flying | Own or independent Instructor. |
| 6 | Preliminary Navigation (To be passed satisfactorily before Solo Navigation Flights are undertaken). | Flying or Navigation Instructor. |
| 7 | Formation Flying | Own Instructor. |
| 8 | Final Navigation | Navigation Instructor. |
| 9 | Wings Test | Examining Officer - Squadron Commander or C.F.I. |

Details of Tests will be found in the respective sections of the flying syllabus.

TUITION PHASEINTRODUCTION

During this phase of training the pupil is to be made competent in the general handling of the advanced trainer and is to receive his basic instruction in the advanced sequences.

HANDLING OF AIRCRAFT (DAY)

1. Pupils are to be taught to fly the advanced trainer in accordance with the principles and methods set out in C.A.P. 1 Vol. 2 Ed.2. On completing this phase, pupils should have become thoroughly proficient in the sequences appropriate to their type of aircraft.
2. Both single and twin engined Schools must pay particular attention to stalling (including stalling from turns) and the former to recovery from incipient and steady spins in each direction. These exercises must be repeated at frequent intervals throughout the Course; Landings from both a gliding approach and without flaps must be practiced frequently. Twin engine pupils must be thoroughly instructed in single engine flying. Single Engine Schools must develop the pupil's confidence and ability to handle the aircraft by adequate attention to aerobatics; by the end of the Tuition phase the pupil should be able to FLY his aircraft accurately around such manoeuvres.
3. Cockpit Drill, proper handling of the engines and propellers, and correct use of ancillary controls must be insisted upon at all times. The pupil must also become thoroughly familiar with engine and aircraft limitations, performance data, loading and dimensions of the aircraft he is flying.
4. Ground School lectures cover operation for range and endurance etc., but it is essential that the Flying Instructor should impress the importance of this subject, by both frequent discussion on the ground and constant attention to the application of the principles involved whilst in the air.
5. In order to determine the knowledge and skill of a pupil and his readiness to proceed further with his training, the following tests should be carried out.

| Test Number | Object and nature of test. | By whom. | Approx. hours to reach standard |
|------------------|---|--|---------------------------------|
| 1. Pre-solo Test | Test of general flying ability and suitability to go solo on type | Instructor if not less than "B" category | 4-8 hours |

Standard: Smooth entry and clean recovery from turns, maintaining a/s within 5 m.p.h. whilst climbing, level or on the glide. Straight and confident take-off and an accurate and well judged approach with tail-down landing; ability to carry out safely over or undershoot action and go around again. Full understanding of and ability to carry out good cockpit drill. On single engine aircraft recovery from a spin. On Twin engine aircraft handle the aircraft safely in the event of one engine failing.

HANDLING OF AIRCRAFT (DAY)(CONT'D)

| Test Number | Object and Nature of test. | By Whom | Approx. Hours to reach Standard |
|--|---|---|---------------------------------|
| 2. Intermed- iate Hand- ling(Prog- ress Test. | Test of general progress. To include a forced landing and S.E. landing on T.E. air- craft. | Flight Commander or Exam- ining Officer | 40/50 hours. |

Standard: The pupil's proficiency in the sequences he has covered should clearly indicate his ability to complete the full course successfully.

| | | | |
|---|--|---|---------------------------------------|
| 9. Final Hand- ling Test. (Wing's test) | Test of general flying skill and knowledge of airmanship (to include aerobatics or single engine procedure as applicable). | Squadron Commander or Examining Officer | Towards completion of training. |
|---|--|---|---------------------------------------|

Standard: Confident cockpit drill together with accurate handling of the aircraft and good sound airmanship. A well judged forced or precautionary landing. To include a landing without flaps.

INSTRUMENT FLYING

1. Instrument flying is to be started as soon as the pupil has gone solo, it is to continue along the lines set out in C.A.P. I, Vol. 2, Ed.2, parallel with the clear-hood handling of the advanced trainer.

2. Instructors and pupils must realise the vital necessity for accurate instrument flying under the war-time conditions now existing; Those pupils later going into bomber units may be employed largely on night operations and frequently under difficult conditions. Others must be prepared for posting to night fighters or work that will call for considerable use of instruments.

3. Close liaison must be kept at all times between the flying and Link Instructors, and as far as possible the Link training kept one step ahead of the Air Exercises. Flight Commanders should issue a progress card for each pupil. This card being taken by the pupil each time he reports for LINK, the progress recorded by the Link Instructor and the card returned to the Flight. The Flying Instructor may then be kept constantly informed as to his performance in the Link.

