

FLIGHT

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.

OFFICIAL ORGAN OF THE ROYAL AERO CLUB OF THE UNITED KINGDOM.

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EDITORIAL COMMENT.

The Army Monoplane Report.

Presented on the 3rd of December of last year, the Report of the Departmental Committee on Accidents to Monoplanes has been published after an interval of exactly two months. It appears *in extenso* elsewhere in this issue of FLIGHT, and should prove an intensely interesting document to all classes of our readers, inasmuch as it touches upon a variety of subjects, and concludes with a long list of summarised conclusions of an exceedingly suggestive character. In short, the Report finds that the accidents to monoplanes specially investigated were not due to causes dependent upon the class of machine to which they occurred, nor to conditions singular to the monoplane as such, and sees no reason to recommend the prohibition of the use of monoplanes, provided that certain precautions are taken, some of which are applicable to both classes of aeroplane, biplane as well as monoplane.

Thus the Committee's findings may be said to constitute a whitewashing of the monoplane as a type, using the word in no offensive sense, and it may now be taken as read that the monoplane is re-established in official favour. That the Committee has seen fit to reach the conclusions it has may be viewed with a considerable

amount of relief by all who are interested in the aeroplane either as a commercial proposition, as an accessory to the scheme of national defence, or from the more academic stand-point of a contribution to the tale of scientific progress. It is naturally with the two former aspects of the question that we are more immediately concerned. Taking them in their order as we have placed them, we should have been deeply concerned if the verdict had gone the other way, because there are many firms in this country—as the count of aeroplane manufacturing concerns is told—which have pinned their faith to the monoplane and have sunk considerable capital in its development. That they should have received the almost killing blow that an adverse decision would have meant, would have been a serious thing for an industry which is none too stable at the present moment, although its future is certainly to be viewed with unalloyed optimism.

Next from the point of view of national defence, we should have considered it as being something almost akin to a national calamity if a type had been condemned which we know to be doing satisfactory service in the hands of the flying corps of other countries. In France particularly, the monoplane is regarded as an absolutely essential type for services which cannot be so readily performed by the biplane. Without pretending to go deeply into questions, which are for the tactician to decide, it is quite obvious that an air-fleet consisting entirely of comparatively slow-travelling biplanes must be at an initial disadvantage compared with one which includes a high percentage of very fast and manoeuvrable monoplanes. Not but what we should have accepted the conclusions of the Committee as inevitable had they been the other way about, but still we should have deplored the necessity of abandoning an exceedingly useful type of machine. However, it is unnecessary to dilate upon what might have been, and we can but record our satisfaction at the turn of events.

As we publish the Report in full, there is no need for us to dip too deeply into its details, but there is room for useful comment upon certain of the data and the reasoning out of their details which have led to the decisions of the Committee. The conclusion was reached that "with regard to the cases investigated ... it has been clearly demonstrated that the accidents were not primarily due to causes dependent upon the fact that the machines were monoplanes." Nothing could be more conclusive than that. We have already touched

upon the subject, but we think that the phrasing of this finding is well worth keeping in mind. We will now pass on to a consideration of some other aspects of the question.

One of the outstanding comments relates to the need for protecting vital parts of the aeroplane from evil consequences of failure in the external parts of engines, and thus relates to the proper design and arrangement of cowls.

Another point of importance emphasized in the report is that the 100-h.p. Gnome should not be overhung. Several cases of failure in Gnome engine gudgeon and lug end pins having been investigated, the report adversely criticises the design and construction, and recommends an alteration. Similarly, the report draws attention to the liability of straining the connecting rod through careless tightening of the piston valve in Gnome engines.

As against this, it is at least satisfactory to note that the Report lays the bogey of gyroscopic force to rest very comfortably by estimating that the effect may be com-

pared "with that of a small gust, of known direction, and should cause no difficulty to the flyer."

The accidents to Capt. Hamilton and Maj. Gerrard are clearly regarded as engine accidents, except so far as a fractured propeller may have originated the failure of the overhung engine in the former machine. The stresses on the wing spars for the Dep. and the Bristol were calculated, and the Report recommends that the duplicate Bristol monoplane now at Larkhill be withheld from practice pending further investigation.

Among other recommendations that the Committee offers to constructors are those to the effect that wings should be designed to be safe without external drift wires; that lift wires should not be attached to the undercarriage; that they should be protected as much as possible from accident while the machine is running on the ground; that they should be duplicated, with their attachments of course; that control wires should be made of cable; and that fabric should be more securely fastened to the upper side of the wing, so that it alone can carry the whole load.



The International Maritime Cup.

THE full regulations of the International Cup presented by M. Jacques Schneider were passed by the F.A.I. at the meeting in Paris last week. In addition to the Trophy valued at £1,000 a sum of £1,000 will be deposited for each of the first three years with the club in charge of the competition. For the first competition the Aero Club of France will be in charge of the arrangements. The date of the contest each year must be between April 1st and November 15th, the date to be announced before March 1st. Should the cup be won by one national club three times within five years it will become its property.

For this year the course will be 150 nautical miles entirely over the sea and over a closed circuit of not less than 5 nautical miles.

The Gordon-Bennett Race.

It will be seen from the official notices of the Royal Aero Club that it is probable that the course for this year's race for the Gordon-Bennett Trophy will be about 1000 miles, round. According to the decision of the F.A.I., the full distance for the race shall be 2000 miles, "cross-country and direct," over a closed circuit of not less than 500 miles.

The Hydro-Aeroplane Brevet.

As announced in our last issue the F.A.I. has approved of a special pilot's certificate for hydro-aeroplanes upon similar lines to the land certificate. While holders of the latter will not need to re-qualify for the former, the special hydro-aeroplane certificate will not be available for flying over land until the holder has carried out landing tests and had the certificate endorsed accordingly.



† Mr. C. H. Pixton just ready to start from the Four Winds Aerodrome, Madrid, for a flight on his Bristol monoplane, with the Infanta of Spain, who occupies the front seat, and is wearing a fine wire mask for protection against the wind.

FEBRUARY 8, 1913.

FLIGHT

**MEN OF MOMENT IN THE WORLD OF FLIGHT.
Pioneer Pilot-Constructors.**



MR. T. O. M. SOPWITH.

ENGINE SPEED INDICATORS AND SAFETY.

By G. M. DYOTT.



One of the causes contributory to many of the aviation fatalities that have occurred of late, has been that the pilot has not taken sufficient care to see that his motor is in sufficiently good working order before starting out. Knowing Mr. G. M. Dyott to be a most reliable and careful pilot, and, moreover, he being especially emphatic upon the point that pilots as a rule do not study their motor to the extent that they should, at the request of the Editor he has here set out his views in writing.

fail to learn a valuable lesson which passes by unnoticed.

