

Preliminary Report of the
Special Advisory Committee
on
PRIVATE FLYING

M.C.A.P. 31



MINISTRY OF CIVIL AVIATION

*Preliminary Report of the
Special Advisory Committee*

on

PRIVATE FLYING

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To the Minister of Civil Aviation

10th July, 1947.

My LORD,

We were appointed on the 22nd January 1947, with the following terms of reference:

“ To advise the Minister of Civil Aviation on the development of private flying (including gliding) and to report to him from time to time on questions relating thereto ”.

We now have the honour to submit our Preliminary Report and recommendations.

We have held seventeen formal meetings and innumerable informal meetings. We have had the benefit of oral evidence from fifty witnesses and a very considerable volume of written evidence has been received.

We have taken the opinion of many people of great distinction and experience in the world of aviation. We have learned from the representatives of a number of Associations and Societies the considered view of their members.

Dominion and Foreign Governments and the National Aeroplane Clubs of many countries have generously responded to our request and have provided information which has been most interesting and useful.

The Committee would like to express its gratitude and thanks to all these people who have been so helpful, and particularly to those representatives of National Aero Clubs who kindly came to London to give their evidence in person.

The Committee would like also to express their thanks and appreciation to Mr. W. K. Andrews, the Secretary of the Committee, for all his work in connection with our first report, and also to the many other members of the staff of the Ministry of Civil Aviation who have given us so much assistance. We are also grateful to Mr. Christopher Nicholson, M.A., F.R.I.B.A., and Mr. Hugh Casson, M.A., A.R.I.B.A., for preparing the notes and illustration of the proposed Air Centre.

(Signed) WHITNEY STRAIGHT,

PRIVATE FLYING

Preliminary Report of the Special Advisory Committee

I. HISTORICAL NOTE—LIGHT AEROPLANE CLUBS

1. At the end of the 1914-18 war it was realised that Service conditions had resulted in the production of aircraft which were of little practical value for ordinary civil purposes, particularly so far as private owners were concerned, and it was evident that if any advance was to be made in private flying certain aspects of aircraft design would have to be tackled afresh, particularly from the point of view of providing an aeroplane with a satisfactory performance and at the same time using an engine of a low horsepower, easy to maintain and cheap to run.
2. Until 1923 the few civil aircraft which were used for private and sporting flying were either surplus military aircraft or prototypes built by firms or groups of experimenters. In October, 1923, a competition for light aeroplanes initiated by the Duke of Sutherland was held at Lympne and £1,900 was distributed in prizes. Of the 21 entries, 18 were British, and all the prizes were won by British Aircraft. This and subsequent light aeroplane competitions aimed at developing light aircraft which would extend the scope of private flying and encourage "air mindedness" in the general public. There was also evidence that such aircraft would find a ready sale in many parts of the Empire. In 1924, the Air Ministry offered prizes to the value of £3,000 for a competition limited to aircraft with a power unit about the size of a large motor cycle engine, but results indicated that a higher-powered aircraft was required for private flying. In 1925 the De Havilland Company developed a two-seater bi-plane powered with a 60 h.p. engine, which was put into production at the end of the year. This aircraft, the D.H.60 "Moth", was subsequently manufactured in large numbers, was easy to fly, cheap to operate and did much to popularise aviation.
3. About this time it was considered desirable to develop civilian flying training and to encourage the practice of flying by the general public without imposing any liability for military service. A scheme was drawn up for the formation of six flying clubs to provide instruction on light aircraft at reasonable cost.
4. State assistance was given in the form of grants for the purchase, maintenance and replacement of aircraft and equipment, and a bonus was given for each pupil who obtained a pilot's licence. The De Havilland "Moth" was selected as the standard aircraft for training purposes.
5. This scheme gave birth to the light aeroplane club movement which from 1925 was developed with financial assistance from the State, and did much to encourage "air mindedness" among the general public and to popularise civil flying.
6. It was largely responsible for the development of cheap and efficient light aircraft, which in later years found a ready market in many parts of the world. It also provided a stimulus for the ownership of private aircraft. Many hundreds of civil pilots who were below military standards of fitness or who for other reasons were unable to join the Royal Air Force Reserve obtained their initial training at the light aeroplane club. The clubs also provided employment for a number of instructors and maintenance engineers. The success of the movement encouraged many other countries to establish clubs modelled on the United Kingdom pattern.

7. The Flying Clubs continued to be subsidised by the State, until the outbreak of war in 1939, under various schemes which in the main were based on the defence value of the clubs as providing cheap facilities for people to learn to fly, thus constituting a potential reserve on which the Royal Air Force could draw in emergency though no obligation for military service was imposed. The subsidy was intended to bridge the gap between the actual cost of flying and the amount which it was considered reasonable to expect the member to pay from his own pocket.

8. On termination of the 1925 agreement with the six original "approved" clubs, on 30th July, 1927, payment of block grants for the purchase and maintenance of aircraft and equipment was discontinued and the scheme was completely revised so as to make a continuance of financial assistance dependent on the number of pilots trained on club aircraft, on the amount of flying carried out, and on the number of qualified pilots enrolled. Seven additional clubs, initially, participated in this scheme.

9. A further revision took place in 1932 under an agreement which ran until 1937. Under it, increased grants were made in respect of pilots trained by the clubs. The grant was £25 for a member who qualified on club aircraft for the issue of an "A" or "B" licence, and £10 for a renewal. The maximum payment to any one club was £1,500 a year.

10. A new agreement covering a period of five years came into operation on 1st April, 1937. Under this scheme three types of grant were payable:— a new pilot's grant of £25 on issue of Pilot's licence after a minimum of 10 hours' flying during the preceding 12 months; a renewal grant of £10 on renewal of licence after a minimum of three hours' flying during the preceding 12 months; and a flying grant of 10s. an hour up to a maximum of 20 hours' flying by each member on aircraft belonging to the club, payable concurrently with renewal grant. Fifty light aeroplane clubs were in existence when the scheme was inaugurated, and this subsequently increased to sixty-two. Grants were limited to a maximum of £2,000 per annum to each club. Women as well as men were eligible. There was no maximum age limit and no Service obligations were imposed. No grants were payable in respect of members of the Regular Air Force and the "new pilot's grant" was reduced to £10 in the case of personnel who had served in the Regular Air Force prior to 1st September, 1921. There was no reduction in the grant in respect of members of the Air Force Reserves.

11. In 1938, with Defence commitments in mind, an entirely new scheme was introduced, which greatly broadened the basis of flying club activity. The Civil Air Guard was formed—both men and women who undertook certain obligations were eligible. Financial arrangements were such that flying was provided at a cost to the aviator of between 2s. 6d. and 10s. per hour. The response from the public was extraordinary, and gave a very clear indication that if the price was low enough, flying would appeal to a substantial section of the community.

12. The ban on civil flying imposed on the 3rd September, 1939, automatically terminated the activities of the Civil Air Guard as such. Many of its members were embodied into the Services where use was made of the training they had received. This bold and farsighted scheme then, of necessity, came to a premature end.

13. The flying clubs in 1939 owned some 400 aircraft of which 287 were requisitioned by the Government. The remainder were either lost through enemy action or deteriorated into unserviceability.

14. Statistics in connection with the wartime allocation of the 10,600 effective members of the Civil Air Guard can be found at Appendix S.B.

II. HISTORICAL NOTE—GLIDING CLUBS

15. Gliding was subsidised by the State from 1935 to the outbreak of war.
16. The gliding subsidy scheme provided for the payment to the British Gliding Association of an amount not exceeding £5,000 per annum for four years to be disbursed to individual clubs. Expenditure of the grants was restricted to the purchase of aircraft and equipment and in the acquisition of suitable premises and sites. It was found impracticable to bring the gliding clubs into the Civil Air Guard scheme for light aeroplane clubs when the scheme was introduced in 1938, but in 1939 an arrangement was agreed by which a further sum of approximately £5,000 per annum for four years would be made available to the gliding movement for a cadet training scheme carried out with the help of the Air Defence Cadet Corps and its parent body the Air League of the British Empire, acting in conjunction with the British Gliding Association.
17. In 1939 there were 40 gliding clubs, of which 16 were subsidised. Their membership included about 1,700 persons who had obtained gliding certificates. The clubs owned nearly 300 gliders of all types. The Government requisitioned most of them for Service training purposes, together with winches, retrieving cars and other mobile equipment.

III. GENERAL OBSERVATIONS

18. The Committee have taken careful note of the White Paper on Civil Aviation of 20th December, 1945, particularly paragraph 31, in which it is stated that it is the declared policy of His Majesty's Government to encourage private and club flying and gliding, subject only to such restrictions as are necessary in the interests of safety. This policy was underlined in speeches made by your Lordship in the House of Lords on 26th November, 1946, and 30th January, 1947.
19. The Committee are therefore in no doubt as to the view of His Majesty's Government with regard to the importance of private flying and gliding, and their value to the community. However, arising from the evidence received, the Committee feel that certain points are worthy of your Lordship's special consideration.
20. There is a widely expressed feeling to-day that "air mindedness" especially amongst the younger generation, is a very desirable state of mind. We are in agreement with this view, but in our opinion air mindedness in itself is not enough.
21. For centuries Britain has been a sea-faring nation; the prosperity and high standard of living which this island country has enjoyed were directly related to its ability to maintain world-wide communications. To-day this is more important than ever, but now we are at the threshold of the "Air Age," and consequently, if we are to preserve our position in the world, we must in future be as strong in the air as we have in the past been strong on the sea. We must now take the lead as an "Air-faring Nation."
22. That there is no lack of the air-faring spirit is clearly shown by the eagerness displayed for service in the air during the war when immense forces were recruited from all sections of the community. The man in the street to-day wants to fly and to use air transport for business and pleasure—only the opportunity is lacking.
23. The Committee are strongly of the opinion that the respective activities of model-making, gliding, and power flying should be co-ordinated on a national scale. These activities, starting with modelling by young people still at school, form a "natural chain in the progress of aviation training.

Together they constitute a healthy, educational and constructive occupation offering full scope for development of the ingenuity and individuality inherent in the British race.

24. Just as a thriving ship-building industry is essential to a sea-faring nation, so is a healthy aircraft industry essential to a nation of air-farers.

25. Evidence from the Chairman of the Society of British Aircraft Constructors in person, and subsequent written evidence (Appendix S.D.) have made it perfectly clear that the existence of a vigorous national aviation movement is of fundamental importance to the future well-being of the British aircraft industry, particularly as a flourishing domestic market is an indispensable preliminary to the development of the export trade, on which we depend so much.

26. The views of the Chairmen of British Overseas Airways Corporation, British European Airways Corporation, British South American Airways Corporation, and the British Air Charter Association have been taken, and there is complete unanimity of opinion that a national aviation movement along the lines recommended will materially assist in increasing the number of regular air travellers and users of air transport, to the direct financial benefit of the Statutory Corporations, in which such considerable public funds have already been invested.

27. Although at the moment the Corporations and the Charter Companies can recruit their aircrew from ex-Service sources there is no certainty that such a state of affairs will continue indefinitely; consequently the existence of a well organised and technically efficient national aviation movement may provide a useful and, in fact, necessary reserve of manpower, from which can be drawn the basic material for our merchant aircrews of the future.

28. In many countries private flying, gliding, and in several instances the construction of model aircraft, receive direct financial assistance from the State. One of the main reasons for such assistance is the defence value of these activities.

29. Evidence has been taken from the Royal Navy, the Army and the Royal Air Force. From this evidence the Committee feel absolutely convinced that the recommendations they are making to your Lordship will result in the building up and maintenance, at low cost to the public, of a large and useful reserve.

30. The great contribution made by civilian trained aviators in the last war is already too well known to need additional emphasis, but the Committee would like to draw your Lordship's special attention to Appendix S.C., which shows that very effective use was made of these people by the Royal Navy.

31. The allocation of the Civil Air Guard in the last war is shown at Appendix S.B. Here again statistics show how valuable a nation-wide Civil Air Training Scheme can be in the event of an emergency.

IV. EDUCATIONAL BACKGROUND

32. The Committee are convinced that if this country is to establish itself in a leading position in aviation a start must be made with young people while they are still at school. The means are at hand in our educational system in its modernised and expanded form, coupled with the flying clubs and other aeronautical bodies already in existence.

33. There can be no doubt that among young people there is great potential interest in air matters, but practical encouragement is necessary if this interest is to be fully aroused and given expression.

34. The Committee feel that the opportunities offered by aviation and the fact that the advantages of flying are now available to all and not merely to a few privileged people should be clearly explained in an attractive way. This might be done by means of lectures on aviation subjects, pictures and films, and the provision of reading matter in school libraries. The history of flying might be taught in a manner which would appeal to the imagination, emphasis being laid on the achievements of national figures in aviation. Mathematics and other academic subjects might be in some way related to the problems of the science of aeronautics.

35. On the practical side a number of ways of stimulating and maintaining interest could be found, amongst which are the utilisation of handicraft facilities for making model aircraft, instructional visits to aircraft industries, aerodromes and clubs, free flights for older pupils at senior schools, free air trips abroad as an incentive to good work, and the granting of scholarships whereby certain pupils might learn to fly at no cost to themselves.

36. The Committee recommend that the closest co-operation be maintained between the Ministry of Education, the Ministry of Civil Aviation, and recognised aeronautical bodies in matters designed to foster the air-faring spirit.

V. LIGHT AEROPLANE CLUBS

37. The Committee have carefully considered the present position of the flying clubs in the United Kingdom, of which some fifty are now in existence.

38. The Association of British Aero Clubs, and also individual operators, have left the Committee in no doubt that the situation of these clubs is critical, and it is virtually certain that without State assistance all but a very few will be forced to close down in the near future.

39. Except where they are being operated by commercial concerns who are prepared to carry losses for a limited period as part of an over-all programme, the flying clubs are living on capital.

40. Figures have been produced to the Committee to show that the actual over-all cost of operation exceeds £4 per flying hour. To inflict such a high cost on members would clearly be impracticable, and, generally speaking therefore clubs are at the moment charging about £3 per hour. Even this figure, which represents a loss of at least £1 on each hour flown, is beyond the means of anything but a small section of the community.

41. The cost of an "A" licence issued under present circumstances is about £45, but if the proposals now being considered by the International Civil Aviation Organisation are accepted, and the qualifying hours for an "A" licence are raised to a minimum of 30, then of course there will be a corresponding increase in the cost of the licence.

42. The Committee cannot overstress the necessity for prompt action if the flying clubs are to be saved. With this in view the following recommendations are made:—

That an agreement should be entered into between the Ministry of Civil Aviation and approved flying clubs for the payment of subsidy on the basis of the amount of flying carried out, coupled with a further grant in respect of pilots' licences issued or renewed. The agreement should contain inter alia the following provisions:—

- (i) The term of the agreement to be 5 years commencing 1st September, 1947.

- (ii) Subsidy to be payable at the rate of £2 per flying hour, by club aircraft. In addition a bonus of £30 to be payable in respect of each "A" licence issued, and a bonus of £5 to be paid for each "A" licence renewed.
- (iii) The above payment to be subject to the following exceptions:—
 - (a) No subsidy or bonus to be paid in respect of qualified pilots serving as such in His Majesty's Forces or holding a current commercial licence.
 - (b) The bonus in respect of licences issued or renewed to persons who have already learned to fly at state expense, other than those referred to in paragraph (iii) (a) to be £5.
- (iv) Maximum charges for subsidised flying to be £1 per hour.
- (v) Some limit may have to be imposed on the subsidised flying of any single individual. It is suggested that the limit could be 50 hours per annum for pilots with less than 100 hours flying and 25 hours per annum for pilots with over 100 hours total flying.
- (vi) The Committee feel that ground instruction is as important as flying instruction and that a high standard of instrument training, radio procedure and ground and air discipline should be aimed at. With this in view a condition of subsidised flying might be that each pupil does one hour ground instruction for every two hours spent in the air, and one hour Link Trainer instruction for, say, every five hours spent in the air, the latter proviso subject to Link instructors and equipment being reasonably available.
- (vii) No person to be unreasonably debarred from membership of the club. There must be no entrance fee and the total subscription should not exceed an annual fee of £1 1s. or a weekly fee of 6d.
- (viii) Annual accounts and simple statistical returns to be kept in an agreed form and to be available for inspection by the Ministry of Civil Aviation or their authorised representative.
- (ix) Club activities should be based on standards agreed between the Ministry of Civil Aviation and the Royal Aero Club (or an affiliated body), and some adequate system of control and inspection should be initiated.

43. At the present moment the scheme would, of course, apply only to the 50 clubs now in existence, but these 50 clubs do not by any means provide adequate coverage of the country as a whole. The Committee have given careful consideration to this point and it is felt that approximately 100 clubs will be required if the main areas of population are to be properly served. With this point in mind the scheme should be designed so that the creation of new clubs, subject to adequate safeguards, will be encouraged. These clubs would be brought into the scheme as and when the Ministry of Civil Aviation, in conjunction with the Royal Aero Club, were satisfied as to public demand in the area concerned and the technical and financial standing of the particular organisation.

44. It will be noted that the financial arrangements proposed are to hold for a term of five years. The Committee feel however that the actual rate of payment involved might be reviewed at the end of three years as no doubt during that time considerable operational experience will have been gained and initial difficulties overcome and very possibly assistance on a reduced rate may be practicable.

45. A further consideration is that the new type of aircraft proposed by the Informal Light Aircraft Committee should then be coming into action and it is hoped that this aircraft will be able to operate at a cheaper rate than the existing types.

46. It is difficult to assess the total cost of this scheme as it is so dependent on the rate of formation and entry into operation of new clubs. It is also dependent on the degree to which available resources in aircraft and spares can support the substantial increase in flying which will result from these proposals. However, based on the existing 50 clubs in the first year, and increased to, say 75 in the second year and 100 in the third year, the Committee estimate that the results to be expected and the maximum total cost to the Treasury will be according to the table as follows. An average rate of utilisation of 500 hours per aircraft per year is assumed.

THREE YEAR FINANCIAL PROGRAMME FOR LIGHT AEROPLANE CLUBS

<i>By end of</i>	<i>...</i>	<i>...</i>	<i>...</i>	<i>1st Year</i>	<i>2nd Year</i>	<i>3rd Year</i>
No. of Clubs	...	...	...	50	75	100
No. of Pilots	...	...	...	2,500	5,625	10,000
<i>Maximum subsidy which can be earned year by year :—</i>						
				£	£	£
Subsidy at £2 per flying hour on basis of six aircraft at 500 hours per annum per club	...	...	...	6,000	6,000	6,000
Bonus for "A" licences issued or renewed per club	...	...	...	3,000	3,000	3,000
Maximum payment per club	...	...	...	9,000	9,000	9,000
Total maximum payment	...	...	...	450,000	675,000	900,000

VI.- GLIDING CLUBS

47. The Committee is of the opinion that gliding is an integral part of aviation training, and that gliding experience is one of the finest means of obtaining air experience.

48. Today there are only 12 active gliding clubs. Of these, only eight are offering both elementary training and soaring, and only three are in a position to offer regular mid-week facilities.

49. The basic problem of the gliding clubs is that an economic charge is beyond the financial means of the average potential club member. A secondary, but most important, problem is the lack of suitable sites, hangars, and ground equipment.

50. Immediate financial assistance is essential.

51. The Committee feel that any scheme for the resuscitation of the gliding clubs should provide for the maximum co-ordination with other forms of private flying, and ensure as far as possible that gliding is an integral part of the Air Centre Organisation referred to in Section XXII of this Report. On this basis the aim would be to have a gliding club at, or in reasonably close proximity to, the Air Centre headquarters.

52. The difficulties in acquiring sufficient sites near populous areas suitable for obtaining the Royal Aero Club "C" certificate do not allow of a workable subsidy scheme based on this standard. We recommend, therefore, that the scheme should be based on payments to clubs on the grant of a "B" certificate to club members who qualify on club gliders. (The "B" certificate means that the pupil can make circuits of the airfield.) In order to encourage advancement beyond the "B" stage, additional grants should likewise be payable on the grant of the "C" certificates and silver badges.

53. The certificates and badges are not subject to periodical renewal. These recommendations are therefore framed solely on the basis of non-recurring payments.

54. We suggest that the grants should be as follows:—

- (a) On the issue of a " B " certificate—£10.
- (b) On the issue of a " C " certificate—£20.
- (c) On the issue of a silver badge—£90.

55. It is estimated that subsidy given on this basis will be equivalent to the pupil of two-thirds of the total cost of each certificate or badge.

56. For a subvention of £490,000 over a period of five years a total of 100 clubs (or centres) could produce 20,000 pupils with glider training up to at least the " B " certificate standard.

57. An outline of a programme to achieve this figure will be found below.

58. We recommend that the administration of the subsidy scheme should be arranged through the Royal Aero Club by the British Gliding Association Board of Trustees, who would be responsible for discipline.

59. The conditions which should be embodied in the agreement with the Ministry of Civil Aviation should include the following:—

- (i) The agreement should be for a period of five years commencing from 1st September, 1947, but a review of the financial provisions shall take place at the end of the third year.
- (ii) Assistance to be given at the rates suggested at paragraph 8 above.
- (iii) Maximum charges to a club member should be:—
Elementary training, per day—5s. od.;
Soaring, per hour—8s. 6d.
- (iv) There should be no club entrance fee, and the total annual subscription should not exceed an annual fee of £11 is. od., or a weekly fee of 6d.
- (v) Annual accounts and statistical returns to be kept in an agreed form, and to be available for inspection by the Ministry of Civil Aviation or their authorised representatives.
- (vi) Club activities should be based on standards agreed between the Ministry of Civil Aviation and the Royal Aero Club (or an affiliated body), and some adequate system of control and inspection should be initiated.

60. We are informed that there is a serious dearth of gliding instructors for the clubs. The establishment of a central civil gliding instructors' school to make good the deficiency in the initial stages is strongly recommended.

