

# FLIGHT

& AIRCRAFT ENGINEER

First Aero Weekly in the World.

Founder and Editor: STANLEY SPOONER

A Journal devoted to the Interests, Practice, and Progress of Aerial Locomotion and Transport

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## Flight

and The Aircraft Engineer

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## EDITORIAL COMMENT.

**S**OME exceedingly strong comments on Air Ministry methods of finance are contained in a letter from the Treasury on the action of the Administrator of Works and Buildings in cancelling a number of contracts entered into by the War Office and substituting revised terms which were more favourable to the contractors, increasing their estimated remuneration in bulk from £98,000 to £164,000. The letter in question states:—

**Pity the Poor Taxpayer!** " Their lordships regret that the Administrator of Works and Buildings should have taken the step, which was clearly outside his competence as an officer of the Ministry of Munitions, of cancelling and revising, in a sense more favourable to contractors, the already liberal contract terms on which

the aerodromes were being constructed for the War Office. As these contractors were receiving a percentage on their expenditure and incurring no risk, it is difficult to understand what public benefit could be derived from a change which increased their remuneration (by an amount which they note is estimated at £66,000) without (so far as my lords can see) securing in any particular an additional advantage to the State.

" They note that the ground alleged is that the contractors were not making sufficiently handsome profits, and had, therefore, 'lost interest' in their contracts, but that the Army Council state that this statement is entirely at variance with the information at their disposal.

" The complaints which their lordships have received from many quarters as to the waste of money which is arising in connection with aerodrome contracts reinforce their view that the form of contract on the cost plus percentage system is open to serious objection. In your letter of the 28th ultimo the Air Council represent that the alternative suggestions made by the Treasury are impracticable. My lords understand, however, that they are used by the Admiralty in the almost equally difficult ship construction contracts, though not in works construction."

### " Serious Defects "

It further appears that a recent test examination of the Air Ministry accounts and records for the expenditure on aerodrome construction brought to the notice of the Comptroller and Auditor-General defects in the system of control and accounting of such a serious character that he reported the circumstances to the Treasury, and suggested that the whole matter should form the subject of special inquiry by an independent body, the result of whose investigations might, if necessary, be brought before the Public Accounts Committee at a later period of the Session. On every hand it appears that those responsible for the financial administration of the Air Ministry have been guilty of grave derelictions of duty. For instance, the Comptroller and Auditor-General complains that the action of the Ministry and the Admiralty, acting on their own initiative, had extended the award of the 12½ per cent. bonus to work done in Ireland, though that was not the intention of the Committee on Production. This action had resulted in very serious financial consequences, the Air Ministry having extensive works in progress in Ireland at the time.

It seems to us that the Lords of the Treasury are perfectly right to express their grave displeasure at the abuses which have apparently been rife. In the matter of the revision of contracts, by which, as we

have shown, certain contractors benefited by something very like a free gift of £66,000 of the unfortunate taxpayers' money, the excuse advanced for the Ministry's action—that the contractors had "lost interest" because they were not making sufficiently handsome profits—is about the worst we have ever seen advanced in defence of a public body. What would happen to a responsible employee of a private corporation who revised contracts on such a ground? The answer is too obvious to require stating. Why, then, should a public servant convicted of squandering the nation's resources, especially at a time when the most rigid economy is essential, escape the penalty of his unbusinesslike stupidity, to give it no harsher a name? It is devoutly to be hoped that the suggestion of the Comptroller and Auditor-General for an independent inquiry will be insisted upon, and that the blame for the appalling laxity which seems to have been displayed by the Air Ministry may be fixed and the individuals concerned dealt with as they richly deserve.

Again, there is the question of the extension of the 12½ per cent. bonus to Ireland to be dealt with. This was done, apparently, without the authority of Parliament or the Treasury—not that Parliament has had much to say in matters of finance during the war—and against the express intentions of the Committee on Production. Unfortunately the sum thus lost to the nation is not disclosed, so that we do not know the amount of money thrown to the winds by the obliging officials of the Air Ministry. This is another matter that must be cleared up and the blame properly apportioned. It is a pity that the too officious individuals concerned cannot be surcharged with the amount which has been wasted. That would be about the best example that could be made of them. As it is, when it is ascertained at whose door lies the responsibility for all this waste of public funds, it should be made quite certain that he or they shall never again be placed in a position to deal with a single farthing of the nation's money.

#### The Regulation of Civil Flying

On the 1st inst. the Air Ministry issued the Air Navigation Regulations, 1919, which are to control civilian flying until a more permanent set of rules, based on experience, can be formulated. The Regulations have been drafted for the control, direction and assistance of civil aviation in the British Isles, and do not apply to international aerial traffic, regulations for which will naturally not be issued until the Peace Conference in Paris has agreed upon the shape such international regulations are to take. It is understood, however, that the present Regulations have been drafted in accordance with recommendations made by the Aviation Committee of the Peace Conference, so it is reasonable to assume that they bear some sort of family likeness to those that will ultimately be issued for the control of international traffic. Nor do these present Regulations apply to any of the British Dominions, which are left free to formulate their own aerial laws and which are, it is understood, drafting such laws now and basing them on their own conditions and their varying Customs requirements.

On the whole the Regulations seem to be quite good, especially as they can only be regarded as experimental in the meantime, and will undoubtedly be modified in such directions as future experience

may dictate. Even though they may not be perfect, they will at least enable firms and individuals who have made preparations to enter the business of commercial aviation to make an auspicious start, unhampered by any but the most necessary restrictions.

#### The Regulations in Detail

As the full text of the Regulations will be found printed in another part of this issue of FLIGHT, there is no need for us to do more than glance briefly at a few of the principal points. To begin with, the rules as to the licensing of pilots are extremely stringent, as, in the interests of public safety, they must be. The applicant for a pilot's licence must pass a medical examination carried out under the control of the Secretary of State, and must produce a certificate of competency issued by the same authority, or be qualified as a Royal Air Force pilot. He must further submit proof of recent reasonable flying experience on the class of machine for which the licence is required, or, failing such proof, undergo practical tests. In the case of applicants applying for licences to fly machines otherwise than for the carrying of passengers and goods, the proof of recent flying experience is, apparently, not required. The regulation is practically identical in the cases of navigators and engineers except that again the proof of recent flying experience is not demanded. Pilots' licences remain in force for six months and others for twelve, but there is an additional proviso that holders of licences may be required from time to time to undergo further medical examinations under the control of the Secretary of State. The fee to be charged for each licence issued and for each renewal is five shillings, but in the event of the applicant being required to carry out practical tests as indicated above the fee is to be a guinea. It is true the fees are not high, but we do not see why a pilot or navigator or engineer who is called upon to undergo a further medical examination under the regulations, it may be at the mere whim of some one in authority, should have to pay down five shillings and another guinea for the ordeal. It is not the cost but the principle which seems unjust.

The conditions governing inspection for airworthiness seem to be eminently sound. Certificates will be issued to "type aircraft" under conditions set forth in the Schedules, and for the issue of such certificates the sum of five guineas has to be paid. After the issue of a certificate to a type aircraft, any further aircraft of that type will be inspected for airworthiness by employees of the constructor, under arrangements approved by the Secretary of State, and if the aircraft in respect of which a certificate of airworthiness is desired conforms in all essential respects with the type aircraft, and is of satisfactory workmanship, the certificate will be issued at a charge of one guinea. That seems to be sound and sensible, and to promise the least possible interference from officials. There is, however, one query which might be propounded in connection with the issue of a certificate to a type craft. It is laid down that a certificate will only be granted for any type of passenger aircraft after the design has been approved by the Secretary of State and a satisfactory demonstration has been made in actual flying trials. Exactly what is meant by approval of design? Unless this point is definitely cleared up the inference

## Flight—And the Men



Rear-Admiral CECIL F. LAMBERT, Director of Personnel, Air Ministry.

"Flight" Copyright

is to be drawn that a design might be submitted and turned down absolutely by the Air Ministry without the machine in question being allowed to demonstrate its flying qualities. It is quite conceivable that this provision might act in direct discouragement of originality and improvement. We do not say that it would, but officials are very human and are often inclined to be dogmatic in their views of what is a good design and what is not. As a matter of fact, it does not appear that much else matters than the safety and stability of the machine. In design, pure and simple, it might be what the orthodox would describe as a freak machine, but be at the same time a distinct advance on current practice. Is such a machine to be refused its chance simply because an Air Ministry official does not like its design? We ask the question because it is just as well that designers and constructors should know where they stand at the beginning.

#### Further Provisions for Safety

Stringent rules are made for the periodic inspection and overhaul of all passenger aircraft, while it is also laid down that no such aircraft shall on any day proceed on a journey until it has been inspected at least once on that day by a competent person licensed for that purpose under the Regulations. If the inspector is satisfied that the aircraft is fit in every way for the flight proposed, he must sign in duplicate a certificate to that effect, which certificate must be countersigned by the pilot or some other person in the employ of the owner, one copy to be carried in the aircraft while the other is to be retained by the owner. This seems again to be quite a sound arrangement. It definitely fixes the responsibility for failure in case of any accident due to causes which ought to have been foreseen and guarded against, and will, moreover, tend to ensure care in the work of inspection. Taken all round the Regulations, so far as they relate to the competency and fitness of aircraft and their crews and the consequent safety of aerial navigation, seem to leave very little to be desired. If they seem to go far in the direction of stringency, that in itself is something to the good. We cannot, in the interests of the movement, leave any margin for serious accidents such as would tend to destroy the confidence of the public in the safety of aerial navigation, and we should much prefer at first to see the strings drawn a little too tightly rather than there should be any laxity either in the Regulations themselves or in their administration.

As we have said, there is no necessity to traverse the whole of the Regulations, which are completely self-explanatory. The whole subject of civilian air navigation is dealt with, including the rule of the road in the air, which, as has been generally supposed would be the case, is modelled on the rule of the road at sea. So far as we can see, there is no room for criticism here. The rules are essentially simple and easy to understand. It is impossible to draft any set of rules which will entirely prevent accidents,

but a close adherence to those set forth in the Schedule to the Regulations will at least make accidents inherently improbable. As at sea and on the highways, accidents are caused in the air by one or both aircraft concerned failing to observe the rules which are based on common sense and experience, and if every aircraft pilot will keep that well fixed in his mind these rules will go far to prevent the kind of accidents they are intended to obviate.

#### The Private Owner

In one respect at least the Regulations lack clearness. Nothing is said as to the private owner who desires to pilot his own machine, nor is it laid down with anything approaching certainty what tests he is to be called upon to undergo, or what form of licence he is to have. Paragraph 3 of Schedule III does indeed say that "a person applying for a pilot's licence to fly machines other than passenger or goods aircraft must either be qualified as a Royal Air Force pilot or produce a certificate of competency issued by the Secretary of State." Will he have to pass the same tests as pilots of public-service machines? Will the Secretary of State delegate some other authority or body to carry out tests for pilots of this class of machine? Before the War the *brevet* of the Royal Aero Club, or one of the Clubs associated with the International Federation, was accepted all over the world. Is this to be abolished and the official test and certificate substituted? These again are questions which it would be as well to have answered at the start. They are relatively important and they require to be cleared up.

#### Prohibited Areas

At the time the Air Ministry published its first map of aerial routes a fortnight ago, some misapprehension seems to have arisen as to the precise areas over which flying would be allowed. In one quarter it was stated that the whole of the United Kingdom, with the exception of the stated routes, was to be a "prohibited area." This is not so. On the contrary, it is now made clear that, with the exception of the 71 areas scheduled by the Regulations as "prohibited," aircraft are free to fly over any part of the British Isles. As to the authorised main routes referred to, it is understood that additions are shortly to be made to these, as it can be determined what facilities and assistance can be afforded to aircraft using them. The whole question of prohibited areas, too, will be reconsidered from time to time, and it seems a fair assumption that a certain number of these will be removed from the schedule in course of time. Certainly a study of them gives one to think that some of them cannot be projected as to be permanently scheduled as a part of the defences of our shores.

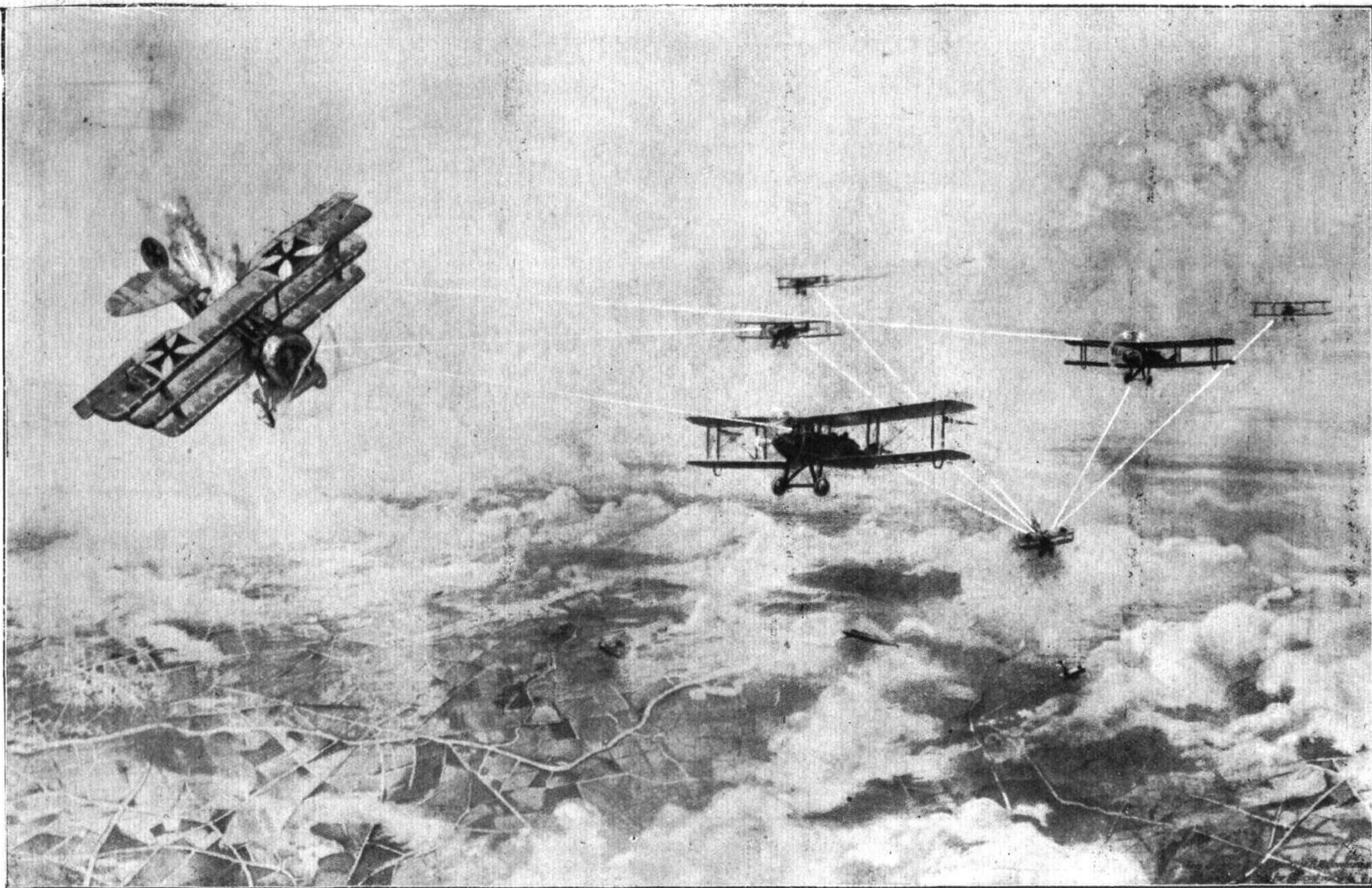
There are other points which may occur to those who study the Regulations with close attention, but we think we have drawn attention to those which most seriously matter to those about to embark upon the business or sport of civilian flying.

#### Civil Aeronautics in Canada

THE Bill providing for the control and encouragement of flying in all its aspects, the issue of licences, inspection of machines, and arrangement of air routes has reached its third reading in the Canadian Parliament. It is proposed to make the control of commercial flying a public monopoly.

#### The Japanese Air Service

A MISSION of 17 officers and 20 men of the French aviation service, headed by Col. Faure, has arrived in Tokyo to assist in the reorganisation of the Japanese Air Service. It is also stated that the French Government is sending 100 aeroplanes to Japan for the use of the Japanese Air Service.



**“STRAFED.”**—This picture, reproduced from a drawing, prepared by the Air Technical Services, shows admirably the advantages of the Vee formation of flying. The fire of all the machines in the formation can be concentrated on a single target, in this instance a Fokker triplane.

## THE TARRANT GIANT TRIPLANE

At last authentic particulars of the Tarrant triplane, regarding which rumour has been busy for some time, are available for publication. Guarded references to this interesting machine have been made from time to time, but these have been mostly of such a nature as to stimulate curiosity without satisfying it with facts and figures. A few days ago the veil surrounding the details of the machine was removed, and our representatives had an opportunity of examining the machine in every detail.

The general lay-out of the Tarrant triplane will be gathered from the accompanying illustrations. The chief characteristic is perhaps the triplane arrangement with top and bottom planes of equal span and a middle plane of considerably greater span than that of the other two. Next comes the power plant, which consists of six Napier "Lion" engines, four of which are mounted on the bottom plane, the other two being placed between the middle and the top plane, and driving tractor screws. The fuselage is of the *monocoque* type, and is of a very good stream-line form. Originally the machine was designed for long-distance bombing, but it will now be converted into a passenger carrier.

All the woodwork has been done at the Tarrant Works at Byfleet, but a good proportion of the metal work has been carried out at the Royal Aircraft Establishment at Farnborough. The most important feature of the Tarrant "Tabor" as regards construction is the adoption of the Warren type of girder to wood construction. In metal, this girder has long been employed, but practical difficulties, chiefly in regard to terminal attachments, has hitherto delayed its employment where wood is the material.

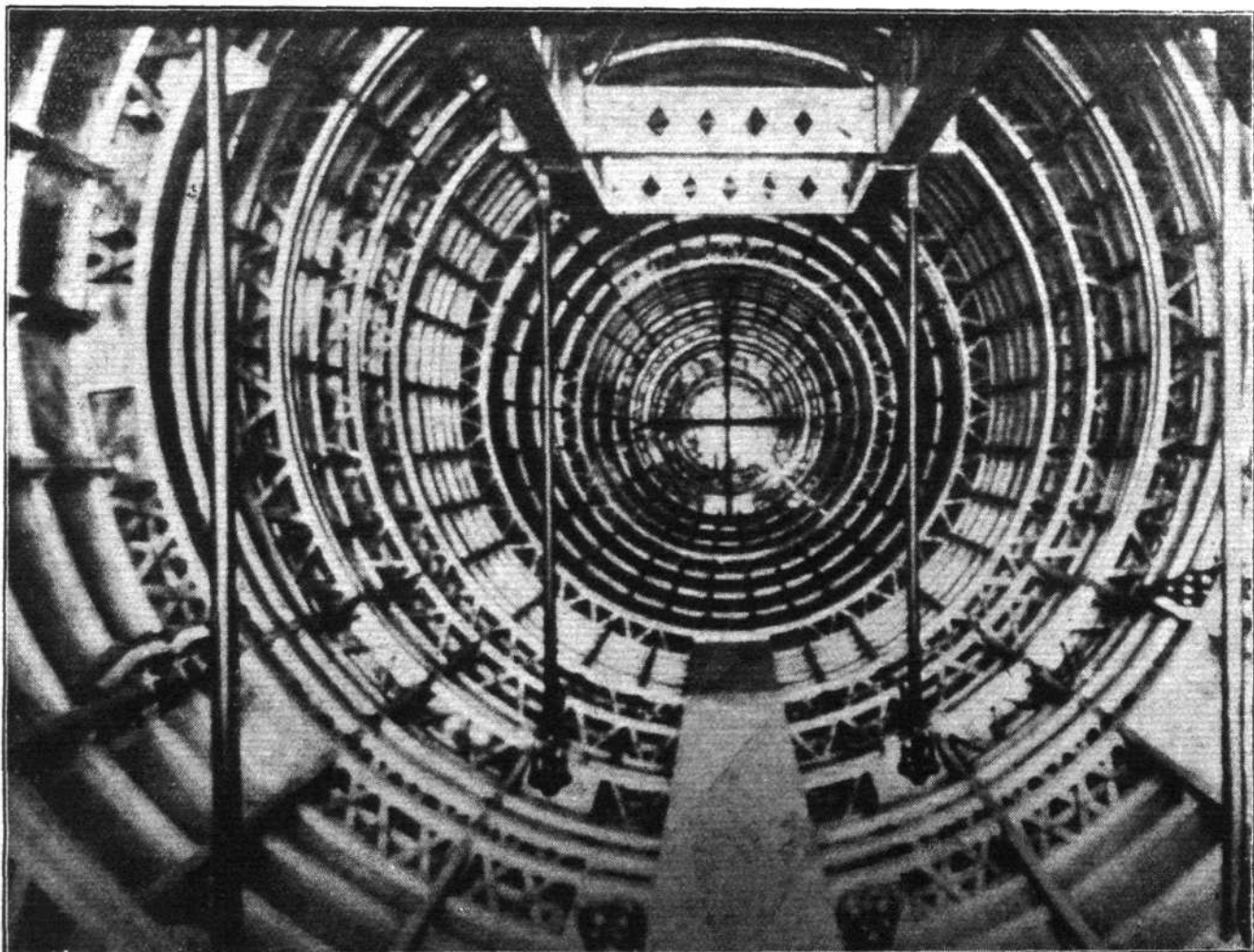
Without actually seeing the machine, the quotation of dimensions is apt to convey only a vague sense of her great size, but when it is mentioned that the span of the middle plane is a little over 130 ft., and the height from the ground to the top plane is 37 ft. 3 ins., some idea can be formed of the magnitude of the task of constructing this machine. The weight of the Tarrant "Tabor," as the machine is named, is approximately 45,000 lbs., of which 9,000 lbs. is available

for passengers and cargo, while 10,000 lbs. are taken up by the fuel for the six engines, which develop an aggregate of 2,700 to 3,000 h.p. With all engines running at full throttle the speed is estimated at 110 m.p.h., giving a range of about 900 miles, while at the "cruising speed" (the most economical speed) the range is calculated to be about 1,200 miles. This is with 10,000 lbs. of petrol on board and carrying 9,000 lbs. of passengers and cargo. If fewer passengers are carried and the tankage increased, the range can be very considerably extended.

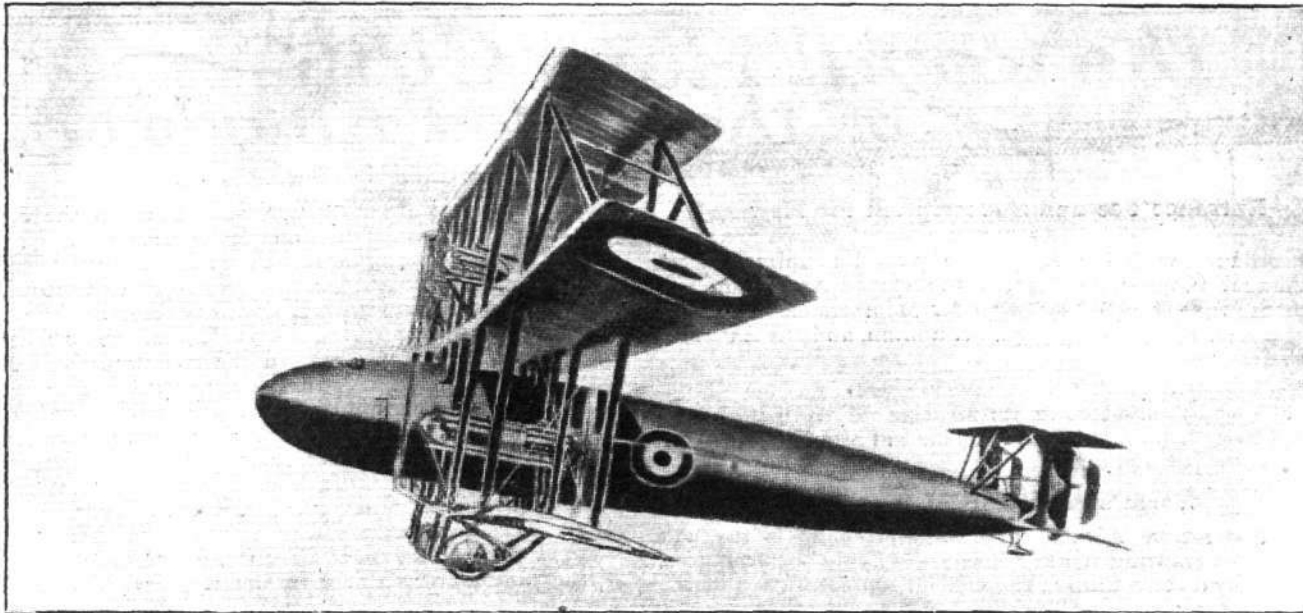
When the machine was inspected a few days ago, she was nearly ready for flight, and barring unforeseen accidents she should be ready for testing very soon.

Mr. W. G. Tarrant, of Byfleet, Surrey, is to be congratulated upon his courage in tackling such a costly experiment in the interests of the development of the large commercial aeroplane of the future, which cannot fail to benefit the cause of aviation not only in this country, but throughout the world. He has associated with him a number of specialists, of whom we mention only a few. Capt. E. T. Rawlings, D.S.C., general manager of the firm, will be remembered as being one of the crew of the Handley Page bomber which flew from London to Constantinople, dropping bombs with good effect on the latter city. Capt. T. M. Wilson, of the Technical Department of the Air Ministry, was lent to the firm by that Department, and has now left the Ministry and joined Mr. Tarrant permanently. It was to a very great extent due to Capt. Wilson that the machine was turned into a practical proposition. The pilot of the Tarrant triplane will be Capt. F. G. Dunn, A.F.C., who will be remembered by most readers of FLIGHT as one of the Grahame-White pilots at Hendon before the War. Finally it should be mentioned that Majors Turner and Grinstead, of the R.A.E., have rendered valuable assistance in the construction and erection of the machine.

Time does not permit of a more lengthy description of the Tarrant triplane this week, but we hope to publish an illustrated detailed description at an early date.



The above photograph, which looks like a tunnel of an underground railway, is really the inside of the fuselage of the big Tarrant flying machine. As will be seen it has an arrangement of circular wooden girders with the longerons passing through each. It is long enough to accommodate a full-size cricket pitch, and is expected to be flying with its engines of 3,000 h.p. in another two or three weeks. With this machine it is claimed it will be easily possible to fly from London to Bombay with but a single stop on route. Another fuselage almost twice the size of this is being designed, and will accommodate about 100 passengers.



**THE TARRANT GIANT TRIPLANE: A drawing of the machine as she will appear in flight. The power plant consists of six Napier "Lion" engines.**

**"Aerograms"**

In the course of his lecture on April 30, under the auspices of the Industrial Reconstruction Council, Mr. Holt Thomas outlined a scheme for combining the services of the aeroplane with the telephone and telegraph in the transmission of long urgent messages, which would be called aerograms. He said the general idea was to telephone or telegraph a message to the aerodrome where it would be taken down in shorthand, carried, say, to France in a plane, and dispatched from there to its destination. Such a system, he thought, would be invaluable for dealing with long Press cables. A message of 3,000 words between Paris and London could be delivered by aeroplane long before it had got across the cable. Moreover, the aeroplane would probably be carrying millions of words and other things as well at the same time. The economy in labour by the use of such a method would be enormous.

It was not going to be easy to organise a service. The public would have to pay for speed in the aerial mail, and for that reason he was not a great believer in passengers, for they would not be able to pay the rate that would be necessary if they were to be transported quickly; if the transportation

was not going to be quick, the passenger had better travel by the old method. Until the time of aerial liners was reached it would be impossible to make aerial travel pay.

**Canadian Aces Over London**

The crack Canadian pilots who were privileged to provide an escort for the procession of Dominion troops through London on Saturday last were deeply disappointed that stringent instructions from the Air Ministry prevented any "stunts" being performed, especially bearing in mind the performance by the Australian flying officers a week previously. Their stately flight was none the less appreciated by the thousands who turned out to see the Overseas troops pass by. The machines were commanded by Lieut.-Col. R. Leckie, D.S.O., D.S.C., D.F.C., and one flight was led by Maj. A. E. McKeever, D.S.O., M.C., and the other by Capt. D. R. MacLaren, D.S.O., M.C., D.F.C., while among other famous aces aloft were Capt. C. O. Johnson, M.C., Maj. J. O. Leach, M.C., A.F.C., Capt. C. Falkenberg, D.F.C., Maj. A. D. Carter, D.S.O., Capt. E. Burn, D.F.C., Lieut. G. R. Howson, M.C.



The Lord Chancellor, Lord Birkenhead, has a "joy-ride" on an Avro. After the flight, from left to right: Mr. Parrott (Messrs. Roe and Co.'s Southampton Manager), Captain Hamersley, Lord Birkenhead's son, Lord Birkenhead, Commander Chillcott.

# The Royal Aero Club of the United Kingdom

OFFICIAL NOTICES TO MEMBERS

## Entrance Fee and Subscription for New Members

In accordance with the Resolution passed unanimously at the Annual General Meeting of the Royal Aero Club, on March 31, 1919, the Subscription for Members elected on or after May 31, 1919, will be £7 7s. per annum, and the Entrance Fee £5 5s.

## Club Bedrooms

The House Committee at its Meeting on April 28, 1919, decided that the price of Bedrooms on and after May 1, 1919, should be 6s. per night.

## World's Aeronautical Records

The Fédération Aéronautique Internationale is the sole authority for granting World's Records of flying performances, and the Royal Aero Club is the Official representative of the Fédération for the British Empire.

The Fédération, being International, it has not been possible for any World's Records to be ratified during the War, and consequently any statements which have been published as to World's Records having been made during the War are not official, and are likely to mislead the public.

With the resumption of civilian flying, the Royal Aero Club will be in a position to supervise attempts on records under the Fédération Aéronautique Internationale and the Competition Rules of the Royal Aero Club.

Any person wishing to claim a World's Record for a flying performance carried out since 1914, is particularly urged to forward particulars to the Royal Aero Club for verification, and subsequent ratification by the Fédération Aéronautique Internationale.