On one occasion I was carrying a passenger from an aerodrome, 8,000 ft. above sea level on returning I could not maintain my altitude in spite of the fact that the revolution indicator showed the motor to be working at its normal speed. A gentle gust caught me and but for a quick dive I would have been over. The first impulse was to blame the motor, but I could not do this, for I knew it, at any rate, was not at fault; analysis was thereby simplified, and it opened my eyes to the real nature of the trouble. Without an indicator I would still have been hopelessly at sea, or else satisfied with an entirely wrong explanation.

There are some men whose sense of hearing is very much more acute than others, and they contend that it is possible to note the least variation in the running of an engine by sound alone. To an extent this may be true after intimate experience with one particular motor, but even at the best of times a drop of 25 revs. in 1,300 would be hard to detect. A falling off of 50 revs. might be apparent to a well-trained ear, but probably too late to do anything. Whereas a proof positive a few seconds before might have averted an emergency landing in an uncomfortable place. If the pilot is called upon to fly different types of machines equipped with various motors, the case becomes still more difficult. His ear might be attuned to the variations in hum of a Gnome-to-day, but he would be lost behind the hoarse bark of an Anzani-to-morrow.

When flying a Gnome over broken country in windy weather, one often notices how the sound of the motor will rise and fall, sometimes almost dying away entirely. Without an indicator my ears would tell me that something was wrong, but with a reliable indication in front of me my mind would be at rest.

Smith found that by careful practice he could descend from the roof of his house to the street below by means of a tight rope. His friends, however, continued to use the staircase, as it required less agility and was more reliable. Does not the line of reasoning apply to the use of speed indicators. Even suppose that after careful practice anyone could train his ear to the least variation in sound would that be a reasonable excuse for not employing a revolution indicator? I should say certainly not. In general, then, we might say that if there is any advantage in knowing the engine

speed of an aeroplane, a reliable indicator is the only way of ascertaining it. The question which now arises is whether such information after all is really worth knowing.

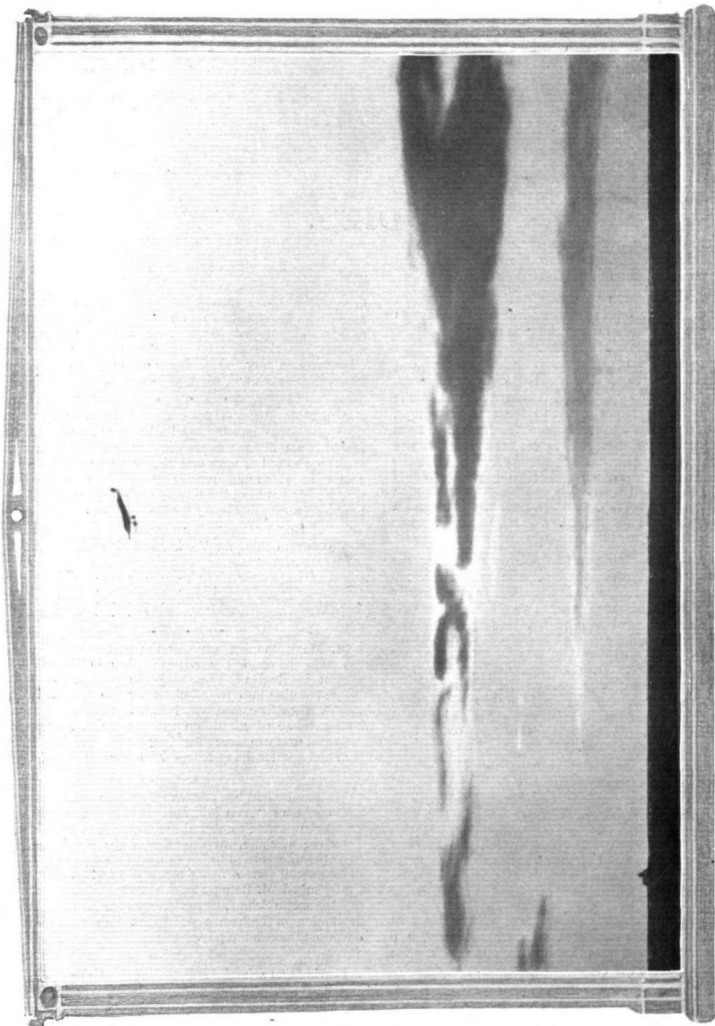
To those who confine their attention to spasmodic flights round an aerodrome, the value of knowing their exact engine's speed may not be apparent, but take the same man and have him fly 10,000 ft. above sea level one week, then move him to some cold, damp place on the coast, shifting him afterwards to a hot, dry plateau in the tropics, and it would not be long before he would not only realise the advantages, but the absolute necessity of such an instrument if he is to get the best out of his machine with a minimum amount of trouble and worry. Let me illustrate the point at issue by relating a few experiences which have come within my personal observation. October, a year ago, I was flying in New York at a meet. The weather was cold and damp, but the machine had been tuned up and was running perfectly. Three weeks later I was in the tropics, where the atmosphere was hot and dry, 8,000 ft. above sea level, and considerable adjustments had to be made before I was able to get the engine in good shape to suit the new atmospheric conditions. On one occasion I had started for an altitude flight when the motor showed signs of slowing up. Immediately I turned round and headed for the aerodrome, and well for me that I did so, for no sooner had the manoeuvre been accomplished when the motor went completely out of business. A long straight run *plaine* just brought me safely within the enclosure and my carburettor and spark plugs were all covered with snow. Had it not been for the few seconds' warning given by the speed indicator I would have been forced to land on very bad ground, may be damaging the machine. Not many weeks later I found myself at sea level again, a very hot place this time, which of course meant renewed engine adjustments. Starting on a cross-country flight one evening I noticed the motor speed gradually dropping, and taking advantage of a natural landing ground I came down to find the oil tap closed. My indicator saved a burnt-out motor and an emergency landing that might have been costly.

On another occasion I was giving an exhibition flight in Western Pennsylvania, and had the machine ready to start. The engine was set in motion, but I could not get the full 1,150 r.p.m. necessary—only a shade over 1,100. A quick get away was imperative in order to clear a row of trees. Besides, outside, the ground was very soft, this was not good enough. The engine was changed, distributor cleaned, and magneto inspected, but all to no avail, the result was the same. Naturally, the people were impatient, and I was sorely tempted to risk it; but, no, what was the use of going against one's better judgment? So a further careful inspection was made, and again the motor refused to come up to speed. At last my mechanic noticed that the petrol did not flow freely from the jet. It was evident that it was clogged up, and we proceeded to take it off. Before doing so I looked inside the petrol tank which was new and had not been fitted with a gauge-glass at that time; it was almost empty, although the last thing the day before it had been filled full. There was no question but what someone had wilfully removed the contents leaving just enough for a three minutes' flight. It is not pleasant to reflect what might have happened. As it was, a new supply of the necessary petrol and off the machine went, showing her full 1,125 on the dial.

Experiences such as these happen to every aviator, and I therefore contend that since in each special case a revolution indicator was, to say the least, of tremendous service, the argument as to whether information pertaining to the engine speed was worth knowing or not has been answered in the affirmative.