FIVE YEAR PROGRAMME FOR GLIDING CLUBS

By the end of...	1st Year	2nd Year	3rd Year	4th Year	5th Year
No. of clubs...	20	40	60	80	100
No. of Pilots...	2,000	5,000	9,000	14,000	20,000

The subsidy which could be gained is given below, with the total amount of money involved in each year:—

	£	£	£	£	£
" B " Certificate ...	20,000	30,000	40,000	50,000	60,000
" C " Certificate ...	20,000	30,000	40,000	50,000	60,000
Silver Badge ...	9,000	13,500	18,000	22,500	27,000
Total per annum ...	49,000	73,500	98,000	122,500	147,000
Total for five years — £490,000					

VII. MODEL AIRCRAFT CLUBS

61. We have been much impressed by evidence from the Society of Model Aeronautical Engineers concerning the activities of the model aircraft movement. The movement has great scope and an abundance of enthusiasm, and is clearly of national importance.

62. The Committee are informed that there are at present more than 350 model aircraft clubs throughout the country. These clubs provide a healthy and constructive recreation for thousands of young people, and an interesting and practical introduction to the world of aviation.

63. A number of model aircraft clubs are already conducted in association with schools, and the Committee feel that in this connection there should be the closest co-operation between the Ministry of Civil Aviation and the Ministry of Education, with a view to introducing aero-modelling in the handicraft curriculum of all appropriate schools. Arrangements should also be made in order that such activities can be co-ordinated with the facilities to be provided at Air Centres, the creation of which is recommended in Section XXII of this Report.

64. We further recommend that redundant aerodromes should be made available for the flying of model aircraft and that other suitable and convenient open spaces should also be made available for use by the model aeroplane clubs, at no cost.

VIII. THE PRIVATE OWNER

65. Private owners can be divided into two main categories—those who fly solely for pleasure, and those who use their private aircraft to a greater or lesser extent in connection with their business activities.

66. While the Committee make no recommendation for direct financial assistance to private owners as such, they feel that individuals in both categories represent a valuable element in civil aviation, and should be encouraged.

67. Private owners will receive considerable indirect benefits if the recommendations of this Report are adopted, more particularly from the establishment of a network of aerodromes available for their use, the improvement of facilities at existing aerodromes, reduction of aerodrome charges, and reduced cost of aircraft suitable for the private owner as recommended by the Informal Light Aircraft Committee.

68. The Committee have also recommended, elsewhere, a general simplification of procedure and formalities in connection with private flying.

IX. AIRCRAFT (*Recommendations of I.L.A.C.*)

69. The Committee feel very strongly that unless the recommendations made in this Report are supported by an adequate number of the right kind of aircraft the scheme, as a whole, cannot be fully effective, especially on the financial side.

70. We are grateful to Mr. Peter Masefield and the Informal Light Aircraft Committee for the constructive report they have made. We have considered the recommendations, with which we are in complete agreement. For easy reference these recommendations are summarised below. The complete Report of the Informal Light Aircraft Committee can be found at Appendix S.F.

(A) AIRCRAFT

(i) BASIC TYPE

The Informal Light Aircraft Committee (I.L.A.C.), having reviewed types of light aeroplanes and gliders likely to be required for use in the United Kingdom and for export, puts forward, as its primary recommendation, a specification for a basic type of two-seat all-metal trainer-tourer (I.L.A.C. Type I). Details of the requirements for this basic type are set out in Annexes "B", "C", and "D". Briefly, the specification calls for an enclosed, two-seat, single-engine aeroplane of all-metal construction with a fixed tricycle undercarriage, capable of cruising at 110 m.p.h., stalling at not more than 44 m.p.h. with full load, and taking off in a distance of 400 yards to a height of 50 feet, carrying a load of two persons and 60 lb. of baggage for an absolute duration of five hours. Side-by-side seating is called for with a preference for a "two-control" system. The specifications require non-spinning and exemplary stalling characteristics, a good all-round view, and lay down detailed safety and maintenance characteristics which must be met.

(ii) OBJECTIVE

The objective which the Informal Committee has had pre-eminently in mind in drawing up the recommended specifications of requirements has been the attainment in one machine (which would be versatile enough for wide use for both training and touring, and capable of being built in large numbers), of the optimum compromise in pursuit of the ideals of maximum

Safety,
Simplicity,
Low Operating Cost,
Moderate Prime Cost, and
Long Life.

(iii) PROTOTYPES

The Informal Committee recommends that the specifications of requirements for the proposed basic Trainer-Tourer should form the subject of a design competition. It recommends that two prototypes should be constructed from each of the three best designs submitted which are backed by companies capable of large scale production and willing to produce in quantity at an acceptable price.

(iv) PRODUCTION

The Informal Committee recommends further, that, after the completion of the six prototypes, a production order should be placed officially for the design selected as being the most satisfactory. So that the price may be economic, the Informal Committee recommends that not less than one thousand aircraft of the selected design should be laid down, all to be delivered within two years of the first flight of the first production machine.

(B) GLIDERS

(i) BASIC TYPE

The Informal Committee believes, with the British Gliding Association, that the most urgent need of British Gliding is a general purpose two-seater of medium-high performance.

(ii) PROTOTYPES

The Informal Committee recommends, therefore, that two prototypes should be built to each of the three best designs chosen from the results of the competition for a two-seater held recently by the British Gliding Association, thus utilising the large amount of work already done.

(iii) PRODUCTION

So that the price may be economic, the Informal Committee recommends that a bulk production order should be placed officially, for not less than two hundred gliders to the design judged to be most satisfactory after the prototype trials.

(C) NECESSARY AID

(i) A NATIONAL PLAN

The Informal Light Aircraft Committee feels bound to emphasise that, in its opinion, the aforementioned recommendations for a basic Trainer-Tourer and a two-seater glider can achieve their purpose of making possible widespread flying in the British Isles and of creating a healthy export market only if a national scheme for financial assistance is instituted to establish light aeroplane flying and gliding in the United Kingdom on a broad scale. Such a national plan, to succeed, would have to reduce flying charges to the public to not more than £1 per flying hour. The I.L.A.C. is of the opinion that without such a scheme there can be no economic demand for the production of new types of light aircraft and, further, no satisfactory development of export sales.

(ii) FINANCIAL ASPECTS

(a) *General.* The Informal Committee is of the opinion that under present conditions the only effective method of creating a new generation of British light aircraft is by means of a Government grant to pay for the building of prototypes and by means of an interest-free loan from the Government to cover and underwrite the quantity production of the types recommended. Such a loan should be recoverable against sales, leaving only the cost of prototypes outstanding.

(b) *Prime Costs.* The Informal Committee considers that a target for the present day cost of a light aeroplane of the basic type recommended, produced in a quantity of not less than 1,000, should be approximately fifteen shillings per pound of loaded weight, or a total of about £1,000 per aircraft. This pre-supposes an engine of low cost, produced in quantity.

(c) *Method of Procedure.* The Informal Committee considers, therefore, that recommendations essential to the completion of the proposed plan are:—

(i) The six prototypes of the three selected designs of the basic Trainer-Tourer should be paid for (preferably through the Royal Aero Club) from a national grant of £60,000 towards their over-all cost. Similarly, the six prototypes of the three selected designs of the two-seat glider should be paid for by a further grant of £24,000 towards their over-all cost.

(ii) After prototype trials, the Government should make available the sum of £1,000,000 to finance the production order of 1,000 aircraft, and a further £170,000 for the production of 200 gliders. This total sum of £1,170,000 would be used in the form of progress payments and/or underwriting of orders, so that work could be

instituted without delays. The Informal Committee is confident that this expenditure would be recovered in its major part or its entirety from the sale of aircraft and gliders in the home and export markets. At the end of this period, production and sales would be expected to be continued. Thus, what would be in effect an interest-free loan of £1,170,000 spread over two years would create a valuable light aircraft industry on a large and economic scale and in addition, through bulk order of materials and components, would make possible prices much lower than could otherwise be attained.

(d) *Recommended Expenditure.* The cost to the national exchequer of founding the equipment side of a National Flying Movement, is therefore, estimated by the Informal Committee at £84,000 for prototypes, as a contribution towards their over-all cost, plus an interest-free loan of approximately £1,170,000 over two years to cover production.

X. ULTRA LIGHT AIRCRAFT (Flying machines not exceeding 1,000 lb. maximum total weight)

71. The Committee has taken evidence from the Ultra Light Aircraft Association. The Association proposes to further the construction and operation of Ultra Light Aircraft, many of which may be home-made. In the main, reliance will be placed on voluntary part-time assistance for maintenance, inspection and instruction in flying. The Association has not requested direct financial assistance.

72. The Committee feel that this form of private flying should be encouraged subject only to reasonable conditions of safety.

73. The question of ultra-light aircraft, however, divides itself into virtually two problems:—

(a) Aircraft already in existence which have at some time held a permit to fly without having been certified as airworthy, and

(b) Aircraft which are to be built in the future.

74. It is considered that both classes of aircraft should possess a certificate of airworthiness but, in the case of those already built, it is not possible to establish that such aircraft were built to any satisfactory design standards or that the materials used or the workmanship were to acceptable standards. It is not, therefore, possible in these cases to contemplate the issue of a certificate of airworthiness. It is nevertheless considered reasonable to allow aircraft which have at any time been granted a permit to fly to be flown again subject to certain safeguards.

75. It is accordingly recommended that such aircraft should be granted Permits to Fly subject to each aircraft first being inspected to ensure a sound state of maintenance. Any such inspection cannot, it is recognised, be directed towards establishing that the aircraft is of satisfactory design.

76. The following conditions should be included in the permission:—

- (i) flights not to extend beyond 3 miles from the coast of the United Kingdom,
- (ii) the carriage of passengers or goods of any kind to be prohibited,
- (iii) acrobatic flying to be prohibited,
- (iv) policy of third party insurance to be in force,
- (v) flights to be limited to " Visual Flight Rules "
- (vi) flights over populous areas to be prohibited,
- (vii) all other requirements of the Air Navigation Regulations to be met.

77. As regards aircraft to be built in the future, it is recommended that they be required to possess a certificate of airworthiness. It is considered that design requirements could be formulated which would ensure a satisfactory standard of safety for this class of aircraft. Such requirements need not be so severe as those at present applicable to large aircraft, providing certain over-all limitations are imposed, e.g. stalling speed not to exceed 40 m.p.h. The precise concessions which would be permitted can, we are assured, be worked out by the Air Registration Board. As regards the construction of these aircraft, it will be necessary to apply safeguards which will ensure that the methods employed and the materials used are acceptable and it is understood that the Board foresee no insuperable difficulty in devising a scheme not dissimilar to the existing one, which will meet the case of the ultra-light aircraft.

78. The Committee considers that every effort should be made, consistent with a satisfactory standard of safety, to reduce the cost of securing a certificate of airworthiness for the ultra-light aircraft.

79. The Committee considers that the facilities provided under the Air Navigation Regulations for experiments and tests to be carried out by genuine experimenters without a certificate of airworthiness should be continued.

XI. HELICOPTERS.

80. The Committee have heard evidence in connection with the use of helicopters. Although the future possibilities are very considerable it is felt that any specific recommendations at this stage would be premature.

XII. FLYING INSTRUCTORS

81. Unless there is an extensive national aviation movement it is difficult to visualize how there could be any appreciable employment of flying instructors. The only sphere otherwise open to these important people in the hierarchy of civil aviation would be in connection with purely service training.

82. Under the recommendations made in Section VII the Committee estimate that 200 instructors would be maintained in full-time employment and a further 300 in part-time employment.

83. Furthermore a considerable number of ground and Link Trainer instructors will be employed, although the precise number cannot be accurately estimated.

XIII. TRAINING OF MAINTENANCE ENGINEERS

84. In the past the flying clubs have been regarded principally as organisations for the training of pilots. The Committee recommend, however, that in the future much more attention should be directed towards the training of maintenance engineers.

85. Training should be both practical and theoretical and the closest liaison should be established between the flying clubs and any Technical Schools which may exist in the same locality.

86. Apprenticeship schemes of various kinds should be closely studied.

87. It is estimated that flying clubs under the proposed scheme would employ at least 400 maintenance engineers.

XIV. GENERAL ASSISTANCE TO AIRCRAFT MANUFACTURERS

88. The Committee have been impressed by the value to private flying of certain action that is being taken in the United States to assist manufacturers generally on problems of common concern.

89. Considerable financial assistance has been provided from public funds in connection with research directed towards finding an undercarriage which will provide safe cross-wind landing for light aircraft. This particular problem is of vital interest to all manufacturers and users as on it depends the size and form of aerodromes, and consequently their cost. There are clearly many other problems of equal importance, the solution of which may be beyond the resources of any single manufacturer.

90. The Committee recommend that attention be given to the research requirements of the light aircraft industry, in particular those mentioned in paragraph 28 of the Informal Light Aircraft Committee's Report, and that appropriate grants be made.

XV. REGULATIONS

91. The Committee are very strongly of the opinion that regulations affecting private flying and gliding should be kept to the absolute minimum compatible with safety, and that before any new regulation is introduced, every consideration should be given by those responsible as to the effect of such a regulation on the freedom of flying.

XVI. CONTROL ZONES

92. The Committee are of the opinion that control zones, especially the London Control Zone, have grown to a size which, to a large extent, curtails private flying.

93. Although the Committee accept the fact that the safety of Transport aircraft is of paramount importance, nevertheless we feel that the interests of private flying should also be considered.

94. The Committee recommend that existing regulations should be reviewed in consultation with the Royal Aero Club, which should also be consulted before any future regulations are promulgated.

XVII. PILOTS' LICENCES

95. The Committee have been informed of the proposals in respect of the Student Pilot's Licence, whereby before commencing dual instruction the pupil must undergo a medical examination. The Committee feel that this proposal will have a very harmful result on flying club activities, and recommend that no medical examination or licence should be required prior to the stage at which the pupil goes solo.

96. The Committee have learned with concern that among the flying clubs there is considerable apprehension in connection with the new regulations for the Pilot's "A" Licence as recommended by I.C.A.O. The Committee suggest that before these regulations are accepted in this country, every opportunity should be given to all interested parties to express their views.

97. Similar remarks apply to the licences which it is understood I.C.A.O. are recommending for Glider Pilots. The Committee feel that the view of the British Gliding Association should be sought before these recommendations are put into force.

XVIII. LANDING FEES

98. The Committee have received evidence from the Aerodrome Owners' Association, from the Association of British Aero Clubs, and from several distinguished private owners. From this evidence it appears that the question of landing fees for private aircraft has in the past caused considerable controversy. It is now understood, however, that as a result of collaboration between the Ministry of Civil Aviation and the Royal Aero Club a system

has been introduced whereby at an annual cost of £10 two cards are issued, one of which entitles the user to land at available State owned aerodromes, and the other at certain aerodromes which are either municipally or privately owned. The Committee feel that these new arrangements represent a most definite step in the right direction, as they have not only effected a reduction in the cost to the private flyer, but have also reduced the irksome formalities previously associated with air-touring.

99. The Committee, however, feel that a further reduction in cost should be considered, and that one card should in due course be substituted for the two which are now issued. Furthermore, it is most desirable that this card should also entitle the user to free landings at foreign aerodromes.

100. It is hoped also that the number of home aerodromes now covered by these cards will be substantially increased.

XIX. HOUSING FEES

101. Housing fees for aircraft may be likened to garage fees for motor cars, but the Committee feel that the charges which private aviators are at present required to pay are high in comparison with those demanded of the private motorist. Furthermore it is disconcerting and inconvenient to find that there is no general standardisation of fees and charges. The Committee, however, have learned with satisfaction that the Ministry of Civil Aviation, the Aerodrome Owners Association, and the Association of Municipal Corporations are seeking to establish one standardised system throughout the country. We feel that this is a very desirable thing and that no effort should be spared to bring such arrangements into force at the earliest possible moment.

102. The Committee also feel that a study should be made with a view to finding a more efficient method of housing aircraft, whereby the amount of space occupied could be reduced with a consequent reduction in cost.

XX. PETROL TAX

103. Among the more important items to be taken into account in the assessment of the cost of flying is the high cost of petrol.

104. The Committee wish to place on record their concurrence with the view expressed by the Committee of Inquiry under the Chairmanship of Lord Cadman in paragraph 77 of their Report (Cmd. 5685) that petrol tax bears far more heavily on aviation than on other users owing to the much higher powered engines necessarily employed, with correspondingly increased fuel consumption.

105. The Committee have noted with interest that in many countries a sharp differentiation is made between the tax on petrol for aeroplanes and the tax on petrol for motor vehicles. In many cases no tax at all is levied on petrol for aviation, but in any event the tax is substantially lower than that imposed on petrol for road users.

XXI. AERODROMES

106. In the past, aerodromes have been conceived as landing grounds, sufficient in area to accommodate aircraft of the largest size in current use. As the weight and landing speed of aircraft increase so must the dimensions of runways, until eventually an aerodrome becomes an extremely costly undertaking. The Committee take the view that an entirely new approach must be made to the aerodrome problem.

107. The Committee feel that a definite specification should be laid down and adhered to in respect of aerodromes intended for private flying and light

charter work. An aerodrome for these purposes in its most simple form need only consist of two strips of say 600 yards by 75 yards. Such an aerodrome need not be at all expensive either to build or maintain and undoubtedly a suitable site can be found in close proximity to almost any centre of population.

108. In this country to-day there are a vast number of aerodromes which were built at State expense during the war. In many cases these are no longer being used for flying and have reverted to agricultural use. The Committee feel that a number of these aerodromes could very well be made available for private flying and gliding and that, without in any way detracting from their agricultural value, they could be put to good use by light aeroplane clubs.

109. In this connection the Committee understand that the grass-drying process is particularly applicable to aerodromes and that a very high yield of valuable and highly concentrated animal feeding stuffs could be produced.

110. The Committee feel also that there should be some relaxation in connection with the use of existing Service aerodromes, except perhaps those used for special purposes. At the present time private flyers are often debarred quite unnecessarily from the enjoyment of facilities which already exist and are maintained at State expense.

111. The Committee have already recommended in Section VII the creation of 100 aeroplane clubs, and consequently at least 100 aerodromes will be required at various points in the United Kingdom. Careful consideration will be necessary to ensure efficient geographical distribution in relation to the main areas of population. There is no doubt that in many cases existing aerodromes can be used, where this is not possible, redundant Service aerodromes should be considered. In a relatively small number of cases new aerodromes will have to be built.

112. An immediate survey should be made and a definite plan decided upon as soon as possible. The Committee feel that the Ministry of Civil Aviation, the Aerodrome Owners' Association, and the Royal Aero Club should enter into consultation on this matter.

113. The Committee wish to stress, however, that flying clubs can only develop and be maintained if backed by local keenness and enthusiasm. Therefore it would be most inadvisable to impose any rigid plan that might in practice kill the very spirit which it is so desirable to encourage.

XXII. AIR CENTRES

114. At each aerodrome it is most desirable that buildings designed in a simple and modern manner should in due course be constructed with particular regard to economy in operation—these buildings to include three sections:—

- (i) *The Operations Section*: This should include a hangar with workshops and stores and lock-ups for private aircraft, a Link Training room and class-room for ground instruction.
- (ii) *The Social Section*: To include a central restaurant which would cater for club members and the public for whom a terrace would be provided where flying could be watched under pleasant conditions; the necessary accommodation for use by club members for social purposes; space for model makers to work and fly their models indoors during the winter months; and dormitory accommodation of the most simple form where people could spend the week-ends at small cost and take advantage of the early hours for flying.

(iii) *The Sports Section*: This section should be added if facilities for bathing, tennis, squash, etc., are not otherwise available in the district. In this connection it is obviously of advantage to group activities of this sort around the social nucleus of the Air Centre, with its catering and other facilities.

115. The construction and operation of the Air Centres is perhaps best undertaken by the municipalities, either in collaboration with private enterprise as sub-contractors or as a direct municipal enterprise along the lines of the interesting experiment now being carried out by the Southend-on-Sea County Borough Council.

116. The Committee feel that in a national scheme of this kind, the highest standards of architecture and design are essential, and that it may be necessary to set up some machinery, possibly in consultation with the Aerodrome Owners' Association, if the somewhat haphazard developments of the past are to be avoided.

117. At Appendix S.E. will be found an impression of what an Air Centre of the future might look like—the Committee, of course, appreciate that under existing conditions a considerable amount of improvisation will have to be done, and temporary arrangements made.

118. The Committee are most anxious that the Air Centre should serve as a social focal point for the activities of Model Making, Gliding and Power Flying, and also possibly for other sports outside aviation. However, controversial evidence has been received as to whether in fact these three flying activities are operationally compatible, more experience will have to be gained, but if Flying Control and aerodrome discipline are really good and no one of the three activities absorbs an undue amount of the available aerodrome capacity, then the Committee take the view that this very desirable arrangement could work harmoniously, although perhaps not on the smaller types of aerodrome mentioned in Section XXI.

XXIII. ADMINISTRATION

119. The effective operation of the plan we have proposed will require a considerable amount of centralised administration. The Committee have carefully considered how best this can be done, and have come to the conclusion that as far as possible the responsibility for day to day matters should be delegated to the Royal Aero Club.

120. The Royal Aero Club, to which are affiliated The British Gliding Association, The Association of British Aero Clubs, and The Society of Model Aeronautical Engineers, possessing as it does excellent facilities at Londonderry House, is well equipped to do this work in an efficient and economical manner.

121. Repayment of expenses incurred in this connection should, of course, be made.

122. A further benefit to be derived from this recommendation is that an even closer working liaison will be built up between the Ministry of Civil Aviation and the Royal Aero Club, to the advantage of both.

XXIV. FINANCIAL SUMMARY

123. *Light Aeroplane Clubs*. If 100 is taken as the upper limit of the number of light aeroplane clubs to be assisted in the five year period of the initial agreement, and the maximum subsidy to any one club in any one year is £9,000, the maximum annual financial liability to the Treasury during that

period will be £900,000. It is difficult to forecast the precise extent to which subsidy will be earned annually on account of the uncertain factors involved; but the maximum will certainly not be reached in the early years.