## The Flying Services Fund

A Meeting of the Flying Services Fund Committee was held on Wednesday, April 30, 1919, when there were present: Brig.-Gen. R. H. More, C.M.G., in the Chair, Mr. Chester Fox, Lieut.-Col. T. O'B. Hubbard, M.C., R.A.F., and Mr. Harold E. Perrin, Secretary.

**Grants and Allowances.**—The following Grants and Allowances were made:—

- (33) A continued allowance of £2 a month for six months to the widow of a 2nd Class Air-Mechanic in the Royal Flying Corps who had been killed on active service.
- (53) A continued allowance of £4 a month for six months to the mother of a Leading Mechanic in the Royal Naval Air Service who had been killed on active service.
- (65) A continued allowance of £3 a month for six months

to the widow of a 1st Class Air-Mechanic in the Royal Air Force who had been killed on active service.

(82) A continued allowance of £2 a month for six months to the widow of a 1st Class Air-Mechanic in the Royal Flying Corps who had been killed on active service.

(84) A continued allowance of £2 a month for six months to the widow of a Sergeant in the Royal Flying Corps who had been killed on active service.

(100) A continued allowance of £3 a month for six months to the widow of a 3rd Class Air-Mechanic in the Royal Flying Corps who had died on active service.

(105) A continued allowance of £2 a month for six months to the mother of a Cadet in the Royal Air Force who had died on active service.

(147) The School Fees up to £20 per annum of the son of the mother of a Cadet in the Royal Air Force who had died on active service.

(165) An allowance of £2 a month for six months to an Ex-Sergeant in the Royal Air Force who had been incapacitated on active service.

(167) An allowance of £5 a month for six months to the widow of a Captain in the Royal Air Force who had died on active service.

(176) An allowance of £2 a month for three months to the widow of a Driver in the Royal Air Force who had died on active service.

(178) A Grant of £10 and an allowance of £5 a month for six months to the widow of a Sergt.-Mechanic in the Royal Flying Corps who had been killed on active service.

(180) An allowance of £2 a month for six months to the mother of a Private in the Royal Air Force who had been killed on active service.

(185) An allowance of £2 a month for six months to the widow of a 3rd Class Air-Mechanic in the Royal Flying Corps who had died on active service.

(186) An allowance of £2 a month for six months to the mother of a Private in the Royal Air Force who had been killed on active service.

(190) An allowance of £1 a month for six months to the mother of a 2nd Class Air-Mechanic in the Royal Air Force who had died on active service.

(191) A Grant of £5 and an allowance of £3 a month for six months to an Ex-2nd Lieutenant in the Royal Air Force who had been incapacitated on active service.

**Offices: THE ROYAL AERO CLUB,  
3, CLIFFORD STREET, LONDON, W. 1.**

**H. E. PERRIN, Secretary.**

## THE TRANSATLANTIC CONTEST

DURING the past week the principal development in connection with the Transatlantic contest has been the accession of the Vickers-Rolls-Royce machine to the list of entries. Details of this machine are given below, and two photographs are reproduced on the next page.

The four-engined Handley Page machine, with Rolls-Royce engines left Liverpool on May 2, and it is not expected that it will be ready to leave Newfoundland before the June full moon.

With a view to giving them a better chance of getting away in certain winds, Messrs. Hawker and Raynham have been searching the island for an auxiliary aerodrome, but so far they have not met with any success. The weather has been so unsettled as to prevent any attempt at the flight.

Dr. Alexander Robinson, the Postmaster-General there, has sealed a second mail and handed it to Mr. Raynham for conveyance across the Atlantic. The stamps are specially surcharged "First Transatlantic Aerial Mail" on the ordinary three-cents stamps. To prevent forgery each stamp is initialled by the Postmaster-General.

While preparing to start for Newfoundland on May 5, two of the United States flying-boats were damaged. Two wings of the N.C. 1 were completely destroyed, and the lower elevator and tail plane of the N.C. 4 were badly damaged. The fire was caused by a spark from an electrically-driven pump falling on a drum of petrol, which took fire. It is expected, however, that N.C. 2 will be sent to Newfoundland as soon as the weather permits. The N.C. type of boat has

a span of 126 ft. The lower wing span is 94 ft. The wings are 12 ft. chord. The length of the hull is 44 ft. 9 ins. Its gasoline capacity is 1,890 gallons, contained in 10 separate tanks. Four 400 h.p. Liberty motors are fitted.

### The Vickers "Vimy"—Rolls-Royce

THE following information concerning the "Vimy-Rolls" entered for the Transatlantic flight has come to hand, and should prove of considerable interest.—ED.

The construction of the Transatlantic "Vimy" has now been completed at the Weybridge aeroplane works of Messrs. Vickers, Ltd. This aeroplane is practically similar in every respect to the standard "Vimy" as supplied to His Majesty's Government. Two standard 350 h.p. Rolls-Royce engines are installed. The capacity of the petrol tanks has been increased to 865 gallons, and the lubricating oil tanks to 50 gallons. With this quantity of fuel the machine has a range of 2,440 miles. The maximum speed is over 100 miles per hour, but, during the flight across the Atlantic the engines will be throttled down to an average cruising speed of 90 miles per hour. The span of the "Vimy" is 67 ft., and overall length 42 ft. 8 ins. The chord of the planes is 10 ft. 6 ins. A wireless telegraphy set, capable of sending and receiving messages over long distances, will be carried, and the pilot and navigator will wear electrically heated clothing.

The pilot, Capt. J. Alcock, D.S.C., was born at Manchester in 1892, and received his technical engineering education at the Empress Motor Works, at Manchester. He became





**THE VICKERS "VIMY-ROLLS."**—Three-quarter front view. The machine will be piloted by Capt. J. Alcock, D.S.C., and the navigator will be Lieut. A. W. Brown, whose article on elementary navigation was published in "Flight" recently

interested in aviation in its early days, and adopted it as a profession. He took the Royal Aero Club's Flying Certificate at Brooklands in 1912, and rapidly rose to the head of his profession, taking part in a large number of the early competition flights, amongst others the well-remembered race London to Manchester and return in 1913, in which he secured second place.

At the outbreak of War he immediately joined the R.N.A.S., and was posted to Eastchurch as an instructor. Later he became the Chief Instructor of the Aerobatic Squadron. He did valuable work on the Turkish front, where he won the D.S.C., and held the record for long-distance bombing raids. He was eventually taken prisoner by the Turks owing to an engine failure, and remained as such until the end of the War.

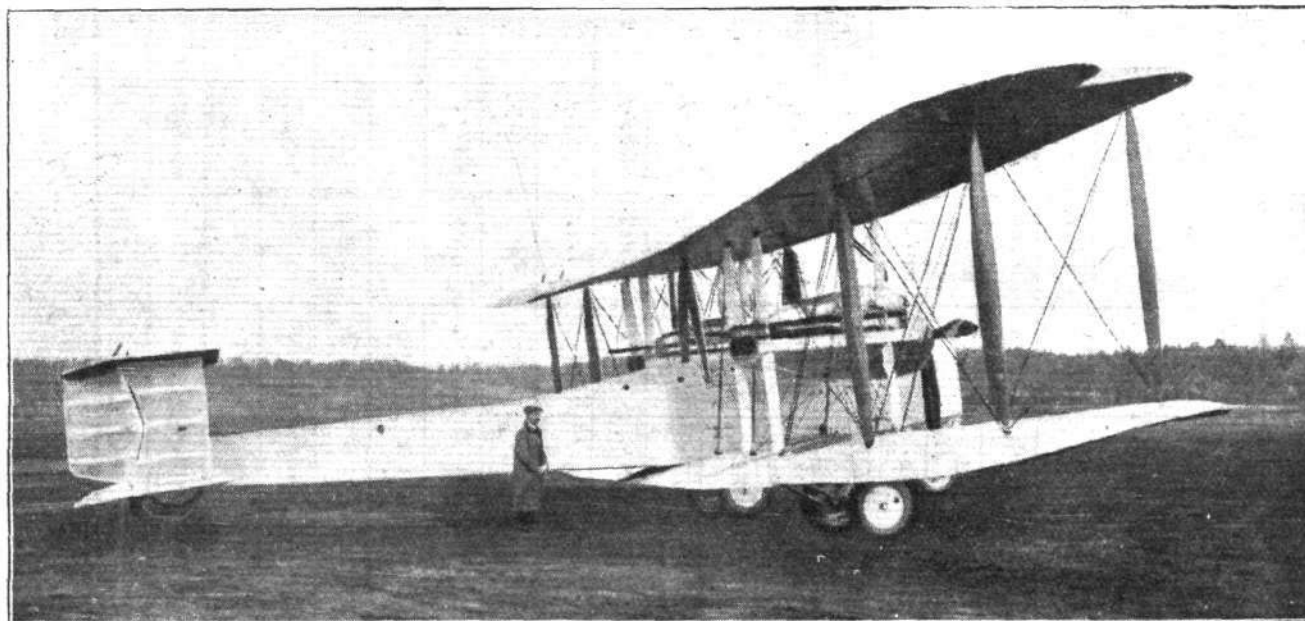
The navigator, Lieut. Arthur Whitten Brown, A.M.I.E.E., M.I.M.E., A.M.F.A.I.E., who will be known to our readers as the author of a recent article in *FLIGHT* on elementary navigation, was born in Glasgow in 1886, and his parents were American citizens. He is an engineer by profession, and received his practical training with the British Westinghouse Co., which is now allied with the Vickers Co. He received a thorough knowledge of surveying, and being interested in aviation, naturally devoted study to aerial navigation as applied to surveying. He enlisted in the University and Public Schools Corps in 1914, later receiving a commission in the Manchester Regiment, and served with

the 2nd Battalion in France during 1915. He then transferred to the Royal Flying Corps as an observer, and was wounded and taken prisoner of war in the same year. He was later interned in Switzerland, and repatriated in December, 1917, since which time he has been engaged with the Ministry of Munitions on the production of aero engines, and has put in a considerable amount of flying at home stations. He is also a pilot of some experience, and has flown many types of machines.

Lieut. Brown, after duration tests in the Transatlantic "Vimy," considers he will have no difficulty in making a successful Atlantic flight. He intends to rely upon a system of navigation similar to that employed in marine navigation, and will carry wireless instruments capable of receiving and despatching messages for a distance of 250 miles, and be able to communicate with passing vessels.

The preliminary flights were successfully carried out at Brooklands Aerodrome, Surrey, by these two officers, who expressed themselves completely satisfied with the tests. The Rolls-Royce engines ran perfectly, and the aeroplane left the ground with its load of four tons of petrol and oil after running a very short distance on the ground.

The aeroplane has now been dismantled and packed in cases. It is awaiting shipment to Newfoundland, and will be accompanied by the pilot, navigator, and mechanics, with their full equipment.



**THE VICKERS "VIMY-ROLLS" ENTERED FOR THE TRANSATLANTIC FLIGHT.**—Three-quarter rear view





account the special requirements of the aircraft industry, which are in some cases somewhat different to those obtaining in other branches of engineering. Thus, in the case of mild-steel plates, for instance,

which are extensively employed in aircraft construction for various fittings, the importance of maximum strength for minimum weight calls for somewhat smaller tolerances than are generally considered

WEIGHT OF STEEL TUBES IN LBS PER FOOT RUN (ACCLES & POLLOCK)		WEIGHT IN LBS PER CUBIC INCH = .283 FOOT = 489.6																			
		THICKNESS OF WALLS IN SWG	OUTSIDE DIAMETER IN INCHES																		
			3/8	1/2	5/8	3/4	7/8	1	1 1/8	1 1/4	1 3/8	1 1/2	1 5/8	1 3/4	1 7/8	2	2 1/8	2 1/4	2 3/8	2 1/2	2 5/8
10	.342	.519	.697	.874	1.051	1.229	1.406	1.549	1.723	1.896	2.069	2.239	2.409	2.587							
11	.324	.483	.642	.800	.959	1.118	1.277	1.436	1.594	1.753	1.912	2.071	2.230	2.389							
12	.307	.451	.595	.740	.884	1.028	1.172	1.317	1.461	1.605	1.749	1.894	2.038	2.182							
13	.282	.407	.533	.659	.785	.910	1.036	1.162	1.287	1.413	1.539	1.664	1.790	1.916							
14	.257	.367	.476	.586	.696	.806	.916	1.025	1.135	1.245	1.355	1.465	1.576	1.685							
15	.231	.326	.422	.517	.612	.707	.803	.898	.993	1.088	1.184	1.279	1.375	1.470							
16	.213	.300	.385	.471	.557	.643	.729	.815	.901	.987	1.073	1.159	1.245	1.331							
17	.195	.272	.348	.425	.501	.578	.655	.732	.808	.885	.962	1.039	1.115	1.192							
18	.169	.234	.299	.364	.428	.493	.558	.623	.688	.747	.808	.872	.936	1.000							
19	.148	.204	.259	.315	.370	.426	.482	.537	.570	.624	.677	.720	.784	.837							
20	.126	.172	.219	.265	.311	.358	.404	.450	.515	.563	.614	.659	.707	.755							
21	.116	.159	.201	.243	.285	.328	.370	.413	.459	.492	.544	.587	.630	.672							
22	.103	.140	.177	.214	.251	.288	.325	.362	.403	.440	.477	.515	.552	.589							

Fig. 33.

WEIGHT OF BRASS TUBES IN LBS PER FOOT RUN		WEIGHT IN LBS PER C IN .298 C FT 517																			
		THICKNESS OF WALLS IN SWG	OUTSIDE DIAMETER IN INCHES																		
			3/8	1/2	5/8	3/4	7/8	1	1 1/8	1 1/4	1 3/8	1 1/2	1 5/8	1 3/4	1 7/8	2	2 1/8	2 1/4	2 3/8	2 1/2	2 5/8
10	.3612	.548	.736	.923	1.11	1.298	1.483	1.634	1.820	2.005	2.184	2.361	2.542	2.733							
11	.3421	.510	.6775	.845	1.011	1.18	1.348	1.515	1.682	1.852	2.02	2.184	2.355	2.522							
12	.3242	.476	.628	.781	.934	1.084	1.238	1.390	1.542	1.695	1.846	2.0	2.150	2.303							
13	.2979	.430	.563	.696	.829	.9615	1.093	1.228	1.359	1.492	1.623	1.757	1.891	2.021							
14	.2714	.3875	.5025	.619	.735	.851	.968	1.072	1.199	1.314	1.43	1.547	1.661	1.779							
15	.244	.344	.445	.546	.646	.746	.848	.948	1.048	1.148	1.25	1.35	1.451	1.552							
16	.225	.3167	.4064	.497	.588	.679	.77	.861	.952	1.04	1.132	1.223	1.314	1.405							
17	.206	.2871	.3675	.4487	.529	.6102	.692	.773	.854	.935	1.015	1.097	1.177	1.260							
18	.1785	.247	.3158	.3845	.452	.5205	.589	.658	.7265	.788	.854	.921	.989	1.056							
19	.1563	.2155	.2734	.3325	.3906	.450	.509	.567	.6015	.659	.715	.761	.828	.884							
20	.133	.1816	.2313	.280	.3285	.378	.4265	.4755	.544	.5945	.680	.695	.746	.7975							
21	.1224	.1679	.2122	.2566	.3008	.3443	.3905	.436	.485	.5195	.575	.620	.6655	.7098							
22	.1087	.1478	.1869	.226	.2651	.3041	.343	.3823	.426	.4645	.504	.544	.5828	.622							

Fig. 34.

necessary for a good many of the other purposes for which mild steel plates are employed. In Fig. 31 is shown the maximum and minimum permissible thickness for standard wire gauges ranging from 6 to 24. It will be seen that greater accuracy is

demanded for thin plates than for thick. This, of course, is due to the fact that a given difference of, say, .005 in. will form a much greater percentage of the thin plate than of the thick one. When determining the strength of a mild-steel fitting, it is often

WEIGHT OF COPPER TUBES IN POUNDS PER FOOT RUN		WEIGHT OF COPPER TUBES IN LBS PER FOOT RUN																		WEIGHT IN LBS PER C IN - 3/16 C FT - 548.1	
		OUTSIDE DIAMETER IN INCHES																			
GAUGE	10	3/8	1/2	5/8	3/4	7/8	1	1 1/8	1 1/4	1 1/2	1 3/4	1 7/8	2	2 1/8	2 1/4	2 3/8	2 1/2	2 5/8	2 3/4		
			383	581	781	979	1178	1376	1573	1770	1968	2122	2322	2505	27	29					
	3628	541	719	896	1073	1251	143	1608	1785	1964	2144	2322	25	2675							
	344	505	667	829	990	1151	1313	1473	1637	1798	1958	212	2280	2445							
	316	456	597	738	880	102	116	1303	144	1582	1723	1863	2005	2145							
	288	408	533	656	780	903	1028	1148	1271	1394	1518	1644	1763	1889							
	2586	3652	4725	579	6855	792	900	1006	1112	1218	1327	1431	154	1667							
	2385	336	431	5276	624	720	817	913	101	1105	1202	1298	1394	1491							
	2184	3044	390	476	561	6475	734	820	905	992	1078	1163	125	1336							
	1892	262	335	408	480	552	625	698	771	836	905	977	1049	112							
	1658	2285	290	353	414	4775	540	602	658	699	7575	806	878	938							
	141	1927	2432	2968	348	401	452	504	577	631	722	738	792	845							
	13	1781	2232	272	3193	3675	414	463	514	551	609	6575	706	753							
	1153	1568	1982	2399	2812	3225	364	405	452	493	534	576	618	660							

Fig. 35.

WEIGHT OF ALUMINIUM TUBES IN POUNDS PER FOOT RUN		WEIGHT OF ALUMINIUM TUBES IN LBS PER FOOT RUN																		WEIGHT IN LBS PER C IN - .092 C FT - 159.6	
		OUTSIDE DIAMETER IN INCHES																			
THICKNESS OF WALLS IN SWG	10	3/8	1/2	5/8	3/4	7/8	1	1 1/8	1 1/4	1 1/2	1 3/4	1 7/8	2	2 1/8	2 1/4	2 3/8	2 1/2	2 5/8	2 3/4		
			1114	1692	227	285	343	4005	458	505	562	618	675	729	785	844					
	1056	1575	209	261	3125	3642	416	468	52	572	6237	675	727	779							
	100	147	194	241	288	335	382	429	476	5235	570	6175	664	712							
	092	1326	174	2146	256	2965	3378	379	419	461	5015	542	583	625							
	0838	1196	155	191	227	263	2985	3342	370	406	4418	4775	5138	549							
	0752	1062	1375	1685	1995	230	262	295	324	3545	386	4165	448	479							
	0694	0978	1255	1535	1818	2096	238	266	294	322	350	378	406	434							
	0636	0886	1134	1385	1632	1885	2135	2385	2637	2885	3132	3388	3635	3888							
	0551	0763	0975	1187	1396	1608	182	2032	2248	2455	2655	284	305	324							
	0482	0678	0845	1027	1206	1389	157	175	186	2036	2208	2348	2565	2726							
	0411	0561	0714	0864	1013	1168	1317	1468	1678	1837	210	2146	2302	2461							
	0378	0519	0655	0792	093	107	1206	1348	1498	1604	1774	1913	2052	219							
	0336	0456	0577	0698	0818	0939	1059	118	1315	1434	1554	1679	180	1922							

Fig. 36.

		WEIGHT OF DURALUMIN TUBES IN LBS PER FOOT RUN																					
		WEIGHT IN LBS PER C. IN C. FT. = $\frac{1015}{175}$																					
OUTSIDE DIAMETER IN INCHES		$\frac{3}{8}$	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{7}{8}$	1	$1\frac{1}{8}$	$1\frac{1}{4}$	$1\frac{3}{8}$	$1\frac{1}{2}$	$1\frac{5}{8}$	$1\frac{3}{4}$	$1\frac{7}{8}$	2	$2\frac{1}{8}$	$2\frac{1}{4}$	$2\frac{3}{8}$	$2\frac{1}{2}$	$2\frac{5}{8}$	$2\frac{3}{4}$		
WEIGHT OF DURALUMIN TUBES IN POUNDS PER FOOT RUN	GAUGE 10	.1228	.1859	.2495	.3128	.376	.440	.5032	.554	.617	.6786	.741	.801	.863	.926								
	11	.1159	.173	.230	.2861	.343	.400	.4565	.514	.5705	.628	.685	.741	.798	.855								
	12	.1099	.1614	.213	.2648	.316	.368	.420	.4713	.5234	.575	.626	.678	.729	.782								
	13	.1009	.1436	.1909	.236	.2809	.3258	.3708	.416	.460	.504	.551	.5956	.641	.6855								
	14	.092	.1312	.1703	.210	.2492	.2885	.328	.367	.406	.444	.485	.5245	.564	.603								
	15	.08275	.1168	.151	.185	.219	.253	.2875	.3216	.3557	.3895	.424	.458	.492	.526								
	16	.07625	.1013	.1378	.1686	.1992	.230	.2609	.2918	.322	.3535	.3845	.415	.4455	.4765								
	17	.0698	.0973	.1245	.152	.1791	.2069	.2342	.262	.2894	.3168	.3441	.372	.3992	.427								
	18	.0605	.0838	.107	.1302	.1532	.1765	.200	.223	.2461	.2673	.2892	.312	.335	.358								
	19	.053	.073	.0927	.1128	.1323	.1524	.1725	.1922	.204	.2233	.2423	.2578	.2806	.2997								
	20	.0451	.0615	.0784	.095	.112	.1282	.1445	.1611	.1843	.2015	.2205	.236	.253	.2702								
	21	.0415	.057	.072	.087	.102	.1173	.1323	.148	.1643	.176	.1948	.210	.2256	.2408								
	22	.0369	.0501	.0634	.0766	.09	.1021	.1183	.1296	.1441	.1574	.1708	.1863	.1976	.2104								

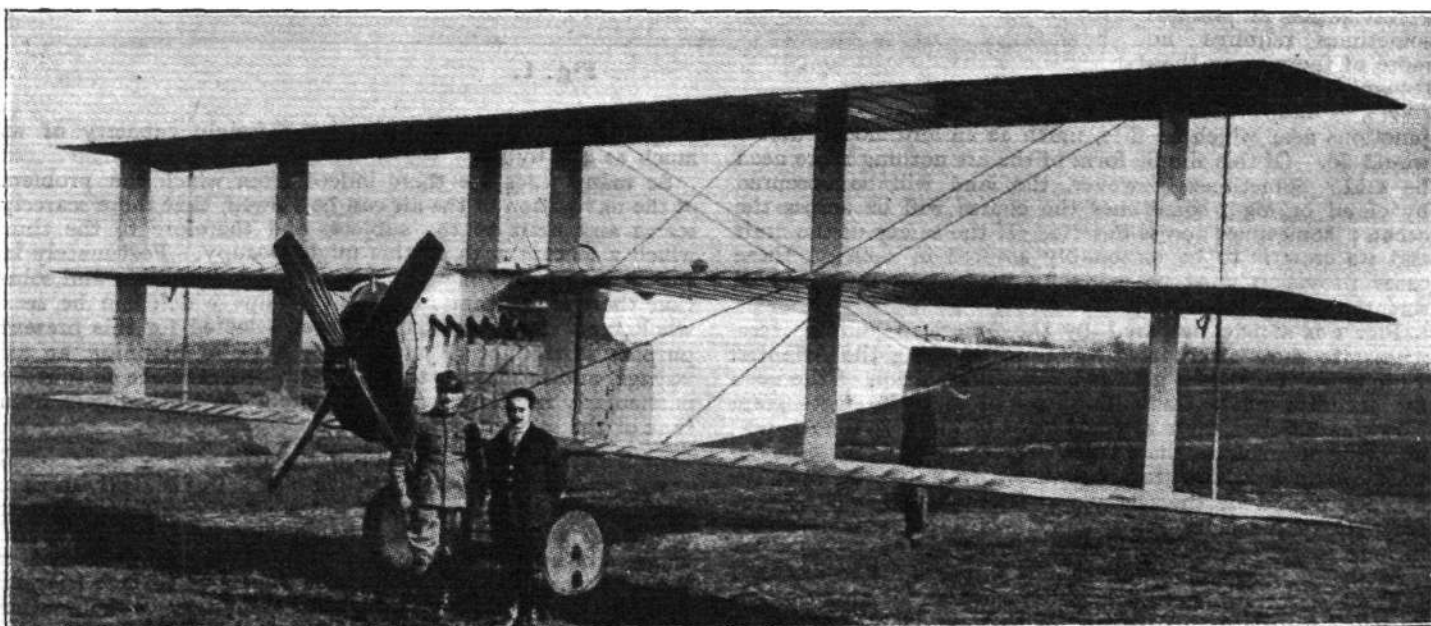
Fig. 37.

convenient to be able to find at a glance the tensile and shearing strength of a certain width of the material. To tabulate these for all the widths that might be required would result in too cumbersome a table, but in the two right-hand columns of the table in Fig. 31 the tensile and shearing strengths of the various gauges have been tabulated for a width of 1 in. From these it will be a simple matter to find the strength for any width. The figures are based on steel having a tensile and shearing strength

(ultimate) of 26 tons per square inch and 20 tons/square inch respectively.

Figs. 32 to 37 inclusive give weights of various plates and tubes, some of which—as, for instance, aluminium and especially Duralumin—are not usually included in the ordinary pocket books. These tables will scarcely need any explanation, and have been found in practice to be very convenient for reference purposes.

(To be concluded.)



The "Baby" Caproni triplane.

# AIR NAVIGATION\*

BY MAJOR H. E. WIMPERIS, R.A.F.

THE subject of air navigation has been chosen because with the ending of the War this becomes the most important of the unsolved problems relating to aviation. It is unsolved mainly, I think, because the actual operations of the War, apart from certain individual efforts of great merit, did not reach the point at which really long flights were made. Had the activity of the War continued there is little doubt that long-distance air navigation would have been impelled to as high a degree of actual achievement as was attained by other branches of the new science of aeronautics.

It happens that one particular aspect of the navigation problem did indeed attract quite a considerable amount of attention during the War; and it may surprise some of my audience to learn that the problem of bomb-dropping is one of navigation in miniature. A little reflection will show that this must be so. It is essential that the course-made-good horizontally by the released bomb shall carry it correctly to its target, and moreover that this journey shall be completed in a period of time precisely equal to that occupied by the falling bomb in its vertical descent to the earth. This course-made-good may happen also to be the course steered, but this is exceptional and will occur only in up or down wind attacks. In general the attack will be in any direction relative to the wind, and the course-made-good will therefore be totally different to the course steered. Any increase in the intensity and accuracy of anti-aircraft defence makes it more than ever necessary to attack across wind: and it therefore follows that bomb sighting requires a solution of the very same horizontal vector triangle of aircraft motion as falls to the air navigator. Thus, it happens that the most important form of air navigation, that called "dead reckoning" or "D.R.," has already received much more attention during the War than would have fallen to it for air navigation pure and simple.

Navigation in practice sometimes requires no more of the airman than recognising the towns, rivers, and railway junctions near which he flies, much as an automobile driver would do. Of this simple form of the art nothing more need be said. Sometimes, however, the land will be obscured by cloud or fog; sometimes the course will lie across the ocean; sometimes across deserts. If the safety of the craft and its crew is to be reasonably assured in each of these cases, provision must be made for navigation by very best scientific methods available.

Fig. 1 is a map prepared by the American journal *Aeronautics* to show alternative routes for crossing the Atlantic. I include it because it affords a good illustration of the need for accurate navigation. Suppose an aircraft starts from Newfoundland on the 1,200 mile flight to Flores in the Azores; an error of no more than three degrees in the course-made-good would lead the craft 60 miles astray by the time the neighbourhood of the island was reached; as will be seen from the map such an error might lead to consequences very serious to the navigator.

With this diagram before us it is worth while to visualise the all-important meteorological fact that an aircraft able to select its route and altitude of flight in such a way as to

have a 30 mile an hour wind behind it would shorten its journey by 720 miles in each 24 hours of flight. On a Transatlantic crossing this would immensely increase the ease and safety of the passage. It appears from a study which has been made of the prevailing Atlantic winds that of the routes shown on the map, the upper route shown is on the average the more favourable for an eastward crossing, whilst for a favourable westward one a route further south than the most southerly one shown, and therefore much longer, would be necessary. The middle one shown involves a "jump" of nearly 2,000 miles, which, without the assistance of a favourable wind, is on the limit of what is feasible for an aeroplane of the present day. It is well within the range, however, of a rigid airship of the No. 33 class; and Captain Maitland has given his opinion that it would be possible to build a commercial airship equal to this range even when carrying 12 to 15 tons of cargo. A more speculative suggestion has been made elsewhere of an airship—not of 2,000,000 but of 10,000,000 cb. ft. capacity—capable of a

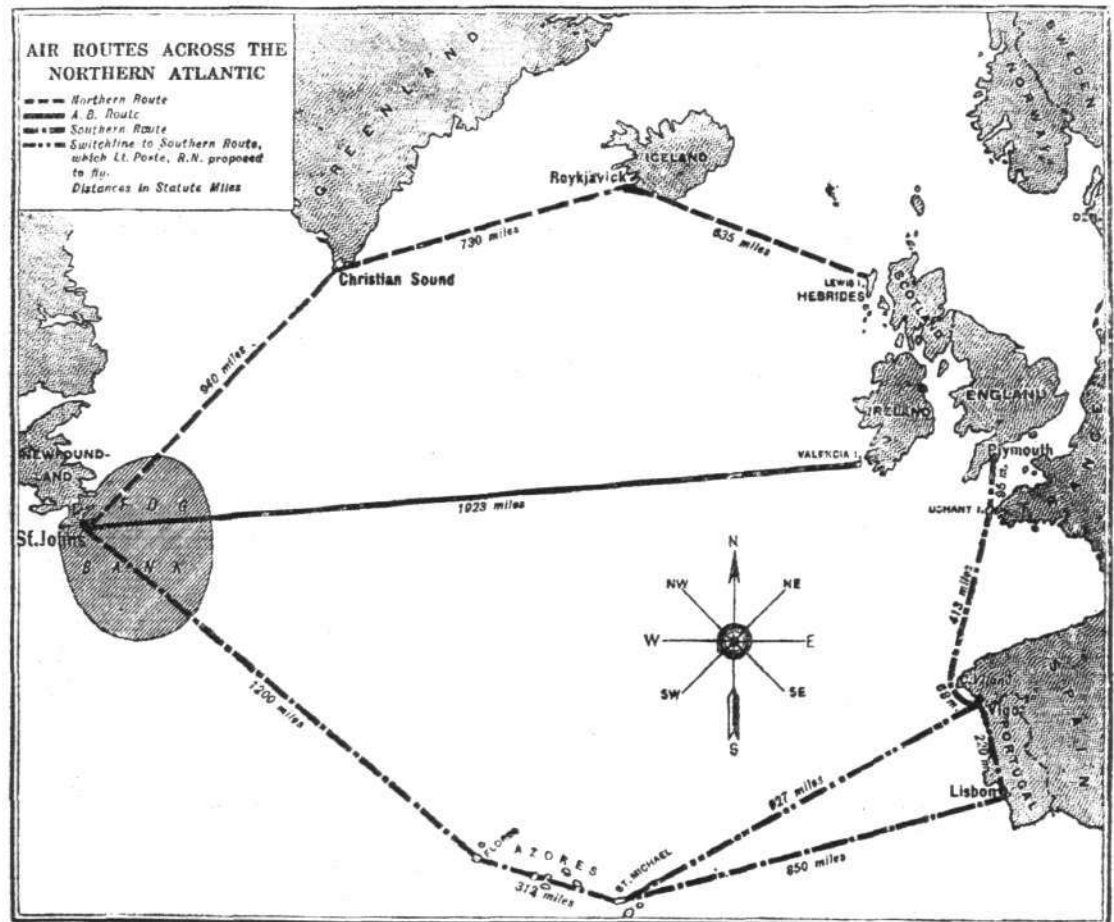


Fig. 1.

range of 20,000 miles and having a freight capacity of as much as 200 tons.