There is one more point I wish to bring up before closing, and that is the necessity of having a reliable instrument. Information that cannot be depended on is worse than none at all. I was flying a monoplane a few months ago equipped with a small indicator driven by a belt. I seldom had two readings agree, and usually had to club the instrument into submission before the pointer would move from zero. This led to a jumble of information that was more confusing. Subsequently I had a larger instrument replaced by a really good one, and in a few flights the following data was obtained:—

With a certain make of propeller of certain dimensions, I found that, with the machine I was flying, I ought to get the engine turning over at 1,150 revolutions per minute at least before leaving the ground. When in the air, if the engine was doing 1,150 or over, for that matter, I felt that I had a margin. If the indicator showed an engine speed of anything from 1,125 to 1,150, I had the idea that something would happen, unless by carburettor adjustment I could bring the speed back to normal. The machine could still climb gently, and remain pretty well in hand in fairly good weather, but all the same, I kept my eyes open for a good landing ground.



AT THE SETTING OF THE SUN.—A fine glide, the actual angle being 1 in 7.9, into the Cuatro Vientos Aerodrome, Madrid, by Mr. C. H. Pixton on a Bristol monoplane. This was the conclusion of a fifteen minutes' flight with the Infanta of Spain.

If the motor at any time slowed down to a point between 1,125 and 1,100 revs. per min., I made a practice of landing as soon as possible. Any further reduction in speed would cause the machine to drop.

This gave me a maximum range of 100 r.p.m. between highest and lowest speed. As a matter of fact, I used to run the engine at about 25 r.p.m. below its maximum speed, so as to reduce wear and tear in the motor. When the monoplane was carrying an extra load of 50 lbs. I found that the indicator readings had to be increased by about 24 per cent. for the machine to show the same navigable qualities as it would when flying light. These observations indicated to me that my machine was working too near its limit of safety, for I had very little reserve engine power.

Let me summarise the points on which I have endeavoured to lay stress in the foregoing words? I am convinced, firstly, that engine

speed indicators clear the way to a better understanding of one's machine by reducing the number of variables involved; that many pilots are ignorant of the exact engine speed at which their machines fly best; that the information given by r.p.m. indicators materially adds to the safety of the pilot; and that whereas it takes much experience to judge engine speed by sound alone, a good speed indicator can give reliable information to the inexperienced; that such information must be reliable to be of use.

I certainly believe that a good reliable instrument for indicating motor speed is an absolutely necessary part of any aeroplane's equipment, whether the machine is the last word in high speed creations or the humble school taxi. Leading, as it does, to a better understanding of the machine by its pilot, the more general use of reliable speed indicators will result in the reduction of the number of fatalities due primarily to badly running motors.

EDDIES.

It has been suggested that, as a particularly rare exhibit at the forthcoming Olympia Show, the War Office ought to have on exhibition a few well-filled order forms.

Music might be provided, ventures a well-known Brooklands pilot, by a monoplane "bann'd."

There is going to be a great deal of activity at Eastbourne during this present year for I hear that the Frank Hucks Waterplane Co., has joined forces with the Eastbourne Aviation Co. For over a year now, Mr. F. B. Fowler of the Eastbourne Aviation Co. has had in operation near that seaside resort a very efficient flying school where he has trained upwards of 14 pupils including several naval men. He has quite a good stud of instruction and exhibition machines comprising a 50-h.p. Bristol, a 50-h.p. Sommer, both biplanes, and a 25, a 35, and a 50-h.p. Blériot.

With the three Farman hydroplanes owned by the Frank Hucks Co., the new firm, which will be termed the Eastbourne Aviation Co., Ltd., will have an unusually complete stock of machines. Two of these Farman biplanes are equipped with 70-h.p. Gnome motors and the other with an 80, while all three are provided with two sets of chassis, so that they may be used either for water or land flying. Four new hangars, each 60 ft. by 40 ft., are shortly to be erected on the beach near the existing aerodrome, and they will house the machines that are to be used for hydroplane tuition and general exhibition work. A British hydroplane school!—it ought to be a great success.

Probably no one can boast of having been associated with such an extensive variety of air-work as has Mr. F. W. Goodden, unless it be Mr. Herbert Spencer, the well-known Brooklands pilot. Before taking up work in connection with heavier-than-air machines, Mr. Goodden was for a long time associated with the Spencer Brothers, carrying out for them at various times balloon ascents and parachute descents. Leaving them, he joined Mr. Willows, and was mainly responsible, so I understand, for the construction of the envelope of the little "City of Cardiff" dirigible balloon, on which Mr. Willows, accompanied by Mr. Goodden, flew from London non-stop to a point near Douai, where the French Breguet headquarters are.

Soon after he returned to England, after an appreciable length of time spent in dirigible work in France, he was drawn towards the aeroplane, and on New Year's

Day of last year started on the construction of a monoplane of his own design at the Port Meadow aerodrome, near Oxford. Working practically single-handed, he had occasional help from an old gentleman who was interested in the work, he completed the monoplane in about five months, and installed a 35-h.p. Jap motor. Since that time and until just recently, he has been flying the machine, making flights of as long duration as three-quarters of an hour, which is no mean performance to achieve with such an early type of motor.

A notable absentee from the forthcoming Monaco hydro-aeroplane meeting will be the Caudron. But the reason is not difficult to give, it is just that their French works are so full of work and they have so many orders coming in, which must receive immediate attention, that they simply have not the time at their disposal to devote to getting a machine ready for that meeting.

Here's something for Verrier, and his compatriots!

Le chi de l'aviation.

*Partir d'un point carré (Poincaré).
Franchir mille rangs (Millerand).
Faire un vol brillant (Briand).
Atterrir sans avoir d'ailes cassées (Delcassé).*

M. Marc Bonnier, who for the past year and a half has been flying for the Nieuport firm in France, is at present in England, examining the ground, as it were, before entering into negotiations for the formation of a British Nieuport company. It is his intention to procure an aerodrome practically on the sea shore, so that the proposed firm can erect building shops and conduct a land and a water flying school from the same centre.

M. Bonnier had his first experience in aviation when he bought an "Avia" biplane in France, a machine whose planes were cambered the wrong way, so that the faster the machine was driven over the aerodrome, the more the wheels tried to bury themselves in the ground. A very useful sort of flying machine that! However, it hardly suited M. Bonnier and not long after he joined the Antoinette School, where he obtained his ticket under the tuition of Latham and Laffont, both of whom are now dead, more's the pity.

Leaving that school M. Bonnier joined the Train firm and flew for them for eighteen months or so, taking machines to Italy to demonstrate them to the military authorities there. It is curious that M. Bonnier was the passenger who M. Train had up with him when, at the

start of the Paris-Madrid race at Issy les Moulineaux, he had to descend through a sudden engine stoppage, unfortunately killing M. Berteaux, then French Minister of War.