124. *Gliding.* The scheme outlined in Section VI of this report envisages an annual subsidy to gliding clubs of £49,000, rising to £147,000 in five years, at a total cost to the Exchequer of £490,000.

125. *Equipment.* The estimated cost to the Exchequer in the provision of prototype aircraft as recommended in the report of the Informal Light Aeroplane Committee (Appendix S.E.) is £84,000, in addition to an interest free loan of approximately £1,170,000 over two years to cover production.

XXV. MAIN CONCLUSIONS

126. (i) If we are to preserve our position in the world, Britain must now take the lead as an air-faring nation as she did in the past as a sea-faring nation (paragraph 21).

(ii) Just as a thriving ship-building industry is essential to a sea-faring nation so is a healthy aircraft industry essential to a nation of air-farers (paragraph 24).

(iii) A vigorous national aviation movement (covering model-flying, gliding and powered flying) is of fundamental importance to the future well-being of the British aircraft industry (paragraph 25).

(iv) If the country is to establish itself in a leading position in aviation a start must be made with young people at school (paragraph 32).

(v) It is virtually certain that without State assistance all but a very few of the light aeroplane clubs will be forced to close down in the near future (paragraph 38).

(vi) Present club flying charges are beyond the means of all but a small section of the community (paragraph 40).

(vii) Gliding is an integral part of aviation training and the proposed Air Centre organisation (paragraphs 47 and 51).

(viii) Immediate financial assistance to gliding clubs is essential (paragraph 50).

(ix) The model aeroplane movement is clearly of national importance (paragraph 61).

(x) An adequate number of the right kind of aircraft is essential if a national aviation movement is to be fully effective (paragraph 69).

(xi) A new approach must be made to the aerodrome problem (paragraph 106).

XXVI. SUMMARY OF RECOMMENDATIONS

127. (i) The respective activities of model-making, gliding and power flying, which form a natural chain in the progress of aviation training, should be co-ordinated on a national scale (paragraph 23).

(ii) The closest collaboration should be maintained between the Ministry of Civil Aviation and recognised aeronautical bodies in presenting in attractive form matters designed to foster the air-faring spirit (paragraphs 34 to 36).

(iii) Subsidy rising to a maximum of £900,000 per annum after three years should be made available to approved flying clubs to enable flying charges to be reduced to £1 an hour (paragraphs 42 and 46).

(iv) An agreement should be concluded with approved flying clubs for a period of five years, with provision for review of the financial conditions after three years (paragraphs 42 and 44).

(v) A scheme should be designed to encourage the creation of new flying clubs to bring the number, with the existing clubs, up to one hundred so as to provide adequate coverage for the country as a whole (paragraph 43).

(vi) Assistance amounting to a maximum of £490,000 spread over five years should be made to gliding clubs (paragraphs 56 and 57).

(vii) An agreement for a period of five years, with provision for a review of the financial provisions after three years, should be negotiated with the British Gliding Association (paragraphs 58 and 59).

(viii) A central civil gliding instructors' school should be established (paragraph 60).

(ix) There should be the closest collaboration between the Ministry of Civil Aviation and the Ministry of Education with a view to introducing aero-modelling in the handicraft curriculum of all appropriate schools, and such activities should be co-ordinated with the facilities to be provided at air centres (paragraph 63).

(x) Redundant aerodromes and other suitable and convenient open spaces should be made available for the flying of model aircraft at no cost (paragraph 64).

(xi) As a contribution towards their over-all cost, a grant should be made of £84,000 to cover prototypes of two-seater all-metal trainer-tourer light aeroplanes and of general purpose two-seater gliders, as recommended by the Informal Light Aircraft Committee, and there should also be an interest-free loan of approximately £1,000,000 to finance a production order of a thousand aircraft, and a further £170,000 for the production of two hundred gliders over two years (paragraph 70).

(xii) Ultra-light aircraft should be required to possess a certificate of airworthiness, but such aircraft which have in the past been granted a permit to fly should be allowed to fly again subject to certain conditions and to inspection to ensure a sound state of maintenance (paragraphs 74 to 77).

(xiii) To encourage the development of ultra-light aircraft every effort should be made to reduce the cost of securing a certificate of airworthiness for these aircraft (paragraphs 72 and 78).

(xiv) Attention should be directed towards the training of maintenance engineers (paragraph 84).

(xv) Attention should be given to the research requirements of the light aircraft industry and appropriate financial grants made (paragraph 90).

(xvi) Regulations affecting private flying and gliding should be kept to the absolute minimum compatible with safety (paragraph 91).

(xvii) Existing regulations in relation to control zones should be reviewed in consultation with the Royal Aero Club who should also be consulted before future regulations on the subject are promulgated (paragraph 94).

(xviii) No medical examination or form of licence should be required by a student pilot prior to the stage at which he flies solo (paragraph 95).

(xix) Every opportunity should be given to all interested parties to express their views before changes recommended by the International Civil Aviation Organisation with regard to "A" Pilots' licences and glider pilots' licences are accepted (paragraphs 96 and 97).

(xx) A further reduction in landing fees should be considered, and the scope of the season ticket landing card extended (paragraphs 98 to 100).

(xxi) A scale of housing fees should be standardised throughout the country (paragraph 101).

(xxii) A study should be made with a view to finding a more efficient method of housing aircraft to economise in space (paragraph 102).

(xxiii) An aerodrome for private flying and light charter work need in its most simple form consist only of two strips of say 600 yards by 75 yards (paragraph 107).

(xxiv) A number of State aerodromes which have reverted to agricultural use could very well be made available for private flying and gliding without in any way detracting from their agricultural value (paragraph 108).

(xxv) There should be some relaxation in connection with the use of existing Service aerodromes except perhaps those used for special purposes (paragraph 110).

(xxvi) An immediate survey should be made and a definite plan decided upon in consultation between the Ministry of Civil Aviation, the Aerodrome Owners' Association, and the Royal Aero Club, to make available for private flying a net-work of one hundred aerodromes suitably distributed over the country (paragraphs 111 and 112).

(xxvii) At each aerodrome there should be constructed an Air Centre consisting of three sections—an operations section, a social section, and a sports section (paragraph 114).

(xxviii) The construction and operation of Air Centres may best be undertaken by municipalities either directly or in collaboration with private enterprise (paragraph 115).

(xxix) As far as possible responsibility for the day to day administration of schemes introduced as a result of the Committee's report should be delegated to the Royal Aero Club (paragraph 119).

Appendix S.A.

List of Societies, Associations and Individuals from whom Oral Evidence has been taken

Aerodrome Owners' Association
Association of British Aero Clubs
British Gliding Association Ltd.
Guild of Air Pilots and Air Navigators of the British Empire
Helicopter Association of Great Britain
Helicopter Society of Great Britain
Ministry of Education
Royal Aero Club of Denmark
Royal Aero Club of Holland
Royal Air Forces Association
Royal Swedish Aero Club
Society of British Aircraft Constructors Ltd.
Society of Model Aeronautical Engineers
Swiss Aero Club
Ultra Light Aircraft Association
Women's Junior Air Corps

Mr. R. R. Allan
M. J. Allez
Flight Lieutenant Vernon Blunt
The Rt. Hon. Lord Brabazon of Tara, P.C., M.C.
Air Commodore Sir J. A. Chamier, C.M.G., D.S.O., O.B.E.
Mr. B. F. Collins
Mr. S. J. Cox
Mr. S. K. Davies
Captain H. Duncan Davis, A.F.C.
Captain Sir Geoffrey de Havilland, C.B.E.
Mr. G. J. R. L. d'Erlanger, C.B.E.
Air Vice-Marshal Sir B. E. Embry, K.B.E., C.B., D.S.O., D.F.C., A.F.C.
Wing Commander W. L. Gordon
Sir Frederick Handley Page, C.B.E.
Lieutenant Commander Campbell-Horsfall, R.N.
Lt.-Col. H. Joergensen, D.S.C., D.F.C.
The Rt. Hon. The Marquess of Londonderry, K.G., P.C., M.V.O.
Mr. T. L. McDonald
Mr. A. G. G. Marshall
Mr. F. G. Miles
Mr. C. Morrison
Mr. W. G. Robson
Mr. J. Rollo
Mr. L. Satterthwaite
Major R. H. Thornton, M.C., J.P.
Squadron Leader J. E. Doran Webb
Mr. L. C. Wheeler

Written Evidence has been received from :

The Army
The Ministry of Civil Aviation
Department of Civil Aviation, Commonwealth of Australia
Department of Transport, Canada
The Director-General of Civil Aviation in India
The Controller of Civil Aviation, New Zealand
Civil Aeronautics Administration, Department of Commerce, U.S.A.
The Director of Civil Aviation, Ministry of Communications, Belgium
The Director-General of Civil Aviation, Holland
The Director-General, Royal Board of Aviation, Sweden
The Federal Air Office, Switzerland
The Royal Aero Club of Belgium
The British Air Charter Association
British Overseas Airways Corporation
British European Airways Corporation
British South American Airways Corporation
Mr. G. Goodhew

Appendix S.B.

Utilisation of 10,600 Effective Members of the Civil Air Guard at the Outbreak of War

1	Aircrew	7,030
2	Ground Duties	2,000
3	Other Employment	1,570
		<hr/>
		10,600

Appendix S.C.

Utilisation of Civil Trained Pilots by the Royal Navy

During the course of the last war the Royal Navy absorbed no less than 510 civilian trained pilots. To fit them for their naval duties these civilian pilots were given a conversion of about four weeks involving approximately 25 hours flying time. This represented a saving of 24 weeks and 160 hours in the training of each pilot. In terms of money, applied to 500 pilots, about £700,000.

Of the 500 or so Pilots, 92 became Squadron Commanders, 30 of them being decorated and 20 killed in action. 115 filled Staff Appointments including the Command of Naval Air Stations, 43 were employed on communications work, 33 as Flying Instructors, 17 as Test Pilots, 7 as Deck-landing Control Officers and 165 in normal second line duties, including one or two specialists in I.F. Instruction, Fighter Direction, Link Trainer and even one Helicopter Pilot. A further 55 were killed whilst carrying on these active duties.

In the view of the Royal Navy, this Civilian Reserve showed itself to be invaluable to rapid expansion in wartime, since it fulfilled the following functions :—

- (i) To permit initial rapid expansion of ancillary units
- (ii) To provide a permanent nucleus of experienced pilots in those units
- (iii) To assist both operational and non-operational morale
- (iv) To provide a proportion of operational pilots of fairly wide experience and stability at a time when rapid expansion threatened stability
- (v) To free regular service pilots for operational duties by taking over many of their staff positions in aviation

On the basis of the above, there can be no doubt as to the valuable contribution which was made by civilian trained personnel to the highly successful operations of the Fleet Air Arm.

Appendix S.D.

THE SOCIETY OF BRITISH AIRCRAFT CONSTRUCTORS LTD.

Light Aeroplanes and the British Aircraft Industry

Memorandum by the Society of British Aircraft Constructors

At the first meeting of the Committee appointed by the Minister of Civil Aviation to advise him on private flying, the President of the Society of British Aircraft Constructors said that several of the constituent companies in the British aircraft industry, including some of the larger ones, owed either their inception or their continuance at critical periods to the existence of a market for light aeroplanes. He said that the Society would prepare a paper setting forth in some detail the argument on which that statement was based. This present document is the result of a subsequent enquiry within the industry.

In the opinion of the Society the evidence is conclusive that the existence of a market for light aeroplanes, particularly in the supply of aircraft to flying clubs and to private owners trained at flying clubs, has been a big factor in encouragement of the British aircraft industry, with an influence extending far beyond the actual business done in light aircraft and aero engines. In the absence of that market such prominent companies as de Havilland, Miles and Percival could scarcely have begun operations, while even a company apparently so remote from the flying club movement as the Avro company of today at one time was deeply indebted to that movement and to the private owner for the business done in light aircraft which helped to sustain it through a difficult period of its existence.

The light aeroplane market is vital to the aircraft industry, for the following main reasons:—

1 It offers a wide field of practice and experience for young designers and technicians.

The continuing quality of British aircraft depends on a continuing flow of fresh and enthusiastic brain to the industry. Light aircraft design provides an admirable and unrivalled field for experience of the problems confronting the designer of every type of aircraft. It provides a stimulus whose importance would be acknowledged by many of the industry's leading designers and technicians of today. That stimulus draws its strength from the existence of a real demand for light aircraft, and the chance that the technical effort might meet it efficiently; in the absence of demand, the mental exercise could be merely academic and the result correspondingly sterile.

2 It provides an introduction to the aircraft industry for manufacturing concerns which could not at first embark on the design of larger aircraft.

(a) The *de Havilland* aircraft, engine and propeller companies and subsidiaries in England, and the group of *de Havilland* companies in the Dominions (including full-scale manufacturing establishments with design capacity) owe their existence largely to the British light aeroplane movement. It provided the company with one of its first opportunities for profitable business, did much to sustain the company through the slump years of 1930-32, and was one of the mainstays of the whole *de Havilland* enterprise up to the outbreak of war in 1939.

(b) *Miles Aircraft, Ltd.*, owe their existence to the manufacture of light aircraft. Some 75 per cent. of the types designed by the company have been in the "under 300 h.p." category; their original and succeeding designs were all light aircraft created to satisfy the flying club and the private flyer.

(c) *Percival Aircraft, Ltd.*, began in 1932 to produce aircraft to meet the requirements of flying clubs and private owners. The company concentrated on such types till the outbreak of war.

3 It provides manufacturers with a valuable home market which can be exploited to advantage in the export field, where it obliges the provision of servicing and maintenance facilities which in due time can be enlarged and improved for larger aircraft.

(a) When the *de Havilland* company was formed in 1920 its aims were not centred upon any particular branch of aviation, either military or civil; it was, however, the realisation of a practical and economical light aeroplane in 1925, and the official encouragement of the club movement in this country which then followed, that gave the company its first serious development and its first general market, both at home and overseas.

Within the next few years light aircraft were sold in all parts of the world and a world-wide selling and servicing organisation was developed which carried the *de Havilland* reputation into all markets and paved the way for export business in transport and other aircraft. There can be no doubt, for example, that the sale of trainer aircraft to foreign Air Forces was frequently the forerunner of orders for British combat aircraft.

A de Havilland company in Australia was inaugurated in 1927, and companies were formed in Canada in 1928, India in 1929, South Africa in 1930, Rhodesia in 1935 and New Zealand in 1939. Representatives and servicing facilities were established in foreign countries all over the world.

(b) The Cirrus engine (for many years now made by a branch of *Blackburn Aircraft, Ltd.*) was designed in 1925, and made possible the early *Moth*, which was taken into use in the flying clubs which soon formed all over the country.

With the creation of this home market, the company was enabled to build up a considerable export business. Up to 1934 it produced nearly 2,000 engines, a large proportion of which sold abroad.

4 *It has provided the stimulus for experiments in design and construction which subsequently have yielded valuable dividends in the design and construction of larger and more costly aircraft.*

(a) The light aeroplane movement gave the de Havilland company the technical organisation and experience that led to its successful development and marketing of transport aircraft, high-performance sporting aircraft and other types, which in turn rendered it capable in 1939 of creating military aircraft such as the *Mosquito*, the *Hornet* and the *Vampire*. The light aeroplane movement yielded the basic trainer for the war-time Commonwealth Air Training Plan.

The light aeroplane movement caused the company to take up the manufacture of aero engines in 1927. It provided the mainstay of a thriving engine business right up to the War, and yielded the trainer engine for the Commonwealth Air Training Plan. The technical organisation and experience thus built up rendered *de Havilland* capable of embarking upon the design of jet engines as early as 1941.

Out of nearly 5,000 aircraft manufactured by the company in England up to 1939 nearly 4,000 were light aeroplanes. Out of about 10,500 Gipsy engines manufactured in England up to 1939 some 9,000 were for light aeroplanes.

(b) Support derived from the light aeroplane market enabled *Percival Aircraft, Ltd.* to develop its first larger type of aircraft, the twin-engine Q.6, which was produced in 1937. On the outbreak of war experience already gained enabled it to produce the *Proctor* series which was used by the Royal Air Force and Fleet Air Arm at home and overseas.

At the end of the War, the company faced the task of developing new types of civil aircraft. The experience gained in production of light aircraft has been of considerable value, to the extent that the company was able to put the *Proctor V* into production and had begun deliveries as early as November, 1945. With production of the *Proctor V* in full swing the Design Department were free to concentrate on the development of new types, one of which is already in production, namely the *Prentice*, which has been accepted by the Royal Air Force as their standard basic trainer.

(c) The stressed-skin experiments conducted by *Short Brothers* in the early 1920s, involving design and construction of light landplanes and seaplanes, had a vital bearing on the design of the company's later flying-boats, notably the Empire boats and the *Sunderland* and its derivatives. The company state that the "C" Class (Empire) flying-boat was tackled with much greater confidence as a result of the experience gained with the *Scion Senior*, which in turn was evolved as a direct result of the success of the *Scion Junior*. It has been said that the *Scion Senior* was a half-scale of the "C" Class boats; it would be more correct to say that the "C" Class boats were a double scale of the *Scion Senior*.

(d) The *Widgeon* light aircraft, designed for the private owner, paved the way to monoplane development of *Westland* military aircraft.

When the fate of biplanes and monoplanes was in doubt, *Westland* designed and built a *Woodpigeon* biplane and *Widgeon* monoplane to the same requirements and approximately the same engine power, and proved that the monoplane was definitely superior to the biplane. Accordingly the monoplane was adopted as the basis of future *Westland* design in the civil and Service field, including the *Lysander*, *Whirlwind* and *Welkin*.

5 *It can be a useful standby in times of reduced demands for military and the larger civil aircraft.*

(a) During the general slump of 1930 to 1932 the *de Havilland* company was enabled to survive only because of the light aeroplane movement. The transport and military fields offered little business but the light aeroplane market, small and scattered as it was, brought sufficient trade from the world's numerous markets to enable the company to keep going. This experience drove home the lesson of economy to such effect that a new series of transport aircraft emerged from 1932 onward which set a new standard of economy in operating cost, resulting in a fresh wave of export business which has virtually continued to the present day, interrupted only in the physical sense during the war years. These light transports, and all the experience that has accumulated in their development, can be attributed directly to the light aeroplane movement.

(b) In the difficult period 1925 to 1935, *A. V. Roe and Co., Ltd.*, relied to a great extent on private flying business. From 1927 to 1935 (part inclusive) the company sold to private owners, flying clubs, schools and foreign Air Forces more than 800 light aircraft worth in the aggregate approximately £1,000,000.

6 *Conversely it establishes and maintains in existence companies with staff, plant and organisation of great strategic value as a measure of war potential, and this at no cost to the taxpayer.*

(a) *Auster Aircraft, Ltd.*, owes its existence solely to production of light aircraft for the civil market and for Civil Air Guard training. Had it not entered the business it could not have contributed to the war effort the output stated below :

From October, 1940—December, 1946, *Auster* repaired :—
368 *Hurricanes*
281 *Typhoons*
339 *Tiger Moths*

These, with new and repaired *Austers* for military purposes, totalled 3,412 aircraft up to December, 1946.

(b) The staff and organisation built up by *Miles Aircraft* to meet requirements of the light aircraft market fitted the company to make a large contribution to the war effort in the form of primary and advanced trainer aircraft, target-towing aircraft, and many kinds of armament and flying control devices.

(c) The production facilities created by *Percival Aircraft* to supply the light aircraft market were used to produce substantial numbers of *Mosquitoes* and *Oxfords* for the Royal Air Force.

(d) *Saunders-Roe, Ltd.*, sold light aircraft, including spares and repair work, worth more than £200,000 in the period 1929-34. This business kept the company going as a design and production unit capable of turning to production of *Walrus* amphibians during the War.

Several of these points are most clearly exemplified in the period following the 1914-18 war, which affords several close analogies with conditions prevailing today.

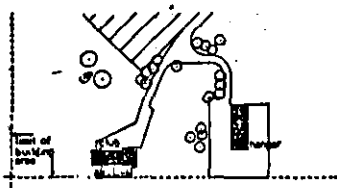
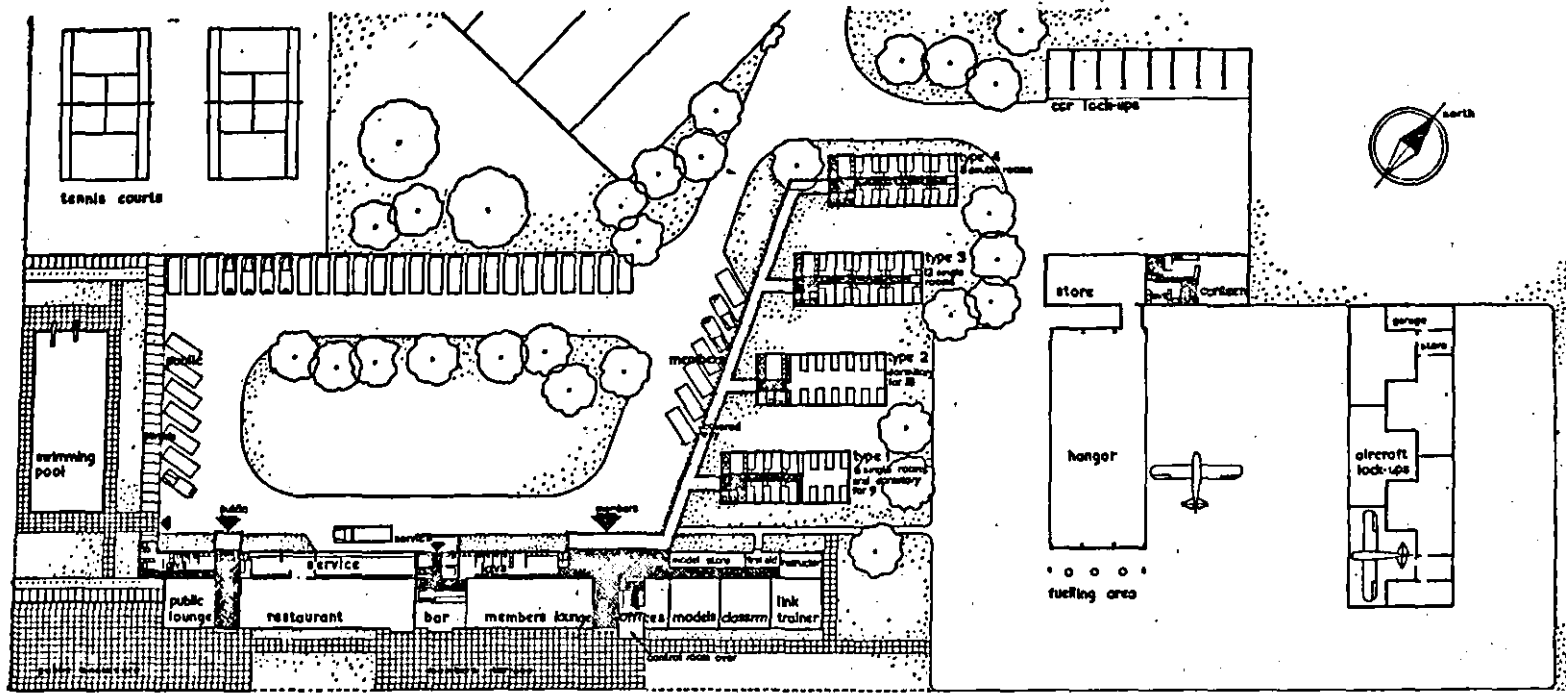
Just as after 1918 the mass importation of foreign light aircraft—had they existed—would have been a most serious blow to a nascent industry, so in 1947 the importation of numbers of American light aircraft would gravely and adversely affect the growth and development of the industry today. There is, indeed, no excuse for importing foreign light aeroplanes in 1947; the capacity available in the country for light aircraft manufacture is ample to meet all home needs and to leave a substantial margin for export trade.