So many sides are there indeed from which the problem of the navigation of the air can be viewed, that there scarcely seems any limit to the subject, and therefore to the time which a lecture such as this might occupy. Fortunately in the mass of the problems which press for discussion and solution there are certain important groups which can be seen whole, and the one which has been selected for this present purpose is the actual navigator's work in planning an air voyage, and in making the necessary observations en route—particularly in those features wherein his work differs from that of the sea navigator.

### Sea Craftsmanship

All navigation begins with the sea. In the early days of sailing ships a knowledge of the surface winds in all parts of the navigable oceans was of first importance. Such knowledge was entirely empirical, and those who possessed it thought very little indeed of such effects as surface friction, and still less of the then unrealised importance of the weather conditions tens of thousands of feet above them. Coupled with an empirical knowledge of the average behaviour of

\* Paper read before the Royal Aeronautical Society, on April 30th, 1919.

surface wind was an empirical knowledge of the ocean tides.

With the advent of the higher speeds of steam-driven ships the tides became of less importance as a factor deflecting the ship from its course, although the greater momentum due to swifter motion made the penalty of misjudgment very much heavier.

Aircraft are concerned with another ocean—that of the air itself. Its tides are far less easy to predict than the tides in the sea, and are of far, far higher velocity. Its tides are the winds themselves and their intensity may range to 100 miles an hour or even more. Here are no permanent tide charts to guide the would-be navigator, be his need ever so pressing. Long experience of surface winds had enabled his maritime predecessor to form some rough judgments of the ways of such winds.

But we cannot count that the long experience of the mariner, however hardly won and however powerfully expressed, will apply in the upper air; the formulation of even rough rules may prove not to be possible, and whether possible or not, certainly they are as yet unrevealed. Meteorology, ever willing to help but sometimes lacking the means, is at last being placed in a position in which it can include in its wide world survey the study of the winds of the upper air. Such study is absolutely essential to the future of air navigation, and that this is beginning to be realised, witness the daily publication since January 21 last in *The Times* of tables of the "Wind Direction and Velocity in the Upper Air," the first of which is given herewith.

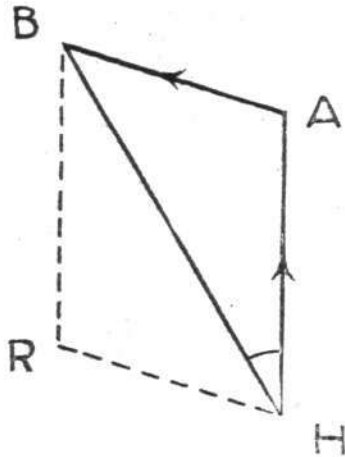


Fig. 2.

*Monday, January 20, 1919—Morning Observations.*

*Wind Direction and Velocity in the Upper Air.*

Height above Ground.

District.	2,000 ft. m.p.h.	5,000 ft. m.p.h.	10,000 ft. m.p.h.	15,000 ft. m.p.h.
Scotland, E. . .	S. 22	S. 28	—	—
England, N. . .	S.S.E. 37	—	—	—
England, N.W. . .	S.S.W. 14	S.W. 13	—	—
England, E. . .	—	S.S.E. 19	N.W. 43	W. 23
Ireland, S.W. . .	—	—	—	—

Velocities are given in miles per hour. Note here the importance of choosing the right level in which to fly. On this day in eastern counties the wind at 5,000 ft. was but 19 m.p.h., whereas at 10,000 ft. it was more than twice as much, whilst at 15,000 ft. the velocity had almost sunk to that at the 5,000 ft. level. Here the wind is seen first to increase with height and then to decrease, whilst the direction also changes considerably. But the more variable are the weather conditions the more necessary is it to have the right sort of meteorological information before setting out on a long air voyage.

*Allowance for Wind.*

It is easiest to allow for the effect of the wind by considering the aircraft to move straight ahead through still air, and then to consider separately the simultaneous shift—which we call wind—of this air ocean relative to the earth. If, for instance, an aeroplane starting from Hendon, heads due north for an hour at an air speed of 100 miles an hour, it would, if there were no wind, then find itself 100 miles north of Hendon, but if, in the meantime, there had existed a uniform wind such that the air in which the machine mounted at Hendon had since arrived at Reading, the airplane would at the end of the hour find itself 100 miles north, not of Hendon but of Reading. Thus, in Fig. 2 the machine flies from H to A, whilst the air moves from H to R and from A to B; so that at the end of the hour the machine finds itself not at A but at B. This is called a vector diagram and the velocity vector HA is said to be added to the wind velocity vector AB giving HB as the answer.

Evidently this means also that a machine wishing to fly from H to B must set its head along the direction HA and not in the direction HB; the angle AHB, the angle between the course steered and the course-made-good, is a very important one, and known as the angle of drift. HA is the course steered and HD the course-made-good.

Note that on an "out and home" journey in the same wind and at the same airspeed the drift angles out and home will be equal. Thus, to fly A to C, see Fig. 3, when the wind is equal to BD in velocity and direction means setting the head of the machine along AB on the outward flight and along CB on the home flight. Then as AB and BC are equal the angles of drift (BAD and BCD) must also be equal. Thus, if a navigator knows the right angle of drift to allow for

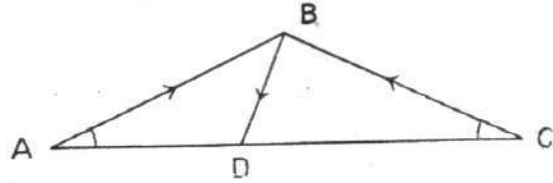


Fig. 3.

on his outward journey, he also knows it for his home journey if the same conditions as to wind and airspeed remain.

So if air speed be known and wind be known, and a good compass be available, the navigator is in the easy position of being able to predict his position from hour to hour with complete precision. He is in the same position as would be the navigator of a ship who knew the record of his log and the precise effect of the tides. The maritime navigator makes use of this knowledge—or of the best approach he can make to it—by plotting on his chart the position his ship would be in were there no tides at all, and this he calls the "dead reckoning" or D.R. position. He then corrects this

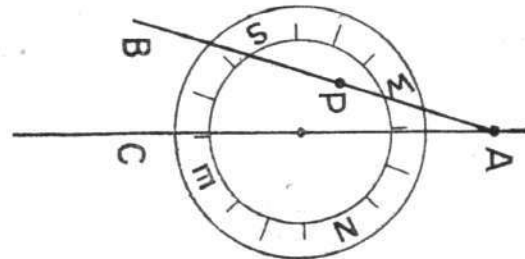
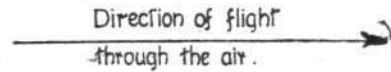


Fig. 4.

position for the effect of the assumed tides, and so arrives at his "estimated position." This needs always to be recorded in the log no matter whatever other navigational methods may be employed as a check. The importance of keeping note of the D.R. and estimated positions has long been known; there are some graphic "instructions" in Hakluyt's voyages, dated 1580.

Our air navigator needs to keep his D.R. position just as carefully, but he is in the more fortunate position in that

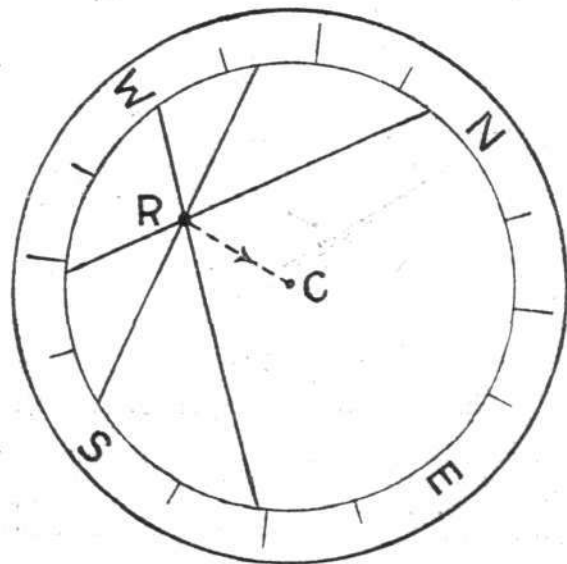


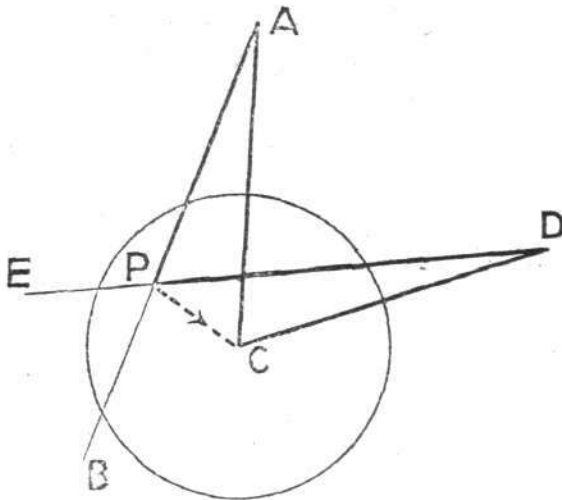
Fig. 5.

he can almost always determine the velocity and direction of the wind (his aerial "tides") from time to time by observation on the visible earth beneath. The ship navigator could only do this if the sea were transparent and he could see the bottom of the ocean and so observe and measure his angle of drift. The air navigator can almost always count on obtaining a glimpse, from time to time, of the earth and so check his current estimate of the wind.

A curious and convenient relationship here comes to the

air navigator's aid. If he uses a horizontal bearing plate having a transparent centre and lays across it a rod pivoted at one end, as shown in the diagram in Fig. 4, so that its length AB is parallel to the direction of the drift of the ground, AC, the line of symmetry being parallel to the fore and aft lines of the machine, and if he then draws a pencil line, AB,

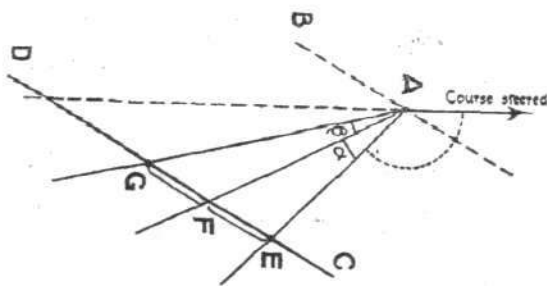
Fig. 6.



on the bearing plate (previously oriented correctly) and then repeats this operation on a number of courses, he will obtain a wind star, and the intersection point, known as the wind point, will give him the velocity and direction of the wind. Thus, in Fig. 5 three such courses are shown, and all, it will be observed, intersect at the wind point; RC is then the velocity of the wind to scale, and the direction of RC relative to the bearing plate scale gives the direction from which the wind is blowing. The point R can, of course, be got by a cut of two lines only, but for accuracy such change of course should not be less than say 50 deg.; this can conveniently be done by turning first 25 deg. one way, and then the other and for equal times, since this does not interfere appreciably with the course desired to be made good. Of course, aircraft on closed patrols, for war purposes, change course several times on each patrol and a wind determination or check can be made at each "corner." On a long straight flight the position of the wind point along the line, AB, in Fig. 4 can, if desired, be obtained by timing over some object on the ground and so determining the length of PA, and hence the position of the wind point. Equally, once the wind point is obtained, the length PA will give the ground speed and the bar, AB, can be graduated directly in m.p.h.

The procedure for setting AB to the drift angle depends on the height. At low heights it suffices to view the ground vertically below, but at considerable heights it is much more accurate to observe the angle which an object passed over

Fig. 7.



some minutes previously bears to the fore and aft line of the machine (a tail bearing). When over the sea a flare may be dropped to afford the necessary fixed point when nothing else is available.

So much for the actual use of the method; the reason why the drift lines in Fig. 5 all pass through the wind point in this convenient manner may seem to need explanation to those who are not prepared to take such construction for granted.

Thus, in Fig. 6, if an aeroplane head due north along CA, and the observed drift line be AB, we know the closing side of the vector diagram will represent the wind, and that it must start somewhere along the line, AB, and must end at C. In short, AB is what is called a "position line" for the wind point. Now head the craft on a new bearing, say 75 deg. E. of N., along CD, and let DE be the observed drift line. Then we get a new vector diagram, and a new position line, DE, for the wind point; these two intersect at P, and

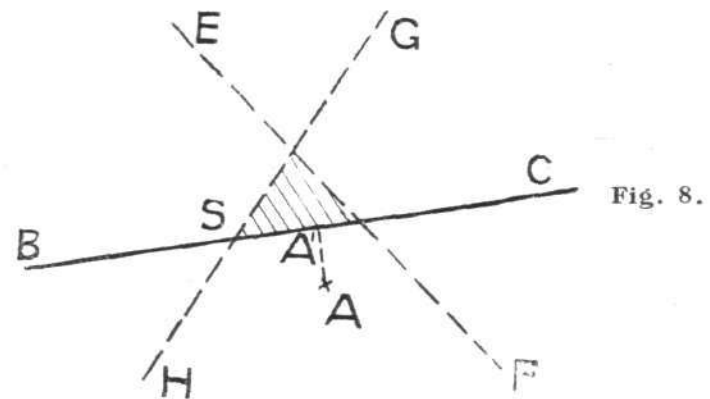
this must, therefore, be the wind point, and PC the velocity and direction of the wind to scale (the scale being the same one as that by which CA and CD represent the air speed).

This is for two courses only, but obviously the drift line for any third, fourth, or additional course must equally pass through the point P. Probably the obtaining of a wind star in this way by flying on several courses in succession affords as accurate a way as can be devised for the ascertaining of the wind elements at any desired altitude and time. Moreover, in the nature of the case, meteorological records must always be received some little time—not infrequently in practice, some hours—after the moment at which they were measured, whereas by this method the instantaneous values can be obtained and can be checked as often as desired.

It should also be noted that AP and DP, in Fig. 6, will measure the ground speeds along each of these courses. Hence, once the wind point is found and the instrument set accordingly figures can be given at once for the ground speed along any contemplated course and the probable duration of flight to cover any desired mileage over the ground.

Sometimes—especially in an ocean flight—a suitable object for drift observations will be seen on the earth's surface, but it may not be so placed as to be in the aircraft's path, or it may not be noticed until it is too late to alter course. For such cases the relative path—see Fig. 7—instead of being AB may prove to be CD. How is one then to determine the course being made good?

Perhaps the best method is to take times and bearings of the object as it passes through the points E, F and G, such that the time from E to F is equal to the time from F to G. Then if the angles  $\alpha$  and  $\beta$  are small, *i.e.*, not more than 15 deg., it is easy to find CD, the course-made-good, by marking off AE proportional to the angle  $\beta$  and AG proportional to  $\alpha$  and then to join FG. Thus, if  $\alpha$  be 15½ degs.



and  $\beta$  say 13 degs., we mark off AE at a length of 1.3 in. and AG at a length of 1.55 in.; this gives us the points E and G. Draw a line through these points and we have the bearing of the course-made-good; its inclination to the course being steered will give the drift angle.

With airships the ability to hover can be made use of. If an airship heads up wind and reduces speed until some object below appears stationary, the speed of the airship relative to the air must be equal and opposite to the wind. Hence, the velocity of the wind can be read on the air speed indicator and its direction noted by reading the course being steered.

Whether this method was actually used by the raiding Zeppelin airships I do not know, but it appears that use was made by them of an alternative and less attractive method. This alternative plan was to steer up wind and suddenly to put the ship on a wide circular uniform turn; on completing 360 degs. change of course the ship would, if the wind be zero, be back over the starting point of the turn—in the other event it would be in the rear of this point by a distance equal to the space covered by the wind in the time of the turn. The additional time taken to recover this lost ground at a known air speed, is related to the total of the two times in the same proportion as the wind velocity is to the air speed.

Thus, if  $T_1$  and  $T_2$  be the two times and V the air speed, then wind velocity =  $T_1V/(T_1 + T_2)$ .

*The Prediction of Wind*

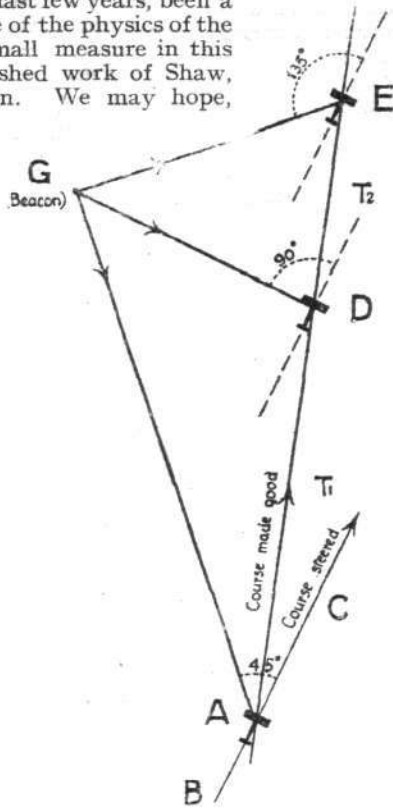
Air navigation requires two things of the meteorologists, first that they shall provide accurate information as to the average weather conditions along any specified air route, and secondly that they shall provide a forecast of the probable winds in the upper air during the ensuing two or three days.



The former is necessary when planning out standard air routes with their chains of landing grounds, and the latter to enable the navigator to select the best altitude for flight and the probable time table for his journey. Forecasting surface winds is, however, a difficult matter, and it may be that the winds of the upper air will prove as little tractable. It happens, fortunately, however, that there has, in the last few years, been a great increase in knowledge of the physics of the atmosphere, due in no small measure in this country to the distinguished work of Shaw, Taylor, Gold and Dobson. We may hope, therefore, that before long the science of meteorology may prove equal even to the considerable demands of the air navigator and his urgent needs.

The ability to predict the upper wind depends upon a knowledge of the pressure and temperature changes in the atmosphere. A few words may perhaps be appropriately inserted here to indicate the method by which this information is utilised. They will indicate the need for further development work in this direction. A knowledge of the barometric pressure throughout a given area enables a series of equal pressure lines, or isobars, to be drawn. The pressure gradient across these lines enables the resulting wind to be calculated; this is known as the gradient wind. The gradient wind is made up of two parts, the geostrophic component and the cyclostrophic component; the former, which is the more important, is due to the earth's rotation and the latter to the curvature of the isobars. The origin and nature of the geostrophic wind cannot be better described than in the following extract from the official "Barometer Manual," which I take the liberty to quote:—

"Let us consider the case of an arctic bird, or an aeroplane, that starts from some point on the parallel of 84 degs. N., and makes a bee-line for the pole (supposed in sight for the purpose of keeping a straight course), and keeps 'straight on' beyond it, flying at 60 nautical miles an hour. It will reach the pole by direct line after six hours' flight, and at the end of 12 hours will have done a journey of 720 miles and have got to latitude 84 degs. again, and meanwhile the place from which it started will have come round with the earth and have made the journey of about 1,130 miles, and the pilot who has made a straight course will find himself at home again. If he had marked his trail by dropping bombs at intervals or in some other effective manner, he would have provided conclusive evidence that he never 'set out' for the pole at all, but after once getting up speed he made off at a great pace to some point about west-north-west, gradually slackened his speed and got drifted towards the pole, and when he arrived there turned slowly round and came back to where he started from and arrived at the starting point again from the east-north-east. Whenever anything flies or floats in the air, as airships or winds do, the rotation of the earth has to be reckoned with, and its effect is to turn the course of a body that is left to its own momentum at the rate of 15 degs.  $\times \sin \lambda$  per hour, where  $\lambda$  is the latitude. On an earth that does not rotate, a body that is left to its own momentum keeps in a vertical plane and moves along a great circle. If the earth rotates the moving body left to its own momentum is diverted from the great circle at the rate of 15 degs.  $\sin \lambda$  per hour, to the right in the Northern Hemisphere and to the left in the Southern. If, on the other hand, it is to be kept in the great circle it has to be pushed from the side on which it would be left behind by the rotation of the earth underneath it. The push must always be at right angles to the direction of the motion, otherwise it would do more than alter the course, it would accelerate or retard



Note  $\tan \text{drift angle} = \frac{T_1 - T_2}{T_1 + T_2}$

Fig. 9.

the velocity, and that is not wanted. With a current of air in the free atmosphere we get, so far as we are able to tell, exactly the conditions required; the pressure difference on the two sides of a moving stream of air is always at right angles to its motion, and just provides the push necessary to steer the air with no appreciable effect upon the speed. We get a proper balance, and the air is moved under its own momentum without being diverted from its path along a great circle if the push represented by the pressure gradient  $\gamma$  is balanced by a speed of motion  $v$  such that  $\gamma = 2\omega v \sin \lambda$ , when  $\lambda$  is the latitude,  $\omega$  the angular velocity of the earth's rotation,  $\rho$  the density of the moving air."

This formula allows the geostrophic wind to be calculated. Careful researches along these lines have brought to light a surprising and most fortunate closeness of connection between the geostrophic wind and the actual wind. It is found in fact that the two may without grave error be regarded as substantially identical. Sir Napier Shaw\* remarks on this:—

"To assume that this balance of wind and pressure in the upper air is an operative principle of atmospheric structure may be thought a hazardous mode of procedure, and it requires the most scrupulous examination, but the proper course seems to be to accept it, at least until the proved exceptions are numerous enough to show that, under the prescribed conditions of motion approximately in a great circle, finite differences of pressure do exist in the air without the compensating velocity in the air currents. It need not be supposed that the balance is always strictly perfect, but only that in ordinary circumstances the accelerating forces operating in the air are so small in relation to the pressures that we measure, that they are beyond our powers of observation."

Shaw also points out that in ordinary circumstances there is a deviation of some 20 to 30 degs. between the direction of the surface wind and that of the geostrophic wind, due to surface friction and in the direction which that friction would indicate. Dobson has shown that although the geostrophic velocity may be arrived at within 1,000 ft. of the earth, the calculated direction will not usually be obtained till 2,500 ft.; it follows, therefore, that if the surface friction effects, always local and uncertain, are to be avoided, as accuracy in air navigation requires that they should, flight at a lower height than 2,000 or 3,000 ft. over land is undesirable. The effect is much less over the sea, and the equivalent heights would be lower. As a general rule, the velocity of the surface wind over the sea is one-third less

Equation to curve AEC

$$2 \left\{ z - \frac{ae}{e^2 - 1} \right\} = \frac{y^{e+1}}{e^2(e+1)} + \frac{a^e}{y^{e-1}(e-1)}$$

where  $\left\{ \begin{array}{l} e = \text{wind speed} \\ \text{air speed} \\ a = \text{a constant} \end{array} \right.$

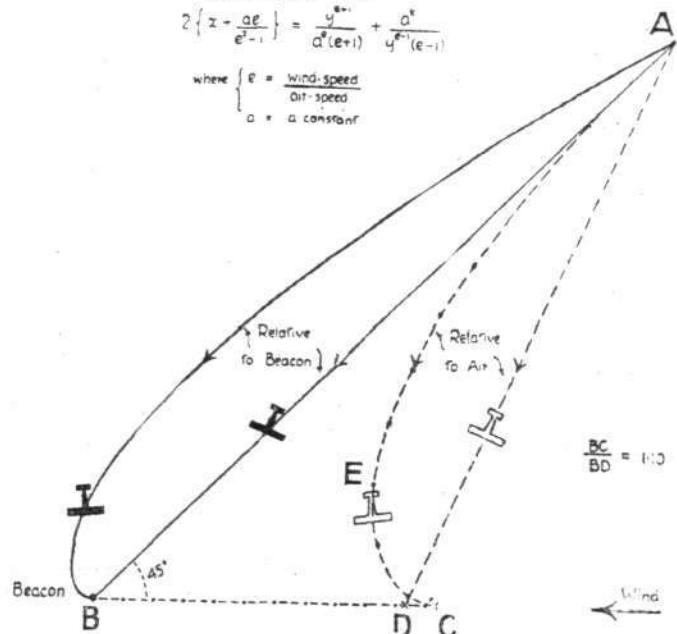


Fig. 10.

than it would be were there no surface friction; and over the land two-thirds less than it would otherwise be. In the absence of surface friction these velocities would each be that of the gradient wind. This loss of velocity of 33 per cent. over the sea involves the loss of about half the wind's kinetic energy; the missing half is found in the energy of the ocean billows.

Fog is so much the worst enemy the air navigator has

\* "Manual of Meteorology."

to face that it may not be out of place to consider the conditions which govern its occurrence. Fortunately meteorologists, are usually able to provide warnings when this danger is likely to be met with, the conditions of its formation being fairly well known. It is known, for instance, that whenever the ground is exceptionally cold so that there is a sharp rise of temperature from the ground upwards and at the same time a slow drift of air over it, there must be fog. This "reversed temperature gradient," as it is called, prevents the air below it from escaping upwards. The air below has a sort of "lid" on it. Thus, over a city a smoky pall will presently spread as the smoke finds itself unable to escape.

It might be expected that in a freely moving atmosphere the temperature would become equalised everywhere, *i.e.*, that it would become isothermal. Owing, however, to the compressibility of the air the law of temperature change is much less simple, being in fact for a well churned atmosphere the same as that which governs the temperature of the air in the compression stroke of an internal combustion engine, *i.e.*, the temperature changes approximate to the adiabatic. Our well-churned atmosphere would have not a uniform temperature, but one falling off at the rate of one deg. C. for each 100 metres of altitude. This condition sometimes arises, and when it does the following curious phenomenon occurs, *viz.*, that any body of air which gets slightly more warmed than its neighbour at once rises to the top, since at all positions it is slightly less dense than the surrounding air. Similarly, any portions slightly colder than their neighbours tend to descend to the bottom. Thus, on such occasions the whole atmosphere is very unstable.

When, however, the temperature falls off less rapidly than 1 deg. C. per 10 metres, then the atmosphere is stable. It is very stable when the temperature is isothermal, and exceedingly so under a reversal of gradient. A steeper falling-off in temperature than the adiabatic would seem to be impossible.

Newfoundland fogs are proverbial, and since Transatlantic flight may well start from that island, the conditions for air navigation on that route seem at first sight somewhat unpropitious. It must be remembered, however, that these particular fogs are chiefly known by their effects on ships, and that the essential danger for air navigation is fog over land, and not fog at sea. Fog at sea, like fog anywhere else, is always low-lying and can be flown above, but fog over a landing ground is another matter.

### Checks on Position

So much for winds and fogs. We now come to the action which the air navigator needs to take to check his estimate of his DR position. In sea navigation, the usual check on the estimated position is by an observation of the sun by day or of the stars by night. A single altitude gives a "position line," *i.e.*, a line on the chart somewhere along whose length the true position of the ship must be. Thus, if in Fig. 8 A be the estimated position, and BC a position line found by the observation of some heavenly body, it would be assumed that the real position of the ship would be at A', since the shift from A to A' attributes the minimum error to the estimated position. BC is sometimes called a "sunmer-line"; mathematically it is the locus of all points in the neighbourhood of A, at which the heavenly body observed has the same altitude. A knowledge of that altitude, therefore, tells the navigator his position must be somewhere along this line, but it does not indicate the exact spot; for that a second observation is required.

If a further position line such as GH could by some means be obtained, then we should know, within the limits of instrumental and observational error, that the ship's position must be at S. For such a cut to be accurate the angle between BC and GH should not be too small. If a third position line, EF, were obtainable then the true position would be assumed to be inside the "cocked hat," which is shown shaded. In air navigation the same methods of observation can be employed, as soon, at any rate, as observational instruments capable of accurate use in the air are available.

At sea the standard instrument is the sextant. It is used to measure the angular elevation of any heavenly body above the visible horizon. This visible horizon at sea is never a great way off; thus from an observing point 50 ft. above the surface of the sea the horizon is but nine miles away. An attempt to use an ordinary sextant from an aircraft, however, brings one up against the serious difficulty that from a height of 5,000 ft. the horizon is nearly 90 miles away, and the thickness of air to be passed through is ten times as great as in the previous instance. With the least haze, therefore, a definite line for the horizon will not be found. Quite commonly, in fact, the "visible horizon" seen from the air is merely the upper line of some haze or cloud lying at an

unknown height. To avoid horizon difficulties, an artificial horizon may be employed; this may be either some gravity controlled level or a gyrostatic mechanism. The former is subject to vibration and acceleration errors of rather troublesome amount. Vibration can be reduced by suitable design, but acceleration errors are much more difficult to deal with. Straight steering on a distant mark coupled with an even air-speed are the most fruitful ways of reducing acceleration errors. When no distant mark is visible, use may be made of a turn indicator and the machine be so flown that the radius of curvature of the path is always five miles or more, in which case the lateral acceleration will be limited to about 1 ft. per sec. per sec. corresponding to a maximum error in the level of about 2 degs.; by taking the average of a number of readings, however, this error can perhaps be reduced to manageable limits.

Gyrostatic means of preserving the level are much more attractive in theory, and thanks to the energy and ingenuity of inventors, there is a good prospect of practical success being achieved; but such apparatus is usually bulky for such work, and this weighs against its greater accuracy.