An interval, during which he flew the Marcel Besson "Canard," and M. Bonnier joined the Nieuport organisation. He conducted their school down at Pau, in the south of France, and he had among his pupils at one time Capt. Gerrard, the well-known British Naval pilot. The people at the Royal Aircraft Factory will remember M. Bonnier as the pilot who carried out the test flights on the 28, the 70, and the 100-h.p. Nieuport monoplanes, when these machines were delivered to Farnborough last summer.

In England, when you want to keep the public from trespassing inside your hangar, you put up a notice which reads, "No admittance except on business." In America such a legend would not be forcible enough. You would write up, "Keep out!—what! me?—YES, YOU!!!"

Considering that the weather was anything but favourable during January, and that on most days during the month it was impossible to do any school work at all, the Bristol schools must be specially congratulated, for they "put through" no fewer than sixteen pupils for their *brevets* last month.

Not only in their schools have they been busy, but the same state of affairs applies to their works. Of the twelve BE-type biplanes for which the War Office have just issued orders, seven of them have been placed with the Bristol Co. For the British Admiralty they are constructing one of their standard school machines, which will be fitted with a 70-h.p. Gnome engine and sent to the Eastchurch school. In addition, they have received a large order from the Spanish Government for tractor biplanes similar to the one that they will be showing at Olympia, and which we are illustrating in this issue.

Mr. Sydney Pickles, who until recently was flying one of the Caudrons owned by the Ewen school at Hendon, has now joined Messrs. Handley Page to fly their monoplane. He made his first flight on their 50-h.p. monoplane on Saturday last, and although it is a long time since he last flew a monoplane, the control came so easy to him that he went right ahead doing circuits and figures of eight. On Sunday he was flying with passengers up all round the neighbourhood before breakfast. Later in the morning he got into the air with Mr. Meredith, Messrs. Handley Page's works manager, intending to fly over to Barking, where their old works were situated. The wind was so strong against them at the altitude at which they steered that after flying for half an hour they found themselves no further than Sudbury. So they turned on their tracks.

Their return trip took them just six minutes!

I hear that one of the most noted of aeroplane designers on the Continent has got out drawings for a military monoplane, which will be capable, driven by a 400-h.p. motor, of attaining a maximum speed of 120 m.p.h. The most curious part of the machine is that it has a single propeller, revolving immediately to the rear of the wings, not at the end of the tail, for with the propeller mounted in this latter way the machine becomes very difficult to handle. The body of the machine will be of monocoque type, and the propeller boss will come out flush with the sides of the body. What the interior construction of the body in the neighbourhood of the propeller will be like I could not say, but at any rate it can be reckoned that it will be strong enough, for the designer in question possesses an enviable reputation for the excellence of his work. In the nose of the machine there will be accommodation for two observers, who will each be provided with a Maxim gun.

The W. H. Ewen Aviation Co.'s works at Lanark commenced operations on Tuesday last. They are putting in hand a batch of six Caudron biplanes.

"OISEAU BLEU."



The 100-h.p. Coventry Ordnance biplane, designed by Mr. W. O. Manning, has, since it has undergone general alterations and been fitted with more supporting surface, done quite a lot of flying at Brooklands of late. Mr. P. Raynham has been its pilot, and he flies it, most often, with a passenger up. The biplane has an unusually wide speed range, it being possible to land the machine at a less speed than 20 miles per hour.

The Royal Aero Club of the United Kingdom

NOTICES TO MEMBERS

ANNUAL DINNER.

The ANNUAL DINNER will take place at the ROYAL AUTOMOBILE CLUB, PALL MALL, S.W. (by kind permission), on THURSDAY, MARCH 13th, 1913, at 7-30 for 8 o'clock.

(Since circularising the members it has been found necessary to alter the date from March 6th to 13th.)

In order to facilitate the arrangements, Members are requested to notify the Secretary as early as possible, if it is their intention to be present, and at the same time give the names of their Guests, if any.

Members may be accompanied by Ladies.

Tickets (exclusive of Wines and Cigars)—15s. each.

The following prizes won during the year will be presented:—

The British Empire Michelin Trophy No. 1, to H. G. Hawker.

The British Empire Michelin Trophy No. 2, to S. F. Cody.

An entertainment will take place after the Dinner.

INTERNATIONAL AERO SHOW AT OLYMPIA.

The International Aero Show organised by the Society of Motor Manufacturers and Traders, supported by the Royal Aero Club, will be held at Olympia from February 14th to 22nd, 1913.

Members of the Royal Aero Club are admitted free on presentation of their membership cards.

A room in the Princes' Gallery will be placed at the disposal of the members during the exhibition.

Committee Meeting.

A meeting of the Committee was held on Tuesday, the 4th inst., when there were present: Sir Charles D. Rose, Bart., M.P., in the chair, Mr. Griffith Brewer, Mr. C. B. Cockburn, Col. H. C. L. Holden, C.B., F.R.S., Mr. F. K. McClean, Mr. C. F. Pollock, Mr. A. Mortimer Singer, Mr. R. W. Wallace, K.C., and the Secretary.

New Members.—The following new members were elected:—Capt. P. G. Barrett, and Lieut. S. H. Batty-Smith, Lieut. G. Blatherwick, John Boyle, Langley F. Ellis, J. J. Hammond, Robert J. MacGeagh Hurst, 2nd Lieut. A. Allen Knight, Capt. Joseph H. A. Landon, Capt. H. C. MacDonnell, Henry Morris, Capt. H. Musgrave, R.E., Lieut. D. Percival, R.G.A., Lieut. P. H. L. Playfair, Hugh C. Tower, and H. B. Wall.

Aviators' Certificates.—The following Aviators' Certificates were granted:—

- 409. Horace A. Buss (Blackburn Monoplane, Blackburn School, Hendon).
- 410. Montague F. Giew (Blackburn Monoplane, Blackburn School, Hendon).
- 411. Hubert Scott (Deperdussin Monoplane, Deperdussin School, Hendon).
- 412. Air Mechanic Reginald Collis (Maurice Farman Biplane, Central Flying School, Upavon).
- 413. Christopher Neville (Bristol Biplane, Bristol School, Brooklands).
- 414. Capt. E. G. R. Lithgow, R.A.M.C. (Short Biplane, Central Flying School, Upavon).

Public Safety and Accidents Investigation Committee.—On the motion of Col. H. C. L. Holden, the following report of the Public Safety and Accidents Investigation Committee was unanimously adopted:—

REPORT ON THE FATAL ACCIDENT TO MR. L. F. MACDONALD AND MR. HARRY ENGLAND WHEN FLYING OVER THE RIVER THAMES NEAR PURFLEET, ON MONDAY, JANUARY 13TH, 1913.

Brief Description of the Accident.—Mr. L. F. Macdonald, with Mr. Harry England, a mechanic, flying on a Vickers Biplane, fitted with a 70-h.p. Gnome engine, was making a trial flight from the Vickers' Trial Ground near Erith, on Monday, January 13th, 1913, at 3.30 p.m. After leaving the ground, the aircraft headed towards the river, which is situated about 1,300 yards from the starting place. The aircraft went partly across the river, turned to the left, and descended slowly on to the water. The aircraft sank, and both men were drowned.