4. The Flying Instructor is to ensure that the pupil understands the care, operation and limitations of the blind flying instruments. He is to ensure that the pupil is familiar with faults that are liable to develop, and the behaviour of both primary and gyro instruments during spins, spiral dives and other unusual positions. These points are to be fully discussed on the ground and then where practicable demonstrated in the air.

5. At the conclusion of the tuition phase at the S.F.T.S. the pupil must be able to handle the aircraft accurately by reference to the instruments only, to carry out safe and steady instrument "take-offs", and maintain accurate courses for long periods. Accurate turns at a given rate (by counting) must be done whilst a constant rate of descent is being maintained. Recovery from unusual positions, on either single or twin engined aircraft is to be given careful attention, and single engine schools are to insist on confident recovery from spins. An extremely valuable exercise at this stage on instruments is "overshoot action".

6. S.F.T.S. instrument flying will naturally stress the use of gyro instruments and the development of accuracy, leading up to B.A. training. However, pupils must be made thoroughly safe and competent in flying by primary instruments only. The frequent necessity for flying during operations by primary instruments only must be stressed.

7. The following tests in Instrument flying are to be carried out:-

| Test Number | Object and Nature of Test | By Whom | Approximate Hours |
|--------------------------|---|---|-------------------|
| 3. Preliminary I.F. Test | To Test the ability and progress in handling the aircraft by instruments. | Independent Instructor of "B" Category. | 12-14 hours I.F. |

Standard: Be able to handle the aircraft safely by reference to Instruments only and show good progress. Be able to carry out safely an I.F. take-off and circuit, and have reached a standard that will permit him to commence night flying instruction and to determine the pupil's ability to proceed with B.A. Training, to recover from unusual positions and to fly by primary instruments.

| | | |
|--------------------|---|--|
| 4. Final I.F. Test | (a) To test the instrument flying skill attained by the pupil. He must be able to execute a smooth and accurate take-off, assume and maintain accurate rates of climb and descent, recover quickly and with confidence from any usual position, execute accurate climbing descending and compass turns. (b) If Beam facilities are available the final instrument test will consist of S.B.A. exercises and will be carried out by the SBA Flight. | Flight Commander or Examining Officer. |
|--------------------|---|--|

Standard: Must be able to fly accurate courses, maintain height and a/s, turn accurately, with or without gyro instruments. To climb and descent at pre-determined rates and airspeed. Sound and confident recovery from unusual positions including spins (S.E.) and single engine flying (T.E.)

NOTE: (a) All instrument flying is to be dual instruction.

NIGHT FLYING

1. The bulk of the bomber pilots operational flying will probably be done at night, and the fighter pilot may well also be employed on night fighter duties. Night flying must, therefore, be given considerable attention during the pupil's training. It is essential that training be spread over as many nights as possible covering varying weather conditions and degrees of darkness.

2. It is appreciated that in the Dominions it may be difficult to simulate war-time 'black-out' conditions, but this can be overcome to some degree by:-

- (a) Use of hooded take-offs by day, which must include such practice as going around again upon receiving an imaginary red light, overshoot and undershoot action.

- (b) Insistence by the Instructor that the pupil really flies by his instruments at night, looking out only after he has turned into the down wind leg in order to obtain a reply to his signals and to avoid collision. After leaving the flare-path and until the turn on to the down-wind leg has been completed the pupil MUST be compelled to fly by his instruments ONLY. The artificial horizon is to be used as the prime instrument.

The standard procedure and flare-path layout as detailed in A.P. 129 will be used.

4. Several pupils who have not yet reached the night flying stage, or who are not actually engaged on night flying, should attend as Airfield Controllers under instruction, in order to gain practical experience.

5. Night flying instruction should commence when the pupil has completed about 30/35 hours flying on the type. Before being sent solo he must:-

- (a) Have had at least two hours dual at night on the type and proved capable of completing a safe take-off and circuit and has a thorough knowledge of night flying procedure.
- (b) Have attained a reasonable standard of Instrument flying and the completion of 6 hours I.F. on the type (T.E. a/c) 10 hours I.F. on the type (S.E. a/c).

6. Before a pupil is sent solo on any night, he is normally to be given a dual check, satisfying his instructor as to his safety. However, during the later stages of his night flying training, he may be sent solo without dual provided that full consideration is given to his experience and ability and that there is no material differences in weather and lighting conditions from those in which he has previously soloed.

7. Fatigue must be carefully watched and no pupil should fly for more than 2 hours on any one night. A minimum of 9 hours rest must be allowed before commencing work after night flying.