Apart from altitude observations with sextants, azimuth readings will be found advisable—as at sea. This opens up a field for research in which much has yet to be done. During recent years yet another means of obtaining position lines has been perfected. It has been found possible to determine from an aircraft the compass direction from which wireless waves are being received, and although the time is not yet ripe for a discussion of the methods of operation actually employed, some general considerations respecting this method of navigation are well worth discussing. On the assumption that such waves precisely follow great circles in their passage round the earth and that their direction on being received can be ascertained, it is obviously possible, on recognising the signal indicating the beacon station from which the waves are sent, to plot a wireless position line; and if two such beacon stations are sending and are suitably placed, a "cut" may be obtained. Or one such position line may be used in connection with one or more obtained by astronomical means. Care must be taken in plotting wireless position lines on a Mercator chart, since great circles on such charts need to be represented by approximately curved lines. The essential point to bear in mind in air navigation, however, is that "estimated positions" by dead reckoning must always be logged; then, that position lines derived from astronomical observations or directional wireless should be obtained as a check on the positions so logged.

A point which may perhaps be worth bringing out is that a combination of bearing and timing observations on a wireless station which is being passed to port or starboard enables the drift angle to be determined without the earth itself being visible. Thus if in Fig. 9 an aeroplane, A, is steering a course, BC, and making good a course, ADF, and the time taken to pass from A where the beacon is on the port bow, to D where it is abeam to port, and from D to E where it is on the port quarter, then the tangent of the angle of drift (the angle DAC) is equal to the difference of these times divided by their sums. This may prove a convenient method of checking the estimated drift angle, and so giving a new position line for the wind point.

A method of wireless navigation which has been proposed is for an aircraft to set its head steadily toward a wireless beacon, and so make sure of arriving at the desired haven, whether the course steered is otherwise a scientific one or not. This will be quite satisfactory in still air, but when there is a high wind blowing it may lead to a somewhat sinuous path. For the existence of wind means that the air ocean has motion relative to the earth; we may regard the air as still and the earth moving under it at the same speed as the wind, but in the opposite direction—the relative motion is the same. Adopting this convention we have a wireless beacon, towards which the aircraft is headed, itself in rapid motion relative to the air. This sets the aircraft on a curved course—the path of a dog running after its master, studied by mathematicians as the "curve of pursuit." In Fig. 10 is seen the path of an aircraft relative to the air under these conditions, with the wind at starting coming over the port quarter with a velocity equal to half the air-speed; and in addition its path relative to the ground. I have also shown by dotted lines the route which would have been followed had the machine been headed by exactly the right allowance for the wind. The "wireless" air path AEC is longer than the correct path, AD, by 10 per cent., and this requires a correspondingly increased fuel capacity if this method of navigation were adopted under high wind conditions. Similar curves can be drawn for other wind velocities and other wind directions.

**AIRISMS FROM THE  
 FOUR WINDS**

FROM Lord French's War book, "1914," which is now appearing in the *Daily Telegraph* in instalments, the first use of aeroplanes by the Allies in actual operations is given as Saturday, August 22, 1914. Speaking of the opening phases of the Battle of Mons on this day, Lord French says: "The intelligence reports, which constantly arrived, and the results of cavalry and aircraft reconnaissances, only confirmed the previous appreciation of the situation, and left no doubt as to the direction of the German advance; but nothing came to hand which led us to foresee the crushing superiority of strength which actually confronted us on Sunday, August 23.

"This was our first practical experience in the use of aircraft for reconnaissance purposes. . . . The number of our aeroplanes was then limited, and their powers of observation were not so developed or so accurate as they afterwards became. Nevertheless, they kept close touch with the enemy, and their reports proved of the greatest value.

"Whilst at this time aircraft did not altogether replace cavalry as regards the gaining and collection of information, yet by working together as they did the two arms gained much more accurate and voluminous knowledge of the situation.

"It was, indeed, the timely warning they gave which chiefly enabled me to make speedy dispositions to avert danger and disaster."

INTEREST in the Transatlantic flight is as keen with the public in the United States as on this side. American officialdom also takes a broad view of the event, and the latest note from New York records that the U.S. naval tender "Melville" is already round about mid-ocean, with a crew of experts, journalists and cinema operators on board to handle at least the American section of competitors in this historical event.

In the West-end of London a booking agent has had a sign painted whereon is the following legend:—

"Agents for the principal Flying, Steamboat, and Railway Companies."

Aviation, it will be noted, takes premier place.

A good subject for dissection upon the mentality of the

Hun is afforded by a proposition put forward recently to a British newspaper representative in Berlin by a young ex-officer with the Iron Cross. He was desirous of finding a Press agent in the United States for the purpose of exploiting Udet, the "ace," who proposes to tour the States with the Fokker machine in which he claims to have shot down 61 Allied airmen! This young Hun was apparently quite surprised at the correspondent's suggestion that perhaps the United States might not enjoy the spectacle. He said Udet hoped to join the American Army as a flying instructor.

NOTHING less than an aeroplane to get about on is now employed by up-to-date "special correspondents" of the great dailies, judging by the reports now being sent from the European centres of unrest. "Since I arrived by an aeroplane of the Bavarian Aerial Lloyd from Berlin on Thursday" is just by way of sample of the means taken to impress superiority upon the humble motorist or weary train traveller of every day life.

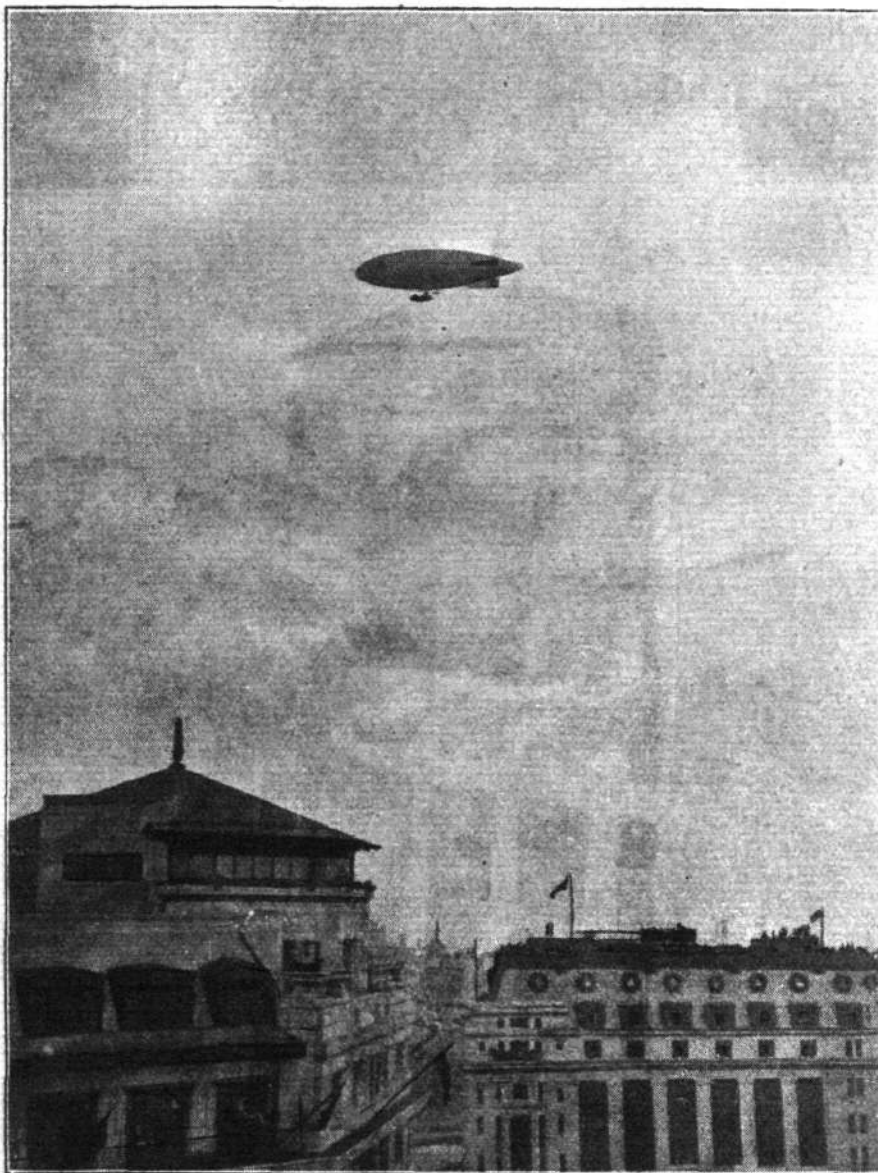
Apropos the self-sealing petrol tanks for aeroplanes, to which reference was made last week by Lieut. J. Imber, a young Canadian officer, and the inventor, the following are some details of this safety tank as given by Mr. Imber:

"The secret of the self-sealing tank lies in the fact that I used the enormous hammer-head pressure set up by the bullet when passing through the petrol to close the exit hole. The hole where the bullet goes is a mere pin-prick; but where it pushes the petrol through the opposite side it leaves a hole you can sometimes put your head through.

"Therefore I made the tank in three parts. Inside is a light framework of aluminium tubing and baffle plates to stop the swish of the petrol. Slipped over this is a thin metal case, and over this again a coating of rubber, a quarter of an inch thick, is vulcanised. Every part 'gives' before the pressure of the bullet. The framework may be

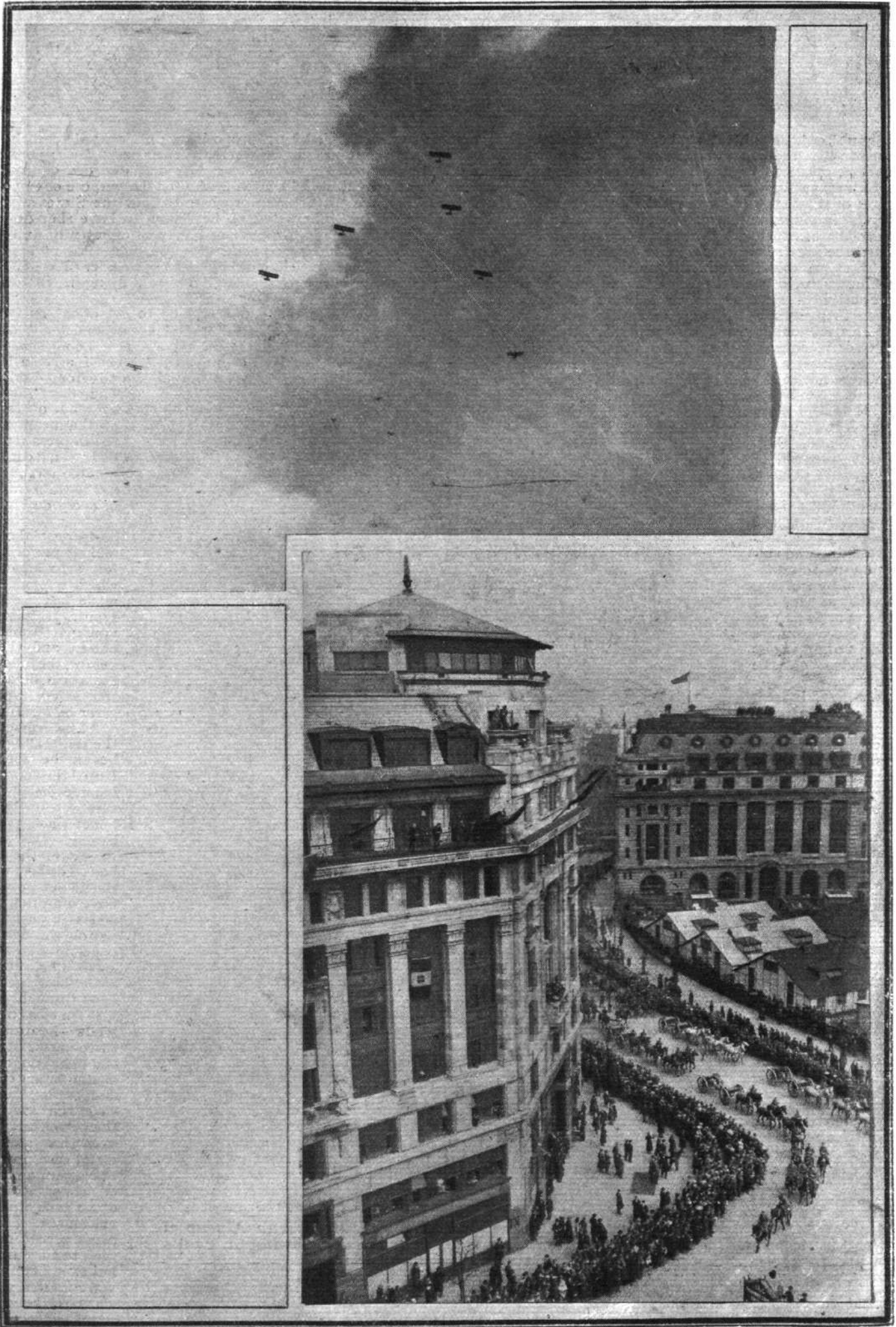
smashed and the side of the tank broken, but the elastic side bulges out before the pressure of petrol, allowing the bullet to pass through. The instant it is gone the elastic flies back into position and closes the hole.

"The same thing happens when the tank is 'crashed,' but in a reverse manner.



THE GREAT OVERSEAS MARCH ON MAY 3rd.—A snap of a Blimp taken from York House, Kingsway, showing St. Paul's Cathedral in the distance.

"Flight" Copyright.



**THE MARCH OF THE OVERSEAS TROOPS ON MAY 3rd.**—A view of the troops rounding Kingsway after passing Australia House (in the distance). Above is a picture, from an untouched negative, of the attending air escort of fourteen Canadian aeroplanes.

WHEN we were small (and deary-me, how long ago that was!) we used to sneak out privily and buy forbidden "bloods" at a penny, which had more bite in them than the rather goody-goody literature authorised by the home authorities. There was always an aerial Raffles in them, a criminal of unlimited resource, who got away with the swag in a flying machine of wondrous design, dropping the corpses of his victims over-side with a series of sickening thuds. Now it is seriously argued by the daily press that steps will have to be taken to prevent just this sort of thing, and America already possesses a winged policeman. These appendages are not visible in the photograph, which shows the customary heavy-jawed Irish-American "cop," "fly cop" in fact, to use another hallowed Americanism. They are of M. Eiffel's section, unknown to angels, and he is to chase the coy house-breaker with them.

PERUSING the popular prints, it would seem that it is much easier now to buy an aeroplane straight off the counter, so to speak, than to secure delivery of a motor-car. The Grahame-White Bantam, the Blackburn Monoplane, and several other light and handy vehicles for the private owner, are selling round about four hundred and fifty pounds. We shall see them in the "Bargain Basement" yet, with an "eleven-three" tacked on to the end of their price!

PARODYING Molière, we can say "*Ou la reclame va-t-elle se nicher?*" Mr. Harry Tate announces with an awful gravity that he intends to be the first comedian to fly round the world. "Sweet are the uses of advertisement!" But we don't fancy that this gentleman with the mirthful moustache will girdle the earth until about the time when his classic car has reached Brighton.

THE scribes of the dailies (a queer breed) have dredged the dictionary for adjectives to describe the work of the Australian pilots on the occasion of the recent "march past" from the Mall to the Mansion House. "Heroic glory-laden soldiers," "spectacular steeple-chasing in the sky," "death-defying aerobatics," "aerial jazz display," etc., etc. We who were

working soberly in the cloistered calm of one of the Inns of Court wondered who had started a saw-mill outside when the business began. Several ripe old residents were heard to express a wonder as to whether the pilots could not read the sign prominently displayed here: "The Porters and Police have Instructions to remove any Persons making a noise within these Precincts." As for the adjectives of the chroniclers, we extemporised a few that were much more pungent, but no matter!

"No strap-hanging in the air," the *Daily Herald* assures us. Thank the kindly gods for that. We have strap-hung (unbeautiful verb!) in tubes, in railways, we have tittupped on our toes (or somebody else's) ever since the War began: the bones in our wrists are sore, and it's a relief to hear that there is some place where one sits. But if ever the traffic combine butts into the aerial business you may be sure that their vehicles will have little leather flaps underneath from which you are to swing by your teeth (passengers with false teeth may have halters). In central Africa the District Railway would do very well, for we believe the denizens of those parts have been thoughtfully provided by nature with tails for the purpose indicated.

SPEAKING seriously for a moment, nothing could be more regrettable than the sensational and ill-informed publicity now being given to aeronautics. On the strength of one short trip in an aeroplane any facile scribbler feels privileged to inflict his jejune opinions on the credulous public, together with all the wildest flights of his rudderless fancy. "It is not, nor it cannot come to good." Any glib clap-trap about aviation is sure of a place in the press, so it is sufficiently sensational. Anyone who ventured to point out with sobriety the wildness of these prognostications would be indeed a prophet in the wilderness. The awakening, and the attendant revulsion, will come, we fear, after the first bad accident in which a passenger machine is concerned. After that aviation may be saved from its *soi-disant* friends, and will be free to develop as it listeth.

## CIVIL AVIATION

### FLIGHTS OF NOTE

SINCE the ban on civilian flying was raised on May 1 there has been so much activity that it is only possible to record the outstanding flights, and a few which are but typical of many others.

The first flight under the new regulations was that of a D.H. 9 with 250 h.p. B.H.P. engine, which left Hounslow before dawn, with a parcel of *Daily Mails*, for Bournemouth. Unfortunately, fog was encountered in the neighbourhood of Portsmouth, and a forced landing on the Portsdown Hills resulted in the machine being wrecked and the pilot, Capt. H. J. Saint, D.S.C., and passenger, Capt. D. Greig, being injured.

The London to Bristol airway was opened on May 1 by a Bristol-Rolls-Royce "Coupe," which brought Mr. H. J. Thomas, Director and Works Manager of the British and Colonial Aeroplane Co., Ltd., to town to keep an appointment with Maj.-Gen. Seely at the Air Ministry. The machine, which was piloted by Lieut. Uwins, is a fast one designed to carry one passenger in a warm closed-in coupe, fitted with a writing desk and other conveniences, including telephonic communication with the pilot. In spite of strong wind and heavy showers of rain, a quick passage was made, and the machine landed at Hounslow 58 min. 5 secs. after taking off at Filton.

During the afternoon a Handley Page Rolls-Royce machine, with ten passengers on board, was flown to Manchester by Lieut.-Col. W. F. Douglas, M.C., D.F.C., and a Sopwith Gnu, with 200 h.p. B.R.2 engine, was piloted by Capt. Allen from Hounslow to Lympne aerodrome with a parcel of papers. A Bristol "Fighter," with a load of film was taken by Capt. West from Reading to Manchester.

On May 3 a four-engined Handley Page Rolls-Royce,

piloted by Mr. Clifford B. Prodder, flew from Belfast to Carlisle, Newcastle, York, Doncaster, Lincoln, Boston, and across the Wash to Bircham Newton, a total distance of 410 miles, in four hours and 20 min. The weather was very bad and at one point the machine ran into a hailstorm.

A twin-engined Handley Page, with seven passengers, piloted by Maj. Foot, M.C., flew from London to Brighton, then on to Eastbourne and St. Leonards and back to Cricklewood, packets of newspapers being dropped at each place.

Mr. Sydney Pickles, on a Fairey Rolls-Royce seaplane, rose from the Thames at Westminster during the afternoon and carried packets of the *Evening News* to Westgate and Margate, afterwards returning to Blackfriars Bridge, where the machine was hoisted on to a barge which serves as a temporary hangar.

Carrying newspapers and ten passengers, the *Daily Mail* two-engined Handley-Page Rolls-Royce aeroplane made a fine non-stop flight of 370 miles on May 5. It left Manchester at 5.20 a.m. and passed over Carlisle, Dundee, Aberdeen, Montrose, and Edinburgh. At Aberdeen Maj. Orde Lee descended by "Guardian Angel" parachute in order to pay a visit to a friend. The machine carried 1,500 lb. of newspapers, which were dropped along the route by parachute.

On May 6 Col. Douglas tried to fly back to Carlisle, but was forced to land at Penrith owing to bad weather.

On May 6 the twin-engined Handley Page Rolls-Royce, made a trip from Cricklewood to Filton, Bristol, then going on to Exeter and back to Plymouth, dropping parcels of papers at these points. The machine, piloted by Maj. Foot, left Cricklewood at 5.43 a.m., reached Bristol at 7.20, Exeter at 8.35, Plymouth at 9.20, and landed at Bristol at 10.40, having covered 310 miles in 4 hours 57 min.

### The Accident to Gen. Sykes

AN aeroplane taking Maj.-Gen. Sir F. H. Sykes, Controller-General of Civil Aviation, to Paris, met with an accident on the afternoon of May 3, at Kenley. The pilot, Capt. E. M. Knott, A.F.C., was killed. Maj.-Gen. Sir F. H. Sykes was badly shaken, but was able to motor to London. He was removed in the evening to a private nursing home, and is making good progress.

The accident happened at a height of about 50 ft., soon after

the machine had begun to leave the ground. Gen. Sykes scrambled out of the machine, and extricated Capt. Knott, but the latter was so severely injured that he died on his way to the hospital.

### Forest Protection in Canada

MR. STUART GRAHAM, who was a naval air pilot in the R.A.F., has arrived at Ottawa to take charge of two planes released by the Canadian Department of Naval Affairs for forest protection in Quebec.



# CIVIL AVIATION

THE Air Ministry makes the following announcement:—

1. The official Air Navigation Regulations (printed below) apply to the United Kingdom only. They do not permit of civil aircraft flying from England across the Channel to any foreign country, and are not applicable elsewhere than in the United Kingdom. Overseas civil flying will not be possible until the International Regulations for the Control of Aviation are published.

2. The regulations dealing with airship and balloon pilots are not yet completed.

3. The air routes and aerodromes so far selected are necessarily tentative, and their permanent retention depends on the value of this newly inaugurated system justifying the cost of maintenance. This consideration accounts for the fact that at present only two official aerodromes in Scotland are included in the list and none in Wales. With the growth of civil aviation and the increasing output of aircraft it may be desirable to open up fresh aerodromes.

4. *Prohibited Areas.*—The list of areas over which flying is prohibited given in Schedule 6 of the Air Navigation Regulations was drawn up to meet war needs, and will remain in force pending the conclusion of peace, when it is hoped that they will be much reduced. A further announcement on the subject will be made in due course.

5. *Accommodation at Aerodromes.*—At each aerodrome, mentioned in the list published on April 25, a hut or part of a hut will be placed at the disposal of civilian aviators as an information bureau, and an officer will be detailed to give information and render every assistance to those requiring it. Information as to the cost of petrol, oil, etc., will be posted up inside the hut, and it is hoped that a regular service of meteorological bulletins and other useful information will shortly be available. These huts will be clearly marked with the letters C.A.T.O. (Civilian Aviation Transport Office).

6. Owing to the shortage of labour and other causes it has been found impossible to equip certain of the specified aerodromes with suitable accommodation for machines by May 1.

7. *Inspection of Aircraft at Aerodromes.*—It will be noted that a necessary part of the aerodromes management is the

provision of licensed ground engineers. As there has not yet been time for firms to provide these, the A.I.D. has been called upon, as a temporary measure, to provide a certain number of skilled personnel to assist. It must be remembered, also, that it is only from aerodromes where licensed ground engineers are located that aeroplanes can start.

8. *Military Markings.*—The bulk of machines which will at first take part in civil flying, having been built as Service machines, are marked with red, white and blue rings, and bear Government numbers. The existing Government numbers will be allotted to these machines as temporary registration marks. When permanent marks are allotted the old registration numbers must be erased and the new permanent marks put on within 14 days of allotment. Owners of aircraft upon which the service ring markings are painted must obliterate them.

9. *Petrol and Oil.*—Petrol, oil and small spare parts, such as sparking plugs, etc., will be purchasable. The following retail prices have been fixed:—

	Per gallon
	s. d.
Aviation petrol, exclusive of tin, . . . . .	3 5½
Castrol oil "R" lubricating oil, inclusive of tin . . . . .	10 3
Oil, mineral, thick and thin, inclusive of tin . . . . .	4 8
Castor oil, pure pharmaceutical, inclusive of tin . . . . .	7 11
Castor oil, treated, inclusive of tin . . . . .	8 1

10. *Accidents.*—Accidents to all aircraft other than those of a minor nature must be immediately notified by telegram to the Air Ministry (Accidents, "Estrand," London), with a view to preliminary enquiry into the nature of the accident. This notification will be made by owners, their representatives, or the Civil Authority. The Air Ministry will then decide whether detailed investigation is required. Until the decision of the Air Ministry has been given the wreckage of any machine to which an accident has occurred must not be disturbed. A formal release for the removal of the wreckage will be given by the Air Ministry.

11. All applications for licenses of every class, aerodromes, air-worthiness of machines, pilots, ground engineers, etc., should be addressed to the Air Ministry (C.G.C.A.).

## AIR NAVIGATION REGULATIONS

The following was published in a supplement to the *London Gazette* on April 30:—

### Order of the Secretary of State under the Air Navigation Acts, 1911 to 1919.

In pursuance of the powers conferred upon me by the Air Navigation Acts, 1911 to 1919, and all other powers enabling me in that behalf, I, the Right Honourable Winston Spencer Churchill, one of His Majesty's Principal Secretaries of State, by order make the following regulations:—

#### General Conditions of Flying

1. No aircraft shall fly within the limits of the British Islands and the territorial waters adjacent thereto unless the following conditions are complied with:—

- (1) The aircraft shall be registered in the prescribed manner;
- (2) The aircraft shall bear the prescribed registration and nationality marks, affixed or painted on the aircraft in the prescribed manner;
- (3) The personnel of the aircraft shall be licensed in the prescribed manner;
- (4) There shall be carried in the aircraft—(a) the certificate of registration; and (b) the licence of any member of the personnel who is required to be licensed;
- (5) The provisions of these regulations as to general safety, and the rules as to lights and signals and rules of the air, as set out in these regulations, shall be duly complied with;
- (6) No mails shall be carried without the consent in writing of the Postmaster-General, and no wireless apparatus shall be installed or worked except under and in accordance with a licence granted by the Postmaster-General, containing such conditions as may be approved by the Secretary of State;
- (7) The aircraft shall not fly over any prohibited area as defined by these regulations;

Provided that—(a) the requirements of this regulation as to registration and as to the bearing of registration and nationality marks, shall not apply to aircraft built for the purpose of experiment, and flown for the purpose of experiment or test only, within 3 miles of an aerodrome or aircraft factory or in accordance with such directions (if any) as may be given by the Secretary of State; and (b) the requirements of this regulation as to licensing of personnel shall not apply within the precincts of an aerodrome in the case of personnel under instruction or of aircraft flying for experimental purposes.

#### Additional Conditions in Certain Cases

- 2. Without prejudice to the last foregoing regulation—
  - (1) A passenger aircraft carrying passengers shall not—(a) fly within the limits aforesaid unless it has been certified in the prescribed manner as airworthy, and the prescribed conditions as to airworthiness, periodical overhaul, and examination before each flight are complied with, and all the prescribed certificates in relation to airworthiness are carried in the aircraft; or (b) use as a regular place of departure or place of landing any place other than a licensed aerodrome, or a R.A.F. aerodrome or aerodrome under the control of the Secretary of State approved for the purpose by the Secretary of State;
  - (2) A passenger or goods aircraft shall not fly within the limits aforesaid unless there are carried in the aircraft the prescribed log books, accurately kept up to date in the prescribed form and manner;
  - (3) An aircraft arriving in or departing from the United Kingdom shall comply with the provisions of these regulations applicable to such a case.

#### Reference to Schedules

3.—(1) The provisions in the schedules to these regulations shall have effect as part of these regulations, and shall be duly observed by all persons concerned in the cases to which they relate, that is to say:—

Schedule	Subject matter
I	Registration of aircraft.
II	Licensing of personnel.
III	Certificates of airworthiness for passenger aircraft, and periodical overhaul and examination of such aircraft.
IV	Registration and nationality marks.
V	Log books.
VI	Prohibited areas.
VII	Rules as to lights and signals and rules of the air.
VIII	Rules as to aircraft arriving in or departing from the United Kingdom.

(2) The Secretary of State may, if he thinks fit, issue directions for the purpose of supplementing or giving full effect to the provisions of the above schedules, or for any purpose for which provision is under these regulations to be made by direction of the Secretary of State.

#### Aerodromes

4.—(1) No place in the British Islands shall be used as an aerodrome or as a regular place of landing or departure by passenger aircraft carrying passengers, unless it has been licensed for the purpose by the Secretary of State, and any conditions of such licence are complied with.

(2) There shall be kept exhibited in a conspicuous place at all aerodromes used for the landing or departure of passenger or goods aircraft, a tariff of charges in such form and on such scale as may be directed or approved by the Secretary of State.

(3) In the case of any contravention of or failure to comply with this regulation, the proprietor of the aerodrome shall be deemed to have acted in contravention of or, as the case may be, failed to comply with these regulations.

(4) This regulation shall not apply to R.A.F. aerodromes or aerodromes under the control of the Secretary of State, the use of which has been sanctioned by the Secretary of State; provided that any directions of the Secretary of State as to the use of such aerodromes are complied with.

#### General Safety Provisions

5.—(1) An aircraft shall not fly over any city or town except at such altitude as will enable the aircraft to land outside the city or town should the means of propulsion fail through mechanical breakdown or other cause;

Provided that this prohibition shall not apply to any area comprised within a circle with a radius of 1 mile from the centre of a licensed aerodrome or of a R.A.F. aerodrome, or of an aerodrome under the control of the Secretary of State.

- (2) No person in any aircraft shall—
  - (a) carry out any trick flying or exhibition flying over any city or town area or populous district; or
  - (b) carry out any trick flying or exhibition flying over any regatta, race meeting, or meeting for public games or sports, except where specially arranged for in writing by the promoters of such regatta or meeting; or
  - (c) carry out any flying which by reason of low altitude or proximity to persons or dwellings is dangerous to public safety; or



(d) drop or cause or permit to be dropped, from the aircraft any article except ballast as authorised by the rules of the air as set out in these regulations.

**Production of Licences, Certificates and Log-books for Inspection**

6.—(1) Any member of the personnel of an aircraft shall on demand produce his licence for the inspection of any person authorised for the purpose by the Secretary of State.

(2) The owner and person in charge of any aircraft shall, on demand, produce for the inspection of any person authorised for the purpose by the Secretary of State, any certificates or licences relating to the aircraft, and also, in the case of passenger or goods aircraft, any of the prescribed log-books.