The evidence of history suggests a further conclusion which the Society considers of importance to the Committee. Successful as were the results obtained by the one or two companies who struggled through the lean years and survived because of the relatively small demand for light aircraft, many other deserving projects either failed or were delayed through lack of financial strength and particularly of a financially stony market. It is more than possible that in more favourable conditions even such advanced technical achievements as the successful rotating-wing aeroplane might have been realised in the form of light aircraft.

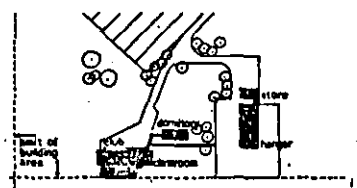
The Society does not suggest that the light aircraft industry should be artificially maintained by direct government assistance, for in this way the valuable spur of competitive design and manufacture is removed, but that the customers of the light aircraft manufacturers—particularly the flying clubs—should be given an opportunity, by a deliberate act of government policy, to establish themselves on a broader basis than ever before and thereby obtain a new degree of stability and strength.

In conclusion, the opinion of the Society is that the light aeroplane movement is a fundamental element of the industry of aviation. It is the cradle of the next generation of airmen and of aircraft designers and engineers. It affords a wide field of practice and experience for young technicians. It provides an introduction to the aircraft industry for manufacturers who could not at first embark on the design of larger aircraft.

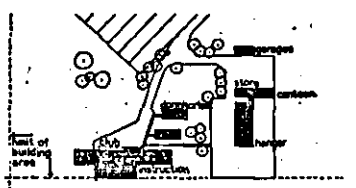
Further, it provides manufacturers with a home market which can be exploited to advantage in the export field. It stimulates experiments in design and construction of far-reaching importance, and is a useful standby and reservoir of war potential in times of reduced demand for combat and the larger civil aircraft. It constitutes in all its aspects a worthwhile contribution to the strength of the nation.



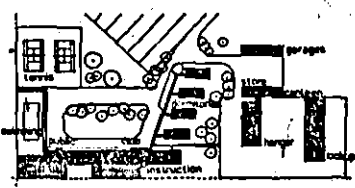
PLAN 1



PLAN 2



PLAN 3



PLAN 4

6/10/56

Appendix S.E.

Notes on Proposed Air Centre

To be read in conjunction with the drawings prepared by:

CHRISTOPHER NICHOLSON, M.A., F.R.I.B.A.,

and

HUGH CASSON, M.A., A.R.I.B.A.

110 Old Brompton Road, S.W.7.

9th July, 1947.

PLANNING

Each centre will have its own problems. Accommodation requirements will vary, as will site features such as shape, orientation and relation to roads, trees, etc. The accompanying drawings describe only one of many solutions, but the plan is capable of wide variation. Further, the structural system proposed makes possible the provision of a group of buildings which can be easily expanded as the Air Centre prospers, and which can at the same time remain self-contained at any intermediate stage. Four such consecutive stages are shown below a detailed plan of the fourth stage.

The buildings are based on a 10' 0" bay, with light standard trusses spanning 20' across the club rooms, dormitories and garages. Where a service section is required, as at the rear of the main club building, this is spanned by a half truss which continues the slope of the roof. The standard truss, which is also used to span the aircraft lock-ups, is capable of rearrangement to provide high level south light into the club rooms on sites where the main windows must face north.

SITING AND LAYOUT

In the particular problems considered here, the buildings are placed in the angle of two flightways where the best views of the airfield can be obtained both from the public enclosure and the control tower. All vehicles approach through one entrance from the main road and then separate to pass either along a service road to the lock-ups and hangars, or along the main drive.

BUILDINGS

1. HANGAR. A Bellman-type is suggested capable of accommodating three unfolded light aircraft with stores, canteen and lavatories as needed.
2. AIRCRAFT LOCK-UPS. To house five aircraft together with stores and garages for station vehicles.
3. GARAGES. Eight are shown on the plan but the number may be varied as required.
4. CLUBHOUSE.
 - (a) *Entrance.* Members park their cars alongside the covered way leading to the Entrance Hall and Dormitory Blocks. Telephone boxes and a shop are provided in the hall which leads direct to the airfield.
 - (b) *Administration.* This comprises Enquiry Office with a counter to the hall, General Office and Secretary's office facing the airfield. Above this is the Control Tower housing and Chief Instructor's room, with an inner balcony window looking down into the Enquiry Office.
 - (c) *Instruction Block.* This is a self-contained unit opening off the Entrance Hall and consists of a classroom and Link Trainer, a model making room and store, and an Instructor's room. There is also a First Aid Room with separate external door.
 - (d) *Club-rooms.* The Club Room, Bar and Restaurant can be thrown into one large area. There is direct access from the bar to both the restaurant and the members' terrace.
 - (e) *Restaurant.* The Restaurant is shared by the club members and the public and in this scheme seats 120 people.
 - (f) *Public.* Separate Lounge and Hall with Enquiry Desk, telephone and lavatories are provided. A public enclosure is sited in the angle of the flightways. Tennis courts, and a swimming pool with dressing cubicles are amenities which could be provided at a later date.
5. DORMITORIES. Dormitory blocks with lavatories, basins and showers may be provided for both sexes. The blocks can be planned either with double or single rooms, or as dormitories with a proportion of double-decker bunks if required.

It is emphasised that economy combined with extreme flexibility both as regards arrangement of the various units and the internal subdivisions of those units has been allowed largely to dictate the scheme. It is believed that the purposeful atmosphere of a building thus produced would harmonize naturally and successfully with the flying activities it is designed to serve.

Appendix S.F.

FIRST REPORT OF THE INFORMAL LIGHT AIRCRAFT COMMITTEE

CHAIRMAN'S NOTE

In presenting this "The First Report of the Informal Light Aircraft Committee"—through the Advisory Committee on Private Flying set up by the Minister of Civil Aviation in February, 1947—I wish primarily to thank all those Members of the Informal Committee who have given, unstintingly, so much of their time and energies to the work of the Committee.

On behalf of the Informal Committee I want to thank also all the many persons who have contributed to the discussions and to the work of the Committee. In addition the Informal Committee is especially grateful to those Departments, organisations and companies concerned with private flying whose members have gone to a great deal of trouble to place evidence before it and have provided valuable assistance to the Committee by reviewing on its behalf particular aspects of the many problems which have emerged.

All the Members of the Informal Committee were invited unofficially and by personal contact to serve on the Committee in a purely honorary capacity. Several of them have had to travel long distances to its meetings. Most of them have had a large number of other commitments, but they have all contributed materially to such results as we now set on paper in this first report.

A word of explanation is perhaps needed on the term "Informal" Committee. "Informal" in this sense has meant that, although formed with the blessing of the Ministry of Civil Aviation and numbering among its members several persons holding official positions both in the Ministry of Civil Aviation and the Ministry of Supply, the Informal Light Aircraft Committee is, in fact, a non-official body.

The membership of the Informal Committee has thus been set up, and remains, on a personal basis. The Members represent only themselves and their combined personal views; not necessarily the corporate views of any body or organisation with which they may be associated.

On this basis, as a Working Party engaged on a task for which all have a common interest and enthusiasm, the Informal Committee presents its first report.

PETER G. MASEFIELD (*Chairman*).

24th June 1947.

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SECTION I

Introduction

1 THE INFORMAL LIGHT AIRCRAFT COMMITTEE was set up under the aegis of the Ministry of Civil Aviation, with the co-operation of the Royal Aero Club, the Association of British Aero Clubs, and the British Gliding Association, in November, 1946, to explore requirements for a new generation of British light aeroplanes and gliders and to report on types likely to be needed for the home and export markets. The composition of the Committee is set out at Annex "A". It remains in session.

SECTION II

Recommendations

(A) AIRCRAFT

BASIC TYPE

2 The Informal Light Aircraft Committee (I.L.A.C.), having reviewed types of light aeroplanes and gliders likely to be required for use in the United Kingdom and for export, puts forward, as its primary recommendation, a specification for a basic type of two-seat all-metal trainer-tourer (I.L.A.C. Type I). Details of the requirements for this basic type are set out in Annexes "B," "C," and "D." Briefly, the specification calls for an enclosed, two-seat, single-engine aeroplane of all-metal construction with a fixed tricycle undercarriage, capable of cruising at 110 m.p.h., stalling at not more than 44 m.p.h. with full load, and taking off in a distance of 400 yards to a height of 50 feet, carrying a load of two persons and 60 lb. of baggage for an absolute duration of five hours. Side-by-side seating is called for with a preference for a "two-control" system. The specifications require non-spinning and exemplary stalling characteristics and a good all-round view, and lay down detailed safety and maintenance characteristics which must be met.

OBJECTIVE

3 The objective which the Informal Committee has had pre-eminently in mind, in drawing up the recommended specifications of requirements, has been the attainment in one machine (which would be versatile enough for wide use for both training and touring and capable of being built in large numbers), of the optimum compromise in pursuit of the ideals of maximum

Safety,
Simplicity,
Low Operating Cost,
Moderate Prime Cost, and
Long Life.

PROTOTYPES

4 The Informal Committee recommends that the specifications of requirements for the proposed basic Trainer-Tourer should form the subject of a design competition. It recommends that two prototypes should be constructed from each of the three best designs submitted which are backed by companies capable of large scale production and willing to produce in quantity at an acceptable price.

PRODUCTION

5 The Informal Committee recommends further, that, after the completion of the six prototypes, a production order should be placed officially for the design selected as being the most satisfactory. So that the price may be economic, the Informal Committee recommends that not less than one thousand aircraft of the selected design should be laid down, all to be delivered within two years of the first flight of the first production machine.

(B) GLIDERS

BASIC TYPE

6 The Informal Committee believes, with the British Gliding Association, that the most urgent need of British gliding is a general purpose two-seater of medium-high performance.

PROTOTYPES

7 The Informal Committee recommends, therefore, that two prototypes should be built to each of the three best designs chosen from the results of the competition for a two-seater, held recently by the British Gliding Association, thus utilising the large amount of work already done.

PRODUCTION

8 So that the price may be economic, the Informal Committee recommends that a bulk production order should be placed officially for not less than two hundred gliders to the design judged to be most satisfactory after the prototype trials.

(C) NECESSARY AID

A NATIONAL PLAN

9 The Informal Light Aircraft Committee feels bound to emphasise that, in its opinion, the aforementioned recommendations, for a basic Trainer-Tourer and a two-seater glider, can achieve their purpose of making possible widespread flying in the British Isles and of creating a healthy export market, only if a national scheme for financial assistance is instituted to establish light aeroplane flying and gliding in the United Kingdom on a broad scale. Such a national plan, to succeed, would have to reduce flying charges to the public to not more than £1 per flying hour. The I.L.A.C. is of the opinion that without such a scheme there can be no economic demand for the production of new types of light aircraft and, further, no satisfactory development of export sales.

FINANCIAL ASPECTS

10 (a) (*General*) The Informal Committee is of the opinion that, under present conditions, the only effective method of creating a new generation of British light aircraft is by means of a Government grant to pay for the building of prototypes and by means of an interest-free loan from the Government to cover and underwrite the quantity production of the types recommended. Such a loan should be recoverable against sales, leaving only the cost of prototypes outstanding.

(b) (*Prime Costs*) The Informal Committee considers that a target for the present day cost of a light aeroplane of the basic type recommended, produced in a quantity of not less than 1,000, should be approximately fifteen shillings per pound of loaded weight, or a total of about £1,000 per aircraft. This pre-supposes an engine of low cost, produced in quantity.

(c) (*Method of Procedure*) The Informal Committee considers, therefore, that recommendations essential to the completion of the proposed plan are:—

(i) The six prototypes of the three selected designs of the basic Trainer-Tourer should be paid for (preferably through the Royal Aero Club) from a national grant of £60,000 towards their overall cost. Similarly, the six prototypes of the three selected designs of two-seat glider should be paid for by a further grant of £24,000 towards their overall cost.

(ii) After prototype trials, the Government should make available the sum of £1,000,000 to finance the production order of 1,000 aircraft and a further £170,000 for the production of 200 gliders. This total sum of £1,170,000 would be used in the form of progress payments and/or underwriting of orders, so that work could be instituted without delays. The Informal Committee is confident that this expenditure would be recovered in its major part or its entirety from the sale of aircraft and gliders in the home and export markets. At the end of this period, production and sales would be expected to be continued. Thus, what would be, in effect, an interest-free loan of £1,170,000 spread over two years, would create a valuable light aircraft industry on a large and economic scale and, in addition, through bulk ordering of materials and components, would make possible prices much lower than could otherwise be attained.

(d) (*Recommended Expenditure*) The cost to the national exchequer of founding the equipment side of a national flying movement is, therefore, estimated by the Informal Committee at £84,000 for prototypes, as a contribution towards their overall cost, plus an interest-free loan of approximately £1,170,000 over two years to cover production.

SECTION III
Time Factors
(A) AIRCRAFT

WORKING SCHEDULE

11 (a) (*Probable Date*) There appears little possibility that any basically new type of light aeroplane, such as the type recommended, could be made available for general use in quantity before the summer of 1950.

(b) (*Programme of Work*) This period of three years is judged by the Informal Committee to be a reasonable estimate of the time necessary to cover the design, prototype trials and production of a new type under present conditions, based on the following schedule :—

- | | |
|---|-----------------------|
| (i) Design Competition authorised | September, 1947. |
| (ii) Design Tenders to be submitted | 15th January, 1948. |
| (iii) Selection of three best designs capable of being produced in quantity | 1st March, 1948. |
| (iv) Prototypes flying and under test | January to May, 1949. |
| (v) Best prototype selected, modifications agreed and production order given | June, 1949. |
| (vi) First production aeroplane flying | June, 1950. |

(B) GLIDERS

DATE ESTIMATE

12 The Informal Light Aircraft Committee is of the opinion that the same process could be followed with the gliders to bring forward production by May, 1949.

(C) INTERIM REQUIREMENTS

NECESSARY PROVISIONS

13 Such a schedule for the new types may appear slow. But the Informal Committee believes that any shorter estimate would be unrealistic. Thus, because the recommended types are unlikely to be available for several years, provision will have to be made for more intensive use of types of aeroplanes and gliders now in service and production.

SECTION IV

Operating Costs

(A) DESIGN FACTORS

MAJOR CONSIDERATIONS

14 The Informal Committee is convinced that an essential of any new type of British light aeroplane must be an inherent and substantial improvement in the cost of operation. The Committee has come to a realisation that the chief factor in reducing operating costs must be an improvement in maintenance characteristics over existing standards. Present day maintenance items account for about 30 per cent. of the total operating costs of existing aircraft. The Informal Committee believes that by careful design these costs can be materially lowered. Such factors have weighed heavily with the Informal Light Aircraft Committee in putting forward its recommendations for a robust and simple two-seat trainer-cum-tourer which aims to combine the lowest possible operating costs with the widest possible appeal at home and abroad.

PRESENT SITUATION

15 The pre-eminent need for such an aeroplane becomes evident from an examination of the situation of light aeroplane flying in the United Kingdom to-day. Clubs are charging between £3 10s. od. and £4 os. od. per flying hour and losing money on it. There are few private owners in the country who can afford to use their aircraft primarily for other than business purposes. The "man in the street" cannot afford to fly.

DIVISION OF COSTS

16 Detailed examination of costs to clubs and flying schools has revealed a fairly wide divergence. But excluding rent, it appears that they can be broadly divided as follows :—

- | | |
|---|--------------|
| (i) Maintenance (Labour and Materials) | 31 per cent. |
| (ii) Flying personnel (Instructors) | 22 per cent. |
| (iii) Fuel and Oil | 18 per cent. |
| (iv) Depreciation and Insurance | 16 per cent. |
| (v) Overheads | 13 per cent. |

A figure for rent of aerodromes, hangars, and buildings has not been included in these figures because of the very wide variation of these amounts which makes assessment difficult. The Informal Committee considers that such items should be standardised under a national scheme at a lower figure than prevails generally at present.

METHODS FOR IMPROVEMENT

17 Further analysis suggests that there are four ways in which flying costs can be reduced by a substantial margin in new designs :—

- (a) By attaining a higher standard of aircraft serviceability for fewer man hours expended on maintenance. That means design specifically for ease of maintenance and for long periods between overhauls.
- (b) By increasing the number of hours flown per aircraft per year, both by improving maintenance characteristics and hence cutting time wasted on the ground, and also by bringing into force improved operating techniques.
- (c) By increasing the number of aircraft per operating fleet without reducing aircraft utilisation; thus spreading overheads over a higher revenue-earning potential.
- (d) By attaining the desired aircraft performance through clean aerodynamic design rather than by use of excessive power.

All of which means, the more the flying the cheaper it can be, provided the aircraft in use are capable of being operated for low maintenance costs at high rates of utilisation.

CHARACTERISTICS REQUIRED

18 The only way of reducing maintenance costs and increasing utilisation is by designing an aeroplane with those specific purposes in view. The highest utilisation will be gained from an aeroplane which can be used equally well for training and for touring. The best maintenance records can be gained only from an aeroplane designed for robustness and ease of servicing. Design characteristics evolved from these considerations and planned to make possible increased use of aircraft at reduced cost are outlined for the basic I.L.A.C. Type I in the "Specification of Maintenance Requirements" set out at Annex "D". In this connection the Informal Committee wish to acknowledge the most valuable assistance rendered by the Technical and Pilotage Committees of the Association of British Aero Clubs.

(B) ESTIMATED FIGURES (GENERAL)

BASIC ANALYSES

19 The Informal Committee has made detailed analyses of the structure of operating costs for a wide variety of light aircraft under varying conditions of operation. The basis of these analyses and the results from them are set out in the tables and graphs shown at Annex "E". The Informal Committee emphasises that the estimated figures set out are representative as indicating only the order of the costs which are likely to be attained under efficient conditions. The Informal Committee recognises that the costs will vary in detail from club to club, according to the basic organisation, operational methods and uses to which aircraft are put. The estimated costs are therefore presented as shown to serve as a general guide and should not be taken as being precise or invariable.

Primary points which stand out, in addition to the maintenance aspects, are :—

- (i) A relatively wide variation in first cost has a relatively small influence on operating costs per hour over a five year life.
- (ii) The cheapest possible form of two-seater, judged on first cost, does not show up well in overall operating cost against a type which costs more initially but has designed into it improved maintenance characteristics, impossible in the cheapest type.
- (iii) Costs per hour decline substantially up to a utilisation of at least 750 hours per aircraft per year.
- (iv) Costs per hour decline substantially for an increase in the number of aircraft operated up to at least 10 per fleet.
- (v) The annual cost to a private owner of even the cheapest form of light aeroplane will, inevitably, place true private ownership beyond the means of any but a very few of those people who will wish to take up private flying in this country. The value of the light aeroplane for business journeys should, however, bring about an increase in this form of private ownership.

(C) ESTIMATED FIGURES (AIRCRAFT)

OPERATIONS BY SCHOOLS OR CLUBS

20 (a) (*Prime Costs*)—Examination of production costs has suggested that the cheapest form of light two-seater could be built for not less than about £800, whereas, built in quantity, the proposed I.L.A.C. Type I Basic Trainer-Tourer should not cost more than £1,000.

(b) (i) (*Hourly Costs*)—Study of the relative maintenance characteristics likely to be attained leads the Informal Committee to the opinion that, whereas a utilisation of more than 500 hours per year would be unlikely to be achieved with the cruder machine, a utilisation of 750 hours per aeroplane per year should be well within the capabilities of the proposed basic Trainer-Tourer.

(ii) Comparisons between the estimates for the cost per flying hour of an £800 two-seater and the proposed £1,000 "I.L.A.C. Type I" show that the "Type I", operated at 750

hours per aircraft per year in a fleet of six, should cost some £2 10s. od. per flying hour, compared with approximately £3 10s. od. per flying hour for a similar fleet of the cruder "£800 type", operated at what is judged to be the maximum utilisation of 500 hours per year. At 500 hours per year—the "I.L.A.C. Type I", would cost about £3 6s. od. per flying hour. Details of these estimates are given in Annexe "E".

(iii) These figures indicate that the more refined all-metal aeroplane is a better proposition than the cheapest possible two-seater, especially having regard to its superior safety qualities (Annexe "C") and its wider appeal.