8. In order to obtain the maximum number of landings and avoid congestion in the circuit or delays at the taxi post, not more than 8 aircraft should be in operation at any one time, but in order to make full use of the facilities available, additional aircraft should be immediately at call to replace those brought in for refuelling and so on, and thus reduce loss of time at change over.

9. Immediately prior to night flying being commenced, the Flight Commander is to give a lecture on Night Flying procedure, Control, Use of Angle of Approach Indicator and other matters pertaining to Night Flying in general. This lecture is essential as it is no longer included in the Ground School Syllabus.

PRACTICES

10. Ten hours circuits and landings at night, of which approximately four should be dual (more if required). Dual to be spaced throughout the night flying training.

11. Pupils are to be given practice in landing both with and without the aid of the Angle of Approach Indicator. Pupils should also have practice in using the landing light as an additional aid.

12. C.A.P. I, Vol. 2, Edition 2. is to be used as a guide to the method of instruction employed.

| Test Number | Object and Nature of Test | By Whom | Approx. Hours to Standard |
|----------------------|---|---|---------------------------|
| 5. Night Flying Test | To assess the pupil's ability to handle the aircraft at night and to ensure that he has had sufficient practice to enable him to fly at night with no visible horizon, and has a complete knowledge of procedure. | Category "B" instructor; own or independent or Flight Commander | 8-10 hours Night Flying |

FORMATION FLYING

1. Operational Units, fighter and bomber alike, stress the urgent need for efficient training in formation flying, and it must be borne in mind that we are training pilots for war. It is well known that the fighter pilot may spend most of his time in formation and that keeping a correct and unvarying position must become so much a second nature to him that he can give attention elsewhere. For the bomber pilot who operates by day - and all bomber pilots must be prepared to do so - formation flying is just as important. The exploitation of mutual fire support demands perfect formation; evasive action may require a form of corkscrewing to be combined with it. The concern of the S.F.T.S. is to supply the pure flying basis and ability to attain and keep station accurately, leaving the O.T.U. to apply such tactical skill as is in accordance with operational requirements.

2. During S.F.T.S. training on either single or twin engine aircraft formation flying is to be carried out at intervals of not less than one span.

3. Positions, signals to be used and all other points relative to the formation about to be practised must be fully understood by Instructor and pupils prior to take-off.

4. C.A.P. 1, Vol.2, Ed. 2, sequence of instruction 28, is to be used as a guide in the method of instruction. On completion of the Tuition Phase the pupil should be able to keep station satisfactorily, and be ready to proceed with the Advanced exercises with safety.

5. Formation flying is to cover -

- (a) Dual: Instruction in station keeping and formation leading, both below and above 5,000 feet. (the object of this latter is to enable the pupil to gain experience in manipulating mixture controls, etc., in formation.)
- (b) Solo: Simple formation flying. (To include formation leading. Formations are not to exceed three aircraft. Steep turns, dives or landings are not to be attempted.)
- (c) Dual: Advanced Formation Flying (To include up to five aircraft). Forming up quickly at 1,000 feet, after individual take-offs - changing position for Vic and Echelon turns and diving turns - dives line astern.
- (d) Solo: As above. (under no circumstances are formations to exceed three aircraft).
- (e) Line astern and line abreast formations are to be included.

No. 3A "Elementary Formation Flying:

- (a) General Consideration.
- (b) Safety Rules.
- (c) Signalling.
- (d) Station Keeping, including definition of correct space interval.
- (e) Description of Vic; Line Astern, Echelon.

FORMATION FLYING (CONT'D)

| Test Number | Object and Nature of Test | By Whom | Approx. Hrs. to Standard |
|---------------------------|---|------------------------|--------------------------|
| 7. Formation Flying Test. | To ascertain the ability of the pupil to fly in a formation of 2 or 3 aircraft. The pupil must retain position with confidence and lead a formation with safety | Pupil's Own Instructor | |

NAVIGATION

1. Navigation is for obvious reasons an essential part of a pilot's training. The S.F.T.S. must start immediately to develop the basic principles of pilot navigation learnt at the E.F.T.S., and in this direction the pupil must first appreciate the higher speed at which the aircraft is passing over the ground.

2. Instructors must insist that on all flights away from the aerodrome pupils use the Standard methods of pilot navigation, i.e., good preparation, accurate course, height and ground speed, and landmarks on the track looked for at the right time. Instructors can teach much by setting an example at all times. The pupil will apply himself more diligently and progress more rapidly if he feels that navigation is part of his normal flying.