**Right of Inspection of and Access to Aerodromes and Factories**

7.—(1) Any person authorised by the Secretary of State for the purpose shall have the right of access at all reasonable times to any aerodrome for the purpose of inspecting the same, or to any place to which access is necessary for the purpose of carrying out his powers and duties under these regulations.

(2) All aircraft belonging to or employed in the service of His Majesty shall have at all reasonable times the right of access to any licensed aerodrome.

(3) During the construction of a passenger aircraft any person authorised by the Secretary of State shall at all times during working hours have the right of access, for purposes of inspection, to that portion of the shops in which parts are being manufactured or assembled, and to drawings of the parts under inspection, whether at the works of the main contractor or of sub-contractors.

**Exceptions**

8. These regulations do not, except where otherwise expressly stated, apply—(a) to military aircraft belonging to or employed in the service of His Majesty; or (b) to any aircraft or to any persons if and to such extent as such aircraft or persons may be exempted from these regulations, or any of them, by direction of the Secretary of State on the recommendation of a Government Department.

**Foreign Aircraft**

9. The provisions of these regulations as to—(a) registration of aircraft; (b) licensing of personnel; (c) airworthiness; (d) log books; and (e) wireless apparatus; shall not apply to foreign aircraft:

Provided that—

(i) no foreign military aircraft shall fly over or land in the British Islands or the territorial waters adjacent thereto except on the express invitation or with the express permission of His Majesty or of a Government Department, but any such aircraft landing on such invitation or with such permission shall be exempt from these regulations to such extent and on such conditions as may be specified in the invitation or permission; and

(ii) where any foreign aircraft, after first landing in the British Islands, flies over any part thereof except in such manner as may be necessary in order to proceed to a foreign destination, all the provisions of these regulations shall apply to that aircraft unless there are carried in the aircraft, and produced for inspection as and when required by the Secretary of State, certificates, licences, and log books issued by the responsible authority in the country to which the aircraft belongs, complying substantially with the provisions of these regulations, and unless (in the case of a passenger aircraft) the conditions of the aircraft from the point of view of the safety of the passengers and personnel correspond substantially with the particulars contained in the certificates produced.

**Penalties**

10.—(1) Where any aircraft flies in contravention of, or fails to comply with, these regulations or any provision thereof, the owner of the aircraft, and also the pilot or commander, shall be deemed to have contravened or, as the case may be, failed to comply with these regulations:

Provided that it shall be a good defence to any proceedings for contravention or failure to comply with these regulations if the contravention or failure is proved to have been due to stress of weather or other unavoidable cause.

(2) If any person obstructs or impedes any person acting under the authority of the Secretary of State in the exercise of his powers and duties under these regulations, such first-mentioned person shall be deemed to have acted in contravention of these regulations.

(3) Any person contravening or failing to comply with these regulations or any provision thereof is liable to imprisonment for a term not exceeding six months or to a fine not exceeding two hundred pounds, or to both such imprisonment and fine.

(4) Any aircraft which flies or attempts to fly over a prohibited area is liable to be fired on in accordance with section two of the Aerial Navigation Act, 1913, and the provisions of these regulations relating thereto.

(5) If any person in any aircraft is guilty of any act of espionage to which the provisions of section one of the Official Secrets Act, 1911, apply, he is liable to penal servitude for a term not exceeding seven years.

**Power to Cancel or Suspend Licences and Certificates**

11.—(1) The licence of any member of the personnel of an aircraft, or the licence of any aerodrome, may be cancelled or suspended by the Secretary of State on sufficient ground being shown to his satisfaction, after due inquiry, and his decision shall be final:

Provided that in special cases the Secretary of State may suspend any such licence temporarily and provisionally pending the holding of an inquiry.

(2) Any certificate relating to the airworthiness of an aircraft may be cancelled or suspended by the Secretary of State if he is satisfied that reasonable doubt exists as to the safety of the aircraft in question, or of the type to which the aircraft in question belongs.

(3) Where any person is convicted of any contravention or failure to comply with these regulations in respect of any aircraft, the Secretary of State may cancel or suspend the certificate of registration of that aircraft.

**Interpretation**

12. In these regulations, unless the context otherwise requires—

“Aircraft” includes airships and flying machines, all balloons, whether fixed or free, and kites;

“Airship” means an aircraft lighter than air and having means of propulsion;

“Balloon” means an aircraft lighter than air and having no means of propulsion;

“Flying machine” includes aeroplanes, seaplanes, flying boats, and other flying machines heavier than air and having means of propulsion;

“Military aircraft” includes naval, military, and air-force aircraft;

“Passenger aircraft” and “goods aircraft” mean respectively aircraft intended for carrying passengers, or goods (including mails), for hire or reward, and include respectively aircraft on which passengers or goods are actually so carried;

“Personnel” (in relation to any aircraft) includes any pilot, commander, navigator, and engineer, and any operative member of the crew;

“Aerodrome” means any definite and limited ground or water area intended to be used and capable of being used, either wholly or in part, for the landing or departure of aircraft;

“Proprietor of an aerodrome” includes any person responsible for the management thereof;

“Licensed aerodrome” means an aerodrome licensed under these regulations;

“Prescribed” means prescribed by these regulations or by directions of the Secretary of State thereunder;

“Prohibited area” means any of the areas referred to in Schedule VI of these regulations;

“Secretary of State” includes, in relation to any purpose of these regulations, any person authorised by the Secretary of State for that purpose.

The Interpretation Act, 1889, applies for the purpose of the interpretation of these regulations as it applies for the purpose of the interpretation of an Act of Parliament, and as if these regulations were an Act of Parliament.

**Saving**

13. Nothing in these regulations shall be construed as conferring any right to land in any place as against the owner of the land or other persons interested therein, or as prejudicing the rights or remedies of any person in respect of any injury to persons or property caused by any aircraft.

**Short Title**

14. These regulations may be cited as the Air Navigation Regulations, 1919.

WINSTON S. CHURCHILL,

One of His Majesty's Principal Secretaries of State.

Air Ministry, London,

April 30, 1919.

**SCHEDULES**

**SCHEDULE I.—Registration of Aircraft**

1. Certificates of registration shall be granted by the Secretary of State and upon registration there shall be assigned to the registered aircraft a registration mark.

2. The applicant, unless the Secretary of State in special cases otherwise allows, must be a British subject, or in the case of a body corporate must be registered and have its principal place of business in the United Kingdom.

3. Application for registration shall be made to the Secretary, Air Ministry.

4. The fee to be charged for registration will be one guinea.

5. Upon any change of ownership of registered aircraft, the certificate of registration shall lapse, but a fresh certificate may be applied for by the new owner.

**SCHEDULE II.—Licensing of Personnel**

**Licensing Authority**

1. Licences shall be granted by the Secretary of State. Applications therefor shall be made to the Secretary, Air Ministry.

**Pilots.**

2. A person applying for a pilot's licence to fly passenger or goods aircraft will be required to—(a) pass a medical examination carried out under the control of the Secretary of State; (b) produce a certificate of competency issued by the Secretary of State, or be qualified as a Royal Air Force pilot; (c) submit proof of recent reasonable flying experience on the class of machine for which the licence is required, or failing such proof undergo practical tests.

3. A person applying for a pilot's licence to fly machines other than passenger or goods aircraft must either be qualified as a Royal Air Force pilot, or produce a certificate of competency issued by the Secretary of State.

**Navigators.**

4. A person applying for a licence to navigate passenger or goods aircraft will be required to—(a) pass a medical examination carried out under the control of the Secretary of State; (b) produce a certificate of competency issued by the Secretary of State.

**Engineers.**

5. A person applying for a licence to be engaged as engineer on passenger or goods aircraft will be required to—(a) pass a medical examination carried out under the control of the Secretary of State; (b) submit proof of sufficient knowledge and experience in the management of aircraft engines; (c) undergo, if necessary, practical and theoretical tests.

**Other Persons**

6. Persons applying for a licence in any other capacity than those above specified must comply with such conditions as may be directed by the Secretary of State.

**General**

7. Holders of licences may be required from time to time to undergo further medical examinations carried out under the control of the Secretary of State.

8. Licences shall remain valid for the following periods:—

Pilots' licences .. .. . 6 months,

Other licences .. .. . 12 months,

and shall not be valid unless endorsed by the Secretary of State at those intervals.

9. The fee to be charged in respect of each licence issued and in respect of each such endorsement as aforesaid shall be five shillings.

In the event of any applicant being required to undergo such practical test as is specified in paragraphs 2 (c) and 5 (c) above, a further fee of one guinea will be charged.

**SCHEDULE III.—Certificates of Airworthiness for Passenger Aircraft and Periodical Overhaul and Examination of such Aircraft.**

**General.**

1. A certificate of airworthiness in respect of one aircraft of any type (hereinafter referred to as “a type aircraft”) will be issued by the Secretary of State in accordance with the conditions set out in this schedule at a charge of five guineas.

2. After the issue of a certificate of airworthiness to a type aircraft, any further aircraft of that type will be inspected for airworthiness by employees of the constructor, under arrangements approved by the Secretary of State, and if the aircraft in respect of which a certificate of airworthiness is desired conforms in all essential respects with the type aircraft, and is of satisfactory workmanship and materials, a certificate of airworthiness will be issued in respect of such aircraft by the Secretary of State at a charge of one guinea:

Provided that the Secretary of State may take steps to test the inspection made by the employees of a constructor, and if such test inspection, in his opinion, warrants such a course, may order a further inspection to be carried out by any person or persons duly authorised by him, and to issue or refuse a certificate, as he may decide, after such inspection, or to refuse to issue certificates of airworthiness in respect of further aircraft of the same type as that subjected to such test inspection that have been or may be constructed by the particular constructor.

3. Licences to competent persons for the purposes of this schedule shall be granted by the Secretary of State on compliance with such conditions as he may direct.

**Type Aircraft**

4. A certificate of airworthiness will not be granted for any type of passenger aircraft until the following conditions stipulated below have been fulfilled:—(a) The design has been approved by the Secretary of State in regard to safety; (b) the construction has been so approved in regard to workmanship and material used; and (c) a satisfactory demonstration in

accordance with the directions of the Secretary of State has been made in flying trials that the aircraft is safe for the purpose for which it is intended.

**Periodic Overhaul**

5. All passenger aircraft must be inspected, overhauled and certified as airworthy by competent persons appointed by the owners or users of them, and licensed for the purpose under this schedule, at such times as the Secretary of State may direct, and such certificate or certificates must be produced to the Secretary of State on demand.

6. Aircraft inspected, overhauled, or certified as provided in the foregoing paragraph may be inspected by authorised representatives of the Secretary of State, and the Secretary of State is entitled under these regulations to cancel or suspend the certificate of airworthiness of any aircraft deemed to be unsafe as a result of such inspection.

**Examination before each Flight**

7. No passenger aircraft carrying passengers shall on any day proceed on any journey unless it has previously been inspected at least once on that day by a competent person licensed for the purpose under this schedule, who shall not be the pilot of the particular machine.

8. If such competent person is satisfied that the aircraft is fit in every way for the flight or flights proposed he shall sign in duplicate a certificate to that effect, which certificate shall be countersigned by another person in the employment of the owner, giving the time and date of such certification. For this purpose the countersignature of the pilot may be accepted.

9. One copy of each certificate will be retained by the owner of the aircraft, and the duplicate copy must be carried in the aircraft.

10. The pilot will be responsible for seeing that the aircraft, before commencing any flight, is, in his opinion, in a satisfactory condition, and does not carry more than the load specified in the certificate of airworthiness, and must sign a certificate to that effect.

**SCHEDULE IV.—Registration and Nationality Marks**

1. The registration and nationality marks shall be such as the Secretary of State may direct.

2. The registration and nationality marks shall be affixed in black on a white ground in the following manner, and underlined with a black line:—

(a) *Flying Machines.*—The marks shall be painted once on the lower surface of the lower main planes, and once on the upper surface of the top main planes, the top of the letters to be towards the leading edge. They shall also be painted along each side of the fuselage between the main planes and the tail planes. In cases where the machine is not provided with fuselage the marks shall be painted on the nacelle.

(b) *Airships and Balloons.*—In the case of airships the marks shall be painted near the maximum cross section on both sides and on the upper surface equidistant from the letters on the sides. In the case of balloons two marks shall be painted on the maximum horizontal circumference as far as possible from one another. In the case of airships the side marks shall be visible both from the sides and ground.

3. The nationality mark in the case of flying machines and airships shall also be painted on the port and starboard sides of the lower surface of the lowest tail planes or elevators and also on the upper surface of the top tail planes or elevators, whichever is the larger. It shall also be painted on both sides of the rudder, or on the outer sides of the outer rudders if more than one rudder is fitted.

In the case of balloons the nationality mark shall be painted on the basket.

4. In the case of flying machines the height of marks on the main planes and tail planes respectively shall be equal to four-fifths of the chord, and in the case of the rudder shall be as large as possible. The height of the marks on the fuselage or nacelle shall be equal to four-fifths of the depth of the narrowest part of that portion of the fuselage or nacelle on which the marks are painted.

In the case of airships the nationality mark painted on the tail plane shall be equal in height to four-fifths of the chord of the tail plane and in the case of the rudder shall be as large as possible. The height of the other marks shall be equal to at least one-twelfth of the circumference at the maximum transverse cross-section of the airship.

In the case of balloons the height of the nationality mark shall be equal to four-fifths of the height of the basket, and the height of the other marks shall be equal to at least one-twelfth of the circumference of the balloon.

In the case of all aircraft the letters of the nationality and registration marks need not exceed 8 ft. in height.

5. The width of the numbers or letters shall be two-thirds of their height and the thickness shall be one-sixth of their height. The numbers or letters shall be painted in plain block type and shall be uniform in shape and size. A space equal to half the width of the numbers or letters shall be left between each number or letter.

6. In the case of underlined letters the thickness of the lines shall be equal to the thickness of the letter. The space between the bottom of the letters and the line shall be equal to the thickness of the line.

7. Where the registration and nationality marks appear together a hyphen of a length equal to that of one of the numbers or letters shall be painted between the nationality mark and registration mark.

8. The registration and nationality marks shall be displayed to the best possible advantage, taking into consideration the constructional features of the aircraft. The marks must be kept clean and visible.

**SCHEDULE V.—Log Books**

1. Log books shall take the form of an aircraft log book, an engine log book, a journey log book, and a signal log book. If more than one engine is fitted a separate log book shall be provided for each engine.

2. Each log book shall be self-contained, but all log books shall be kept together in the aircraft in a waterproof bag of a pattern authorised by the Secretary of State.

3. The log books shall conform in all essentials to the patterns authorised by the Secretary of State, and shall contain such information and particulars as the Secretary of State may direct.

**SCHEDULE VI.—Prohibited Areas**

1. Each of the places named or described in the following list, with the land and territorial waters surrounding such place to a distance of three statute miles in all directions from its boundary, shall be in a prohibited area:—Whole of Scapa Flow; Kirkwall Town; an area enclosed by straight lines joining the following points: Tor Ness, Rora Head, Inga Ness, Mull Head, Old Head (Orkney Islands); Thurso Town; Cromarty Ness; Invergordon Pier; Dalmore Village, near Invergordon; Aberdeen Wireless Station; Montrose Town; Broughty Ferry Castle; Inchkeith Island; Rosyth Dockyard; Pitfirrane Park; Forth Bridge; Tynemouth, North Pier Lighthouse; Elswick Railway Station; Killingholme Air Station; Cleethorpes Wireless Station; Louth Railway Station; Landguard Point Breakwater (Felixstowe); Parkeston Quay; Ipswich Wireless Station; Osea Island; Shoeburyness Church; Fobbing Church; Tilbury Fort; Purfleet Railway Station; Barking Creek Mouth; Waltham Abbey Railway Station; Enfield Lock Railway Station; Chatham Dockyard; Teapot Hard; Chattenden Farm; Allhallows Church; Grain Martello Tower; Sheerness Dockyard; Dover Castle; Archcliffe Fort; Lydd Railway Station; Newhaven Station Harbour Jetty; Fort Cumberland; Spithead; namely, the space between a line from Lee-on-Solent Pier to Wootton Point and a line

from Southsea Castle to Seaview Pier; Portsmouth Dockyard; Cosham Railway Station; Fareham Railway Station; Culver Cliff, Naval Signal Station; Needles Lighthouse; Southampton Docks; Marchwood Park; Hurst Castle; Osmington Church; Weymouth Pier; Portland Convict Prison; Turnchapel Railway Station; Plymstock Railway Station; Keyham Dockyard; Devonport Dockyard; Saltash Railway Bridge; Penlee Point; Thorn Island (Milford Haven); Pembroke Wireless Station; Old Milford Railway Station; St. Ann's Head; Barrow-in-Furness Town Hall; Stevenston Railway Station; Greenock Pier; so much of Loch Long as lies north of a line drawn due east from Knap Point; Carrickfergus Railway Station; Grey Point; Spike Island; Haulbowline Dockyard.

2. The prohibited areas are more particularly shown in a map issued for the purpose by the Secretary of State.

3. The officer to give the signals and take the action mentioned in section 2 of the Aerial Navigation Act, 1913, shall be a commissioned officer in His Majesty's Naval, Military, or Air Forces.

4. The signals which may be given when an aircraft flies, or attempts to fly, over any of the prohibited areas shall be as follows:—

By day: three discharges, at intervals of not less than 10 secs., of a projectile showing smoke on bursting.

By night: three discharges, at intervals of not less than 10 secs., of a projectile showing red stars or red lights.

On such signal being given, the aircraft shall immediately land at the nearest practicable spot; provided that, if it be approaching or flying over any prohibited area, it shall not, in descending, advance further towards or into the area.

6. If an aircraft is unable to land immediately in response to the signal, owing to stress of weather or other unavoidable cause, it shall make the following signal:—

By day: show, from the place where they can be most clearly seen from below, a red triangular flag, together with two black balls superimposed vertically one above the other;

By night: wave a white light, at the same time extinguishing the side lights;

and shall, as soon as possible, land at the nearest practicable spot in the United Kingdom.

**SCHEDULE VII.—Rules as to Lights and Signals and Rules of the Air.**

*Interpretation of Rules*

In these rules—

The word "aircraft" comprises all balloons, whether fixed or free, kites, airships, and flying machines;

The word "balloon," either fixed or free shall mean an aircraft lighter than air, and having no means of propulsion;

The word "airship" shall mean an aircraft lighter than air, and having means of propulsion;

The word "flying machine" shall mean all aeroplanes, seaplanes, flying boats, or other flying machines heavier than air, and having means of propulsion.

The word "visible," when applied to lights, shall mean visible on a dark night with a clear atmosphere.

An airship is "under way" within the meaning of these rules when it is not made fast to the ground or any object on land or water.

The angular limits laid down in these rules shall be determined when the aircraft is in its normal attitude for flying on a rectilinear horizontal course.

**1.—RULES AS TO LIGHTS AND SIGNALS.**

1. The rules concerning lights shall be complied with in all weathers from sunset to sunrise, and during such time no other lights which may be mistaken for the prescribed navigation lights shall be exhibited. The said prescribed navigation lights must not be dazzling.

2. A flying machine when in the air, or manoeuvring on land or water under its own power, shall carry the following lights:—

(a) Forward, a white light, visible in a dihedral angle of 220° bisected by a vertical plane through the line of flight, and of such a character as to be visible at a distance of at least 5 miles;

(b) On the starboard side, a green light, so constructed and fixed as to show an unbroken light between two vertical planes, whose dihedral angle is 110° when measured to the right from dead ahead, and of such a character as to be visible at a distance of at least 3 miles;

(c) On the port side, a red light, so constructed and fixed as to show an unbroken light between two vertical planes whose dihedral angle is 110° when measured to the left from dead ahead, and of such a character as to be visible at a distance of at least 3 miles;

(d) The said green and red sidelights shall be fitted so that the green light shall not be seen from the port side, nor the red light from the starboard side;

(e) At the rear, and as far aft as possible, a white light shining rearwards, and visible in a dihedral angle of 140° bisected by a vertical plane through the line of flight;

(f) In the case where, in order to fulfil conditions (a) to (e) above, the single light has to be replaced by several lights, the field of visibility of each of these lights should be so limited that in no case can more than one be seen at a time.

3. The rules as to the lighting of flying machines shall apply to airships, subject to the following modifications:—

(a) All lights shall be doubled, the forward and aft lights vertically, and the side lights horizontally;

(b) Both lights of each pair forward and aft shall be visible at the same time.

The distance between each light comprising a pair shall not be less than 6 ft.

4. An airship, when being towed, shall carry the lights referred to in rule 3, and in addition those specified in rule 6 for airships not under control.

5. A flying machine, when on the surface of the water and when not under control, that is to say, not able to manoeuvre as required by the regulations for preventing collisions at sea, shall carry two red lights not less than 6 ft. apart in a vertical line one over the other, and of such a character as to be visible all round the horizon at a distance of at least 2 miles. In addition the side lights must be shown if the flying machine is under way.

6. An airship, which from any cause is not under control, or which has voluntarily stopped her engines, shall, in addition to the other specified lights, display conspicuously two red lights, one over the other approximately in a vertical line, not less than 6 ft. apart and constructed to show a light in all directions and of such a character as to be visible at a distance of at least 2 miles.

By day an airship, when being towed, or which from any cause is not under control, shall display conspicuously two black balls or shapes, each 2 ft. in diameter, placed one over the other and approximately in a vertical line.

An airship moored or under way, but having voluntarily stopped its engines, shall display conspicuously by day a black ball or shape 2 ft. in diameter, and shall be treated by other aircraft as being not under control.

7. A free balloon shall carry one bright white light below the car at a distance of not less than 20 ft., and so constructed as to show an unbroken light in all directions and of such a character as to be visible at a distance of at least 2 miles.



8. A fixed balloon shall carry in the same position as the white light mentioned in rule 7, and in lieu of that light three lights in vertical line one over the other, not less than 6 ft. apart. The highest and lowest of these lights shall be red, and the middle light shall be white, and they shall be of such a character as to be visible in all directions at a distance of at least 2 miles.

In addition the mooring cable shall have attached to it at intervals of 1,000 ft., measured from the basket, groups of three lights similar to those mentioned in the preceding paragraph. In addition, the object to which the balloon is moored on the ground shall have a similar group of lights to mark its position.

By day the morning cable shall carry in the same positions as the groups of lights mentioned in the preceding paragraph, and in lieu thereof, tubular streamers, not less than 8 in. in diameter and 6 ft. long, and marked with alternate bands of white and red 18 in. in width.

9. An airship, when moored near the ground, shall carry the lights referred to in rules 2 (a) and (e) and 3.

In addition, if moored but not near the ground, the airship, the mooring cable, and the object to which moored, shall be marked in accordance with the provisions of rule 8, whether by day or by night.

Sea anchors or drogues used by airships for mooring purposes at sea are exempt from this rule.

10. A flying machine stationary on land or water, but not anchored or moored, shall carry the lights specified in rule 2.

11. In order to prevent collisions with surface craft—

(a) A flying machine when at anchor or moored on the water shall carry forward where it can best be seen a white light so constructed as to show an unbroken light visible all round the horizon at a distance of at least 1 mile.

(b) A flying machine of 150 ft. or upwards in length, when at anchor or moored on the water, shall in the forward part of the flying machine carry one such light, and at or near the stern of the flying machine, and at such a height that it shall be not less than 15 ft. lower than the forward light, another such light.

The length of a flying machine shall be deemed to be the overall length.

(c) Flying machines of 150 ft. or upwards in span, when at anchor or moored in the water, shall carry in addition at each lower wing tip one such light as specified in (a) of this rule.

The span of a flying machine shall be deemed to be the maximum lateral dimension.

12. In the event of the failure of any of the lights specified under these rules to be carried by aircraft flying at night, such aircraft shall land at the first reasonably safe opportunity.

13. Nothing in these rules shall interfere with the operation of any special rules made by the Government of any nation with respect to the additional station and signal lights for two or more military aircraft or for aircraft in formation, or with the exhibition of recognition signals adopted by owners of aircraft which have been authorised by their respective Governments and duly registered and published.

14.—(a) Aircraft proposing to land at night on aerodromes having a ground control shall before landing—

Fire a green Very's light or flash a green lamp; and in addition shall make by international Morse code the letter group forming its call sign.

(b) Permission to land will be given by the repetition of the same call sign from the ground, followed by—

A green Very's light, or flashing a green lamp.

15. The firing of a red Very's light or the display of a red flare from the ground shall be taken as an instruction that aircraft are not to land.

16. An aircraft compelled to land at night shall, before landing, fire a red Very's light, or make a series of short flashes with the navigation lights.

17. When an aircraft is in distress and requires assistance, the following signals shall be used or displayed, either together or separately:—

- (1) The international signal, S.O.S., by means of visual or wireless signals;
- (2) The international code flag signal of distress, indicated by NC;
- (3) The distant signal, consisting of a square flag, having either above or below it a ball, or anything resembling a ball;
- (4) A continuous sounding with any sound apparatus;
- (5) A signal, consisting of a succession of white Very's lights, fired at short intervals.

18. In fog, mist, falling snow, or heavy rainstorm, whether by day or night, an aircraft on the water shall make the following sound signals with any sound apparatus:—(a) if not anchored or moored, a sound at intervals of not more than two minutes, consisting of two blasts of about 5 secs. duration, with an interval of about 1 sec. between them; (b) if at anchor or moored a sound at intervals of not more than 1 minute, consisting of one blast of about 5 secs. duration.

II.—RULES OF THE AIR

(a) General Rules of the Air

19. Flying machines shall always give way to balloons, fixed or free, and to airships. Airships shall always give way to balloons, whether fixed or free.

20. An airship when not under its own control shall, for the purposes of the rules of the air, be classed as a free balloon.

21. A motor-driven aircraft must always manoeuvre according to these rules as soon as it is apparent that, if it pursued its course, it would pass at a distance of less than 200 yards from any part of another aircraft.

22. When two motor-driven aircraft are meeting end on, or nearly end on, each shall alter its course to starboard.

23. When two motor-driven aircraft are on courses which cross, the aircraft which has the other on its own starboard side shall keep out of the way of the other.

24. An aircraft overtaking any other shall keep out of the way of the overtaken aircraft by altering its own course to the right, and must not pass by diving.

Every aircraft coming up with another aircraft from any direction more than 110° from ahead, i.e., in such a position with reference to the aircraft which it is overtaking that at night it would be unable to see either of that aircraft's side-lights, shall be deemed to be an overtaking aircraft; and no subsequent alteration of the bearing between the two aircraft shall make the overtaking aircraft a crossing aircraft within the meaning of these rules, or relieve it of the duty of keeping clear of the overtaken aircraft until it is finally past and clear.

As by day the overtaking aircraft cannot always know with certainty whether it is forward or abaft this direction from the other aircraft, it should, if in doubt, assume that it is an overtaking aircraft and keep out of the way.

25. Where by any of these rules one of the two aircraft is to keep out of the way, the other shall keep its course and speed. When in consequence of thick weather or other causes, such aircraft finds itself so close that collision cannot be avoided by the action of the giving-way aircraft alone, it shall take such action as will best aid to avert collision.

26. Every aircraft which is directed by these rules to keep out of the way of another aircraft shall, if the circumstances of the case admit, avoid crossing ahead of the other.

27. In following an officially recognised aerial route every aircraft, when it is safe and practicable, shall keep to the right side of such route.

28. Aircraft on land or water about to ascend shall not attempt to "take off" until there is no risk of collision with alighting aircraft.

29. Every aircraft in a cloud, fog, mist, or other conditions of bad visibility, shall proceed with caution, having careful regard to the existing circumstances and conditions.

30. In obeying and construing these rules, due regard shall be had to all dangers of navigation and collision and to any special circumstances which may render a departure from the above rules necessary in order to avoid immediate danger.

31. The dropping of ballast other than fine sand or water from aircraft in the air is prohibited.

(b) Regulations for Air Traffic on and in the vicinity of Licensed Aerodromes

32. At every licensed aerodrome there shall be a flag hoisted in a prominent position which shall indicate that if an aeroplane about to land finds it necessary to make a circuit or partial circuit such circuit shall be left-handed (anti-clockwise) or right-handed (clockwise) according to the colour of the flag. A blue flag shall indicate a right-handed circuit, i.e., that the flag is kept to the starboard side or side which carries the green light of the aircraft, and a red flag shall indicate a left-handed circuit, i.e., that the red flag is kept to the port side or side which carries the red light of the aeroplane.

Similarly aeroplanes leaving a licensed aerodrome shall conform to the circuit as indicated by the flag.

33. When an aeroplane starts from a licensed aerodrome it shall not turn until 500 yards distance from the nearest point of the aerodrome, and the turning then made must conform with the circuit regulation.

34. All aeroplanes flying between 500 and 1,000 yards distance from the nearest point of a licensed aerodrome shall conform to the circuit law, unless such aeroplanes are flying at a greater height than 6,500 ft.

35. Side-slip and trick landings are prohibited at licensed aerodromes. Aircraft are prohibited from indulging in trick flying within a distance in any direction of at least 2,000 yards from the nearest point of such aerodromes.

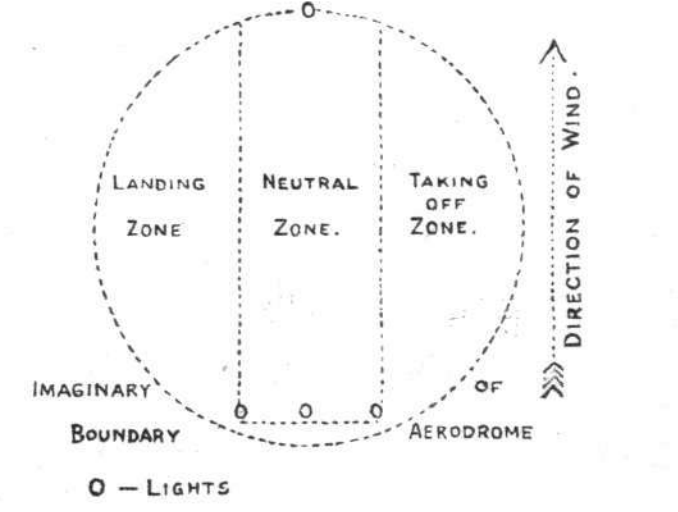
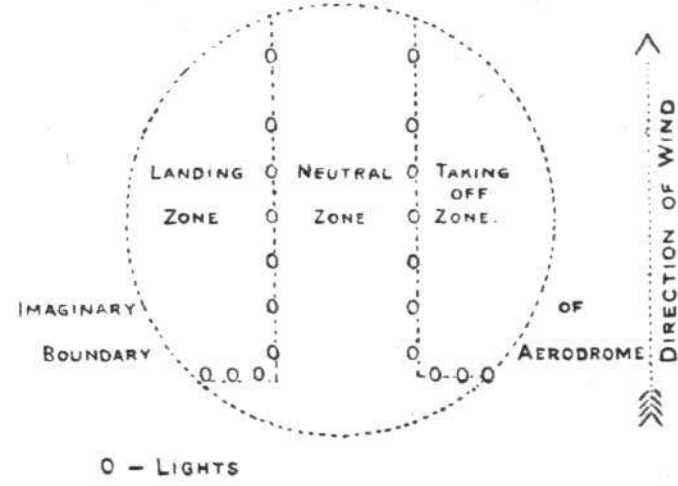
36. At every licensed aerodrome the direction of the wind shall be clearly indicated by one or more of the recognised methods, e.g., landing tee, conical streamer, smudge fire, etc.