(iv) The Informal Committee is of the opinion, therefore, that under ideal circumstances, without profit, an efficiently run school or club should be able to attain an operating cost of some £2 10s. od. per flying hour for a fleet of six aircraft totalling 4,500 flying hours per year when the recommended type becomes available. If only 3,000 flying hours were accumulated in the year then the cost would work out at about £3 6s. od. per flying hour.

(c) (*Likely Charges*)—Thus to remain in existence on a business basis, flying clubs would have to charge about £3 0s. od. per flying hour for 750 hours per aircraft per year, or £3 15s. od. per flying hour for 500 hours per aircraft per year.

(d) The Committee emphasises that this minimum figure of £3 0s. od. per flying hour is somewhat idealistic in that it implies :—

(i) Not less than six aircraft in a fleet.

(ii) 750 flying hours per aircraft per year (4,500 hours flying per year for each club).

(iii) All aircraft are of the recommended type, attaining low operating cost.

In such circumstances the charges in practice are likely to have to exceed £3 0s. od. per flying hour by a substantial margin. An economic charge in excess of £3 0s. od. per flying hour, even with the recommended type, is obviously a good deal more than the average man can afford. This again emphasises the need for a national scheme of financial aid if light aeroplane flying is to flourish.

PRIVATE OWNERS

21 (a) (*Estimates*)—The Informal Committee has made similar estimates for the cost of private ownership. The results are set out in detail in Annexe "E".

(b) (*Utilisation and Annual Costs*)—Few private owners, flying for non-business purposes, would achieve a utilisation of 200 hours per year. The average figure would be more nearly 100 hours per year. On these bases the estimated cost of flying to the private owner works out as follows for the recommended basic Trainer-Tourer.

Private Ownership	Utilisation of 100 Hours per Year			Utilisation of 200 Hours per Year		
	£	s.	d.	£	s.	d.
Cost per Hour	6	2	6	3	11	7
Overall Cost per Year ...	627	0	0	717	0	0

(c) (*Prospects*)—These figures show clearly that under present conditions private ownership must remain beyond the means of any but a very few. The Informal Committee can foresee little hope of expanding light aeroplane flying on a private owner basis unless some radically new technique should appear. Experience has shown that joint ownership of light aircraft by a number of individuals, although superficially attractive, has not worked satisfactorily in practice. The Committee nevertheless looks forward to an increasing use of private aircraft by business houses for their executives and is watching the activities of the Ultra-Light Aircraft Association with the greatest of interest.

COST CONCLUSIONS

22 The opinion of the Committee is therefore :—

(i) The proposed all-metal I.L.A.C. Trainer-Tourer, in which maintenance has been specially studied, is likely to prove substantially cheaper over a period of time than any other type of comparable light aeroplane.

(ii) Under present conditions (1947) efficiently run schools and clubs are likely to have to charge somewhat more than £3 0s. od. per flying hour for economic operation of the proposed I.L.A.C. Type I, without subsidy. This figure is higher than can be generally afforded and some form of financial assistance on a national scale is therefore essential.

(iii) There can be little future for the private owner who flies for pleasure only, because of the expense.

(iv) The most practical way to establish a flourishing light aircraft movement in the United Kingdom is through the development of efficient flying clubs combined with "Hire-and-Fly-Yourself" schemes, equipped with adequate numbers of aircraft.

(D) ESTIMATED FIGURES (GLIDERS)

HOURLY COST AND CHARGES

23 On the basis of evidence received, the Informal Committee is of the opinion that gliding clubs would be able to operate the proposed two-seat glider at a cost of about £1 15s. od. per hour without profit, at a rate of 400 hours per year for a fleet of six gliders.

The hourly charge to members would have to be about £2 os. od. In addition to the most generous Kemsley Plan some national scheme is clearly required to bring the charges economically within the reach of the "man in the street".

SECTION V Immediate Programme

Summary

DESIGN COMPETITION

24 Provided that some form of financial assistance is possible to support a National flying movement, the Informal Light Aircraft Committee recommends that design studies be sought for the recommended type of basic Trainer-Tourer from designers working in close association with manufacturers capable of large scale production of metal aircraft.

PROTOTYPES

25 The Informal Committee further recommends that two prototypes should be ordered by the Government, preferably through the Royal Aero Club, at a price of £10,000 each, from each of the three best designs submitted which are capable of being backed by large scale production. A similar course should be adopted to secure six prototypes of two-seat medium-high performance gliders at a price of £4,000 each.

PRODUCTION

26 The Informal Committee recommends that, after the completion of flying trials of the six prototypes, a production order should be placed officially for not less than 1,000 aircraft of the design judged to be most satisfactory, all to be delivered within two years of the first flight of the first production machine. A similar course should be adopted to secure production of not less than 200 two-seat gliders.

SECTION VI Future Programme

TYPES

27 The Informal Committee sets out in Annexe "F" an outline of a related range of types of light aeroplanes designed to cover the requirements of light aeroplane flying, from the ultra-light single-seater up to the eight-seat executive aeroplane. The Informal Light Aircraft Committee proposes to discuss these aircraft in more detail in coming months and, possibly, to put forward further specifications of requirements. The Informal Committee is, however, of the opinion that further types should be produced by private initiative under Government sponsorship, to meet the demands certain to grow from a national scheme of encouragement for private flying. Similar methods should be adopted for gliders.

RESEARCH AND DEVELOPMENT

28 In the meantime, the Informal Committee recommends that attention be given to research and development programmes in the light aeroplane field, with particular emphasis on establishing the possibilities of:

- (i) Simplified controls and flying characteristics
- (ii) Improved undercarriage characteristics for cross-wind landing
- (iii) Improved forms of construction and production
- (iv) Low-cost radio aids
- (v) Reduction of noise and vibration
- (vi) A "Roadable" aeroplane
- (vii) A cheap, easy-to-fly, helicopter
- (viii) Improved power plants

SECTION VII Conclusion

ACTION (Stage I)

29 The Informal Light Aircraft Committee therefore recommends the official expenditure of £84,000 to provide 12 prototypes, (six two-seat aeroplanes of three designs, and six two-seat gliders of three designs) the aeroplane to be built to the specifications of requirements attached at Annexes "B," "C" and "D", and the gliders to the winning designs from the British Gliding Association's two-seater competition.

ACTION (Stage II)

30 Provided that an encouraging number of orders are forthcoming at the prototype stage (and that will depend on an overall national scheme to encourage light aeroplane flying and gliding) the Informal Light Aircraft Committee recommends a production order for 1,000 of the basic light aeroplane at about £1,000 each and 200 gliders at about £850 each, delivery of the aeroplanes to begin not later than July 1950 and of the gliders not later than June 1949.

ANNEXE A

Informal Light Aircraft Committee
Composition and Objectives

1 Members of the Informal Light Aircraft Committee were invited to serve in an honorary capacity on the basis of their personal knowledge of an interest in various aspects of light aeroplane flying and of gliding in the United Kingdom; none of them being directly concerned in the light aeroplane industry.

2 The membership is :—

	<i>Current Pilot's Licence</i>
MR. PETER G. MASEFIELD, M.A., F.R.A.E.S. (<i>Chairman</i>)	A
MR. R. H. WALMSLEY, F.R.A.E.S. (<i>Vice-Chairman</i>)	B
W/CDR. BRIAN DAVEY (<i>Instructor</i>)	A, B, C, & S, 'C'
MRS. ANN C. DOUGLAS	A
MR. E. R. G. HEATH, M.A., M.B.E.	B
MR. THURSTAN JAMES	B
MR. MARCUS LANGLEY, F.R.A.E.S., A.M.I.MECH.E., A.M.INST.N.A.	A
W/CDR. C. J. MAHONY	A & B lapsed
MR. ARTHUR MARSHALL, M.A.	A
MR. G. H. M. MILES	A
MR. C. H. NAYLOR, B.SC.	A
COL. R. L. PRESTON, C.B.E. A.F.R.A.E.S.	A, B & C
MR. GUY ROBSON	B
MR. W. S. SHACKLETON	A
MR. S. SCOTT-HALL, M.SC., A.C.G.I., F.R.A.E.S.	A, B & C
MR. E. COLSTON SHEPHERD, B.A.	B
MR. MAURICE SMITH, A.F.C.	A
S/LDR. E. H. SPENCE	A
MR. WHITNEY STRAIGHT, C.B.E., M.C., D.F.C.	A
MR. H. A. TAYLOR	A
MR. WALTER TYE, B.SC., F.R.A.E.S.	A
MR. A. E. WOODWARD-NUTT, B.A., F.R.A.E.S.	A
MR. B. VAUGHAN WILLIAMS, M.SC.	A
MR. L. TIBBY (<i>Secretary</i>)	A

3 The work of the Informal Committee has been, and remains, focussed on the technical and economic requirements for new aircraft. There have been no formal terms of reference but an informal plan of action under which the Committee has been engaged in studying the broad requirements for light aeroplanes and gliders with particular reference to :—

- (a) Types of aircraft,
- (b) Performance and powers,
- (c) Prime costs,
- (d) Operating costs, and
- (e) Numbers likely to be required.

4 The Informal Committee has kept before it a basic requirement for providing means of getting the maximum number of persons into the air

Safely
Cheaply and
Simply.

5 During the first eight months of its work, in which 20 meetings have been held, the Committee has taken evidence from persons directly concerned with all aspects of the light aircraft movement and has inspected and flown many types of light aeroplane currently available. The Informal Committee wishes to thank all those who have assisted in its discussions.

The Committee remains in being.

ANNEXE B (Part I)
Reasons for the Basic Type
Recommendations

Five fundamental reasons lie behind the selection of the I.L.A.C. Type I as the type of aeroplane recommended for primary attention.

- (i) The shortage of any modern standard trainer ; hence the need for an aeroplane which will set standards of safety and ease of maintenance on which a new era of light aeroplane flying can be founded.
 - (ii) The desirability of standardising one type suitable for basic training, club use, " Hire-and-Fly-Yourself ", and for export, thereby spreading overhead costs over the largest number of aircraft.
 - (iii) The need for a type of aeroplane which, in standardised form, can lead, both in manufacture and training, to later types of higher capacity and performance.
 - (iv) The need for the cheapest possible aeroplane which will combine characteristics of low operating cost, wide appeal, safety and simplicity.
 - (v) The fact that engines of the appropriate power and cost are likely to be more readily available for such a two-seater than for any other class.
- 2 Emphasis has been placed in the specification on the following points :—
- (i) *Two seats side-by-side.* Two seats provide the cheapest type of wide appeal and hence are preferable to a single-seater or to a three- or four-seater for the basic type. Side-by-side seating is judged to be preferable for training and for touring.
 - (ii) *Two doors.* Ease of entry and exit are essential for popular appeal and in case of accident.
 - (iii) *Tricycle undercarriage.* The tricycle is chosen, despite its slight extra cost and weight :—
 - (a) Because of its immense advantages in simplifying landings and hence decreasing cost of instruction.
 - (b) Because of its improved safety characteristics as a result of better view and control for taxiing.
 - (c) Because of its superior properties in high winds on the ground.
 - (iv) *All metal.* A metal aeroplane is specified because of its superior maintenance properties, its wider export appeal, its better characteristics in minor accidents, and its excellent weathering. A simplified structure is required with the number of parts reduced to a minimum.
 - (v) *Folding Wings.* Folding wings are not recommended. The question has been discussed in much detail by the Informal Committee, which is of the opinion that the disadvantages of folding wings exceed their advantages on grounds of cost, weight, safety, maintenance and size of crate for export.
- 3 This specification for a conventional, but relatively complex, type of aeroplane must be judged in relation to the cheapest possible type which could be constructed in present day circumstances. The simplest possible open two-seat tandem type of aeroplane with tailwheel undercarriage, compared with the I.L.A.C. Type I, has less utility and export appeal, and will be inferior on maintenance. On the evidence the Informal Committee has had before it, the operating costs of the recommended type should be lower than that of any comparable aircraft of similar power.

ANNEXE B (Part II)

Specification of Requirements for a Basic Two-seat Trainer-Tourer

(I.L.A.C. Type I)

1 *Purpose*—A single-engine light aeroplane suitable for primary instruction and air touring at home and abroad.

2 *General Note on Specification*—(a) The basic principle observed in the preparation of this outline specification has been a desire to give designers the greatest possible freedom for expression of their own ideas. Only those points which are considered to comprise essential and fundamental requirements have been included.

(b) A really robust machine is of paramount importance. Long life of units must be aimed at in the design. Ease of maintenance with minimum cost should be a primary consideration. This aeroplane should show a substantial advance in four respects:—

- (i) Safety and simplicity of handling in the air and on the ground.
- (ii) Reduction of inspection, maintenance and overhaul costs.
- (iii) Ease of entry and exit and reasonable comfort.
- (iv) Adaptability for operation in extremes of climate.

(c) Any reasonable compromise in the specification as now set out will be considered if it has as its result the introduction of an appreciable improvement of robustness of construction, economy of servicing, safety or comfort.

(d) The selected aircraft will be required to undergo intensive trials between the prototype and production stages.

3 *Power-Plant*—Engine to be adequate to achieve the performance set out in paragraph 11. Starter and generator are required as standard fittings. The generator should normally be of 150 watts output but the drive must be capable of providing for at least 300 watts output. The aim should be 750 hours between overhauls. It is hoped that the engine required will not cost more than £150 for quantity production.

4 *Layout*—Two-seat enclosed side-by-side, two-door aeroplane with emphasis on good view. Particular attention should be paid to ease of entering and leaving the aircraft. This should be possible without treading on the seats.

5 *Controls*—(a) Full dual controls to be provided with the right controls easily removable. Preference will be given to a two-control system, eliminating the rudder-bar. If a two-control system is provided, provision should be made also for installation of a conventional three-control arrangement to special order.

(b) Hydraulic or pneumatic services for the operation of controls will not be accepted. Manually operated controls are to be provided.

6 *Flying Characteristics*—A non-spinnable aeroplane with exemplary stalling characteristics is required. However, the designer should bear in mind that a spinnable version with three controls might be required to special order.

7 *Accommodation*—(a) *Seats*—Width of cabin at elbow level to be not less than 50 inches. Alternatively, a narrower cabin would be accepted if a convenient and practical method of staggered seating can be arranged without jeopardising the dual control arrangement. Particular attention to be given to adequate headroom, seat dimensions, and angles as set out in F.P.R.C. 682, with a view to avoiding fatigue.

(b) *Baggage Space*—Reasonable stowage space for up to 80 lb. of baggage within C.G. limits with full tanks and full load. Stowage space should be available for a lightweight V.H.F. two-way radio for which a weight of 30 lb. should be allowed in the tare weight figures.

(c) *Towing*—Provision to be made for a towing attachment at the rear of the fuselage for use as a light glider-tug.

(d) *Noise*—The noise level in the cabin should be such that conversation should be possible without raising the voice and cabin should be free from drumming or other objectionable noise.

(e) *Shipping*—Wings should be quickly detachable at the sides of the fuselage. Aeroplane should be easy to dismantle for shipping.

(f) *Cabin*—The cabin must be weatherproof, draughtproof, well-ventilated and free from vibration. Consideration will be given to designs in which provision is made for an occasional third seat in substitution for baggage capacity, but it is not desired to sacrifice the prime requirements of the two-seater for the less urgent demands of the three-seater

8 *Visibility*—A good all round view while taxiing, taking off, flying horizontally, and circling an airport, is considered a prime requirement. With this object the seats should be as far forward as possible in relation to the leading edge of the wing, and the cockpit enclosure should be of reasonable height. Preference is expressed for a screen of vertical or slightly sloping form, without double curvature, and particular attention should be given to good anti-mist qualities. There must be provision for an opening clear-view panel for use in bad weather which may take the form of conveniently placed opening side-windows. An uninterrupted view is required forwards, sideways and backwards, horizontally, throughout the whole upper hemisphere and also below the horizontal circumferential plane at an angle of not less than ten degrees from the forward horizontal centre-line on each side when the aeroplane is on an even keel. These minimum requirements of visibility should not be restricted in any way on the inside of a turn when, for example, the aeroplane is circling an aerodrome.

9 *Instruments*—Provision to be made for a full blind flying panel to be fitted on special order. (Full blind flying panel will be required in prototype aircraft.)

10 *Undercarriage*—Fixed, faired, tricycle undercarriage, with steerable nosewheel. Emphasis should be placed on nosewheel of adequate diameter, with complete absence of shimmy. A guard or deflector to be provided to prevent damage to the airscrew through mud, stones, etc., thrown up by nosewheel. The track of the undercarriage to be not less than 25 per cent. of the span.

Two-wheel brakes to be fitted. Heel operated brakes are not acceptable. No hydraulic or pneumatic services should be installed.

The compression struts are to be of the simplest form. Oleo-pneumatic systems calling for expensive and elaborate ground equipment are not acceptable.

Treaded tyres are required.

11 *Performance*—The following requirements under standard conditions must be met :—

(a) *Stalling Speed* Not more than 44 m.p.h. with full load, engine off.

(b) *Take-off* Height of 25 feet to be gained in not more than 300 yards from rest on grass in a 5 m.p.h. wind at sea level. A height of 50 feet to be gained in not more than 400 yards in the same conditions. Minimum initial rate of climb with full load not to be less than 600 feet per minute at sea level, with a gradient climb of $3\frac{1}{2}$ per cent.

(c) *Landing run* To be within the above take-off figures. Aeroplane required to come to rest over the same heights within the same distances using brakes.

(d) *Cruising Speed* Not less than 110 m.p.h. true air speed at 1,000 feet under no more than 70 per cent. power.

(e) *Duration* Tanks to be provided for not less than 5 hours duration at the above cruising speed and power, including take-off and climb to 1,000 feet. This duration to be attained with a payload of not less than 420 lb. (two persons at 180 lb. each, plus a total of 60 lb. of baggage). Stowage must be provided within C.G. limits with full or empty tanks without recourse to the carriage of ballast.

12 *Servicing*—The aim must be to provide an aircraft in which :—

(a) A far longer life of components is obtained than heretofore.

(b) Servicing schedules need fewer operations, absorbing a smaller number of man-hours per schedule. These operations, as far as possible, to be of a simple nature so that a higher proportion of semi-skilled labour can be employed.

(c) Schedules to be completed at less frequent intervals.

(d) The design is to be such that few special tools and little special equipment is needed. The aim should be for standard tools and ground equipment to be used as far as possible.

(See Annex "D" attached and the Initial Report of the Technical Committee of the Association of British Aero Clubs).

13 *Safety Provisions and "Crashworthiness"*—(See Annex "C" attached).

14 *Construction*—Preferably all metal, including covering. (A fabric-covered metal frame would be considered.)

15 *Price*—The opinion of the Committee is that a price of not more than £1,000 should be possible (exclusive of radio and blind flying instruments but otherwise in full flying condition with dual controls) based on a quantity of 1,000 standard aircraft. Every endeavour must be made to meet this price.

16 *General*—Emphasis should be placed on :—

(a) Good view, and viceless flying characteristics (including non-spin).

(b) Robust construction and ease of maintenance.

(c) "Crashworthiness".

(d) Clean aerodynamic design.

ANNEXE C

Specification of Safety Provisions and "Crashworthiness" Requirements

The following safety provisions are required by the Informal Committee to be built into the recommended I.L.A.C. Type I :—

- 1 *Overturning*—Crash-proof hoops, or adequate strengthening arrangements forming part of the cockpit enclosure to be provided to prevent telescoping of the cabin structure in the event of overturning. Provision to be made for easy escape from the aeroplane if overturned on the ground.
- 2 *Straps*—Belts and easily adjustable shoulder-straps to be provided in both seats. These belts and straps to be stressed to not less than the same factors as the rest of the main structure, and, in any event, not less than 25 g. This should apply equally to the structure and anchorage of the seats and to baggage compartment bulkheads, which must provide adequate securing for baggage.
- 3 *Parachutes*—Provision to be made for built-in-parachute seats and for the easy jettisoning of the doors on each side of the cabin by the pulling of suitably safeguarded levers.
- 4 *Controls*—Control wheel, if fitted, to be curved to give support to chest in the event of a crash. Any form of projecting knob in the centre of the control wheel must be avoided. In the event of a crash the control wheel must not be able to pin the occupants in their seats. (The wheels should not come back when the body goes forward. Provided this can be achieved, a push-pull control linkage through the dashboard, with wheels, is preferable to sticks). Wheels made from cast alloy or other brittle material are to be avoided.
- 5 *Instrument Panel*—Upper edge of instrument board to be well padded. Instrument board itself to be free of projecting knobs which would cause damage to the face in the event of a crash. Preference given to shock-absorbing balsa-wood covering to the panel with the instruments countersunk.
- 6 *Tanks*—Flexible bag-type tanks preferred.
- 7 *Low Wing Versus High Wing*—Although the designer may make his own choice between either high or low wing, their respective merits, from the point of view of safety, should be considered. An advantage of the low wing is that it provides better view when circling a crowded airport, and the solid structure below the occupants provides for better energy absorption in a crash landing. There is, perhaps, less risk of the occupants' feet and lower limbs being crushed in these conditions. The high wing is probably better in overturning than a low wing.
- 8 *Tractor versus Pusher Engine*—The designer may make his own choice, but "crashworthiness" should be borne in mind. American analyses of light aircraft accidents show a preponderance of accidents in which the aeroplane stalls into the ground. The tractor structure can always be made lighter than the pusher structure to prevent telescoping in such an accident. Adequate strength must be provided in the longerons between the cabin and the engine mounting. These longerons should be designed locally to take the weights in front of and behind them under 25 g conditions.

ANNEXE D

Specification of Maintenance Requirements

INSPECTION

1 Inspection facilities must be specially studied. Fabric rip patches should not be used. All main attachment fittings should be easily accessible. Inspection must be possible by removal of inspection doors or panels, which, when in place, should be held rigidly so as not to distort or shake loose.

UPHOLSTERY

2 Cabin upholstery should not be attached to the main members of the fuselage. Upholstery over any main member or main attachment joint should be attached to a light subsidiary structure which can be removed from the main structure in panels. When any repair or inspection is necessary to the main fuselage it should be possible to do this without damaging the upholstery.