3. Chief Instructors are to realize that the pupil pilot is being trained as a pilot and however desirable it may be for him also to be a fully qualified Navigator, the time available will not permit this. A little experience in the position of Navigator will, on the other hand, assist him in his duties as pilot and Captain of the aircraft, giving him also confidence in D.R. methods. For this reason such experience has been included in the S.F.T.S. Syllabus.

4. Navigation should, as far as possible, be taught by the Flying Instructors rather than by specialist Instructors. The latter should be used more in the nature of advisers and to ensure that the correct methods are being employed. In the air exercises following the work has been divided between the navigation and the flying instructor; the latter must be made to realize his responsibility in this part of flying training.

5. The pupil must develop his ability to map read, steer accurate courses, use time scales, estimate track errors and make corrections. He must also be given adequate practice in 'mental D.R.'

Before proceeding on cross-country flights the pupil must prepare his maps and flight plan carefully, using the Met. information available. These must be carefully checked by the Flying or Navigation Instructor. During the flight he must keep a log on the appropriate form, which must be checked over in the presence of the pupil on return and all errors and remedies pointed out. The importance of these checks cannot be too strongly emphasised, and must not be neglected merely to rush the aircraft into the air.

6. At twin engine Schools a pupil flying solo may carry a second pupil as Navigator on an authorised cross-country flight provided he has:-

- (a) Completed a minimum of 50 hours combined solo and dual on the type and is considered safe and competent; and
- (b) have passed Exercise 1(b) Under Pilot Navigation methods (T.E. Schools)

7. The methods of instruction to be employed in S.F.T.S.'s navigation training are outlined in C.A.P. 1, Vol. 2, Ed. 2, Sequence 27, and A.F.P. 31.

8. Typical exercises to be covered:

| <u>Twin Engine Schools</u> | <u>Flying Times</u> | | |
|----------------------------|---------------------|--------------|--------------|
| | <u>Day</u> | <u>Night</u> | <u>Total</u> |
| <u>Pilot Navigation</u> | | | |
| Dual | 12 | 4 | 16 |
| Solo | 12 | 2 | 14 |
| 1st Navigator | 8 | - | 8 |
| | | | <u>38</u> |

The above are approximate times only.

PILOT NAVIGATION METHODS (T.E.SCHOOLS)

1. DAY

(a) Dual Instruction - Day (2 hours with S.N.I.)

Reading compass, setting course, checking gyro, turning and acceleration errors, altering course. Student to practice maintaining constant course, airspeed, and height for at least 10 minutes at a time.

Systematic procedure for identifying towns, map reading follow-in continuous landmarks, map reading flying estimated course along track drawn on map, map reading along track on map when flying at various heights (8,000 to 300 ft.) estimation of course and E.T.A. for base and map reading without track drawn in, procedure when lost.

(b) Dual Instruction - Day (2 hours with S.N.I.)

Triangular cross-country. Flight plan to be prepared from Mot w/v, map prepared with 10° track error lines, time marks. Instructor to fly first leg and explain procedure to student and give him entries for log. Student to fly second leg with assistance from instructor. Third leg to be test, with instructor giving no assistance unless necessary.

(c) Solo Cross-Country Flight - Day (2 hours)

Straight line flight to turning point and back along same route. Ten degree lines and time intervals to be marked on map (preparation for flight is to be checked by instructor and pilot's log turned in at the end of the flight). Fuel consumption to be checked and w/v estimated mentally by error in D.R. Position.

(d) Solo Cross-Country Flight - Day (2 hours)

Triangular route is to be followed. Ten degree lines and time intervals to be marked on map (preparation for flight is to be checked by instructor and pilot's log turned in at the end of the flight). Fuel consumption to be checked and w/v estimated mentally by error in D.R. Position.

PILOT NAVIGATION METHODS (T.E.) SCHOOLS (CONT'D)(e) Navigator - Day (3 hours)

Triangular route to be followed. Students to navigate the 1st and 2nd turning points using standard D.R. procedure. Airplot to be kept and w/v's to be determined by airplot and multiple drift. Mercator plotting chart to be used. W/V to be checked and E.T.A. corrected by 3 course wind finding method (a/c 60° back 120° for equal length of times then resume original course). A line overlap will be taken of one of the turning points.

(f) Pilot - Day (3 hours)

Student to act as pilot for a navigator doing previous exercise. Student will follow instructions of navigator and will concentrate on flying accurate courses, heights and airspeed. He should also practice map reading using precomputed time scale marked on track and know the position of the aircraft at all times.