37. Every aeroplane, when taking off or alighting on a licensed aerodrome, shall do so up-wind, except when the natural conditions of the aerodrome do not permit.

38. In the case of aeroplanes approaching licensed aerodromes for the purpose of landing, the aeroplane flying at the greater height shall be responsible for avoiding the aeroplane at the lower height, and shall, as regards landing, observe rule 24 as to passing.

39. Aeroplanes showing signals of distress shall be given free way in attempting to make a landing on a licensed aerodrome.

40. Every licensed aerodrome shall be considered to consist of three zones when looking up-wind. The right-hand zone shall be the taking off zone and the left-hand shall be the landing zone. Between these two there shall



be a neutral zone. An aeroplane when landing should attempt to land as near as possible to the neutral zone, but in any case on the left of any aeroplanes which have already landed. After slowing up or coming to a stop at the end of its landing run, an aeroplane will immediately taxi into the neutral zone. Similarly an aeroplane when taking off shall keep as far as possible towards the right of the taking-off zone, but shall keep clear to the left of any aeroplanes which are taking off or about to take off.

41. No aeroplane shall commence to take off until the preceding aeroplane is clear of the aerodrome.

42. The above rules shall apply equally to night landings on licensed aerodromes, when the signals shall be as follows:—

(a) A red light shall indicate a left-hand circuit and a green light shall indicate a right-hand circuit. The right-hand zone will be marked by white lights placed in the position of an "L," and the left-hand zone will be similarly marked. The "L's" shall be back to back, that is to say that the long sides of the "L's" will indicate the borders of the neutral zone. The direction of landing shall invariably be along the long arm of the "L" and towards the short arm. The lights of the "L's" should be so placed that the lights indicating the top extremity of the long arm shall be the nearest point on the aerodrome upon which an aeroplane can safely touch ground. The lights indicating the short arm of the "L" should indicate the limit of safe landing ground for the aeroplanes, that is, that the aeroplane should not over-run the short arm. (See sketch on previous page.)

(b) Where it is desired to save lights and personnel, the following system may be used:—

Two lights should be placed on the windward side of the aerodrome to mark the limits of the neutral zone mentioned in rule 40, the line joining the lights being at right angles to the direction of the wind; two more lights shall be placed as follows: one on the leeward side of the aerodrome on the line drawn parallel to the direction of the wind and passing midway between the two lights on the windward side, for showing the extent of the aerodrome and the direction of the wind, and the other shall be placed midway between the two lights marking the limits of the neutral zone.

Additional lights may be symmetrically put along the boundary lines of the neutral zone and on the ends of the taking-off and landing zones, on the line through the three lights on the windward side. (See sketch on page 11.)

43. No fixed balloon, kite or moored airship shall be elevated in the vicinity of any aerodrome without a special authorisation.

44. All licensed aerodromes must be protected on land within a zone of 500 yds. by means of suitable markings on obstacles dangerous to flying.

### (c) Miscellaneous.

45. Every aircraft manoeuvring under its own power on the water shall conform to the regulations for preventing collisions at sea, and for the purposes of those regulations shall be deemed to be a steam vessel, but shall carry the lights specified in these rules, and not those specified for steam vessels in those regulations. The sound signals specified in those regulations shall not be used by or apply to such aircraft, except as specified in rules 17 and 18 above.

46. Nothing in these rules shall exonerate any aircraft, or the owner or personnel thereof, from the consequences of any neglect to carry lights or signals, or of any neglect to keep a proper look-out, or of the neglect of any precaution which may be required by the ordinary practice of the air, or by the special circumstances of the case.

47. Nothing in these rules shall interfere with the operation of any special rule or rules duly made and published relative to navigation of aircraft in the immediate vicinity of any aerodrome or other place, and it shall be obligatory on all owners and personnel of aircraft to obey such rules.

### SCHEDULE VIII.—Rules as to Aircraft Arriving in or Departing from the United Kingdom Preliminary

1.—(1) For the purposes of the rules in this schedule the following aerodromes are appointed aerodromes, that is to say:—

- New Holland, Lincolnshire;
- Hadleigh, Suffolk;
- Lympne, Kent;
- Hounslow, Middlesex.

Provided that the Secretary of State may by directions add any aerodrome to the list of appointed aerodromes or remove any aerodrome from that list.

(2) For the purposes of the rules in this schedule—

"Importer" has the same meaning as in the Customs Consolidation Act, 1876;

"Commissioners" means Commissioners of Customs and Excise;

"Examination station" means a space at an appointed aerodrome approved by the Commissioners as an examination station;

"Pilot" includes person in charge.

Other expressions have the same meaning as in the general provisions of these regulations.

### Arrival at and Departure from Appointed Aerodromes

2. No aircraft entering the United Kingdom from abroad shall land for the first time in the United Kingdom except at an appointed aerodrome: Provided that this rule shall not apply where an aircraft is compelled to land before arriving at an appointed aerodrome, owing to accident, stress of weather, or unavoidable cause, in which event the procedure laid down in rule 21 (hereafter) will be followed.

3. No aircraft shall fly to a place outside the United Kingdom unless it has departed from an appointed aerodrome.

4.—(1) No person in any aircraft entering the United Kingdom shall carry or allow to be carried in the aircraft—

(a) any goods the importation of which is prohibited by the laws relating to Customs;

(b) any mails, except with the permission in writing of the Postmaster General.

(2) No person in any aircraft entering the United Kingdom shall break or alter any seal placed upon any part of the aircraft or upon any goods therein by a Customs officer at the aerodrome at which he departed for the United Kingdom.

5. No aircraft shall enter or leave the United Kingdom, having any secret or disguised place adapted for concealing goods.

6. The pilot of any aircraft arriving at an appointed aerodrome from a place outside the United Kingdom shall, on landing, forthwith take his aircraft to the examination station at that aerodrome; provided that a pilot shall not be deemed to have contravened or failed to comply with this rule if he proves that circumstances over which he had no control prevented him from taking his aircraft to the examination station, and that, after the report required by rule 7 (hereunder) had been duly made by him, all goods carried in the said aircraft were removed to the examination station in the presence of an officer of Customs and Excise or some person duly authorised by the Secretary of State.

7. Within 24 hours after the landing at any appointed aerodrome of an aircraft from a place outside the United Kingdom the pilot shall—

(a) make a report to the proper officer of Customs and Excise in the form prescribed by the Commissioners; and

(b) truly furnish the several particulars required by such form; and

(c) deliver to such officer with such report his log book, manifest, and declaration of the goods on board his aircraft signed by the proper Customs officer at the aerodrome from which he departed for the United Kingdom; and

(d) land at such aerodrome for examination of baggage all passengers carried in such aircraft, and, after making such report, shall produce, and, if required to do so, shall land, all goods in such aircraft for examination.

8. If at any aerodrome or other place within the United Kingdom goods or passengers are loaded for conveyance by air to an appointed aerodrome, the

pilot shall obtain from the proprietor of the aerodrome of departure a certificate of departure in the form prescribed by the Secretary of State and the Commissioners, and on arriving at the appointed aerodrome the aircraft, and all goods and passengers carried therein, shall, on production of such certificate, be exempt from inspection by an officer of Customs and Excise, unless such officer has reason to suspect that the aircraft has, since the issue of such certificate, called at a place outside the United Kingdom.

9. The pilot of every aircraft in which goods are to be exported shall, before any goods be taken on board, deliver to the proper officer of Customs and Excise a notice of departure for a foreign destination in the form prescribed by the Commissioners, in which shall be truly stated the particulars required by such form.

10.—(1) Every pilot of an aircraft carrying goods to any place outside the United Kingdom shall deliver to the proper officer of Customs and Excise at an appointed aerodrome, together with any log books belonging to the aircraft, an application for clearance from that aerodrome in the form prescribed by the Commissioners, in duplicate, and also, if the aircraft carries any goods a manifest and declaration in the form prescribed by the Commissioners, declaring the goods and stores on such aircraft, and shall truly state therein the particulars required by such forms respectively; and such forms, when signed by such officer, shall be the clearance and authority for the aircraft to proceed to its foreign destination.

(2) No pilot shall depart in any such aircraft from the United Kingdom until he has obtained such authority, or shall, after obtaining such authority, call at any other place in the United Kingdom before proceeding to his foreign destination. Any pilot intending to land at one or more appointed aerodromes before proceeding to his foreign destination shall apply for the said clearance and authority at the last appointed aerodrome at which he lands.

### Importation, Entry, and Unloading of Goods

11. No person importing goods in an aircraft shall bring the goods into any place in the United Kingdom other than an appointed aerodrome, or shall unload the goods from any aircraft except at an examination station (unless such goods are unloaded in the presence of an officer of the Customs and Excise under the provisions of rule 6 above) and shall not unload the goods except between such hours as the Commissioners prescribe, or remove the goods from an examination station unless the goods have first been duly entered in manner provided by these rules and produced to the proper officer of Customs and Excise and duly cleared by him.

12. No person shall remove from any aircraft any goods imported therein until the report required by rule 7 (above) has been made, and the authority of the proper officer of Customs and Excise has been obtained.

13. The importer of any goods imported in aircraft shall deliver to the collector of Customs and Excise in whose district the aerodrome of importation is situated an entry of such goods in accordance with the provisions of the Customs Acts, and shall truly furnish thereon the several particulars required by the form of entry, and shall pay to such collector all duties chargeable thereon at the times and in the manner prescribed by the said Acts; provided that no entry shall be required in respect of diamonds or bullion or the baggage of passengers.

14. All goods imported into an appointed aerodrome in any aircraft shall be duly entered and unladen within seven days from the time of the arrival of such aircraft at that aerodrome or within such further period as the Commissioners may allow.

15. All goods imported in aircraft which have not been examined and cleared by the proper officer of Customs and Excise shall be stored in a transit shed at the appointed aerodrome, and no person shall remove such goods from the transit shed before examination and clearance by such officer.

### Exportation of Goods

16.—(1) The exporter of any goods intended for exportation in aircraft shall deliver to the proper officer of Customs and Excise at the appointed aerodrome from which such aircraft is cleared to its foreign destination, an entry in the form prescribed by the Commissioners, and shall truly state in such form the particulars hereby required; and such form when signed by the proper officer of Customs and Excise shall be the clearance and authority for the exportation of such goods.

(2) No person shall export goods on such aircraft until such authority has been given by the proper officer of Customs and Excise.

17. No person shall without the consent of the proper officer of Customs and Excise unload from any aircraft any goods loaded thereon for exportation which have been cleared under rule 16 above, or open, alter, or break any lock or mark or seal placed by any officer of Customs and Excise on any goods in any aircraft about to depart from the United Kingdom.

### General Provisions

18. No person shall make any signal to or from an aircraft entering or leaving the United Kingdom except such signals as are authorised by these regulations; provided that no offence shall be deemed to be committed under this rule if the person making such signal proves that the signal was not given for the purpose of evading or of assisting any person in evading these rules.

19. If any officer of Customs and Excise in the execution of his duty boards any aircraft in any place, the pilot thereof shall not convey him in the aircraft away from such place without his consent.

20. No dutiable goods shall be removed in aircraft from the Isle of Man to Great Britain or Ireland except from an appointed aerodrome and with the consent of the proper officer of Customs and Excise.

21. If any aircraft arriving from a place outside the United Kingdom shall land in any place other than an appointed aerodrome, the pilot shall forthwith report to an officer of Customs and Excise or police constable, and shall, on demand, produce to such officer or police constable the log books belonging to the aircraft, and shall not allow any goods to be unloaded therefrom without the consent of an officer of Customs and Excise, and no passenger thereof shall leave the immediate vicinity without the consent of an officer of Customs and Excise or police constable. If such place of landing shall be an aerodrome the pilot shall forthwith report the arrival of the aircraft and the place whence it came to the proprietor of the aerodrome, and the proprietor of the aerodrome shall forthwith report the arrival of the aircraft to an officer of Customs and Excise, and shall not allow any goods to be unloaded therefrom or any passenger thereof to leave the aerodrome without the consent of such officer.

22.—(1) The proprietor of any aerodrome shall at all times permit any officer of Customs and Excise to enter and inspect his aerodrome and all buildings and goods thereon.

(2) The pilot of any aircraft shall permit any officer of Customs and Excise at any time to board and inspect his aircraft and any goods laden thereon.

(3) The importer or exporter of any goods imported or exported in aircraft shall produce such goods to the proper officer of Customs and Excise at the aerodrome of importation or exportation, as the case may be, and permit him to inspect such goods.

23. Any provisions for the time being in force of the Aliens Restriction Order or of the Defence of the Realm Regulations with respect to persons arriving in or departing from the United Kingdom by sea, shall apply to persons arriving or departing by air as if the same were herein set out, with such modifications as are necessary for adapting them to such purpose, and

in particular with the substitution of appointed aerodrome for the approved ports specified in the Aliens Restriction Order.

24. All persons importing or exporting or concerned in importing or exporting goods, mails, or passengers, into or from the United Kingdom in aircraft and all pilots of aircraft arriving in or departing from the United Kingdom shall observe and comply with the provisions of sections 53, 76, 102, 104,

and 118 of the Customs Consolidation Act, 1876, as if any references in such provisions to ships or vessels and the masters or captains thereof, and to the loading or unloading of goods thereon or therefrom, included references to aircraft and the pilots thereof, and to the loading or unloading of goods thereon or therefrom, and as if references in such provisions to a quay included a reference to an examination station.

## SUPPLEMENTARY AIR REGULATIONS

The following directions have been issued by the Secretary of State for Air under para. 3 (2) of the Air Navigation Regulations, 1919, dated April 30, 1919:—

### Directions

The Air Navigation Regulations, 1919, recently issued, provide for the issue of supplementary "Directions" as may be necessary, and the following Directions are accordingly notified for the information of all concerned:—

#### I.—Registration of Aircraft

1. With reference to Regulation 1 (1) and Schedule 1, applications for registration should be made to the Secretary, Air Ministry, London W.C. 2.

2. Application forms will be supplied on demand.

#### II.—Licensing of Personnel

1. With reference to Regulation 1 (3) and Schedule II, applications for licences should be made to the Secretary, Air Ministry, London, W.C. 2.

2. Any member of the personnel of an aircraft, other than those specifically mentioned in Schedule II, can obtain on application to the Secretary, Air Ministry, particulars of the requirements for obtaining a licence.

3. Application forms will be supplied on demand.

#### MEDICAL REQUIREMENTS

4. Every applicant before obtaining a licence as a pilot, navigator or engineer of aircraft engaged in public transport will present himself for examination by specially qualified men appointed by or acting under the authority of the Secretary of State.

5. Medical supervision, both for the selection and the maintenance of efficiency, shall be based upon the following requirements of mental and physical fitness:—

(a) Good family and personal history, with particular reference to nervous stability. Absence of any mental, moral or physical defect which will interfere with flying efficiency.

(b) Minimum age for pilots and navigators engaged in public transport shall be nineteen (19) years.

(c) General Surgical Examination.—The applicant must neither suffer from any wound, injury or operation, nor possess any abnormality, congenital or otherwise, which will interfere with the efficient and safe handling of aircraft.

(d) General Medical Examination.—The applicant must not suffer from any disease or disability which renders him liable suddenly to become incompetent in the management of aircraft. He must possess heart, lungs, kidneys and nervous system capable of withstanding the effects of altitude and also the effects of prolonged flight.

(e) Eye Examination.—The applicant must possess a degree of visual acuity compatible with the efficient performance of his duties. No pilot or navigator shall have more than two (2) dioptres of latent hypermetropia; muscle balance must be good and commensurate with the refraction. He must have a good field of vision in each eye, and must possess normal colour perception.

(f) Ear Examination.—The middle ear must be healthy. The applicant must possess a degree of auditory acuity compatible with the efficient performance of his duties.

(g) The vestibular mechanism must be intact, and neither unduly hypersensitive nor hyposensitive.

(h) Nose and Throat Examination.—The applicant must possess free nasal air entry on either side, and not suffer from serious acute or chronic affections of the upper respiratory tract.

6. The successful applicant will receive a medical certificate of acceptance, which must be produced before the licence can be issued.

7. In order to insure the maintenance of efficiency, every applicant shall be re-examined periodically, at least every six months, and the findings attached to his original record. In case of illness or accident, also, a pilot, navigator or engineer shall be re-examined and pronounced fit before resuming aerial duties. The date and result of each re-examination shall be recorded on the applicant's flying certificates.

8. No applicant who, before May 1, 1919, has given proof of his flying ability, shall, so long as he retains such ability, be necessarily disqualified because he fails to fulfil all of the above requirements.

9. Applications for medical examination should be made to the Secretary, Air Ministry, London, W.C. 2.

#### FLYING CERTIFICATES

10. Certificates for Pilots of Flying Machines:—

"A" Flying Certificate for private pilots (not valid for flying passenger or goods aircraft).

"B" Pilot's Flying Certificate for flying passenger or goods aircraft.

##### "A" Private Pilot's Flying Certificate

(I) Practical Tests.—In each practical test the candidate must be alone in the flying machine.

(a) Test for Altitude and Gliding Flight.—A flight without landing, during which the pilot shall remain for at least an hour at a minimum altitude of 6,000 ft. above the point of departure. The descent shall finish with a glide, the engines cut off at 4,500 ft. above the landing ground. The landing shall be made within 150 yds. or less of a point fixed beforehand by the official examiners of the test without starting the engine again.

(b) Tests of Skill.—A flight without landing around two posts (or buoys) situated 500 yds. apart, making a series of five figure-of-eight turns, each turn reaching one of the two posts (or buoys). This flight shall be made at an altitude of not more than 600 ft. above the ground (or water) without touching the ground (or water). The landing shall be effected by:—

(i) Finally shutting off the engine or engines at latest when the aircraft touches the ground (or water).

(ii) Finally stopping the flying machine within a distance of 50 yds. from a point fixed by the candidate before starting.

(II) Technical Examination.—(a) Rules as to lights and signals, and rules of the air.

(b) Rules for aerial traffic in the vicinity of aerodromes.

"B" Pilot's Flying Certificate for Flying Passenger or Goods Aircraft

(I) Practical Tests.—In each practical test the candidate must be alone in the flying machine.

(a) The tests for altitude and gliding flight and for skill are the same as those required for a private pilot's Flying Certificate. Candidates already in possession of the latter certificate are not required to pass these tests again.

(b) Test of Endurance.—A cross-country or oversea flight of at least 200 miles, and the final landing shall be made at the point of departure.

This flight shall be carried out by the same aircraft within eight hours, and include two obligatory landings, during which the machine must come to rest, which shall not be at the point of departure, but which shall be fixed by the judges.

At the time of departure the candidate shall be informed of his course and furnished with a map. The judges will decide if the course has been correctly followed.

(c) Night Flight.—A thirty minutes' flight at an altitude of at least 1,500 ft., made between two hours after sunset and two hours before sunrise.

(II) Technical Examination.—After satisfactory practical tests have been passed, candidates will submit themselves when summoned to examination on:—

(a) Flying machines. (b) Engines. (c) Navigation.

(a) Flying Machines. Aeroplanes and Seaplanes.—Theoretical abstract knowledge of the resistance of the air in connection with planes, rudders, elevators and propellers; functions of the different parts of the machine and of their controls. Assembling of aeroplanes, propellers, undercarriages, rudders, elevators and their controls. Practical tests on rigging.

(b) Engines.—General knowledge of internal combustion engines, and their various functions; valve gear, carburation, ignition, exhaust. Characteristics of aero engines and a general idea of their construction, adjustment and assembling. Causes of the faulty running of engines. Fuel and oils. Description of the details of the aero engines used. Adjustments, lubrication, upkeep, disassembling and assembling of the principal parts; causes of breakdown. Use of throttle and other controls. Practical tests in running repairs.

(c) Navigation.—Knowledge of rules as to lights and signals, rules of the air and rules for aerial traffic in the vicinity of aerodromes. Practical knowledge of the special conditions of aerial traffic. Map reading, use of compass, location of position.

Remarks.—The practical tests shall be carried out within a maximum period of one month. They may be carried out in any order, and each may be attempted twice. They shall be witnessed by at least two properly accredited examiners who will hand over the official reports to the proper authorities. The official reports will give full details of the flights, especially of the landings. The candidates shall furnish, before each test, proof of identity, which the examiners have the right to demand. A barograph shall be carried on all practical tests, and the graph signed by the two examiners shall be attached to their report.

11. Certificate for Navigators.—The candidate must pass a theoretical and practical examination in the following:—

(A) Practical Astronomy.—True and apparent movements of the celestial bodies. Different aspects of the celestial sphere. Hour angles, mean, true and astronomical time. Shape and dimensions of earth. Star globes and maps. Methods of determining latitude, longitude, time and azimuth.

(B) Navigation.—Maps and charts—how to read them. Compass—magnetic meridian—declination, deviation, variation. Courses—bearings—and their corrections. Compensation of compasses (technical and practical). Calculations of azimuth. Flight by dead reckoning—measure of the relative speed—drift, traverse table. Chronometer—chronometer rate—comparisons. Sextants—adjustments. Nautical almanac. Determination of positions by means of bearings and altitudes of stars. Knowledge of great circle navigation. Aeronautical navigational instruments.

(C) General Knowledge.—International rules for aerial and maritime navigation. Practical knowledge of international aerial legislation. Good knowledge of meteorology and of weather charts.

#### III.—Certificates of Airworthiness

1. With reference to Regulation 2 (1) and Schedule III, applications for certificates of airworthiness should be made to the Secretary, Air Ministry London, W.C. 2.

2. Application forms will be supplied on demand.

##### TYPE AIRCRAFT

3. Subsequent to the forwarding to the Secretary Air Ministry, of an application form duly completed for a certificate of airworthiness for a type aircraft, the applicant shall forward to the Director of Research, Air Ministry, general arrangement drawings of the proposed aircraft, together with such particulars of load, fuel, engines, etc., as will enable a preliminary opinion to be formed as to general safety.

4. The applicant shall forward subsequently such drawings and particulars of the proposed aircraft as may be necessary for the checking in detail of the safety of the aircraft.

The information and drawings required for this purpose should be, where applicable, in accordance with forms to be supplied on application. (C.O. Forms 12 and 13.)

(Blue prints or rough sketches may be sufficient to enable the said checking to proceed provided they are fully dimensioned.)

5. The applicant may proceed with the construction of any part or parts of the aircraft as and when these are approved by the Secretary of State.

6. The workmanship and materials of construction of the aircraft shall be approved by the Secretary of State in accordance with detailed directions in para. 20 below.

7. On completion of the aircraft, flying trials will be carried out by the applicant's or constructor's pilot in the presence of representatives of the Secretary of State.

8. After the satisfactory completion of the check calculations, inspection, and applicant's flying trials, and after any modifications considered necessary for safety have been completed to the satisfaction of the Secretary of State, the applicant will be instructed to deliver the aircraft to the official aerodrome for official trials.

9. At any time prior to the delivery of the aircraft for official trials, modifications to the aircraft may be made by the applicant, provided that full particulars and drawings of the proposed modifications are first submitted to the Director of Research, Air Ministry, and that such as affect the safety of the aircraft are approved by the Secretary of State.

10. During official trials, which may be attended by a limited number of representatives of the applicant, the aircraft will be in the charge of the representatives of the Secretary of State, but the Secretary of State and/or his representatives shall not be liable for any loss or damage caused to such aircraft during official trials.

11. If any modifications are considered by the Secretary of State to be necessary for safety as a result of such official trials, such modifications shall be carried out by the applicant, and on completion thereof the aircraft shall be delivered, if required, for further official trials.

12. On the completion of official trials, the applicant will be notified, and reports on calculations and tests will be supplied to him by the Secretary of

State on application. The aircraft will either be handed over to the applicant at the official aerodrome for removal, or will be delivered by an official pilot to an aerodrome selected by the applicant, and approved by the Secretary of State.

13. On the satisfactory completion of the official trials, and after the completion to the satisfaction of the Secretary of State of any modifications considered necessary for safety, a certificate of airworthiness will be issued. Prior to the issue of such certificate the applicant shall deliver to the Director of Research, Air Ministry, a complete set of working drawings (process tracings) of the aircraft.

**SUBSEQUENT AIRCRAFT**

14. Following the receipt by the Secretary, Air Ministry, of an application form, duly completed, certificates of airworthiness for subsequent aircraft which conform in all essential respects with a type aircraft for which a certificate of airworthiness has previously been issued will be granted subject to the following conditions and procedure.

15. The applicant may make modifications (including change of engine type) to the aircraft and may depart from the approved complete set of working drawings (process tracings) of the type aircraft that are in the possession of the Secretary of State; but full particulars and drawings of the proposed modifications shall first be delivered to the Director of Research, Air Ministry, and such as affect the safety of the aircraft shall be approved by the Secretary of State.

16. During the construction of the aircraft the inspection of the workmanship, construction and materials shall be as approved by the Secretary of State in accordance with detailed directions in para. 21 below.

17. In the case of an aircraft, which in the opinion of the Secretary of State differs considerably from the type aircraft, or in the case of an aircraft built by a constructor not familiar with the type aircraft, on completion of the aircraft, the Secretary of State may require flying trials to be carried out, by the applicant's or constructor's pilot, in the presence of his representatives, and/or may require the aircraft to be delivered to the official aerodrome for additional trials. The procedure in this case will be in accordance with the procedure governing similar trials in the case of a type aircraft, as laid down in paras. 10, 11 and 12 hereof.

18. On the satisfactory completion of the aircraft and of any trials that may be required by the Secretary of State, and when any modifications considered necessary for safety have been completed to the satisfaction of the Secretary of State, a certificate of airworthiness will be issued.

Prior to the issue of such certificate, the applicant shall deliver to the Director of Research, Air Ministry, a complete set of working drawings (process tracings) of any modifications to or departure from the type aircraft.

19. In the foregoing directions the term "aircraft" includes the aircraft and all equipment (unless the context otherwise implies), except that working drawings will not be required for engines or equipment of approved types.

**METHOD OF APPROVAL OF WORKMANSHIP AND MATERIALS**

20. *Type Aircraft.*—(a) Inspection of type aircraft will be carried out by representatives of the Secretary of State.

(b) The Director of Aircraft Inspection will accept wherever in his opinion possible the inspection of details, components and/or materials for type aircraft made by employees of the constructor under the supervision of his representative, but each component will be finally inspected and approved by a representative of the Director of Inspection, who will co-operate with the constructor's inspecting staff.

Constructors must notify Director of Aircraft Inspection seven days before commencing work on any part of the aircraft, the inspection of which is necessary prior to further work.

(c) The constructor must also fulfil the conditions detailed hereunder for subsequent aircraft.

21. *Subsequent Aircraft.*—(a) Constructors must satisfy the Secretary of State that their inspecting staff is such as to ensure that aircraft passed by them conform in all essential respects to the type design.

(b) Constructors must purchase material to the specifications approved for the type design, and must arrange that each and every batch of such material is proved to comply with such specifications by suitable examination, sampling and testing, as may be approved by the Director of Aircraft Inspection.

(c) Constructors must make such arrangements at their works as will preclude the use of material other than that approved as in para. (b) above.

(d) Constructors' inspecting staffs, referred to in 21 (a) above, must stamp or otherwise provide means for the identification of each and every detail, in such a way that the individual responsible for such approval can subsequently be traced, selective inspection being adopted where considered possible.

(e) Constructors must issue only details or parts approved as in para. (d) above to the shops for assembly into components.

(f) Constructors must maintain an efficient process inspection during such work of assembly, and record such inspection on a process card for each component. Every component must be finally inspected by a qualified member of their inspecting staff, who will stamp the component in such a way that he may afterwards be identified, and will also sign the process card.

(g) Constructor's methods of carrying out the following operations must be approved by the Director of Aircraft Inspection, or other recognised authority, viz.: Heat-treatment of steel, seasoning and conversion of timber, gluing of important parts, and doping.

(h) Constructors must ensure that all instruments and other parts affecting airworthiness purchased from sub-contractors have been inspected and approved in accordance with these conditions.

(i) Constructors (aircraft or engine as may be arranged) must ensure that all engines have been inspected and approved in accordance with these conditions, and further, that they have satisfactorily undergone such bench tests as are required by the Secretary of State, and for this purpose that suitable test stands and accessories are provided to the satisfaction of the Director of Aircraft Inspection.

(j) Aircraft constructors must carry out an efficient inspection of the installation of all engines, instruments and parts that are fitted by them into the aircraft, such inspection to ensure that they function correctly, the individual responsible being indicated by a signature on the process card referred to above.

(k) Constructors must limit the power of their inspection staff to grant concessions to matters which do not affect the weight, the strength or the functioning of the part. Should any of these points be affected, the matter must be referred to the designer of the aircraft, and if affecting the type design, to the Director of Research as laid down for modifications to type designs.

**IV.—Persons Competent to Undertake Periodical Inspection and Overhaul and Examination before each Flight of Aircraft**

1. With reference to Regulation 2 (1) and Schedule III (3 and 5-10), the following is the procedure for any person desirous of being licensed as a competent person, hereinafter referred to as "ground engineer," to undertake the inspection of periodic overhauls of aircraft required to be certified as airworthy, or as a competent person to examine such aircraft before each flight.

2. Applications for licences should be made to the Secretary, Air Ministry, London, W.C. 2.

3. Application forms will be supplied on demand.

4. Subsequent to the forwarding to the Secretary, Air Ministry, of an application form for a ground engineer's licence, the candidate will be requested to report to a local representative of the Director of Aircraft Inspection for examination. At this examination the candidate will be required to submit proof:—

- (a) That he is not less than 21 years of age.
- (b) That he has served at least two years as a mechanic or engineer on internal combustion engines, or a like period on aircraft construction or maintenance, or a period of not under three years on joint aero. engine and aircraft construction or maintenance.