Mr. L. F. Macdonald was granted his Aviator's Certificate, No. 28, on November 15th, 1910, by the Royal Aero Club.

Report.—The Committee sat on Monday, January 20th, and Monday, January 27th, 1913, and received the report of the Club representatives who visited Erith. This report included the evidence of eye-witnesses. Capt. H. F. Wood, of Messrs. Vickers, Ltd., attended and gave evidence on the various points raised by the Committee.

From the consideration of this evidence the Committee regards the following facts as clearly established:—

- (1) The aircraft was built in December, 1912.
- (2) There was practically no wind at the time of the accident.
- (3) The flight lasted less than three minutes, during the latter part of which the aircraft was flying slowly.
- (4) When over the river, which at this point is about half-a-mile wide, and within about 200 yards of the opposite shore, the aircraft, after turning to the left, went a hundred yards or so up the river, descending slowly.
- (5) The aircraft rose momentarily when over the middle of the river.
- (6) When the aircraft alighted on the water the engine was running, and the propeller broke on touching the water.
- (7) After alighting, the aircraft sank gradually, not being designed to float. It took about two minutes to disappear.
- (8) The quick release belts supplied by the firm were used by both men.
- (9) One man sank with the aircraft and the other sank close to it.
- (10) Up to February 4th, 1913, neither the men nor the aircraft have been located.

Opinion.—The Committee is of opinion that the accident was primarily due to a flight at a low altitude over the river being attempted when the engine was not working properly. Whilst crossing the river, and on turning, the pilot was unable to prevent the aircraft from descending gradually on to the water.

Recommendation.—The risk that is run by a pilot in persevering in a flight with a faulty engine has already been drawn attention to in the Committee's report on the fatal accident to Lieut. Parke, R.N., at Wembley, on December 15th, 1912, and this further accident adds additional emphasis to the danger. This flight, in that it was effected over water at a low altitude, demanded additional precaution.

When flights over water are habitually attempted, precautionary measures should always be taken, either the aircraft itself should be capable of floating for a reasonable time, or, alternatively, the men should wear, or have available, some appliance for keeping them afloat until rescued.

F.A.I. Paris Conference.—Mr. Griffith Brewer briefly reported to the Committee the decisions arrived at by the Extraordinary Conference of the Fédération held in Paris on January 28th and 29th, which will be found under a separate heading. A unanimous vote of thanks was passed to the delegates who attended the Conference on behalf of the Club.

Fédération Aéronautique Internationale.

An extraordinary conference of the Fédération was held in Paris on January 28th and 29th, 1913. Delegates from all countries affiliated to the Fédération were present, the Royal Aero Club being represented by Mr. Griffith Brewer and Mr. H. E. Perrin.

Gordon-Bennett Aviation Cup.—It was decided that the race for this year, which takes place in France, should be for a distance of 200 kilometres over a course of not less than 5 kilometres. The Aero Club of France, who will organise the race, informed the Fédération that it hoped to arrange a course of at least 10 kilometres.

Hydro-Aeroplane Certificates.—The Fédération decided that the ordinary Aviators' Certificates should be valid for flights over both land and water.

It was further decided that certificates should be granted in respect of tests made over the water, but that such certificates should not be valid for flights over land. It will therefore be seen that it is not necessary for the holders of the F.A.I. aviator's certificate to obtain a special water certificate.

In the case, however, of aviators who have passed the water tests only, their certificates will be endorsed accordingly, and do not imply qualification for land flights. The holder of a certificate so endorsed can have it converted into a full F.A.I. Aviator's Certificate, on carrying out the landing tests at present in force.

The full regulations dealing with the tests to be carried out over water will be issued in due course.

House Committee.

A meeting of the House Committee was held on Friday, January 31st, 1913, when there were present: Mr. C. F. Pollock, in the chair, Mr. Ernest C. Bucknall, Mr. C. G. Grunhold, Mr. E. V. Sassoon, and the Secretary.

Annual Dinner.—The arrangements for the Annual Dinner were approved.

Competitions Committee.

A meeting of the Competitions Committee was held on Monday, the 3rd inst., when there were present: Major F. Lindsay Lloyd, in the chair, Mr. Ernest C. Bucknall, Mr. G. B. Cockburn, Mr. F. K. McClean, Mr. E. V. Sassoon, and the Secretary.

British Empire Michelin Cup No. 1.—It was decided that a Sub-Committee should interview Mr. M. J. Wolf of the Michelin Tyre Co., and discuss the conditions for this year's competition.

Mr. A. Mortimer Singer's Prize.—The conditions for the prize were drawn up and ordered to be submitted to Mr. A. Mortimer Singer for his approval.

Gordon-Bennett Balloon Race.

The Royal Aero Club has sent in to the Aero Club of France

THE ROYAL FLYING CORPS.

The following appointment was announced by the Admiralty on the 31st ult.:

Gunner F. Everett (T.), to "Actæon," additional, for service with Airship Section of Royal Flying Corps, to date January 30th.

Questions in Parliament.

ON Monday in the House of Commons:

Mr. Fred Hall asked the First Lord of the Admiralty if it was proposed to equip all battleships and cruisers with "waterplanes," and if so, by what date the necessary machines would be provided.

Mr. Churchill: I am not aware of any such proposals.

Portsmouth to Eastchurch on Naval Biplane.

LIEUT. WILDMAN LUSHINGTON, of the Naval Wing of the Royal Flying Corps, returned to Eastchurch from Portsmouth last week-end. Leaving Portsmouth on the 30th, he ran into a thick fog near Newhaven and landed near Rotherfield Hall, where he stayed overnight, at the invitation of Sir Lindsay Lindsay-Hogg.

two entries for the Gordon-Bennett Balloon Race, which takes place in France on Sunday, October 12th, 1913. The representatives of the Royal Aero Club will be Mr. John D. Dunville and Mr. Jean de Francia. Mr. Dunville will be accompanied by Mr. C. F. Pollock.

Gordon-Bennett Aviation Cup.

The cup having been won by a representative of the Aero Club de France, the race for 1913 will take place in France. The exact time and place will be announced later.

The race will be a speed contest for a distance of 200 kilometers over a course of not less than 5 kilometers.

Each club affiliated to the Fédération Aéronautique Internationale has the right to challenge the holder, the Aero Club de France, and such challenge must be sent in before March 1st, 1913.

The Committee of the Royal Aero Club will select the three competitors to represent the British Empire, and intending candidates are requested to notify the Secretary on or before February 25th, 1913, of their willingness to compete, if chosen. Applications must be accompanied by a cheque for £20, the entry fee, which amount will be returned should the entrant not be selected.

166, Piccadilly.

HAROLD E. PERRIN, Secretary.

The forty miles to Eastchurch were covered by the Maurice Farman biplane in half an hour on the following morning.