(g) Low Altitude Navigation Flight - Day (1 hour with S.N.I.)

This is to be a triangular flight at an altitude between 300 and 800 feet in the area set out for the purpose with the pupil flying and navigating. Tracks and time marks at 5 minute intervals are to be marked on the map beforehand and the route carefully studied. Time scale is to be used in conjunction with map reading, and all landmarks anticipated.

(h) Navigator - Day (2 hours)

- (i) Pilot is given sealed orders which provide courses and times on each course. The navigator is to keep an airplot and calculate W/V's both by multiple drift and airplot. When requested by the pilot, he is to estimate immediately a course to steer for base and within 10 minutes calculate an accurate alteration of course and an E.T.A. base.

Pilot - Day (2 hours)

- (ii) Student to act as pilot for a navigator doing previous exercise. Pilot is to be given sealed orders (with courses and times) which are to be opened just after take-off. He is to inform the navigator of each alteration of course as he makes it. At a specified time the pilot is to request from the navigator a course to base. The pilot must fly accurate courses and maintain constant height and airspeed. He must know the position of the aircraft at all times.

(i) Cross-Country Flight - Day (2½ hours with Flying Instructor)

A triangular flight with student flying on instruments under the hood. One pin point should be given the pupil by the instructor, when requested on each leg of the flight. Pupil must make necessary alterations to course and E.T.A. using pilot navigation procedure. Hood to be removed on E.T.A. pupil identify his position, fly to 1st turning point and set course on 2nd leg. Hood to be replaced and 2nd and 3rd leg to be completed on instrument correcting course and E.T.A. from pin points requested from the Instructor. Log to be kept and handed in on completion of flight. The instructor will note carefully the fatigue periods experienced by the pupil, and if the pupil has any difficulty due to these periods, the instructor should submit a report to the Flight Commander and Chief Instructor for inclusion in the pupil's form #5012.

(j) Pilot Navigator Test - Day (2½ hours with S.N.I.)

Triangular flight of about 300 miles. Student to draw in first two tracks only. Student will fly and navigate by standard pilot-

navigation procedure. Students will fly second leg under the hood and hood will be removed on E.T.A. After identifying his position student will estimate course and E.T.A. for base and fly this course informing the instructor of any changes of course and/or E.T.A. A complete log will be kept.

(k) Navigator - Day (3 hours)

(i) A D.R. Navigation Exercise of 3 hours duration using mercator plotting chart. The form of exercise to be arranged at schools to cover the ground Navigation Syllabus depending upon the equipment available in the aircraft. A line overlap will be taken of one of the turning points.

Pilot- Day (3 hours)

(ii) A student is to act as pilot for the student navigator doing previous exercise. The pilot is to climb to 10,000 ft. on course at maximum rate of climb. He will fly at the height, course and the air speed denoted by the navigator. He will record the petrol consumption for the flight in half-hour intervals.

(l) Low Altitude Navigation Flight - Day (2 hours with Flying Instructor).

This is to be a triangular flight at an altitude between 300 and 800 feet in the area set out for the purpose with the pupil flying and navigating. Tracks and time marks at 5 minute intervals are to be marked on the map beforehand and the route carefully studied. Time scale is to be used in conjunction with map reading, and all landmarks anticipated.

2. NIGHT

(a) Dual Cross-Country - Night (2 hours with Flying Instructor)

Straight line flight to turning point and back along same route, maintaining constant course, height and airspeed. Map reading to be practised. Map is to be marked with 10° lines and time markings.

(b) Dual Cross-Country - Night (2 hours with S.N.I.)

Triangular route to be followed with prepared map (10° lines and time markings). Map reading to be practised and two w/v's estimated using error in D.R. position.

(c) Solo Cross-Country - Night (2 hours)

Triangular flight. Prepared maps to be used with 10° lines and time markings.

Single Engine Schools

| | <u>Day</u> | <u>Night</u> | <u>Total</u> |
|-------------------------|------------|--------------|--------------|
| <u>Pilot Navigation</u> | | | |
| Dual | 12 | 4 | 16 |
| Solo | 11 | 2 | 13 |
| 1st Navigator | 9 | - | 9 |
| | | | <u>38</u> |

The above are approximate times only.

PILOT NAVIGATION METHODS (S.E. SCHOOLS)

1. DAY

(a) Dual Instruction - Day (2 hours with S.N.I.)

Reading compass, setting course, checking gyro, turning and acceleration errors, altering course. Students to practise maintaining constant course, airspeed, and height for at least 10 minutes at a time.