SEAT ATTACHMENTS

3 Special attention should be paid to the attachment of seats. The development of quick-release attachments for seats is desirable. Such attachment should have positive locking.

DRAINAGE AND VENTING

4 Drainage and venting of all components should receive scientific consideration. (The days when accepted practice was to bore a few holes in a haphazard fashion have now passed.)

ANTI-CORROSION PROTECTION

5 The protection of all members and surfaces, particularly those in the interior of main planes, the rear end of fuselages, and behind cabin upholstery, should show a very considerable improvement on pre-war standards.

WING EDGES

6 Robust trailing and leading edges are required. (On a pre-war light aeroplane much repair cost was occasioned through defects of this sort. In addition a loss of performance ensued.)

BEARINGS

7 In order to reduce maintenance costs, an increase is required over previously accepted sizes of bearing areas in all joints and hinges in control systems, engine bearers, undercarriage and tail wheels, etc. Joints and control systems on which there is frequent movement should be provided with ball races. The main fulcrum points in the undercarriage should be bushed.

ENGINE INSTALLATION

8 The engine installation should be easily accessible. The cowling must be robust and its attachments must be positive and easy to remove and replace.

JACKING

9. Positive jacking points must be provided.

REPAIR SCHEMES

10 Repair schemes must be planned at the same time as each component is designed, and a complete set of repair schemes must be produced for consideration with the prototypes. Speed and simplicity of repairs is of paramount importance.

SERVICING SCHEDULES

11 Servicing schedules, with approximation of man-hours involved by the various classes of labour, should be planned before the aeroplane is constructed to ensure that the design of detail is such as will result in economical servicing. Such schedules must be supplied and demonstrated with the prototypes.

SPARES

12 Plans must be set up for fabrication of spares to ensure immediate delivery of an adequate range of spares at reasonable prices.

ANNEXE E
Introduction
(SECTION A)

1 *Requirements*—Fundamentals in consideration of any new type of aeroplane are :—

(a) Its First Cost.

(b) Its Overall Running Costs—per flying hour and per year.

2 *Estimates*—An analysis of over-all flying costs has been made for a series of broadly similar light aeroplanes costing, hypothetically, between £800 and £1,500 and operated under conditions prevailing generally in 1947 in the United Kingdom.

The basic estimates are set out in Part II (Tables I and II).

The results from the tabulated estimates are illustrated graphically in Part III.

3 *Conclusion*—The conclusion reached is that operating costs per flying hour are of more importance, within broad limits, than is the first cost of the aeroplane, considered over its service life. Equally, money spent in design for ease of maintenance and ease of flying is of more importance than a saving of initial cost in producing a crude aeroplane as cheaply as possible. Nevertheless the Committee has not lost sight of the fact that the initial price is an important item, influencing sales.

4 *Summary*—Results from a breakdown of costs may be summarised under two heads, as set out below :—

(SECTION B) Estimated Costs for Private Owners.

(SECTION C) Estimated Costs for Club Operations.

These estimates should be taken as a broad indication of the order of costs likely to be achieved under favourable circumstances, rather than as exact and rigid figures.

(SECTION B)

SUMMARISED COSTS FOR PRIVATE OWNERS

5 *Estimates for I.L.A.C. Type I, Privately Owned*

(a) *Assumed First Cost* £1,000

(b) *Annual Fixed Costs* (for five years service life, privately owned) :

(i) Depreciation (10 per cent. residual value after five years)	£180
(ii) Insurance	£100
(iii) C of A Overhauls	£122
(iv) C of A Fees	£5
(v) Landing Fees (Two Landing Cards)	£10
(vi) Hangarage... ..	£70
(vii) Sundries	£50
Annual Fixed Costs—TOTAL	£537 per year
(Not varying with number of hours flown)	

(c) *Hourly Flying Costs, varying directly with hours flown :—*

(i) Fuel and Oil	s. d.
(ii) Inspection of aircraft and engine	7 0
(iii) Maintenance	5 0
(iv) Spares	3 0
(v) Telephone (Met, Landings, etc.)... ..	2 6
TOTAL Hourly Costs	18 0
(Varying directly with hours flown)	

(d) *Total Cost per year (Privately owned)*

Adding the annual fixed costs and the hourly flying costs for varying numbers of hours of flying per year, the following results are arrived at :—

For 100 hours flying per year ...	Annual cost £527 to private owner.
For 200 hours flying per year ...	Annual cost £717 to private owner.
For 300 hours flying per year ...	Annual cost £807 to private owner.
For 500 hours flying per year ...	Annual cost £957 to private owner.

(e) *Total Cost per hour (Privately owned)*

Resolved into the over-all flying costs per hour the results are :—

For 100 hours flying per year	...	Hourly costs	£6 2s. 6d. to private owner.
For 200 hours flying per year	...	Hourly costs	£3 11s. 7d. to private owner.
For 300 hours flying per year	...	Hourly costs	£2 13s. 4d. to private owner.
For 500 hours flying per year	...	Hourly costs	£1 19s. 6d. to private owner.

6 *Financial Aspects (Private Owner)*—Thus the lowest cost of private ownership is likely to be more than £600 per year. There can be no doubt that all the above figures are beyond the means of the average man of to-day if he wishes to use his aeroplane for pleasure flying only.

7 *Joint Ownership*

(a) There are two ways of spreading the operating costs to reduce their impact on individual pockets. The first of these is through a pool of private owners, some half-dozen part-owners banding together to share one aeroplane. The second is through the flying club or Air Centre (dealt with in Part II, Table I).

(b) Six persons combining to own one aeroplane and flying 50 hours per year each, making a total of 300 hours per year for the aeroplane, would each have to pay some £134 10s. od. towards the total annual cost of £807 for operating the hypothetical £1,000 aeroplane. These figures work out at £2 13s. 4d. per hour per person.

(c) Unfortunately experience in the United States, where such pooling of private ownership has been tried on a wide scale, has shown that the system does not work well in practice, and is likely to cost considerably more than the idealised figure. For non-business flying the most satisfactory solution is undoubtedly the flying club.

SECTION C

SUMMARISED COSTS FOR CLUB OPERATIONS

8. *Comparative Figures*

Estimates have been made for the comparative costs of operating an efficiently run fleet of three club aircraft costing respectively £800 and £1,000 each. The breakdown of costs on which these estimates have been founded are set out in Table I.

9 *Tabulation (Based on a five year service life)*

The comparative figures for cost per flying hour may be summarised as follows :—

Utilisation per Aircraft per year	Cost per Flying hour					
	Cheapest possible two-seater (wood and fabric)			Proposed I.L.A.C. Type I Basic Trainer-Tourer (all metal)		
	Fleet of :—			Fleet of :—		
	3 Aircraft	6 Aircraft	10 Aircraft	3 Aircraft	6 Aircraft	10 Aircraft
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
200 hours	6 16 0	5 8 2	4 16 7	7 2 5	5 13 10	5 0 2
500 hours	3 15 9	3 0 10	2 16 0	3 18 7	3 3 0	2 17 2
750 hours	2 15 2	2 6 0	2 2 5	2 16 7	2 7 2	2 3 5
1,000 hours	2 10 8	1 18 7	1 16 0	2 11 7	1 19 10	1 19 0

10 *Provisos*—The foregoing tabulated figures are considered to be representative of the order of possible results from use of the I.L.A.C. Type I aeroplane, efficiently operated. The figures are inclusive except for the following, which tend to cancel out one another :—

- The figures do not include aerodrome rents and charges, which vary so widely that no reasonable estimate can be given at this time.
- The estimated figures as set out do not take into account the calculated reduction in maintenance costs which should be attained with the I.L.A.C. Type I.
- The hangarage charges quoted are based on the lowest rates in force with the Aerodrome Owners Association at the present time. Under a national scheme such charges should be reduced to a minimum.
- A service life of five years with a 10 per cent. residual value has been taken for both the types compared.

11 Maintenance (I.L.A.C. Type I)

Design for a reduction in costs of maintenance and inspection has been stressed in I.L.A.C. Type I. When the estimated effect of the improved maintenance and inspection characteristics of the all-metal I.L.A.C. Type I are taken into consideration (which has not been done in the figures quoted above (Paragraph 9)) the over-all operating costs of the I.L.A.C. Type I should be reduced by between four and five shillings per hour.

12 Service Life

The Informal Committee considers that the all-metal I.L.A.C. Type I should have a service life of seven years, although the present standard figure of five years has been taken in preparing the tabulated estimates; and the breakdown of cost. A seven year life would reduce the hourly costs of the I.L.A.C. Type I aeroplane by the following amounts:—

Annual Utilisation	200 hours	500 hours	750 hours	1,000 hours
Reduction in cost per hour ...	s. d. 5 0	s. d. 2 0	s. d. 1 4	s. d. 1 0

13 Final Analysis

Thus, if the I.L.A.C. Type I aeroplane is assumed to:—

- (a) cost £1,000,
- (b) be operated for 750 hours per year in a fleet of six aircraft,
- (c) have a service life of seven years,
- (d) attain the calculated improvements in maintenance cost over existing standards,
- (e) make a contribution to the aerodrome charges,

then the cost per flying hour should work out at about £2 10s. od., without any profit under the somewhat idealised conditions specified. This figure should not be taken as precise or invariable because it will naturally alter with individual circumstances and efficiencies. Moreover 4,500 hours of flying per club per year is a high figure depending, among other things, on good weather. Nevertheless, subject to these provisions, the cost of £2 10s. od. per flying hour may be taken as representing the order of costs which might be achieved with the I.L.A.C. Type I, without profit, in ideal conditions. Its fluctuation according to variations in hours flown, number of aircraft operated, and first cost of aircraft, is shown in the curves in Part III. The Informal Committee considers that in practice a charge of somewhat more than £3 os. od. per flying hour would have to be made by efficient flying clubs. Even in the idealised conditions, at 500 hours per year the likely charges would be more than £3 15s. od. per hour.

ANNEXE E (Part II)

Table I.—Flying Club Operating Costs

The figures below are based on a utilisation of three machines

	TOTAL FOR THREE AIRCRAFT £800 value aircraft						TOTAL FOR THREE AIRCRAFT £1,000 value aircraft					
	200 hours		500 hours		1,000 hours		200 hours		500 hours		1,000 hours	
	£	s. d.	£	s. d.	£	s. d.	£	s. d.	£	s. d.	£	s. d.
Depreciation (The figure given is the average over 5 years allowing 10 per cent. of purchase price as its residual value after 5 years use)	432	0 0	432	0 0	432	0 0	540	0 0	540	0 0	540	0 0
Insurance (Taken as 10 per cent. of purchase price. No allowance made for 1st part of any claim)	240	0 0	240	0 0	240	0 0	300	0 0	300	0 0	300	0 0
Licensing (C of A Fees)	15	0 0	15	0 0	15	0 0	15	0 0	15	0 0	15	0 0
Hangarage (Taken at £80 per aircraft per annum)	240	0 0	240	0 0	240	0 0	240	0 0	240	0 0	240	0 0
45 Club premises (Rent and rates)	175	0 0	175	0 0	175	0 0	175	0 0	175	0 0	175	0 0
Repairs to buildings, roads, etc.	20	0 0	20	0 0	20	0 0	20	0 0	20	0 0	20	0 0
Office furniture and equipment (Depreciation)	25	0 0	25	0 0	25	0 0	25	0 0	25	0 0	25	0 0
Office heat and light	40	0 0	40	0 0	40	0 0	40	0 0	40	0 0	40	0 0
Office Insurances (Fire and fidelity, etc.)	10	0 0	10	0 0	10	0 0	10	0 0	10	0 0	10	0 0
Office telephones and postage	60	0 0	75	0 0	90	0 0	60	0 0	75	0 0	90	0 0
Office stationery	60	0 0	75	0 0	90	0 0	60	0 0	75	0 0	90	0 0
Advertising (weekly "smalls" in "Aeroplane" and "Flight")	100	0 0	100	0 0	100	0 0	100	0 0	100	0 0	100	0 0
Fire fighting equipment	25	0 0	25	0 0	25	0 0	25	0 0	25	0 0	25	0 0
Sundries (Local transport and various)	100	0 0	125	0 0	150	0 0	100	0 0	125	0 0	150	0 0
Chief Instructor/Secretary	900	0 0	900	0 0	900	0 0	900	0 0	900	0 0	900	0 0
1st Assistant Instructor	—		700	0 0	700	0 0	—		700	0 0	700	0 0
2nd Assistant Instructor	—		—		650	0 0	—		—		650	0 0
Insurance (Instructors' Personal Accident £2,000 cover)	65	0 0	130	0 0	195	0 0	65	0 0	130	0 0	195	0 0
Timekeeper/Storekeeper	300	0 0	300	0 0	300	0 0	300	0 0	300	0 0	300	0 0
A.B.A.C. Subscription	20	0 0	20	0 0	20	0 0	20	0 0	20	0 0	20	0 0
Senior Licensed Engineer	500	0 0	500	0 0	500	0 0	500	0 0	500	0 0	500	0 0
Junior Licensed Engineer	—		400	0 0	400	0 0	—		400	0 0	400	0 0
Unlicensed Mechanic/Cleaner	156	0 0	—		156	0 0	156	0 0	—		156	0 0

ANNEXE E (Part II)—continued

Table I—(contd.)—Flying Club Operating Costs

The figures below are based on a utilisation of three machines

	TOTAL FOR THREE AIRCRAFT £800 aircraft			TOTAL FOR THREE AIRCRAFT £1,000 aircraft		
	200 hours	500 hours	1,000 hours	200 hours	500 hours	1,000 hours
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Insurance (National Health for Ground Staff)	62 0 0	62 0 0	183 0 0	62 0 0	62 0 0	183 0 0
Workmen's Compensation (Pilots)	23 0 0	40 0 0	56 0 0	23 0 0	40 0 0	56 0 0
Workmen's Compensation (Ground Staff)... ..	4 0 0	6 0 0	7 0 0	4 0 0	6 0 0	7 0 0
Aircraft Spares (General)	60 0 0	75 0 0	105 0 0	60 0 0	75 0 0	105 0 0
Aircraft Spares and Materials (for C of A)	150 0 0	175 0 0	200 0 0	150 0 0	175 0 0	200 0 0
Cleaning materials	20 0 0	35 0 0	45 0 0	20 0 0	35 0 0	45 0 0
46 Operating costs for 3 aircraft (excluding Petrol and Oil and engine overhaul cost)... ..	3,802 0 0	4,940 0 0	6,069 0 0	3,970 0 0	5,108 0 0	6,237 0 0
Operating costs for ONE aircraft (excluding Petrol, Oil and engine overhaul costs)	1,267 6 4	1,646 13 4	2,023 0 0	1,323 6 4	1,702 13 4	2,079 0 0
Cost per hour per aircraft (excluding above)	6 6 9	3 5 9	2 0 5	6 12 5	3 8 7	2 1 7
Add Cost of Petrol and Oil at 7s. per hour	7 0	7 0	7 0	7 0	7 0	7 0
Add cost of engine complete overhaul per hour (£75 per 500 hours)	3 0	3 0	3 0	3 0	3 0	3 0
TOTAL cost per flying hour, NO PROFIT	6 16 0	3 15 9	2 10 5	7 2 5	3 18 7	2 11 7

Table II.—Operating Costs for a Privately Owned Aeroplane

	Value of Aircraft :—			
	£800		£1,000 (I.L.A.C. Type I)	
	200 hours per annum	500 hours per annum	200 hours per annum	500 hours per annum
Depreciation	£ 144 0 0	£ 144 0 0	£ 180 0 0	£ 180 0 0
Insurance of Aircraft	80 0 0	80 0 0	100 0 0	100 0 0
Hangarage—(AOA rates)	70 0 0	70 0 0	70 0 0	70 0 0
C of A overhauls (estimated average over 5 years)	130 0 0	130 0 0	122 0 0	122 0 0
C of A fees	5 0 0	5 0 0	5 0 0	5 0 0
Landing fees (Landing Card)	10 0 0	10 0 0	10 0 0	10 0 0
Sundries	50 0 0	50 0 0	50 0 0	50 0 0
TOTAL FIXED COSTS/YEAR (ex- cluding Petrol, Oil, and ser- vicing)	489 0 0	489 0 0	537 0 0	537 0 0
Cost per hour	2 9 0	19 6	2 13 7	1 1 6
Add :—				
Fuel and Oil	7 0	7 0	7 0	7 0
Inspection of aircraft and engine	5 0	5 0	5 0	5 0
Maintenance	3 9	3 9	3 0	3 0
Spares	2 6	2 6	2 6	2 6
Telephone (Met, Landings, etc.)	0 6	0 6	0 6	0 6
TOTAL COST PER HOUR	3 7 9	1 18 3	3 11 7	1 19 6

General Comments on the foregoing Breakdown of Costs

- Spares*—The item "Aircraft spares" is, although possible, rather too low. With a little bad luck such as having to replace a propeller one has spent the full year's allowance for this item. There are other similar major components. Also the cost of bearing the first part of any insurance damage.
- Incidentals*—Only the main basic items have been listed—there are always numerous incidentals costing the average club the odd £100 or so, which have not been provided for, and in the case of a private owner there can be included such headings as expensive transport to and from aerodromes, carnets, maps, etc.
- Ground Staff*—With increased competition for ground staff labour wages are likely to increase.
- Office Work*—The club costs set out in Table I do not allow enough for such items as office and aircraft cleaning, etc., and assume that the Instructor and Ground Engineer will look after most of this. In practice other arrangements will have to be made, thereby increasing costs slightly. The figure quoted also provides, optimistically, for the Instructor and Ground Engineer doing all the secretarial and typing work. This would not be practical for a national movement on a comparatively large scale.
- Instructors*—The Chief Instructor's salary has been put at £900 p.a., because it is important that the clubs should have first-class instructors, coupled with the fact that the Civil Aviation Act states that wages of Charter Companies, etc., are to be comparable with the terms and conditions of the Air Line Corporations. The comparison for the clubs will be the terms and conditions in the civil operated R.A.F.V.R. flying schools.
- Direct and Indirect Costs*—The only direct charge items are the petrol and oil, and engine overhaul, and these have been added on to the bottom of the schedule. Most of the other expenses are incurred irrespective of flying hours.
- General*—Thus, in general, the costs as set out may be somewhat low. Clubs operated with reasonable efficiency in pre-war days found their flying costs worked out at between £3 and £4 per hour for about 500 hours per aircraft per year. To achieve the same figures to-day would entail tremendous efforts towards improved aircraft, higher utilisation, and efficient techniques.

ANNEXE E (Part III)

Graphical Analyses of Estimated Operating Costs
of I.L.A.C. Type I Aircraft

INTRODUCTION

1 Detailed calculations based on the operating costs set out in the foregoing Parts I and II of Annexe "E" have been made for a hypothetical series of light aircraft taking into account the following range of variables:—

- (a) Aircraft first cost between £800 and £1,500.
- (b) Annual utilisation between 200 and 1,000 hours.
- (c) Number of aircraft operated in one unit between 3 and 20.

These variables have been analysed in relation to both club use and the private owner.

2 *Method*—The information has been analysed, and all expenses of a similar nature grouped together, and fitted into simple formulae. These formulae are listed below as hourly cost for club or private owner operation. The assumption has been made that instructors are available for the first 500 hours utilisation of each club aircraft and not for any additional flying which is based on "Hire-and-Fly-Yourself" schemes.

3 *Results*—The results are expressed graphically as over-all hourly costs per aircraft for:—

- Fig. 1 A club operating six aircraft of varying first cost.
- Fig. 2 A club operating a varying number of aircraft costing £1,000 each.
- Fig. 3 A club operating ten aircraft of varying first cost.
- Fig. 4 A club operating a varying number of aircraft of varying first cost at 750 hours per year, each.
- Fig. 5 A club operating at 750 hours per year (cross plot of 4).
- Fig. 6 A club operating ten aircraft (cross plot of 4).
- Fig. 7 A private owner operating one aircraft of varying cost and utilisation (cost per hour).
- Fig. 8 A private owner operating one aircraft of varying cost and utilisation (cost per year).

4 *Conclusions*

(a) Utilisation is of primary importance and to obtain cheap flying it is essential to obtain as many flying hours per year as possible. (Figs. 1 and 3.)

(b) Next in order of importance in club operation is the number of aircraft operated. For small numbers over-all costs are high. There appears to be little saving however for clubs operating more than 10 to 15 aircraft. (Figs. 2 and 5.)

(c) Aircraft first cost has only a small effect on over-all operating cost at utilisations of more than 500 hours per year per aircraft. For smaller utilisation first cost becomes increasingly important. (Figs. 4 and 6.)

5 Over-all hourly operating costs of a privately owned aeroplane are less, at the same utilisation, than for a club operated machine. (Figs. 1, 3 and 7.) This is mainly through absence of instructional costs and through reduced overheads. It is, however, more difficult for the private owner to achieve a high utilisation, and a figure of 200 hours per year is likely to be a maximum.

6 Figure 8 suggests that the minimum annual expense to the private owner will be in the neighbourhood of £600 for the type of aeroplane considered.

7

FORMULAE

Operating costs of I.L.A.C. Type I Aircraft

	£ per hour/aircraft		
	Club	Private Owner	
Depreciation	0.18 c/u	0.18 c/u	
Insurance	0.10 c/u	0.10 c/u	
Interest on capital invested	—	—	
General aircraft spares	0.11	0.125	
Engine overhaul	0.15	0.15	
Fuel cost	0.35 to 0.45	0.35 to 0.45	
Flying personnel	$750/un + 0.62$	—	
C of A	5/u	5/u	
C of A overhaul	55/u	122/u	
Hangarage	} Overheads =	70/u	
Landing fees		$\frac{380/u + 167}{8}$	10/u
Telephones		}	0.025
50 hour inspection			0.25
Sundries			50/u
Non-flying personnel	$920/un + 0.22$	—	

WHERE c is the aircraft first cost complete (£),
u is the yearly utilisation per aircraft (hours),

n is the number of aircraft.