A Flying Corps for India.

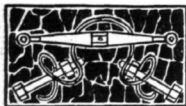
ACCORDING to the Allahabad *Pioneer* the next Indian Army Estimates will include provision for the organisation of a flying corps in connection with the Indian Army.

Accident Investigation in U.S.A.

THE Aero Club of America has appointed a Committee on public safety and accidents, modelled on similar lines to the Committee of the Royal Aero Club which has done such good work in investigating accidents in Great Britain. Col. Robert M. Thompson is chairman of the new Committee, which numbers among its 41 members, Capt. W. Irving Chambers, U.S.N., Capt. C. de F. Chandler, U.S.A., Dr. A. F. Zahm, Orville Wright, J. A. D. McCurdy, Glenn H. Curtiss, W. Starling Burgess, General James Allen, U.S.A., Claude Grahame-White, Col. Cornelius Vanderbilt and Alfred J. Moisant.



A BLÉRIOT FOR THE BRITISH GOVERNMENT.—Some of those who took part in the presentation to Col. Seely, at the War Office last week, of the Blériot monoplane which was last year flown round the country by Mr. Slack on behalf of the International Correspondence School, the machine having been subscribed for by the students of the I.C.S. Our photograph shows the deputation leaving the War Office. Lord Desborough, who was at the head of the deputation, is standing on the left (l), and to the right is Sir J. Ward, President of the I.C.S. in New Zealand.



WHAT THERE WILL BE TO SEE AT &

In many ways the Fourth International Aero Show, which will open at Olympia on Friday next week, will constitute a notable landmark in the history of British aviation. Naturally, the keynote of the exhibition will be Progress, and progress of a very marked degree. Much has been achieved during the past twelve months, as the records which have appeared from time to time in the pages of *FLIGHT* bear eloquent witness, but the comparative interest will undoubtedly be even greater than would appear to the casual thinker, inasmuch as it is not the result of a year's work which will be manifested in design, but of two years—the interval which has elapsed since last an Aero Show was held at Olympia.

Another point of interest will lie in the fact that, whereas at former Shows the dirigible almost dominated the exhibition—in point of numbers the aeroplane was first, of course, but four or five dirigibles naturally bulk larger in the eye of the spectator than twenty aeroplanes—on this occasion the heavier-than-air craft have it all their own way, for, save the Army dirigible Delta, there is not a gas-lifted craft in the building. This is a significant sign of the times, and one which we confess we do not view with a great deal of satisfaction, particularly in view of the enormous progress that is being made in dirigible design in Germany and France. However, the purpose of a Show report is to deal with things as they exist within the four walls of the exhibition building.

The most gratifying feature of the Show is beyond question the manifestation of official interest in aviation afforded by the exhibit of the Royal Flying Corps. For our fighting services to actively interest themselves in a trade exhibition is unprecedented, so far as our recollection serves us, and must be regarded as the happiest of auguries for the future relations between the State and the industry. We trust we are not guilty of too much optimism in expressing this feeling, but whatever the ultimate result may prove to be we do think that the thought which prompted the official exhibit was an entirely happy one. In thus supporting the Show, our own War Office has followed the lead of France, whose War Department not only provided much of the interest which centred about the recent Aero Show in Paris, but proclaimed its interest from the house-tops—or, to be literal, from every second lamp-post in Paris. However, it matters little how the precedent came to be created. It has been so created, and we are correspondingly thankful.

So far as the most noticeable trend of progress is concerned, this, as our readers will gather from the very full descriptions we shall give of the exhibits, will be found in connection with the hydro-aeroplane—a clumsy nomenclature, but the best we have at the moment. Whereas this type of craft had scarcely been evolved at all at the time of the last Aero Show in London, there will be seen next week at least four of these interesting machines, and possibly more. It would be going too far to say that this type of machine will be the leading one of the future, but there is little doubt but that, so far as we as a sea-girt nation are concerned, it is a type to whose development a great deal of attention must and will be paid. At the moment it is the subject of careful experiment at the hands of several of our own leading constructors, while it is by no means being neglected either in France or Germany.

Finally, in scientific model work there will be shown a great advance over the crudities of design which were the staple of this side of the aerial science two years ago, and for this we are inclined to take some amount of credit to ourselves. It is a branch in which we have the most profound belief as a stepping-stone to higher things, and one which we shall continue to encourage by all the means in our power.

THE MACHINES.

The War Office Exhibit.

On the space retained for the War Office will be staged two biplanes, a "BE 2" and "a Cody," while suspended from the roof of Olympia will be the Army dirigible "Delta." Of the "BE 2," it may be said that it is one of the two or three most successful machines constructed, which, after all, it is only natural to expect, since the Royal Aircraft Factory have facilities for



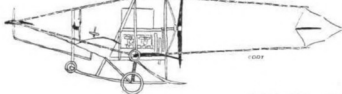
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The "BE 2" British Army biplane.

experimenting with devices to be embodied in standard machines such as perhaps no private firm of aeroplane builders possesses. A fair number of these machines are at present in use in the service of the country, and shortly they will be supplemented by many more of the same design that have been ordered from various British firms. The "BE 2," it may be recalled, holds the British height record, obtained when Mr. G. de Havilland, with Major Sykes as

passenger, ascended to 9,500 ft. over Salisbury Plain on August 12th last.

The Cody biplane shown will be the identical machine on which, fitted with a 120-h.p. Austro-Daimler motor, Mr. S. F. Cody won



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The 120-h.p. Cody biplane.

the British Military Aeroplane trials on Salisbury Plain in August, 1912. A machine of unusual interest, for it was with the self-same biplane that Mr. S. F. Cody won the two Michelin competitions of 1911, completed the *Daily Mail* circuit of Britain, did command flights before the King, and won the speed Michelin of 1912. Altogether, this historic biplane has covered more than 7,000 miles in the air.

The Royal Aero Club of the U.K.

The exhibit shown directly under the aegis of the Club will consist mainly of models, for the encouragement of which branch of the industry the Club has offered prizes. Since the models will

OLYMPIA



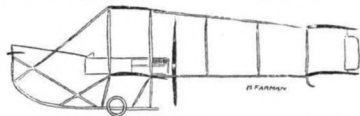
be of such varied types it would be impossible to give in the space at our disposal even a brief description of them in this advance report. They will form probably the finest collection of scientific models ever brought together in this or any other country, and they will be dealt with later by the Model Editor of FLIGHT.

The Aeronautical Society of Great Britain.

On their stand will be many exhibits of historical interest. There will be two gliders on exhibition, a Lilienthal glider which was purchased by the late Mr. P. S. Pilcher before it was eventually presented to the Aeronautical Society, and a Pilcher glider, this latter being the identical machine on which Pilcher was killed in 1899 when making an exhibition glide in a gusty wind at Stamford Park, the seat of Lord Braye. It is interesting to record that, like Lilienthal, he intended fitting his glider with an engine, and, had he not been killed, he would undoubtedly have made, after Ader, the first power-driven flight. Photographs will be exhibited illustrating the manipulation of the glider. Besides, there will be shown relics of Stringfellow's experimental aeroplanes, those with which he experimented during the period from 1842 to 1870. Further exhibits will be a stuffed condor, a mounted skeleton of the herring gull, different specimens of flying fish, and various prints and photographs relating to the pioneer work of aviation. On this stand, too, will be offered for sale the various publications of the Society.