5. A candidate may apply to be licensed as a ground engineer to overhaul and inspect all flying machines and/or engines after overhaul and each day before flight; or may apply for a licence limited to the inspection of any named type or types of flying machine or engine either after overhaul and/or each day before flight.

6. Candidates will be required to submit proof of knowledge:—

(a) For engines: Of the general principles of internal combustion engines applied to aircraft, including the general principles of ignition, carburatoric lubrication and cooling; knowledge of the inspection, testing and adjustments necessary for the installation and functioning of the complete power unit in the aircraft; and the capacity to supervise, or inspect running repairs and/or overhaul of particular engines.

(b) For flying machines: The general principles of construction, rigging, trueing-up and adjustment of flying machines; a detailed knowledge of construction, adjustments, maintenance and final inspection of the flying machine's components; and the capacity to supervise, or inspect running repairs, and/or the overhaul of specified types of flying machines.

7. The examination may be in part written, and in part oral. Candidates may be required to give practical proof of knowledge.

8. Aircraft certified daily by such licensed ground engineers will be eriodically re-inspected by a person or persons duly authorised by the Secretary of State, who reserves the right to suspend or revoke licenses granted as above should such certified aircraft be deemed by him as a result of such examination to be unsafe.

9. Ground engineers certifying flying machines or engines as airworthy after overhaul, must be in a position to certify that all the conditions required for the inspection of subsequent aircraft during construction that apply to the overhaul have been carried out. The Secretary of State reserves the right to suspend or revoke the licence of the ground engineer responsible for certifying that the overhaul has been correctly carried out, should a test inspection be deemed by the former to indicate that the flying machine is not airworthy.

10. Ground engineers' licences will be issued at a charge of 5s., and will be valid for a period of twelve months, and will then be subject to renewal. The Secretary of State reserves the right to re-examine the candidate for renewal, if considered necessary.

11. In the event of any applicant being required to undergo a practical examination, a further fee of one guinea will be charged.

12. Certificate No. ....

**PILOT'S CERTIFICATE OF GENERAL FITNESS OF AIRCRAFT BEFORE FLIGHT**

Flying Machine Type ..... Registration No. ....  
 Preparatory to Flight from ..... on ..... Time to .....

**Loading**  
 Total weight of the aircraft including all items of load does not exceed ..... lbs.

Loading (including placing of passengers) such that the centre of gravity of the aircraft is within the specified limits.....  
 Petrol, oil and water sufficient for proposed journey.....

Name	Officers and Crew Duty	Licence No.
.....	.....	.....
.....	.....	.....

Number of passengers.....  
 This aircraft is considered fit in every way for the proposed journey.

Date..... Signed.....

13. Certificate No. ....

**DAILY CERTIFICATE OF SAFETY OF AIRCRAFT**

Flying Machine Type ..... Registered No. ....  
 Inspection at ..... on ..... time .....

I hereby certify that I have this day examined the above flying machine and that I consider it safe in every way for flights to-day when loaded as specified in the Certificate of Airworthiness.

Signed..... (Ground Engineer).

Date.....

I hereby certify that I have this day examined the engines, engine installations and accessories of the above flying machine, and that in my opinion they are in every way safe for flights to-day.

Signed..... (Ground Engineer).  
 Countersigned.....

Date.....

NOTE.—Both certificates may be signed by the same individual if licensed for both flying machines and engines.

**V.—Instructions for Use of Log Books**

1. With reference to Regulation 2 (3) and Schedule V, the several log books should contain the information shown below.

2. The constructor should fill in and sign the original entries in the log book, as far as he is in a position to do so. Subsequent entries should be made and signed by the pilot or competent person.

3. A copy of the certificate of airworthiness should be kept in the pocket at the end of the aircraft log book.

4. All entries to be in ink, except in the case of journey and signal log books, the entries for these may be made in pencil in a rough notebook, but should be entered in ink in the log book every 24 hours. In the event of any official investigation the rough notebook may be called for.

5. No erasures should be made in, nor pages torn from, any log book.

6. A copy of these instructions should be inserted in each log book.

*I.—Journey Log.*—(a) Type to which the aircraft belongs: its nationality and registration marks; the name, Christian names, nationality and residence of the owner; name of contractor and the carrying capacity.

(b) In addition for each journey:—(i) The name, nationality and residence of the pilot and crew. (ii) The place, date and hour of departure, the route followed, and all incidents en route, including landings and weather conditions.

*II.—Aircraft Log.*—(a) Type to which the aircraft belongs, its nationality and registration marks, the name, Christian names and nationality and residence of the owner, name of constructor and the carrying capacity, and capacity of tanks.

(b) Type and series number of engine, type of propeller, showing number, pitch, diameter and maker's name. (c) Type of wireless apparatus fitted. (d) Table showing the necessary rigging data for the information of persons in charge of the aircraft and of its maintenance. (e)



A fully detailed engineering record of the life of the aircraft, including all acceptance tests, overhauls, replacements, repairs and all work of a like nature (see specimen sheet the form of which should be followed).

III.—*Engine Log.*—A separate log book shall be kept for each engine and shall always accompany the engine. It shall contain the following particulars:—(a) Type of engine, series number, makers' name, power, normal and maximum revolutions of engine, date of acceptance and first date put into service; petrol consumption; oil consumption. (b) Registration mark and type of aircraft in which the engine has been installed. (c) A fully-detailed engineering record of the life of the engine, including all acceptance tests, hours run, overhauls, replacements, repairs and all work of a like nature (see specimen sheet, the form of which should be followed).

IV.—*Signal Log.*—(a) Type to which the aircraft belongs, its nationality and registration marks; the name, Christian names and nationality and residence of the owner. (b) Place, date and time of the transmission or reception of any signal. (c) Name or other indication of the person or station to whom a signal is sent or from whom a signal is received.

Specimen sheets are given which show the following details:—*Aircraft Log.*—Date; hour; commanding officer; route; time in air; hours, mins.; petrol consumed; oil consumed; water consumed; number of passengers; repairs or replacements; time in the air since last overhaul; hours, mins.—date of; remarks; signature of authorised person.

*Engine Log.*—Date; hour; engineer in charge; revolutions per minute: on ground, in air (state climbing or level); time run; defects found; particulars of overhaul or replacement; time run since last overhaul: hours, mins.—date of; remarks; signature of authorised person.

**VI.—R.A.F. Aerodromes and Seaplane Stations**

1. With reference to Regulation 4 (4), the dues to be charged at R.A.F. aerodromes are as follows:—

**A.—ACCOMMODATION**

The charge for accommodation will be based on the floor space occupied, i.e., the product of span and overall length. With folder aircraft the span to be taken as the overall width when folded. Charges will be as follows:—

	8 Hours or less	Up to 24 hours
	£ s. d.	£ s. d.
Small type, less than 900 sq. ft. . . . .	0 2 6	0 5 0
Medium type, not exceeding 1,800 sq. ft. . . . .	0 5 0	0 10 0
Large type, over 1,800 sq. ft. . . . .	1 0 0	1 0 0

*Monthly Rates.*—Accommodation for monthly periods will be at rates of £5, £10 and £20 respectively. Any accommodation so reserved, but not made use of, to be available for hire to other aircraft. No refund to be made to the monthly lessee, unless he is thereby prevented from obtaining accommodation, in which case a proportionate refund will be made as in the opinion of the Secretary of State appears reasonable.

**B.—LANDING FEES**

These will be in respect of the cost of maintenance of the aerodromes, use of landing lights and beacons and supply of navigational information.

The charges will include ordinary attendance, e.g., guiding machines, starting propellers, re-fuelling, etc. (For pushing machines with stopped engines any considerable distance charges will be made in accordance with 3 (a) below.) At R.A.F. aerodromes where no attendance is available the charges will remain the same. The charges will be:—

	For single landing.	For books of 10 coupons
	£ s. d.	£ s. d.
Small type . . . . .	0 2 6	1 0 0
Medium type . . . . .	0 5 0	2 0 0
Large type . . . . .	0 10 0	4 0 0

Each coupon to permit of one landing on any R.A.F. aerodrome for a period of 3 months from date of issue. Coupons to be transferable between aircraft, but not between owners.

No extra landing fee will be charged in respect of test flights before departure.

**Mr. Churchill's Message to America**

"MAY this new art and science prove a bond of kinship between the English-speaking people. The ocean divides us, let the air unite us in a comradeship of daring and in painstaking study of means for mutual protection," was the message which Mr. Churchill wirelessly to the second pan-American Aeronautical Congress.

Mr. Baker, Secretary of War, also cabled greetings, stating that the world was on the verge of aerial conquest that would make commercial transportation by air assured.

**Post Office and Air Mails**

In connection with the aerial mail service which is being conducted by the Post Office, in co-operation with the Army, between Folkestone and Cologne, it is pointed out that while considerable success has been attained, the aeroplane cannot be generally adopted for mails until regularity and reliability can be assured. In most favourable circumstance the postbags for the Army of the Rhine have been conveyed by aeroplane from the Kentish port to Cologne in 2 hrs. 35 min. On the other hand, owing to weather conditions, such as prevailed at the end of last week, it has been impossible to fly for two or three days together. Much is expected from the experimental service between Egypt and India, which is being watched very closely by the authorities. With regard to home aviation, an express aerogram service is regarded as a more likely field of development than the ordinary postal mail services, at all events for the present.

**An Inventor's Claim**

AT the meeting of the Royal Commission on Awards to Inventors on May 5, Mr. Justice Sargant presiding, the claim by Mr. J. F. Power, of Park Lane, formerly a second lieutenant of the R.A.F., for £10,000 in respect of the Power Target, was considered. It was stated that the invention had been extensively used by the Government in training

2. The R.A.F., its servants or agents, will not be liable for loss or damage by fire, flood, tempest, explosion or other inevitable accident to aircraft or to the pilots, engineers, or other members of the crew thereof, or to any passengers, goods, or mails carried therein landing at or accommodated in any R.A.F. aerodrome

3. (a) Attendance on civil aircraft by R.A.F. personnel other than the ordinary attendance included in the landing fees, will be charged for on the basis of labour and time. Such R.A.F. personnel will be available to assist civil aircraft only to a limited extent, and at certain aerodromes to be specified by the Secretary of State.

(b) Stores, such as fuel, oil, tyres, etc., and any standard spares that may be available, will be supplied to civil aircraft by the R.A.F. wherever possible, to meet emergency demands and when no other source of supply is available. Such supplies will be charged for at the current retail prices.

(c) Repairs will be carried out by the R.A.F. for civil aircraft on emergency when no other arrangements can be made. Repairs will be confined to such work as will enable the aircraft to proceed by air within a short period. No repair which will exceed a cost of £10, exclusive of the cost of stores and spares supplied, will be undertaken before an estimate has been made and submitted to the owner of the aircraft.

Repairs carried out by the R.A.F. will be carried out to the satisfaction of the responsible inspecting officer, but no responsibility as to the airworthiness of the aircraft shall rest on the R.A.F. aerodrome staff.

(d) Where R.A.F. workshops are available but no R.A.F. personnel can be spared, arrangements will be made to permit the use of the workshops by civilian firms on appropriate terms.

(e) Subject to the exigencies of the service, salvage of aircraft will be undertaken by the R.A.F. inside R.A.F. aerodromes, and as far as possible outside R.A.F. aerodromes. In both cases charges will be made according to the cost involved.

(f) Mechanical transport at R.A.F. aerodromes will be placed at the service of the civil firms on emergency, and when circumstances permit. The rates to be charged will be:—

	Per mile		Per mile
	s. d.		s. d.
5-ton lorry . . . . .	1 9	Motor car . . . . .	1 0
3-ton lorry . . . . .	1 6	Motor cycle . . . . .	0 4
30-cwt. lorry . . . . .	1 3		

These charges to include the driver, no vehicle being hired without an R. A. F. driver.

(g) Arrangements will be made for the use of telephone, telegraph, and Post Office facilities at R.A.F. aerodromes by civilian firms using the aerodromes.

4. Arrangements will be made for the use of aerodromes for purposes of tuition, exhibitions, or sporting contests. The charge will be in the form of a lump sum for the period for which the aerodrome is required.

The firm leasing an aerodrome for any such meeting shall be entitled to charge such entrance fee to spectators as they may desire. But they shall not charge more than the prescribed landing fees for any aircraft landing during the meeting. Such landing fee shall remain the property of the firm holding the meeting.

**SEAPLANE STATIONS**

5. The arrangements and charges at R.A.F. seaplane stations will be, as far as practicable, similar to the above arrangements and charges at R.A.F. aerodromes.

**VII.—Licensed Aerodromes**

1. The proprietors of licensed aerodromes will be regularly supplied through the Air Ministry with the latest approved meteorological information, and will be responsible for exhibiting the same in a conspicuous place, and for supplying the same to pilots requiring it.

2. Proprietors of licensed aerodromes should, as far as possible, keep records of wind and weather.

3. Adequate first-aid appliances must be kept at all licensed aerodromes.

WINSTON S. CHURCHILL,  
Secretary of State for Air.

artillery observers. The flying student, seated in a little car suspended from the ceiling, looked down upon the "target," and saw spread before him a very considerable area of country. The country was either represented by a coloured target or by photographic slides, so that the young officer could see a piece of actual country reproduced. The apparatus would indicate the particular object which the instructor desired to be the objective of the guns. The observer, in his car suspended from the ceiling, signalled just as he would if actually flying. A gun was then fired according to the instructions. There was a flash and a puff of smoke, and the observer was able to indicate the result of the shot. It was stated that whilst the Government expended £30,000 on reproducing the apparatus, all that Lieut. Power had received was a sum of £30 in respect of out-of-pocket expenses.

Evidence as to the use of the invention was given by Mr. Power, Capt. A. H. W. Wall, Col. H. C. M. Drew and Col. J. G. Hearson. Mr. Watson, addressing the Commission for the Crown, submitted that inventive merit was not the only thing to be taken into consideration, and Mr. Power's apparatus was not a great invention as such. It might be a useful piece of apparatus. He admitted that the inventor was entitled to some reward. Any payment, being in a sense *ex gratia*, should not be made necessarily on the footing of royalty, but on the value of the service rendered to the country, and it depended purely on the public utility of the invention and the position of the inventor. He submitted that it was Mr. Power's position as an officer in the Field Artillery that first enabled him to conceive the idea, and that had enabled him to earn money on his foreign rights.

The Chairman intimated that the Commission would consider their award, which would be promulgated to the Treasury in due course.

The Commission then adjourned.

**THE LATE PETER LEGH**

THE toll of the air has been unusually heavy this last week, but no sadder tragedy has been recorded than the fatal accident to Mr. Peter Legh (late Flight Commander, R.N.A.S.), which has deprived aviation of a brilliant pilot. He was making an altitude test of a Bat "Basilisk"—the fighting scout biplane, designed and built by the British Aerial Transport Co., fitted with an A.B.C. "Dragonfly" 350 h.p. motor, when his machine was seen to burst into flames over Finchley and dive. The pilot jumped clear when near the ground, apparently in an endeavour to break his fall among some trees, but without success, and he fell into a field and was instantly killed.

The story of Peter Legh's career is one of remarkable devotion to aviation. Flying fascinated him during his school-days, and he gave all his spare time to the hobby with rare enthusiasm. He was the only son of Maj. the Hon. Gilbert Legh, Grenadier Guards, a brother of Lord Newton, and was born in 1896 and educated at Wellington. His keenness for flying is indicated by the fact that at the age of 15 he had built a full-sized aeroplane at home during several school holidays, and fitted it with a second-hand aero-engine, of 20 h.p. He taxied it up and down a field at his father's house at Thornham, in Norfolk, for three weeks, and at last succeeded in getting it off the ground, but his experiments ended in a collision with a fence, in which the machine was wrecked, to the great relief of his relatives.

On leaving Wellington, he served an apprenticeship of nine months at the Sopwith works at Kingston, acquiring considerable technical skill in the construction of aeroplanes. On the outbreak of war his determination overcame all obstacles, and on his eighteenth birthday he was already a certificated pilot, having been trained at the British Caudron School at Hendon, where he took his brevet (No. 927) on October 8, 1914. He joined the R.N.A.S. as a probationary flight sub-lieutenant and was first posted to Eastchurch. From there he went to Whitley Bay, Northumberland, where he was engaged in night flying and coastal patrolling. While at this station he had the distinction of being the first pilot to fly after a Zeppelin in the dark without landing lights or any of the facilities later on looked upon as indispensable. He was transferred early in 1916 to the Isle of Grain for experimental work, and flew practically every type of machine then in the possession of the R.N.A.S. He was quickly recognised as a pilot of exceptional ability, in spite of his youth, and did most valuable work for his country.

In May, 1916, he went to Dunquerque with No. 1 Naval Squadron, and saw considerable active service as a fighting pilot in France and Belgium until the following September. At this time he met with a serious accident while experimenting with Le Prière rockets, and after being sent home on sick leave received special permission from the Admiralty to resign his commission in order to take up experimental work for Messrs. Armstrong, Whitworth and Co.

He flew all the productions of that firm from December, 1916, to June, 1917, when he was appointed test pilot for the British Aerial Transport Co. It is no exaggeration to say he has been one of the greatest assets of that company. His intimate technical knowledge of aircraft construction, combined with his amazing skill as a pilot, undoubtedly played a most important part in the production of new machines which have given remarkable performances.

To see him flying the "Bat" was an unforgettable experience. Pilots many years his senior have said on numerous occasions that he seemed a part of his machine, so skilful and complete was his mastery of it in the air. He could do anything with it, and the demonstrations he gave before experts, both in this country and in France, were surprising and impressive.

The "Bat" is, of course, what may be described as an abnormal machine, designed to Air Ministry specifications for abnormal fighting conditions. It is in no sense to be confused, as some of the daily Press appear to think, with commercial or sporting types of aeroplanes, and is not a machine for the novice. Peter Legh had flown it through all its various stages of evolution, and, as all his friends were aware, flew it with keen enjoyment.

On the identical machine in which he met his death he had

a few days earlier reached an altitude of 21,000 ft., and descended again inside 20 minutes, which sufficiently indicates the extraordinary climbing powers it possessed. On Saturday morning last he ascended again from Hendon for the purpose of making a further climbing test before handing the machine over to the Air Ministry, and he was equipped with oxygen and all the necessary apparatus. The official enquiry into the accident may, it is to be hoped, elucidate the mystery of its cause.

For the sake, however, of the future of civilian flying, now at a most critical period in its history, it cannot be too strongly emphasised that this was a service flight on a service machine, built for special fighting conditions, and was carried out under the ordinary routine of test work.

Of the personal aspect of the tragedy, it is, indeed, difficult to speak. His loss is particularly distressing to all who



The late Peter Legh.

knew him, for he had an unusually charming and lovable personality. He gave himself wholeheartedly to his work, and was never so happy as when in the air, for which he appeared to have a natural aptitude. He was always the very essence of modesty, brave in the highest degree, and ever eager to tackle new problems in the science of aviation. His handsome, boyish face had a freshness which appealed instantly to all who came into contact with him, and he will certainly be remembered with real affection by a wide circle of friends.

The loss of Peter Legh is a great loss to aviation, and must be felt with special severity to his colleagues of the British Aerial Transport Co., notably to Mr. Frederic Koolhoven, with whom he had been for so long and so closely associated. To them and to his relatives one can only offer the deepest sympathy.

D. W. T.

**French Civil Aeronautics**

WORD comes from Paris that Lieut.-Col. Sacconey, who was largely responsible for the development of the kite balloon in France, has been appointed to succeed Lieut.-Col. Leclerc as Director of Civil Aeronautics in France.

**Inter-Collegiate Racing in U.S.**

THE University of Pennsylvania won the first inter-collegiate seaplane race held at Atlantic City recently.

Columbia secured second place, with Yale third and Amherst fourth. Columbia won the inter-collegiate aeroplane race, Yale being the only other entry.

**Berlin to Stockholm**

ARRANGEMENTS are said to have been made for a flight from Berlin to Copenhagen and thence, to Stockholm by the first German aerobus, piloted by Dr. Sablatnig, who is claimed to be one of the foremost aeroplane constructors in Germany.

## AVIATION IN PARLIAMENT

### Enemy Air-Raids (Destitute Dependants)

Mr. BILLING, on April 29, asked the Prime Minister whether he is aware that in many cases the dependants of people killed by enemy air-raids during the War are in a destitute condition; and whether, having regard to the profits which the Government has made through aid-raid insurance premiums, he will consider the desirability of devoting such profits to the relieving of destitution among this class?

Mr. Baldwin (Joint Financial Secretary to the Treasury): My right hon. friend regrets that he cannot see his way to adopt the proposal in the question.

Mr. Billing: Is it not a fact that the Government have made a vast sum of money out of air-raid insurance, that there exist in this country many destitute families of people killed in enemy air-raids, and are not the Government prepared to consider the matter?

Mr. Baldwin: I am not aware of the fact mentioned in the first part of the question, and, with regard to the second part, I have no information as to dependants of people killed in air-raids being in a state of destitution.

Mr. Billing: May I ask whether the Leader of the House is prepared to receive a deputation of dependants who are destitute?

Mr. Bonar Law: If a case is made out, I will consider it, but I should prefer that the question should be addressed to the Chancellor of the Exchequer.

### All-Steel Aeroplanes

Mr. JOYNSON-HICKS, on April 30, asked the Under-Secretary of State to the Air Ministry whether his attention has been called to the burning of the Paris-Bordeaux postal aeroplane on the 7th inst.; and whether he will cause experiments to be made with a view to the utilisation of more steel and less inflammable materials in the construction of civilian aircraft?

Mr. Pratt (Lord of the Treasury): I am not aware of the actual cause of the accident referred to, but in the great majority of such cases fire is caused primarily by petrol. The substitution of metal for framework and fabric would reduce only slightly the risk of fire or the probability of injury to personnel. Experiments on the lines suggested are actually being made, but till further knowledge is obtained—and this will take some time—I do not anticipate that it will be practicable to employ metal extensively in aircraft construction. The risk of fire from petrol is being reduced in English aeroplanes by various improvements which are being introduced.

### Civil Aviation Department

Mr. JOYNSON-HICKS asked the Under-Secretary of State to the Air Ministry whether he can now make a statement as to the staff and work of the Civil Aviation Department?

Mr. Pratt: The provisional staff for the Department of Civil Aviation has been put forward by the Controller-General and his proposals are now being considered by the Re-organisation Committee preparatory to obtaining Treasury sanction for the organisation as a whole.

Meantime provisional Treasury sanction has been obtained for some of the higher posts in the Department and the Controller-General is carrying on with a nucleus staff lent by the Royal Air Force and composed of officers who have during the War gained the necessary experience in the various directions required.

The work which the Department of Civil Aviation will at present undertake may be broadly divided into four heads, of which I am circulating a full description with the Official Report, as it is too long for oral answer.

The following is the description referred to in the last paragraph of the foregoing answer:

(i) For general consideration, co-ordination and planning, including that of air routes both at home and abroad. For examining and advising on the broad aspects of schemes for commercial aviation. The branch will have two main subdivisions; one to deal with questions concerning the United Kingdom and the other with similar matters arising overseas.

(ii) To obtain, co-ordinate and issue technical and non-technical information of value to the industry and the other branches of the Department through the Controller-General to supply information to the Royal Air Force and all other services concerned. In this branch three sub-divisions are being formed, one to deal with non-technical information; the second with technical subjects, and the third to co-ordinate and issue information of every kind and to deal with publicity generally.

(iii) The third branch will be known as the "Communications" Branch, and its duties will consist in giving technical advice and assistance to aerial navigation in regard to navigation questions and all forms of signals and communications, including wireless, directional, and otherwise, visual signals and land lines. This branch will also be responsible for work in connection with aerial surveys and for the preparation and issue of special maps and charts necessary for aerial navigation. It will have two main sub-divisions, one to deal with signals in a broad sense, and the other with navigation, charts, maps, and survey.

(iv) The fourth branch will deal with questions relating to the inspection and organisation of all aerodromes used for civil purposes, and with the licensing and registration of aerodromes, aircraft, pilots, and technical personnel employed in civil aviation. It will also carry out the investigation of accidents and their causes and the compilation of technical reports and records relating to this subject. This branch will have three main divisions. The first will deal with the inspection and organisation of aerodromes, and airship and seaplane stations; the second with the licensing and registration of aerodromes, aircraft, and personnel; and the third with accidents.

In addition to these four branches it is proposed that there should be a Meteorological Section directly under the Controller-General. This section would deal with the location and supervision of local meteorological centres and stations, the issue of forecasts, warnings, and upper-air information, and generally with the meteorology of air routes. It would also carry out special investigations into climatic conditions generally, taking care to co-ordinate its operations with any other services concerned. At present the general question of the organisation of the meteorological services is under consideration by the Cabinet, but pending a decision the Controller-General has taken over the meteorological branch which served the Royal Air Force during the War,



### A British Machine in Spain

FOLLOWING up his recent four-hour trip from Madrid to Seville and back—nearly 500 miles—Major Havilland, on his Airco (De H. 9) with 450 h.p. Napier engine, flew from the capital to Barcelona and back on May 5. Helped by a favourable wind, the outward voyage was made in 2 hours 30 minutes; the express train takes 15 hours.

### General Stefanik Killed

THE Czecho-Slovak cause has lost one of its most valuable

and the personnel of this branch are being lent provisionally to his Department, which supplies all information required by the Royal Air Force.

### Motor-Cars for R.A.F.

Mr. PRESTON, on May 1, asked the Under-Secretary of State for the Air Ministry whether large numbers of motor cars are still being purchased each week by the Royal Air Force; whether it is necessary for the Royal Air Force to have so many additional motor cars; and, if so, whether he can arrange that motor cars for which the Army have no longer any use can be transferred to the Royal Air Force, and thus save the expense of purchasing new cars.

Maj.-Genl. Seely: All contracts for M.T. were cancelled after the Armistice, and no new vehicles have been delivered to the Royal Air Force since the middle of January last. The remaining parts of the question, therefore, do not arise.

### Dismantling Aeroplanes, Farnborough

Lieut.-Col. Sir S. HOARE asked the Under-Secretary of State to the Air Ministry whether German prisoners have been, or are now, employed in dismantling and scrapping aeroplanes at Cove Camp, Farnborough; whether many of these planes are new planes; if so, why they are being dismantled; and whether some of the planes so dealt with are still in their factory wrappings; and some which have been used could easily be repaired?

Maj.-Genl. Seely: The answer to the first part of the question is in the affirmative. A certain number of new machines have been reduced to produce at Farnborough. They are all of types which are obsolete for present purposes and for which there was no prospect of profitable disposal. No standard machines which it would have been economical to repair have been thus dealt with. I have satisfied myself, after careful inquiry, that the cost to the State of dealing with these machines in this way is less than that of housing and maintaining them with a view to sale.

### Cypress for Aeroplane Construction

Mr. REMER asked the Secretary of State for War whether he has had inquiries made into the circumstances how cypress came to be sanctioned for use on aeroplanes contrary to all the expert advice given by timber opinion; how many pilots' lives were lost through this unsuitable timber being used; what was the cost to the nation of this colossal blunder, and whether, in order to avoid such occurrences in future, he will appoint a trade committee to fully investigate and advise on the proper woods to be used in aeroplane construction, having regard to the bearing this matter has on the future safety in civilian and military flying?

Maj.-Genl. Seely: Owing to the shortage of the best tried types of wood the use of cypress for aeroplanes was for a time sanctioned by the responsible Technical Department on expert advice to meet war necessities. One fatal accident was held to be partly, but not wholly, attributable to the use of this wood, which has now been discontinued. The best independent expert opinion is already at the disposal of the Air Ministry on the subject of woods for aeroplane construction, and I do not think that there is any occasion for the appointment of a committee such as is suggested in the last part of the question.

### Civil Flying

Mr. A. M. SAMUEL asked the Under-Secretary of State to the Air Ministry whether permission to private owners to fly aircraft shall be accorded only subject to their insuring themselves against liability for damage, so that innocent sufferers may be certain of recovering loss for proved damage to the commission of which they have not contributed?

Maj.-Genl. Seely: Every possible safeguard has been provided in the regulations for civil flying to prevent loss and damage to the public. The working of the Regulations will be carefully watched, but at present I do not think it would be advisable to adopt my hon. friend's suggestion.

Mr. A. M. Samuel asked the Under-Secretary of State to the Air Ministry whether Government-owned and privately-owned aircraft are liable in times of peace for damage accidentally done by them to life and property?

Maj.-Genl. Seely: There is now no special law applying to damage done by aircraft, and therefore responsibility for damage of the nature referred to in my hon. friend's question must be determined by the ordinary law unless and until fresh legislation is made.

### Air Routes for Portsmouth

Maj. Sir B. FALLE asked the Under-Secretary of State to the Air Ministry why Portsmouth, the first Naval port and dockyard of the country, has been left out of the scheme of the Air Ministry; and if he is aware that Portsmouth is one of the largest towns on the South Coast and has some magnificent alighting ground for aeroplanes?

Maj.-Genl. Seely: There is no fully-equipped aerodrome in the immediate vicinity of Portsmouth. The air routes recently published are based on existing aerodromes where facilities in the shape of accommodation and personnel may be made available. Should the Portsmouth borough authorities have in view a suitable site, an officer of the Air Ministry will be sent to view it and discuss the possibility of its inclusion in the list of approved aerodromes.

### Dope Recovery from Aeroplane Wings

Col. Sir ALEXANDER SPROT asked the Under-Secretary of State to the Air Ministry whether the plant which the Government was in process of erecting at Farnborough last autumn for the recovery of dope from scrap aeroplane wings has been completed; if so, has it been decided to work the plant; if not, are the Government going to sell it; what sum has been expended on the plant; what quantity of scrap fabric has been treated; has the recovered dope been found satisfactory; why are the Government selling off the scrap to the public when they have a plant for recovery of the dope; and what is the name of the official in charge of the plant?

Mr. Kellaway: The plant in question has not yet been completed; when completed it will be worked by the Government. Up to the present a sum of about £1,500 has been expended on the plant. Only a small quantity of scrap fabric has so far been treated experimentally. The treatment has proved successful. The officer at present in charge of the plant is Dr. J. E. Ramsbotham.

leaders in Gen. Stefanik, who was killed in an aeroplane accident near Pressburg on May 5. He was flying from Italy to Prague with several Italian officers when for some unknown reason the machine suddenly fell from a height of 1,300 ft., and all the occupants were killed. At the outbreak of War, Gen. Stefanik, who was in Paris, joined the French Air Service, and had seen service on the French, Serbian and Italian fronts. He had latterly been assisting in the organisation of the Czecho-Slovak military forces.