These formulae, when summed, for club use become :—

	Less than 500 hours utilisation	More than 500 hours utilisation
Cost less than £1,000 ...	$1.45 + 0.28 \text{ c/u} + 227/\text{u} + 2,050/\text{un}$	$0.83 + 0.28 \text{ c/u} + 537/\text{u} + 2,050/\text{un}$
Cost greater than £1,000 ...	$1.43 + 0.28 \text{ c/u} + 216/\text{u} + 2,050/\text{un}$	$0.81 + 0.28 \text{ c/u} + 526/\text{u} + 2,050/\text{un}$

For the private owner these become :—

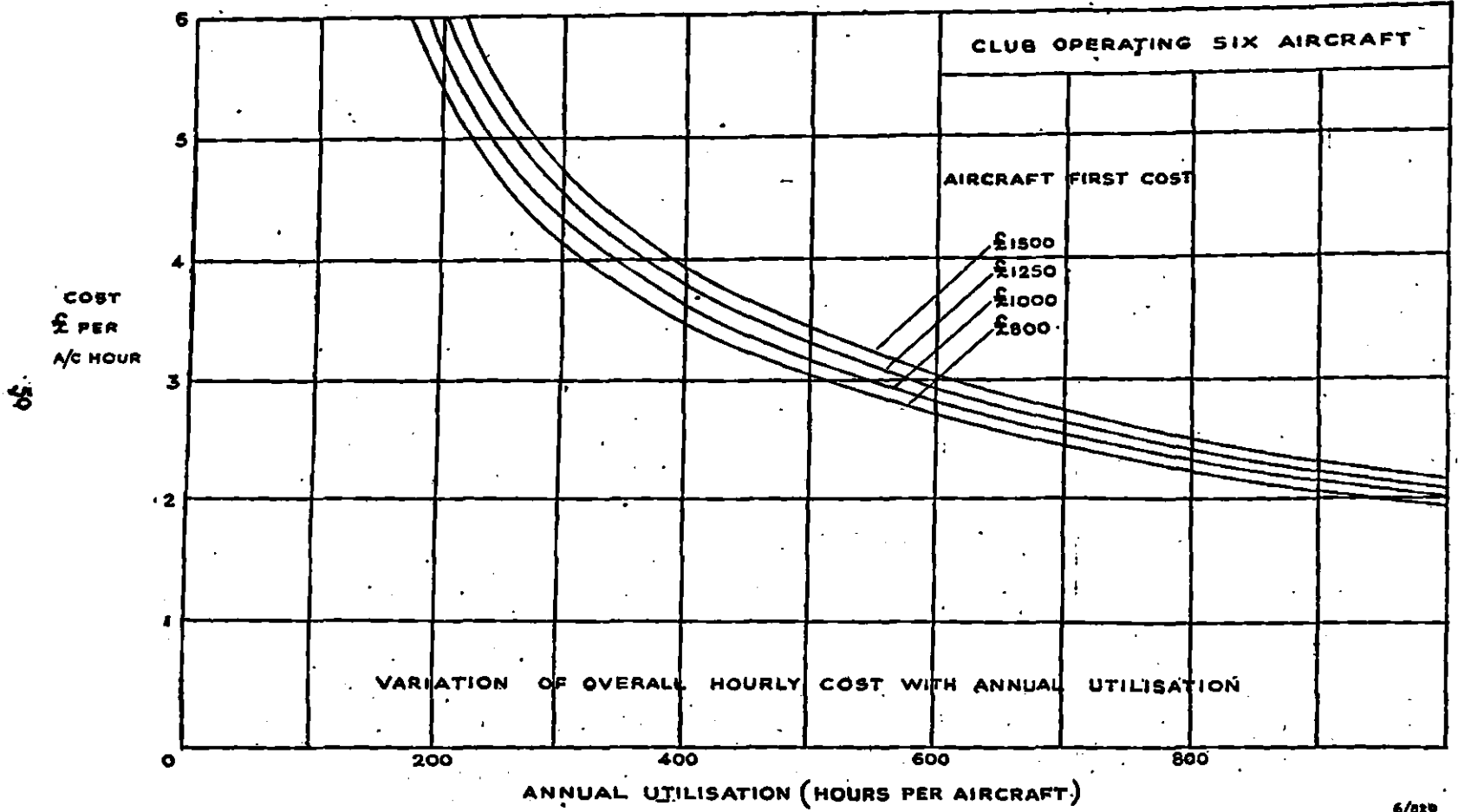
$$\text{Cost} = 0.28 \text{ c/u} + 257/\text{u} + 0.9 \text{ £/hr.}$$

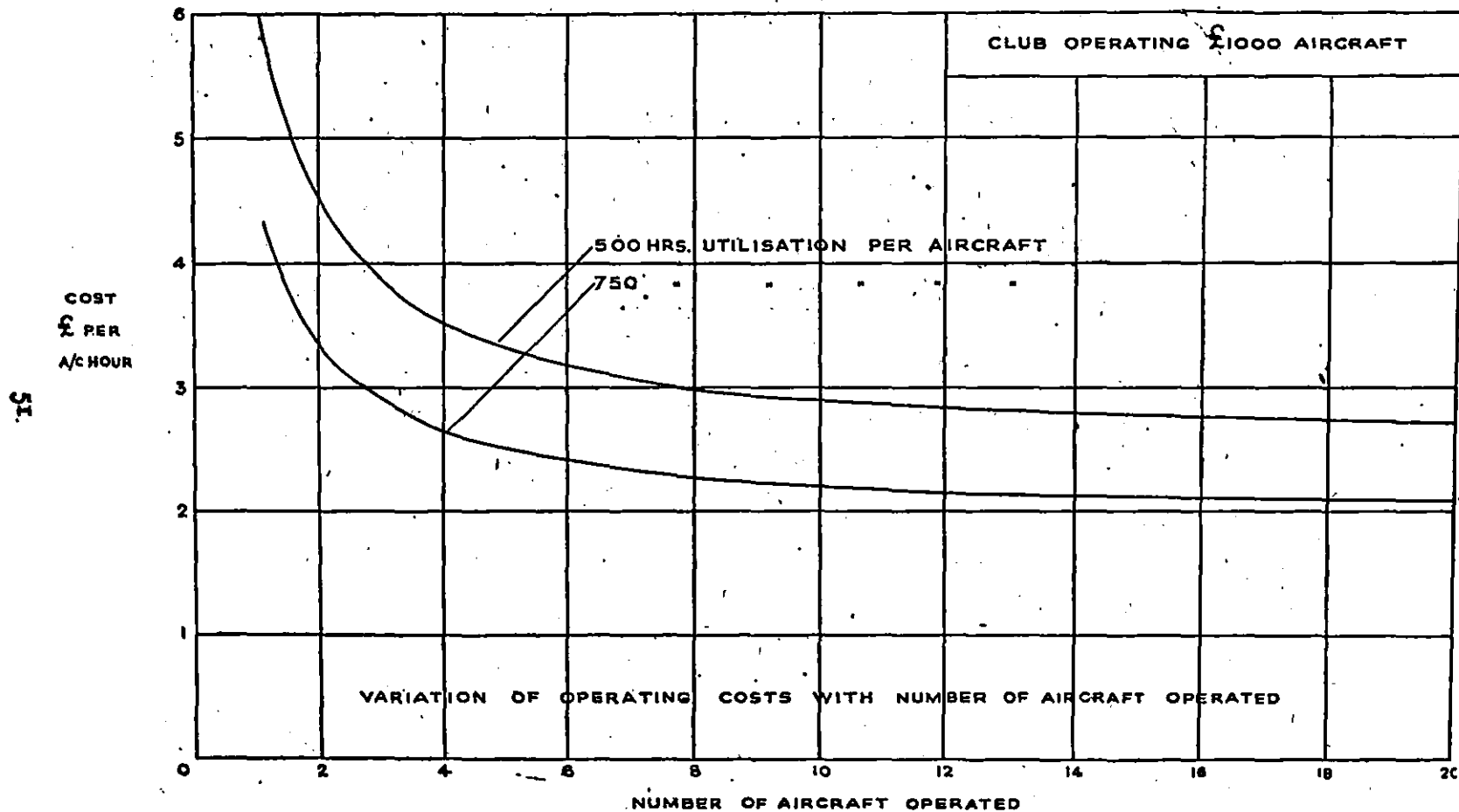
Operating Costs of a Club operating 6 Aircraft of £1,000 each

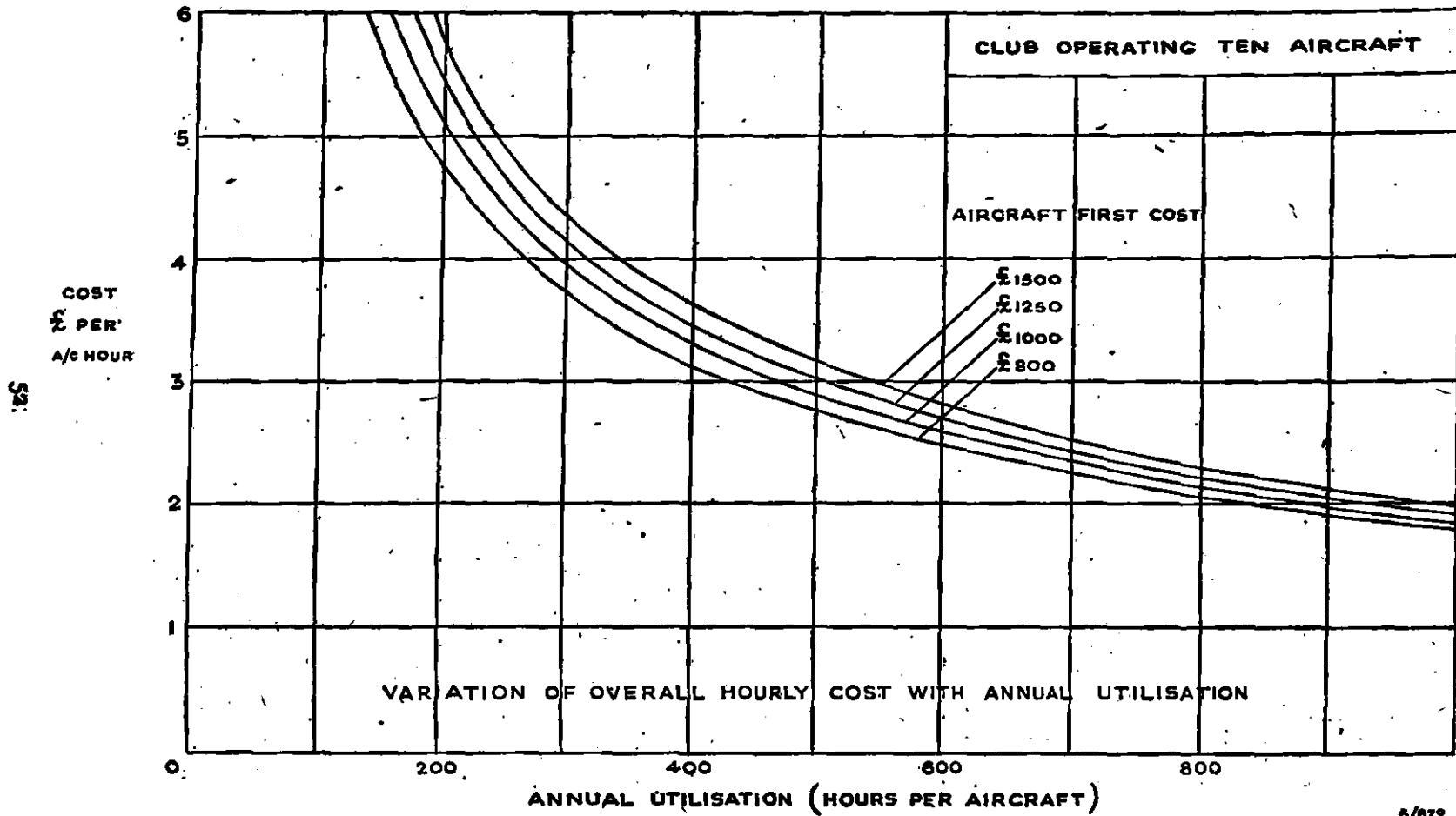
Item	200 hrs. utilisation		500 hrs. utilisation		750 hrs. utilisation		1,000 hrs. utilisation	
	Cost £/a/c hr.	Per cent. of total cost	Cost £/a/c hr.	Per cent. of total cost	Cost £/a/c hr.	Per cent. of total cost	Cost £/a/c hr.	Per cent. of total cost
Spares	0.11		0.11		0.11		0.11	
Engine Overhaul ...	0.15		0.15		0.15		0.15	
Non-Flying Personnel	0.99		0.53		0.42		0.37	
C of A Overhaul ...	0.28		0.11		0.07		0.06	
Total of "Maintenance" Items ...	1.53	26.8	0.90	28.5	0.75	31.6	0.69	34.5
C of A	0.03		0.01		0.01		0.01	
Flying Personnel ...	1.25		0.87		0.58		0.44	
Fuel Cost	0.35		0.35		0.35		0.35	
Total of "Flying" Items	1.63	28.6	1.23	39.1	0.94	39.7	0.80	40.0
Depreciation ...	0.90		0.36		0.24		0.18	
Insurance	0.50		0.20		0.13		0.10	
Total of items dependent on initial cost	1.40	24.5	0.56	17.8	0.37	15.6	0.28	14.0
Overheads	1.15	20.1	0.46	14.6	0.31	13.1	0.23	11.5
Total Cost £/a/c/hr. ...	5.71	100.0	3.15	100.0	2.37	100.0	2.00	100.0

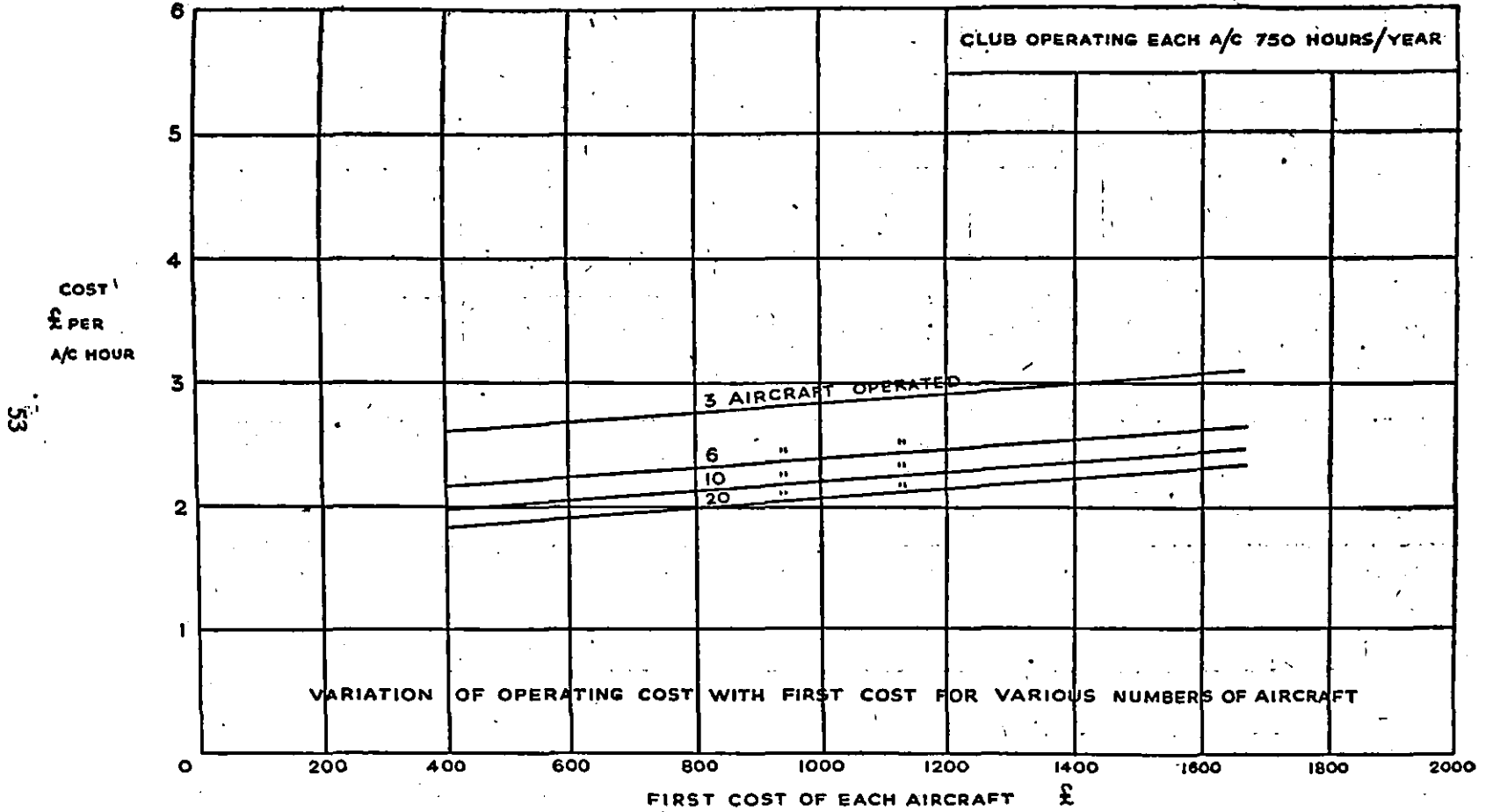
8 The hourly cost for the £1,000 aircraft of Fig. 1 has been split into its components. The various items are given in the foregoing table, and are plotted in Fig. 9.

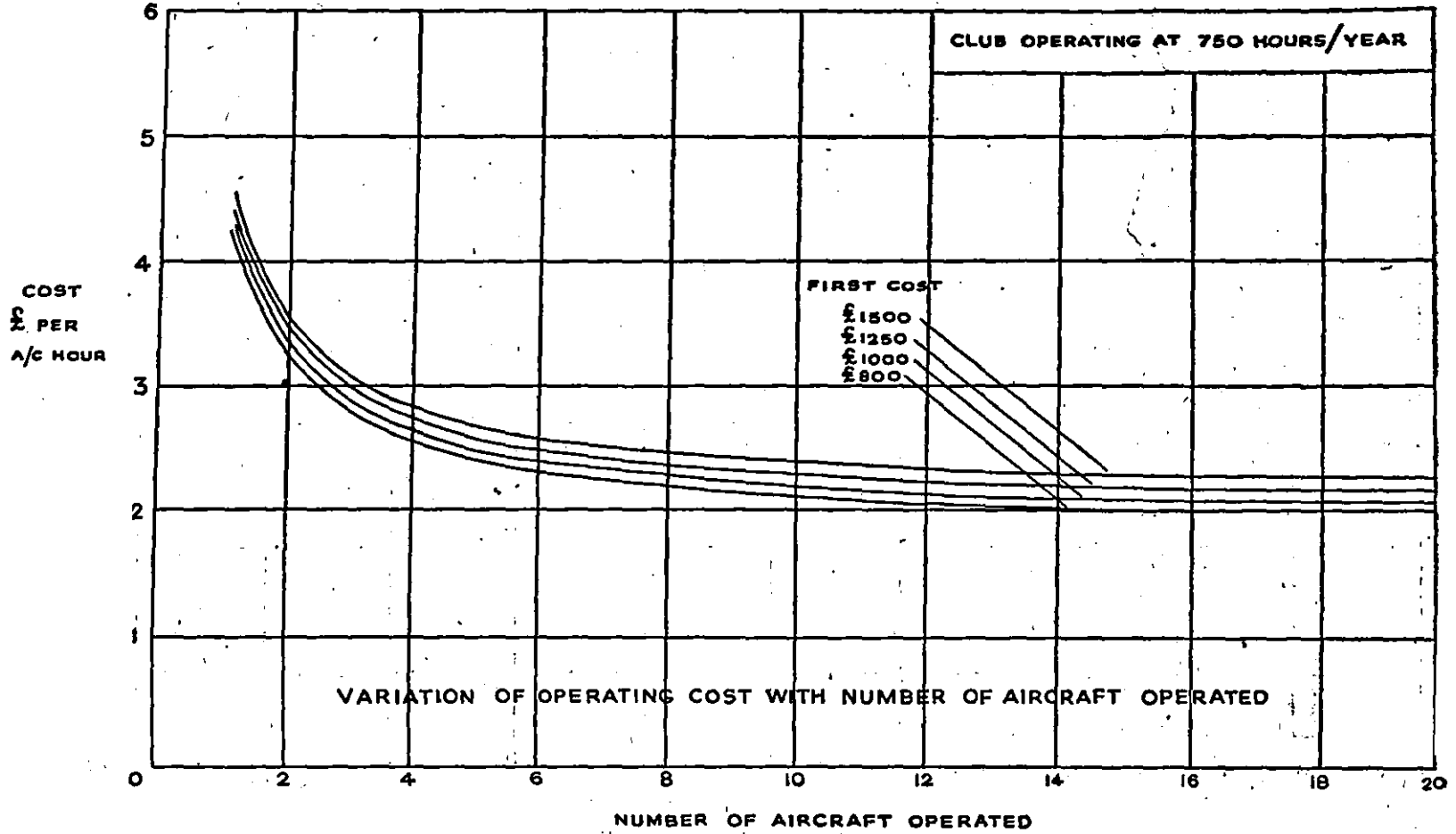
Labour costs are found to constitute the major portion of the maintenance costs, which are of the order of one third to one quarter of the total hourly costs, so that design for easy maintenance can have appreciable effect on the hourly operating costs.