The Aircraft Manufacturing Co., Ltd.,

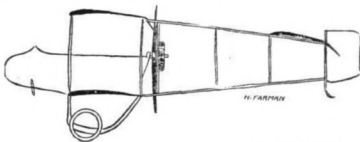
Constructors of British-built Henry and Maurice Farman biplanes, will be showing a machine of each type. Their British-built Maurice Farman biplane, equipped with the 70-h.p. Renault motor, flown so well by officers in the Royal Flying Corps, and by Verrier



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The 70-h.p. Maurice Farman biplane.

at Hendon, is too well known to need any description here. The Henry Farman biplane that will be shown, we are not so closely acquainted with. In its general lines it will greatly resemble the 80-h.p. H. Farman owned by the Grahame-White Aviation Co., and flown at Hendon by Louis Noel. Its chassis, however, will



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The 80-h.p. Henry Farman biplane.

be different, and its body will be of a more modern type. It will be fitted with an 80-h.p. Gnome motor.

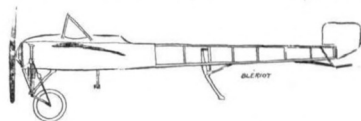
In addition, the Aircraft Co. will have on exhibition specimens of Fabre floats, for which they have lately acquired the British agency. These floats, we should mention, have been used with great success on many machines in France, such as the Astra, Voisin, R.E.P., Caudron, &c. A further interesting exhibit on the stand of the Aircraft Co. will be a motor-driven repair shop, similar in type to those owned by the French War Office. The repair shop is mounted on a Dennis chassis, and is so arranged that the sides of the body open outwards on to legs, thus giving an enlarged floor

space when at rest. Inside the repair shop will be found an electrically driven lathe, drill, &c.; benches fitted with vices, forge, and all hand tools necessary for the repairing of aeroplanes.

They will also be showing a selection of aero instruments, including the *référé* speed indicator, the Behrens revolution counter, and various types of chart cases and compasses.

Blériot.

This well-known firm will be represented at the Show by their latest model, a two-seater tandem monoplane, fitted with an 80-h.p. Gnome motor. As far as its general appearance is concerned, it will be almost identical with the 70-h.p. Blériot two-seaters that have



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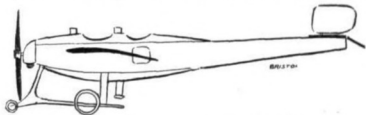
The 80-h.p. Blériot monoplane.

been flown with such success in England by Hamel and Hucks. However, being equipped with an engine of higher horse-power, there will necessarily be minor constructional modifications. This new two-seater, termed type XI 2, has proved a great success on the Continent, and the Blériot works have in hand, for various governments and private customers, orders for 30 of them. This monoplane is 27 ft. in length, and its wings span 31 ft. and have an area of 198 sq. ft. Its weight is approximately 800 lbs., and it has been flown to do 75 miles per hour.

In addition, several photographs will be shown on the stand illustrating the Blériot firm's latest types of machine. These will portray the new 80-h.p. armoured monoplane, with its cleverly constructed body of cork, paper, and fabric, the *canard*, on which Perron has been doing some most surprising stunt flying at Buc de late, a new hydro-monoplane, and the latest type Blériot side-by-side passenger carrier.

The British and Colonial Aeroplane Co., Ltd.

On the stand of the enterprising manufacturers of Bristol aeroplanes will be shown two machines, an 80-h.p. two-seater monoplane, fitted with a Gnome engine, and a 70-h.p. Renault-engine tractor biplane. The monoplane will be identical with the machine that

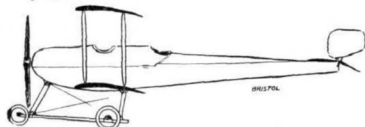


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The 80-h.p. Bristol monoplane.

flew so well in connection with the British Military Aeroplane Trials of 1912, and which was placed third in order of merit among the 32 entries that were received. Replicas of this monoplane have been bought extensively by foreign governments. The backbone of the monoplane, 28'5 ft. in length, is formed by a girder constructed of four longitudinal members of ash, braced by piano wire, with cross members and struts of spruce. For the reduction of head resistance, the whole is covered in by fabric, and the top and bottom are made convex. The 80-h.p. Gnome motor, supported by *carlingues* on both sides of the crank-case, is mounted in front and half enclosed by a semispherical cowl that prevents any of the oil thrown off by the motor reaching the pilot or passenger. Regarding the wings, which span 43 ft., their chief features are that they are each built about two spars of heavy gauge wood-filled steel tubing, and that the ribs, cut from wood and covered with

fabric to prevent them splitting, are fitted loosely over the spars in order to prevent any fatigue in the construction as a result of continual wing warping. The landing gear is of the wheel and skid type, and it has the peculiarity that the hollow vertical chassis struts are attached to the fuselage and to the skids by pin-joints, so that more flexibility may be given to its structure. A flap hinged to the rear of a semicircular fixed tail-plane controls the elevation. Without passengers or fuel, the monoplane weighs 1,050 lbs., and is capable of carrying a useful load of 726 lbs. at an average flying speed of 72 miles per hour. It is interesting to note that this 80-h.p. Bristol monoplane had the best gliding angle, 1 in 7.2, of all the machines entered for the British Military Aeroplane Trials.



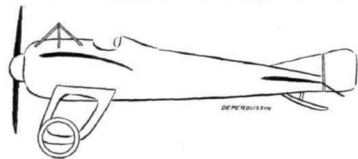
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The 70-h.p. Renault-Bristol biplane.

The 70-h.p. Renault-engine tractor biplane that the Bristol firm will be showing will be of a new type. Designed by the firm's well-known engineer, Mr. Henri Coanda, who also prepared the drawings of the monoplane we have just briefly described, this biplane will have many features in common with that machine. Thus, its fuselage will be practically identical with that of the monoplane, its landing gear will be of similar design, and the same method of wing construction will be noticeable in the assembly of its planes. The motor, mounted in front, will be almost entirely covered in by an aluminium shield, and will drive a two-bladed Bristol propeller 2.6 metres in diameter. The control will be the same as that employed on the monoplane, the elevator and wing warping being operated by a vertical wheel mounted on an inverted U-shaped bridge. The dimensions of this biplane will be: overall length, 27.5 ft.; span, 38 ft.; chord, 6 ft.; area, 440 sq. ft.; weight, light, 946 lbs.; total useful load, 880 lbs.; speed, 62.5 m.p.h.