**THE ROYAL AIR FORCE**

*London Gazette, April 29*

The following appointment is made:—

*Staff Officer, 2nd Class (Q.)*.—Capt. A. H. S. Baker; Nov. 18, 1918.

*Flying Branch*

Capt. D. G. Donald to be actg. Maj. whilst employed as Maj. (A.); April 4. Capt. G. Donald, D.F.C., to be actg. Maj. whilst employed as Maj. (A. and S.) (from Aug. 30, 1918, to Feb. 12) (substituted for notification in *Gazette* April 8). Lieut. L. G. Robinson, M.C., to be actg. Capt. whilst employed as Capt. (A.); Sept. 1, 1918. Lieut. (actg. Capt.) E. Burney, M.C., to be Lieut. (A.), and relinquishes the actg. rank of Capt., from (S.O.); April 9.

Sec. Lieuts. to be Lieuts.:—F. J. H. Ayscough; Aug. 27, 1918. G. Kidd; March 28.

J. J. W. Nelmes (late Gen. List, R.F.C., on prob.) is confirmed in his rank as Sec. Lieut. (K.B.); Oct. 20, 1918. A. R. Turner (Lieut., York and Lanc. R., S.R.) is granted a temp. commn. as Sec. Lieut. (A.); Sept. 28, 1918, and to be Hon. Lieut. (substituted for notification in *Gazette* Oct. 25, 1918). 12270 Ft. Cdt. W. S. Lawson is granted a temp. commn. as Sec. Lieut. (A.); Oct. 24, 1918.

The following relinquish their commns. on ceasing to be employed:—Lieut. (Hon. Maj.) G. P. Howe (Maj., Alb. R.); Feb. 24. Lieut. L. H. Scott (Lieut., Can. Eng.); March 16. Lieut. (actg. Capt.) G. E. G. Craig (Capt., Brit. Col. R.); March 17. Lieut. E. L. O'Leary, M.C. (Lieut., Can. F.A.); March 18. Sec. Lieut. (Hon. Lieut.) T. Pitkethly, M.M. (Lieut. Quebec R.); March 20.

(Then follow the names of 291 officers who are transfd. to the Unemployed List under various dates. We regret that owing to the great pressure on our space, it is impossible to reprint this portion of the list.—Ed.)

Capt. (actg. Maj.) W. G. Barker, M.C., D.S.O., M.C., resigns his commn. and is permitted to retain the rank of Maj.; April 29. Capt. W. L. Grahani relinquishes his commn. on account of ill-health, and is permitted to retain his rank; April 30. Capt. G. M. Lord Torrington resigns his commn.; April 30. Lieut. W. C. Greene relinquishes his commn. on account of ill-health, and is permitted to retain his rank; April 30. Sec. Lieut. J. McDonald, D.F.C., relinquishes his commn. on account of wounds, and is permitted to retain his rank; April 26. Sec. Lieut. C. B. Campbell is antedated in his appointment as Sec. Lieut., Flying (A. and S.); April 16, 1918.

The rank of Maj. (actg. Lieut.-Col.) E. D. Horstall is as now described, and not Maj., as stated in *Gazette* of March 28.

The rank of Lieut. H. S. Starkey is as now described, and not Sec. Lieut. (Hon. Lieut.) (actg. Lieut.) as stated on page 4421 of the *Gazette* of April 4.

The initials of Lieut. R. W. Smyth-Pigott are as now described, and not E. W., as stated in the *Gazette* of April 11.

The initial of L. Francis is as now described, and not L. E., as stated in the *Gazette* of March 25.

The notification in the *Gazette* of March 28 concerning Lieut. S. P. Tarrant is cancelled.

The notification in the *Gazette* of April 1 concerning Capt. J. W. Alcock, D.S.C., is cancelled. (*Gazette* notice of March 28 to remain.)

The notification in the *Gazette* of April 25 concerning Capt. W. Taylor is cancelled.

The notification concerning Sec. Lieut. R. C. Pattule in the *Gazette* of Oct. 8, 1918, on page 11865 is cancelled.

*Administrative Branch*

Lieuts. (A.) to be Lieut.:—J. A. Atkins, R. F. Auerbach, S. P. Briggs, A. H. F. Brothers, G. T. W. Burkett, M.C., L. H. Clemetson, C. P. Creighton, S. L. Empton, W. Hunt, D. W. Paton, D.F.C., T. F. X. Smallwood, J. R. Webb (and to relinquish the actg. rank of Capt.); April 17.

Lieuts. (O.) to be Lieuts.:—N. B. Arbuthnot, W. R. Ashwell, W. S. Aulton, M. Ralston, A. N. Burrow, H. C. E. C. P. Dalrymple, C. R. Gross; April 17. Lieut. W. J. Beach (London R., T.F.) is granted a temp. commn. as Lieut.; Sept. 13, 1918.

S. H. Coronel is granted a temp. commn. as Sec. Lieut., and to be actg. Lieut. whilst specially employed; April 29.

J. H. Amery is granted a temp. commn. as Sec. Lieut.; Jan. 22.

(Then follow the names of 46 officers who are transfd. to the Unemployed List under various dates.)

Lieut. (actg. Capt.) C. G. Darwin is antedated in his appointment as actg. Capt.; May 22, 1918.

The notification in *Gazette* Feb. 14, on page 2277, concerning Lieut. A. G. Horlock is cancelled.

*Technical Branch*

Maj. A. S. Hellowell, O.B.E., to be actg. Lieut.-Col. whilst employed as Lieut.-Col., Grade (A.); April 1, 1918.

Capt. P. C. C. Passman to be graded for pay and allowances as Capt. whilst employed as Capt., Grade (A); June 17, 1918.

Lieut. B. R. Bostock to be actg. Capt. whilst employed as Capt., Grade (A); April 14.

Lieut. W. K. Manning to be Lieut., Grade (B), from (O); Jan. 13. Lieut. H. J. Dolan to be graded for pay and allowances as Lieut. while employed as Lieut., Grade (B); Sept. 11, 1918.

Sec. Lieut. (Hon. Maj.) R. W. Hodges to be Lieut., without pay and allowances of that rank, and to retain his hon. rank; Dec. 1, 1918.

Sec. Lieut. W. Wyatt to be actg. Lieut. while employed as Lieut. (Grade A); Sept. 26, 1918.

Sec. Lieut. H. W. Hills to be Sec. Lieut., Grade (A), from (Ad.); March 2. (Then follow the names of 69 officers who are transfd. to the Unemployed List under various dates.)

*Physical Training Branch*

Capt. R. Northover is transfd. to the Unemployed List; March 1.

*Medical Branch*

Capt. H. R. B. Hull to be actg. Maj.; Nov. 18, 1918 (substituted for notification in *Gazette* of April 8, page 4578).

Hon. Lieut.-Col. G. Dreyer relinquishes his commn. on ceasing to be employed; March 31.

The following are transfd. to Unemployed List:—Capt. A. G. H. Moore; March 1. Capt. W. R. Nasmyth; March 6. Capt. J. Grimoldby; April 10.

*Memoranda*

F. J. Toulmin is granted a temp. hon. commn. as Capt. while specially employed with the A.I.D.; April 18 (substituted for notification which appeared in *Gazette* of April 18).

Temp. Hon. Sec. Lieut. (Hon. Capt.) W. G. Adams relinquishes his commn. on ceasing to be employed; March 31.

(Then follow the names of 12 officers who are transfd. to the Unemployed List under various dates.)

Maj. (actg. Col.) E. G. Mackenzie relinquishes his commn. on account of ill-health contracted on active service, and is permitted to retain the rank of Col.; April 30.

The rank of Lieut. (actg. Capt.) H. B. Langton (R.G.A.) is as now described, and not Sec. Lieut. (actg. Capt.), as stated in *Gazette* Feb. 18.

*London Gazette, May 2*

The following temporary appointment is made:—*Graded for Pay at Air Ministry rates, Staff Officer, 1st Class (Air)*.—Lieut.-Col. R. P. Ross, D.S.O.; April 1.

*Flying Branch*

Lieut. (actg. Capt.) S. C. Iron is confirmed in his rank of Capt.; May 2. Lieut. G. H. Clifford to be Lieut. from (Ad.); Sept. 3, 1918.

Sec. Lieuts. to be Lieuts.:—(Hon. Lieut.) H. Sainsbury; April 13, 1918. (Hon. Lieut.) E. A. Collis; May 28, 1918. W. G. Millar; July 30, 1918. A. MacArthur; Dec. 27, 1918.

P. F. O. H. E. Hudson (late R.N.A.S.) is granted a temp. commn. as Sec. Lieut. (A. and S.); June 9, 1918 (since killed).

Sec. Lieut. H. F. Workman (late Gen. List, R.F.C., on prob.) is confirmed in his rank as Sec. Lieut. Obs. Officer; Sept. 13, 1918.

The following relinquish their commns. on ceasing to be employed:—Lieut.-Col. C. J. L'Estrange Malone, O.B.E. (Lieut., Royal Navy); Dec. 28, 1918. Lieut. C. Osenton, A.F.C. (Lieut., B. Col. R.); Feb. 6. Lieut. T. M. Kerruish (Lieut., Manitoba R.); March 31. Sec. Lieut. (Hon. Lieut.) F. G. Gardiner (Lieut., C. Ont. R.); Lieut. J. E. Wood (Lieut., Brit. Col. R.); March 16. Sec. Lieut. (Hon. Lieut.) O. M. Martin (Lieut., Manitoba R.); April 1.

(Then follow the names of 179 officers who are transfd. to the Unemployed List under various dates. We regret that owing to great pressure on our space it is impossible to reprint this portion of the list.—Ed.)

Capt. B. A. Millard relinquishes his commn. on account of ill-health contracted on active service, and is permitted to retain his rank; May 3.

Lieut. (Hon. Capt.) H. M. Rusworth (Lond. R.) relinquishes his commn. on account of ill-health; May 3 (substituted for notification in *Gazette*, March 15).

The following Sec. Lieuts. relinquish their commns. on account of ill-health, and are permitted to retain their rank:—G. T. Cunningham; April 13 (substituted for notification in *Gazette* March 21). D. F. Tysoe (caused by wounds), S. Pile; May 3.

The following Sec. Lieuts. resign their commns.:—R. Mantegazza, G. McHardy; May 3.

Sec. Lieut. D. G. Tory to take rank and prec. as if his appointment as Sec. Lieut. bore date Oct. 1, 1918.

The surname of Sec. Lieut. W. G. Duncombe is as now described, and not as stated in *Gazette* Nov. 8, 1918, on page 13216.

The Christian names of Lieut. F. H. Berry are as now described and not as stated in *Gazette* March 11.

The surname of Lieut. R. B. B. Sievier, M.C., is as now described, and not Sievier, as stated in *Gazette* March 21.

The surname of Sec. Lieut. E. J. Norris is as now described, and not Morris, as stated in *Gazette* March 21.

The notification in *Gazette* of April 1 concerning Lieut. M. P. Lafleur is cancelled.

The notification in *Gazette* Jan. 17 concerning Lieut. A. G. Bewes is cancelled (notification in *Gazette* Feb. 7 to remain).

*Administrative Branch*

Sec. Lieut. (actg. Maj.) C. A. E. Lloyd to be Lieut., and to retain his actg. rank; April 2, 1918.

Lieut. (actg. Capt.) B. Turner retains the actg. rank of Capt. while employed as Chemical Warfare and Explosive Expl. Officer, from March 29 to April 30.

Sec. Lieut. A. H. Hasler to be actg. Capt. while employed as Capt.; Nov. 15, 1918 (substituted for notification in *Gazette* Sept. 11, 1918.)

Lieuts. (A.) to be Lieuts.:—H. S. Brackenbury, N. G. Caridia, C. H. Clifford, R. C. Day, C. F. Embleton, F. Green, N. A. Holmes, E. Hillary, P. N. Hoyle, H. H. Jones, G. Knight, R. C. F. Nailer, H. M. Paterson, H. F. Proctor, G. H. Raitt, G. Scarrett, H. B. Turner, F. H. Watts, R. Waugh; April 17.

Capt. C. H. W. Godfrey to be Lieut., from (A/ship); April 17.

Lieut. T. H. J. Wright to be Lieut. from (K.F.); April 17.

Lieuts. (O.) to be Lieuts.:—L. J. S. Dowland, A. H. Lancaster, A. N. Nesbitt, A. D. Tatham; April 17.

J. G. Haslan (Temp. Lieut. and Qrmr.) is granted a temp. commn. as Lieut.; April 1, 1918.

Lieut. T. J. Southern (Yorks Hrs.) is granted a temp. commn. as Lieut.; April 17, seniority April 1, 1918.

Sec. Lieuts. to be Lieuts.:—H. F. Phillips; May 4, 1918. S. A. Gordon; Nov. 31, 1918.

Sec. Lieuts. to be Sec. Lieuts., from (A.):—R. Cookson, E. T. A. Keitzman, M. H. McRae; April 17.

Sec. Lieuts. to be Sec. Lieuts., from (A. and S.):—P. Rabinson, P. R. Cook (and to be Hon. Lieut.); April 17.

Sec. Lieuts. to be Sec. Lieuts., from (O.):—H. H. Creighton, T. A. Chilcott, W. S. Hedley, J. B. Russell, D.F.C.; April 17.

Sec. Lieut. C. G. F. Carver to be Sec. Lieut., from (K.B.); April 17.

The following Sec. Lieuts. (late Gen. List, R.F.C., on prob.) are confirmed in their rank as Sec. Lieuts.:—W. D. Tye, C. E. Briant, H. C. Bird; March 1.

The following relinquish their commns. on ceasing to be employed:—Lieut. E. D. Whittles (Lieut., R. War. R.); July 13, 1918. Lieut. C. L. Hancock (Lieut., Leicester R.); Nov. 24, 1918.

(Then follow the names of 24 officers who are transfd. to the Unemployed List under various dates.)

Maj. R. H. Ferguson is removed from the R.A.F.; April 30.

Capt. (actg. Maj.) H. W. Morgan (Capt., K.R. Rif. C.) relinquishes his commn. on account of ill-health contracted on active service; May 3.

Sec. Lieut. F. A. Crowe resigns his commn.; May 3.

The rank of Lieut. (actg. Capt.) G. C. Bateman is as now described, and not as stated in the *Gazette* of April 15.

The date of appointment of Sec. Lieut. C. W. Whitworth is Sept. 1, 1918, and not Sept. 2, as stated in *Gazette* of Sept. 6, 1918.

The notification in the *Gazette* of April 1 concerning Sec. Lieut. A. H. Jarman is cancelled.

The notification in the *Gazette* of April 1 concerning Sec. Lieut. F. W. R. Johnson is cancelled.

The notification in the *Gazette* of Feb. 25 concerning Lieut. (Hon. Capt.) G. H. Simpson is cancelled.



# SIDE-WINDS

To those concerned with the upkeep and maintenance of aeroplanes engaged in civil aviation the announcement made by the British Emaillite Co., Ltd., on the front cover of this issue of FLIGHT, is of considerable importance. The doping scheme is one which has been fully tested successfully on active service on all fronts and under conditions varying from Arctic to tropical. Its success is the result of long experience associated with the use of the finest materials, and it is gratifying to know that the scheme is now available for use on civil machines and on aeroplanes built for foreign governments. The British Emaillite Co., Ltd., 5, Hythe Road, Cumberland Park, Willesden, N.W. 10, will be pleased to supply full particulars to anyone interested.

ANY manufacturer who has a surplus stock of linen should note that Messrs. Aero Coverings, Ltd., are in the market for same. The material must, of course, be subject to A.I.D. inspection. Offers should be sent to the firm at 175, Piccadilly, W. 1.

THE business of Barimar, Ltd., the well-known welding specialists, of 10, Poland Street, Oxford Street, London, W. 1, has month after month gone on increasing to such an extent that the directors are once more faced with the necessity for extension. There was never a time, apparently, in which there was such exceeding difficulty in getting suitable factory accommodation in Central London positions as there is to-day, and, after inquiries extending over some months, Barimar, Ltd., is offering a premium of £100 to the person who first puts them into touch with the owner of a suitable property with a floor space of 30,000 to 50,000 ft., the amount in question being payable as soon as negotiations are completed and possession of premises given. An impetus was, of course, given to the welding industry by the War, and there were many who thought that, once War-time activities slackened down, there would be less need for the services of the specialist in metal fusion. So far from this being the case, however, we learn that since the Armistice was signed the demands upon Barimar, Ltd., have more than doubled, and the company finds it a matter of some difficulty to comply with every request for immediate treatment.

SPEAKING at a staff dinner given by Messrs. Wm. Beardmore and Co., Ltd., in Glasgow the other day, Sir Wm. Beardmore, in reviewing the War work of the firm, said he found they had provided 650 aeroplanes altogether of types ranging from Baby Sopwiths with 80 h.p. engines, B.E. 2C's with 70 h.p. engines, to the large Handley Page bomber with four engines of a total of 2,000 h.p. The first aeroplane was delivered on March 8, 1915. He considered,

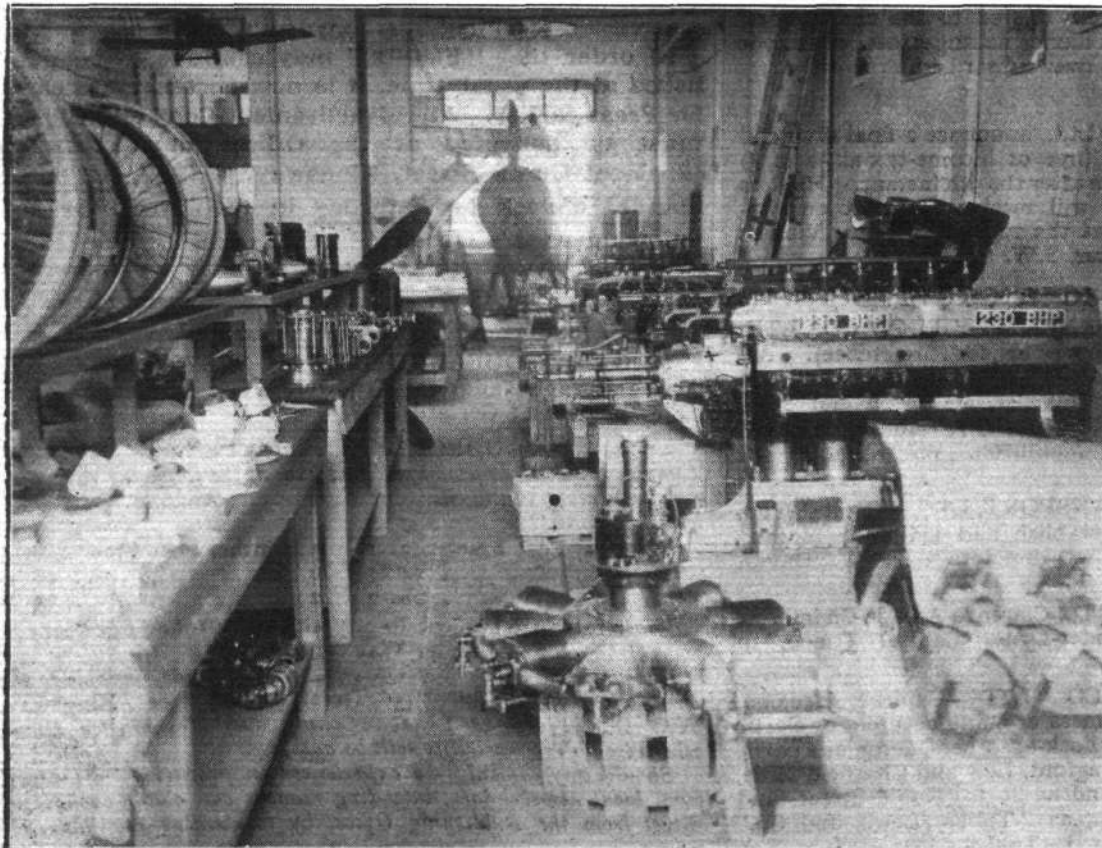
however, that the most interesting and important development of all, was the construction of rigid airships. The work of building the airship shed at Inchinnan was commenced in January, 1916, and so expeditiously was the work carried out by Messrs. Arrols that they were able to commence the building of the first ship in the middle of that year. Their first ship, R. 24, of 970,000 ft. capacity, was laid down on July 21, 1916, and her flight trial took place on September 20, 1917. The second ship, R. 27, with 1,000,000 ft. capacity, was laid down on March 16, 1917, and went through her flight trials on April 8, 1918. The third ship, R. 34—the one about which they had heard so much has a capacity of 2,000,000 ft. It was laid down on December 9, 1917, and had her flight trials on December 20, 1918. He mentioned that the first of their ships was of the size originally used by Germany, and the last one, viz., R. 34, was equal to the largest they have built. Two other airships were in hand, one being practically the same as R. 34 and the other one 50 per cent. larger, namely, 3,000,000 ft. capacity.

THE firm also built the first seaplane carrier for the British Government—the "Argus"—and it had proved a great success.

THE Regent Carriage Co. held a very successful Fancy Dress Ball last week at the King's Hall, New King's Road, which was largely attended by several hundred employees of the firm. The prizes were very handsome, three being for the best ladies' and three for the best gentlemen's costumes, and two special consolation prizes. The judges were Mr. and Mrs. Myles Scarff and Mr. Peter Arondel, and they had anything but an easy time to pick the winners. The prizes were presented by Mrs. Myles Scarff.

MESSRS. AYLING AND SONS, Riverside, Putney, whose name is well-known in connection with boating matters on the Thames, and who have been very busily engaged for some time past on Vickers, de H., Handley Page and Sopwith machines, have now in course of preparation a 350 h.p. biplane of their own design, which, we gather, embodies some novel improvements. At this juncture that is all the information we can give, but we hope before long to give full details.

MESSRS. AEROPLANE GENERAL SUNDRIES, LTD., whose head offices are at Fulwood House, Fulwood Place, High Holborn, W.C. 1, have opened a motor department and show-rooms at 55, High Street, Bloomsbury. During the War their business was confined to supplying aeroplane parts and fittings, which they are continuing, and the department which they are now opening at Bloomsbury is for the business of supplying automobile component parts and general accessories.



A corner of the  
 R.A.F. Sale De-  
 partment Show  
 Room in York  
 House, Kings-  
 way, giving an  
 idea of the  
 variety of en-  
 gines, parts, etc.,  
 open for the pub-  
 lic to acquire in  
 large or small  
 quantities.

**RESETTLEMENT**

THERE are many officers and men of the R.A.F. who are demobilised or are about to be demobilised.

In order to assist those who are undecided or are seeking advice as to their prospects in civil life, the Editor has arranged for an expert, with wide experience of service, industrial and educational conditions, to give advice to those who may solicit it through the medium of this Journal.

Applications, which must be in writing, should be marked *Resettlement*, and addressed to the Editor, FLIGHT, 36, Great Queen Street, Kingsway, W.C. 2. They will be dealt with in these columns, as far as possible, in rotation.

**ARMAMENT, EX-CAPT., R.A.F.**—We fear you would not possess sufficient technical knowledge for the kind of post you suggest. In the Service what really matters is the ability to handle the finished article, but in a works it is different. What is usually required in the latter is thorough practical knowledge with capability for design. This knowledge generally takes years to acquire. We think you would be best advised to approach one of the firms you mention with a view to spending a year or two in the works and subsequently specialising in Aerial Armament.

**A.H.G., LIEUT., R.A.F., B.E.F.**—You can improve your knowledge by private study and by taking advantage of the Army Education Scheme. A few good books to read are:—(1) "The Aeroplane," by A. Fage, A.R.C.Sc. (Griffin and Co., Ltd.); (2) "Aeroplane Design," by F. S. Barnwell (McBride, Nast and Co.); (3) "The Design of Aeroplanes," by A. W. Judge, A.R.C.Sc. (Whittaker and Co.). On demobilisation you will find that there are facilities offered for a course of Aeronautical Engineering by the Appointment Department of the Ministry of Labour.

**E.S.C., EX-LIEUT., R.A.F.**—Unfortunately many others are in the same boat. We can only suggest that you seek employment in your normal profession.

**J.A.C., EX-LIEUT., R.A.F.**—We think you are well advised in starting in the motor trade. With your previous experience we cannot but anticipate that you will be successful.

**G.M.H., EX-FLIGHT CADET.**—We think you will be best advised to seek immediate employment in the profession in which you have served your apprenticeship, and in which you state you have had considerable experience. There is very little prospect of employment in any branch of aviation at present. Moreover, the supply is vastly in excess of the demand.



**COMPANY MATTERS**

**Triplex Safety Glass Co., Ltd.**

THE nominal capital of the Triplex Safety Glass Co., Ltd., has been increased to £200,000. An issue of 60,000 £1 ordinary shares, which were offered to the shareholders at 15s. premium, has just been made, making a total of 120,000 shares issued. The issue was over-subscribed.

**Vickers, Ltd.**

THE directors of Vickers, Ltd., announce a final dividend for 1918 of 1s. 6d. per share (free of income-tax at 5s. in £) on the ordinary shares, payable after the 9th instant. Holders of share warrants to bearer will receive payment on presentation of coupon No. 23 at the registered office, Vickers House, Broadway, Westminster, S.W.

**NEW COMPANIES REGISTERED**

**AERONAUTICAL AND PANEL PLYWOOD CO., LTD.**—Capital £100,000, in £1 shares (25,000 preference). Acquiring business of timber and plywood merchants and saw millers recently carried on by W. M. Mallinson and Sons, Ltd., at 218-226, Kingsland Road, and 5-7, Laburnum Street, E. 2. First directors: W. Mallinson, W. J. Mallinson, L. V. Mallinson.

**CAMBRIAN AERIAL TRANSPORT, LTD.**—Capital £100, in £1 shares. Objects, to establish and maintain aircraft lines and services, etc. First directors: T. W. David, D. M. Rees, T. L. Demery.

**STAMFORD MOTORS, LTD.**, Clarence Arcade Chambers, Stamford Street, Ashton-under-Lyne. Capital £5,000, in £1 shares.

**TUBBS, LEWIS AND CO., LTD.**—Capital £250,000, in £1 shares. Acquiring business of manufacturers of elastic webs, cords and braids, etc., shock-absorbers, aeroplane parts, etc., carried on at Abbey, Langford, Lew and Charfield Mills, Wotton-under-Edge, Glos., and at 29-30, Noble Street, and Charterhouse Buildings, E.C., as "Tubbs, Lewis and Co." First directors: S. W. Tubbs, L. Tubbs.

**Aeronautical Specifications Published**

**Abbreviations:**—cyl. = cylinder; I.C. = internal combustion; m. = meters.

**APPLIED FOR IN 1917**

The numbers in brackets are those under which the Specifications will be printed and abridged, etc.

Published May 8, 1919

- 1,657. A. CAZANAVE. Aeroplanes. (125,169.)
- 9,119. A. CAZANAVE. Aeroplanes. (125,171.)

**APPLIED FOR IN 1918**

The numbers in brackets are those under which the Specifications will be printed and abridged, etc.

Published May 8, 1919

- 5,661. F. STEAD. Propeller shaper. (125,196.)
- 6,222. J. ROBERTS. Indicators for ignition circuits. (125,222.)
- 6,308. R. E. SHIRLEY. Attachment for wires, etc., on aircraft. (125,227.)
- 7,935. W. MORTON. Attaching fabric panels to aircraft. (125,261.)
- 8,577. BOULTON AND PAUL and J. D. NORTH. Loading fuselages with bombs, etc. (125,270.)
- 9,590. J. F. KAHL. Aeroplanes. (116,893.)
- 19,442. E. E. BROWN and D. J. MOONEY. Struts for aircraft. (125,284.)
- 15,177. H. W. MILLER and F. BINGLEY. Girders, spars, etc., of aircraft. (125,317.)
- 19,580. SOC. DES MOTEURS SALMSON (SYSTEME CANTON UNNE). Tail-piece for aeroplanes. (121,464.)
- 21,304. A. ANZANI. I.C. engines. (121,745.)

**APPLIED FOR IN 1919**

The numbers in brackets are those under which the Specifications will be printed and abridged, etc.

Published May 8, 1919

- 6,508. L. B. SPERRY. Controlling aeroplanes. (125,090.)
- 6,580. A. V. ROE. Aircraft wings. (125,092.)
- 6,587. F. COCHRANE. Fabrics having property of invisibility. (125,093.)
- 6,764. J. B. HENDERSON. Indicators of changes in course of aircraft, etc. (125,096.)
- 7,182. FAIREY AVIATION CO. and C. R. FAIREY. Seaplanes, etc. (125,106.)
- 7,193. F. C. NESTLER and F. C. NESTLER, LTD. Portable sheds or hangars, etc. (125,109.)
- 7,221. L. M. M. HALL. Aeroplanes. (125,111.)
- 7,286. E. B. MAXTED and G. R. RIDSDALE. Hydrogen. (125,112.)
- 7,301. T. M. RITCHIE and A. A. PERRIN. Airships, etc. (125,113.)



**PUBLICATIONS RECEIVED**

*All About Aircraft.* By C. J. Blackburn and E. J. Newby. London: Simpkin, Marshall, Hamilton, Kent and Co. Price 3s. 6d. net.

*Zooms and Spins: An Army Pilot's Light and Shade Impressions.* By "Rafbird." London: Sampson, Low, Marston and Co., Ltd.



**The 8-page Index for Vol. X of "FLIGHT" (January to December, 1918) is now ready, and can be obtained from the Publishers, 36, Great Queen Street, Kingsway, W.C. 2. Price 8d. per copy, post free.**

**If you require anything pertaining to aviation, study "FLIGHT'S" Buyers' Guide and Trade Directory, which appears in our advertisement pages each week (see pages liii, liv, lv, and lvi).**

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IN order that "FLIGHT" may continue to be published at the usual time, it is now necessary to close for Press earlier. All Advertisement Copy and Blocks must be delivered at the Offices of "FLIGHT," 36, Great Queen Street, Kingsway, W.C. 2, **not later than 12 o'clock on Saturday in each week for the following week's issue.**

**FLIGHT**

and *The Aircraft Engineer,*

36, GREAT QUEEN STREET, KINGSWAY, W.C. 2.  
Telegraphic address: Truditur, Westcent, London.  
Telephone: Gerrard 1828.

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