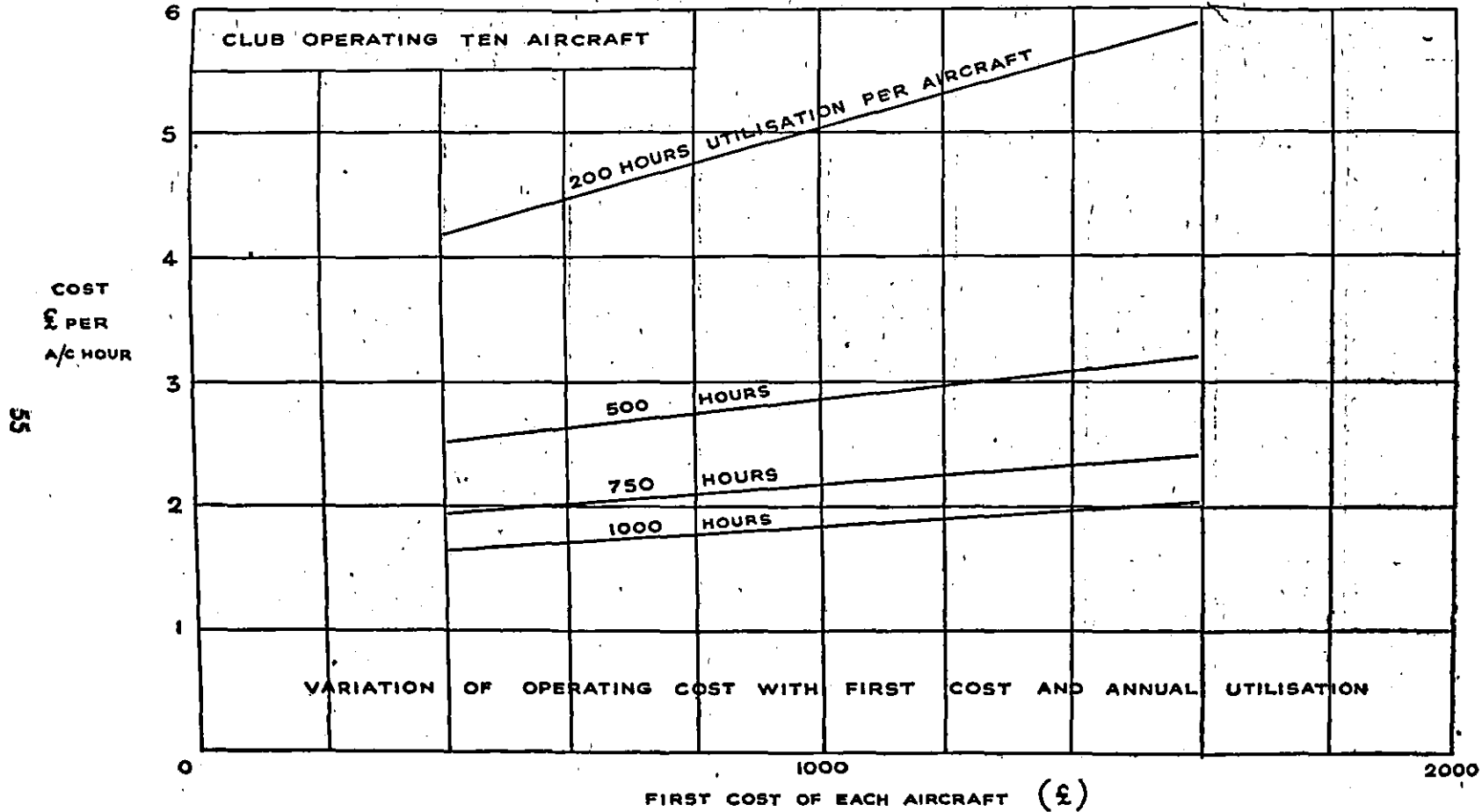


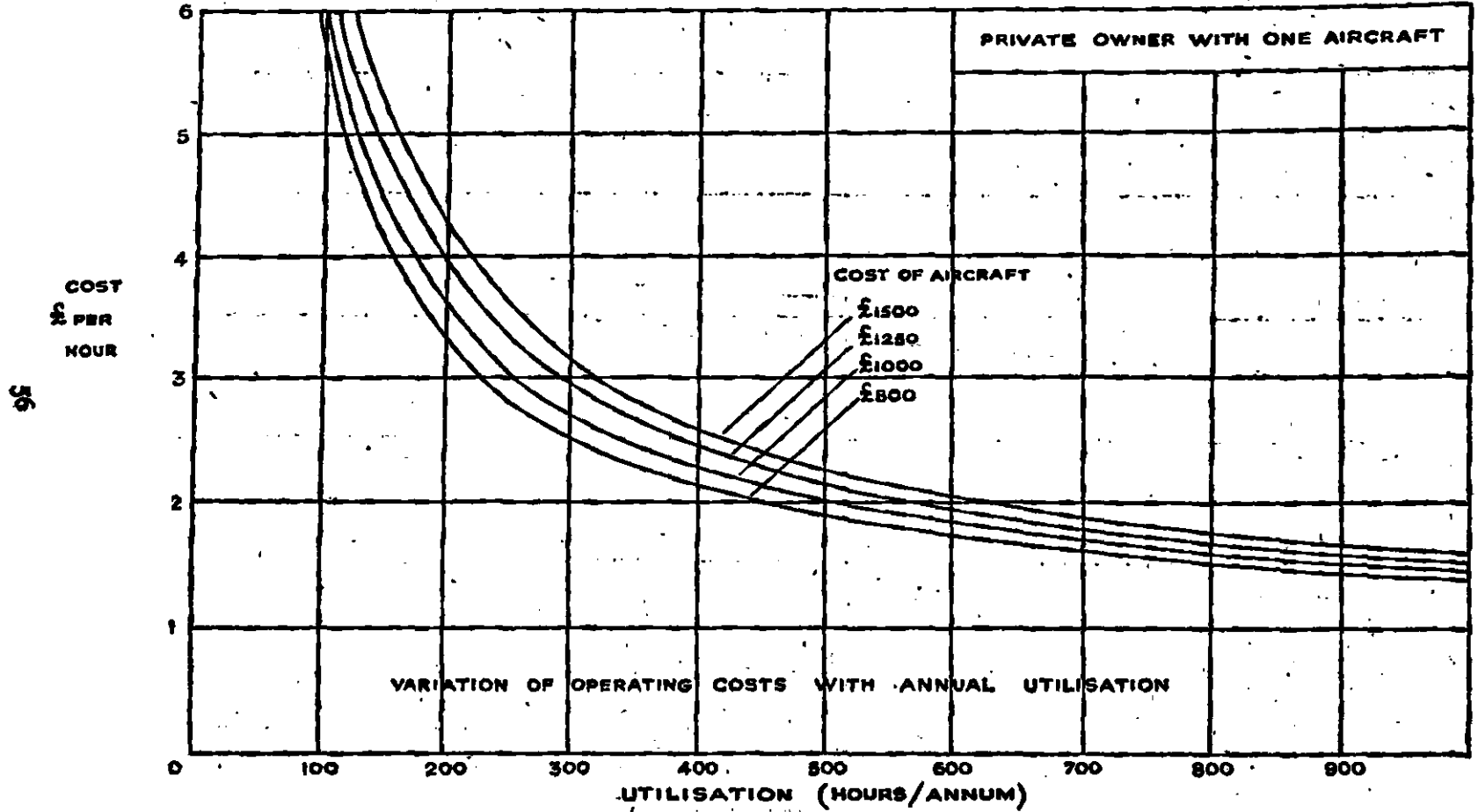




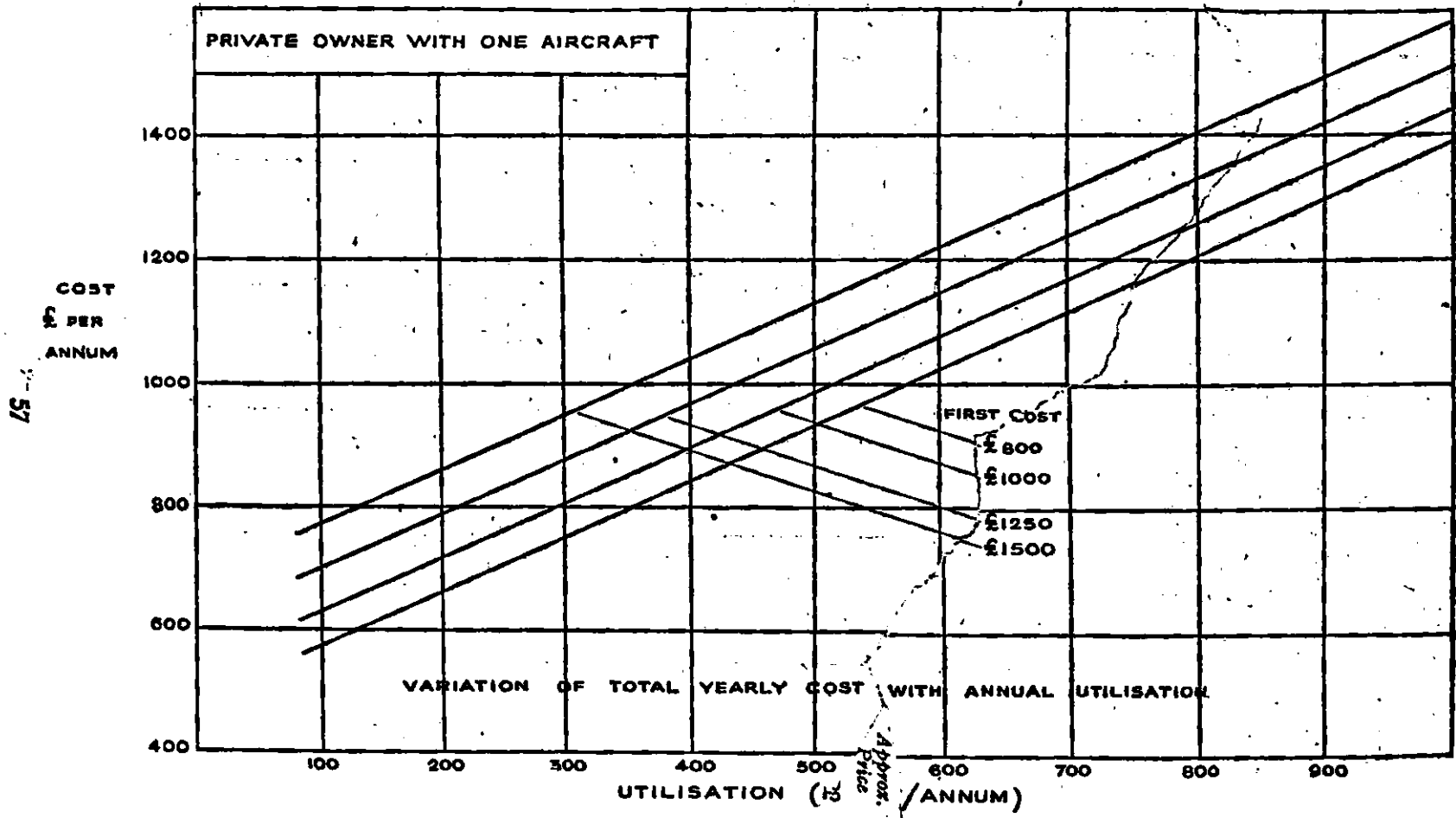


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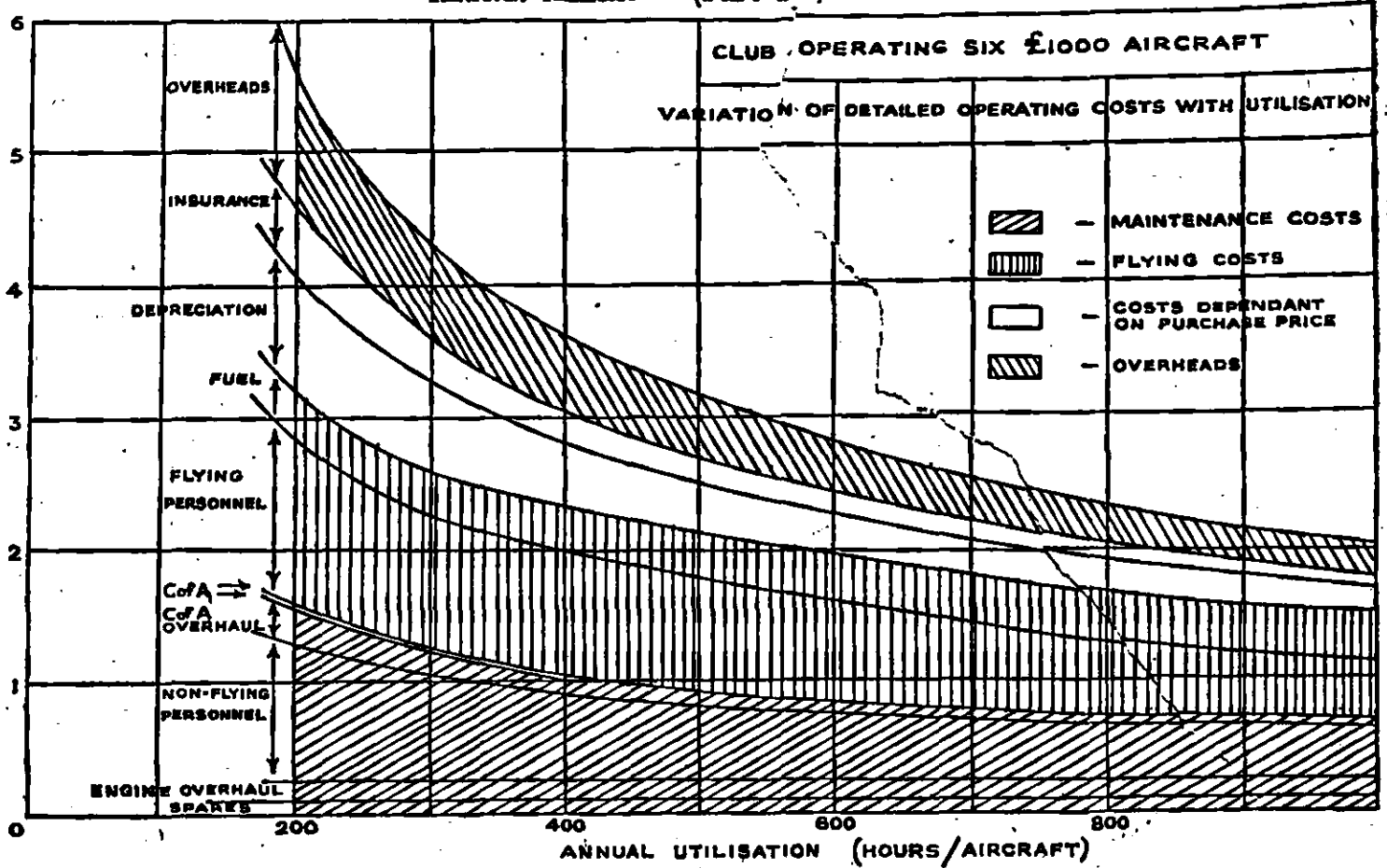


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ANNEXE F.

The Range of Types Considered

1 Although the Informal Light Aircraft Committee recommends in this report only one type of light aeroplane on which efforts should be concentrated immediately, the Committee has felt that this recommendation would not be seen in its true perspective unless reference was made also to the full pattern of types which have been discussed, into which the Type I fits as an integral part. The Committee wishes to point out that the types mentioned in the outline survey have not been considered in full detail and that mention of them in general terms should not be taken to mean that the I.L.A.C. is inflexibly decided that they are the only types or indeed exactly the right requirements. Much more evidence is needed before the full picture can be drawn up on a firm basis of recommendations for other than the initial Type I. Naturally also the requirements will be changing from time to time as progress is made in the technique of design.

2 Nor are these broad specifications intended to imply that there is no requirement for many excellent types of private venture light aeroplanes now in being or under construction. The I.L.A.C. recommendations are intended rather as a guide to likely requirements and are in no sense exclusive. The Committee has, equally, stressed a somewhat conventional approach to these types with emphasis on design for low maintenance cost in an effort to found post-war flying on solid ground from which more adventurous progress may go forward.

3 With this background and with the availability of engines prominently in mind, the Committee suggests that the range of types needed to produce a balanced output of British light aircraft should include the following:—

Type	Purpose	Seats	Engines	Approx. Cruising Speed (5 m.p.h.)	Take-off to 50 ft. (m.p.h.)	Range (miles)	Under-carriage	Approx. Price
I	Basic Trainer Tourer	2	1	110 m.p.h.	400 yds.	550	Fixed Tricycle	£1,000
(Main recommendation—A basic two-seat trainer-tourer of about 100 b.h.p.)								
A	Ultra-Light ...	1	1	90 m.p.h.	380 yds.	180	Fixed Tricycle	£500
(A single-seat ultra-light type on which flying hours could be accumulated cheaply. (About 40/60 b.h.p.) Dependent on suitable engine—not yet available.)								
B	Light Tourer ...	4	1	120 m.p.h.	400 yds.	550	Fixed Tricycle	£1,750
(Development of Type I. A single-engine four-seat tourer of medium performance.)								
C	Extended Tourer	4	1	165 m.p.h.	400 yds.	750	Retractable Tricycle	£2,250
(Higher power version of Type A. A single-engine four-seat tourer of higher performance and cost.)								
D	Light-Twin ...	4/5	2	150 m.p.h.	500 yds.	700	Retractable Tricycle	£2,500
(Cheapest possible twin of adequate performance. A light twin-engine 4/5 seat tourer of medium performance and cost.)								
E	Extended Tourer	4/5	2	200 m.p.h.	400 yds.	950	Retractable Tricycle	£3,000
(Higher power version of Type D. A twin-engine 4/5 seat tourer of higher performance and cost.)								
F	Executive ...	6/8	2	220 m.p.h.	?	1,050	Retractable Tricycle	
(A six-seat twin-engine executive type.)								
G	Executive ...	8/10	2/3	240 m.p.h.	?	1,150	Retractable Tricycle	
(An 8/10-seat twin-engine or three-engine high performance executive type.)								
H	"Roadable" ...	4	1	110 m.p.h.			Fixed four-wheeled	
(A four-seat "Roadable" aeroplane.)								

Brief Outline of Types considered by the Informal Light Aircraft Committee

Type I (Main Recommendation)—A two-seat trainer-tourer powered with a single engine of about 100 b.h.p. Designed for club use and primary training. It would have a stalling speed of approximately 44 m.p.h., with flaps down, and cruise at about 110 m.p.h. This type is recommended as a subject for immediate action.

Type "A"—An ultra-light single-seater designed specifically for the cheap accumulation of flying-hours required for international licences. Its satisfactory evolution must be dependent on a reliable and cheap engine of about 40 b.h.p. Such an engine is not at present in sight.

Type "B"—A simple four-seat aeroplane, suitable for limited range touring, powered with a single engine of about 175 b.h.p. Stalling speed would be approximately 44 m.p.h., with flaps down, and the aeroplane would cruise at about 120 m.p.h. Some of the components of Type I could be used for "B".

Type "C"—A four-seat light aeroplane, powered with a single engine of about 220 b.h.p. Designed to be suitable for more extended touring and light charter flying. Stalling speed would be about 50 m.p.h., and the aeroplane would be a higher powered version of Type "B".

Type "D"—A 4/5 seat, "cheap-twin" light aeroplane, powered with two engines of about 175 b.h.p. each. Designed to be suitable for touring, including over-water and night flying in the cheapest possible twin-engine category with I.C.A.O. single-engine performance. Stalling speed would be about 55 m.p.h., with flaps down, and it should be capable of a cruising speed in the neighbourhood of 150 m.p.h.

Type "E"—A 4/5 seat aeroplane, powered with two engines of about 220 b.h.p. each. Designed to be suitable for extended range touring including over-water and night flying. Stalling speed would be about 60 m.p.h., with flaps down, and the cruising speed would be about 200 m.p.h.

Type "F"—A high performance 6/8 seat aeroplane of the executive type, powered with two engines of about 320 b.h.p. each. Designed to be suitable for executive use and charter flying. Stalling speed would be about 60 m.p.h., with flaps down, and the cruising speed would be approximately 220 m.p.h.

Type "G"—A high performance 8/10 seat super executive type, powered with two engines of about 450 b.h.p. each. Designed to be suitable for extended range, high-class air travel, including over-water and night flying. Stalling speed would be approximately 60 m.p.h., and the cruising speed would be approximately 240 m.p.h.

ANNEXE G
Possible Engines

<i>H.P.</i>	<i>Name of Engine</i>	<i>Brief Description</i>
35/45	Wren	4-cylinder, flat, 2-stroke. (Under development)
75	Monaco	4-cylinder flat (in final stages of development. Private venture)
90	Blackburn Cirrus Minor I	4-cylinder, inverted, in-line (in production)
100	Blackburn Cirrus Minor II	4-cylinder, inverted, in-line (in production)
95	Jameson (ungeared)	4-cylinder flat
100	Nuffield	4-cylinder, flat (early model with carburettor but provision for injection) (prototype due mid-1947)
100	Monaco	4-cylinder, flat (Private venture project)
120	Monaco	4-cylinder, flat (Private venture project)
145	de Havilland Gipsy Major VII	4-cylinder, inverted, in-line (in production—service use)
145	de Havilland Gipsy Major X	Similar to Gipsy Major VII with additional accessories (in production)
155	Blackburn Cirrus Major III	4-cylinder, inverted, in-line (in production)
160	de Havilland Gipsy Major 30	4-cylinder, inverted, in-line (No decision yet on production)
180	Blackburn Bombardier	4-cylinder, inverted, in-line, fuel-injection (project)
195	de Havilland Gipsy Major 50	Similar to Gipsy Major 30, but supercharged
210	de Havilland Gipsy Queen II	6-cylinder, inverted, in-line (in production)
250	de Havilland Gipsy Queen 30	6-cylinder, inverted, in-line (in production)
270	Blackburn Musketeer	6-cylinder, inverted, in-line (Type tests—late 1947)
285	de Havilland Gipsy Queen 50	Similar to Gipsy Queen 30 but supercharged
307	Blackburn Grenadier	6-cylinder, inverted, in-line, fuel injection
340	de Havilland Gipsy Queen 70	As Gipsy Queen II—geared and supercharged
420	Armstrong-Siddeley Cheetah XV	Air-cooled, 7-cylinder radial, supercharged (Established type)
475	Armstrong-Siddeley Cheetah 25	Convertible from Cheetah XV
505	Alvis Leonides	Air-cooled, 9-cylinder radial, supercharged (due for production as private venture)