The British Deperdussin Aeroplane Co., Ltd.,

Will be showing two monoplanes, a two-seater hydro-monoplane, fitted with one of the new 10-cyl. 100-h.p. Anzani motors and a 50-h.p. Gnome engine single-seater *monocoque*. The former of these two machines is British-built. It is at the present time nearing



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The 50-h.p. Deperdussin monocoque

completion under the supervision of Lieut. J. C. Porte and M. Krohloven, at the firm's excellently equipped works at Highgate, N. The machines chief peculiarity is that the wings are braced, not in the manner usually associated with monoplanes, but similarly to the Etrich monoplane that Lieut. Bier flew in connection with the *Daily*



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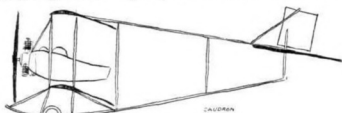
The 100-h.p. Anzani-Deperdussin hydro-monoplane.

Mail Round Britain prize. Each wing is built up of two sections, the entering section, perfectly rigid, braced with a steel tubular understructure, and the trailing section, extremely flexible, which is hinged to it, and which is alone used for warping. The body of the monoplane is of the *monocoque* type; really it should be termed a *bicoque* because the shell is made in two sections, an upper and a lower, which are afterwards joined together.

The 50-h.p. single-seater monoplane that will also be shown is a French-built *monocoque*, a great deal on the lines of the speed creation with which Vedrine carried off last year's Gordon-Bennett trophy. It will come to Olympia direct from Brussels where it has been on exhibition. Besides these two monoplanes, the British Deperdussin Co. will have miscellaneous specimens of their workmanship showing, such as an uncovered wing, and perhaps a landing chassis unit.

The W. H. Ewen Aviation Co., Ltd.

This well-known firm, with centres at Hendon, Lanark, and Glasgow, will be showing two machines on their stand No. 47, a monoplane and a biplane. Originally they had made arrangements to exhibit a 50-h.p. Gnome-engine single-seater monoplane, and a 35-h.p. Y-type Anzani biplane, both brand-new and of Caudron

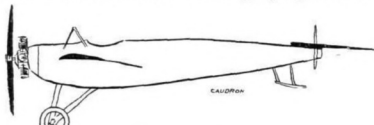


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The 35-h.p. Caudron biplane.

design and manufacture. However, such has been the demand, that they have sold both these machines, the monoplane to a well-known English customer, and the biplane to Mr. A. W. Jones, who has despatched it to Australia, where Mr. Jones holds the agency for Caudron machines. Thus the Ewen firm have had to fall back on machines that they had already in stock, and for that the exhibit will be none the less interesting. In place of the 50-h.p. Gnome-Caudron monoplane, they will show the 45-h.p. Anzani-engine single-seater, of which Mr. Ewen took delivery at Croydon and flew back to England in the early part of last year. On this same machine too, Mr. Guillaux flew in connection with the Aerial Derby last year. Although comparatively low-powered, such was the machine's speed that that excellent pilot would have probably won the race had he not, when quite near the finishing point, lost his way, and then run out of petrol. The monoplane is especially interesting for the fact that it is one of the smallest and speediest successful monoplanes built.

For the biplane, Mr. Ewen is making an attempt to get delivery from the French Caudron works of a new 35-h.p. biplane. If he



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The 45-h.p. Caudron monoplane.

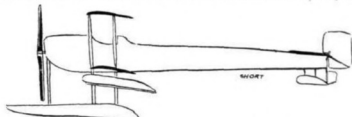
cannot get delivery in time, his firm will exhibit their *brevet* biplane, on which, at Hendon, something like 15 tickets have been taken inside seven months. Naturally it will not be a show-finished machine; it will be shown, taken direct from strenuous school work, in its natural oil and mud-bespattered condition.

In addition, the Ewen Co. will have on their stand samples of Kelvin compasses, which have a reputation for being the most deadbeat instruments of their kind ever constructed. They will also be showing a range of Gremont propellers and a type of petrol motor of quite revolutionary design.

Mr. Percy Grace.

On Mr. Grace's stand—Mr. Grace is, by the way, the agent for Messrs. Short Brothers, the well-known constructors of Enderbury, Isle of Sheppey—will be shown a Short tractor hydro-biplane fitted with an 80-h.p. Gnome engine. In general design the machine will be very similar to the Short S.41 type, which, as readers will remember,

made its first flight under the pilotship of Commander Samson, at Weymouth, in May, 1912. In span the machine will measure 48 ft., and it will be 24 ft. 6 in. long. The chord and the gap between the main planes are both 5 ft. Its weight is approximately 1,200 lbs. On the water, it rests upon three floats, two main ones of catamaran type arranged below the *cellule*, and a smaller float which supports the tail. In addition, a small float is fitted to each tip of

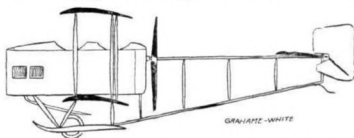


The 80-h.p. Short hydro-biplane.

the lower plane. As for its seating accommodation, provision has been made, in this machine, for two passengers to occupy the front seats, placed side by side, while the pilot sits behind them. The 80-h.p. Gnome motor is so fitted that it may be started by one of the passengers without leaving the machine. At the time of writing the machine is not yet fully erected, but it will doubtless be complete in every respect by the time Olympia throws open its doors to the public.

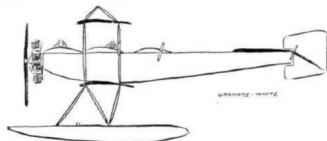
The Grahame-White Aviation Co., Ltd.

This progressive firm, the proprietors of the popular London Aerodrome at Hendon, will be showing two biplanes, one a land machine and the other designed for water flying. The first of these machines is equipped with a 90-h.p. Austro-Daimler motor which



The 90-h.p. Grahame-White military biplane.

drives through a steel shaft and chains, a large diameter propeller arranged to the rear of the main planes so that the machine may be used for offensive tactics in war. The motor is mounted at the front of a stream-line *nacelle*. The pilot, sitting behind it, is in a position that makes for maximum safety, should the machine for any reason suffer an unusually heavy landing. The main planes are of the extension type, the top plane being considerably longer in span than the lower. For the landing gear, it is exceptionally strong, and has the original feature that each of its two running

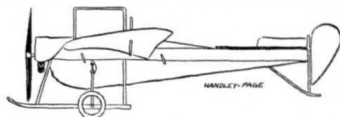


The 60-h.p. Anzani-Grahame-White hydro-biplane.

wheels is flexibly mounted in a slot cut in each of the two unusually wide built-up skids. The tail is supported by an open triangular construction, the top member of which passes through the propeller boss. The second machine that the Grahame-White Co. will be showing will be a two-seater tractor hydro-biplane, driven by a 60-h.p. Anzani air-cooled motor. Its body will be somewhat reminiscent of Nieuport design, and it will be fitted with a pair of main floats of the long catamaran type. In addition, there will be exhibited on the stand various specimens of workmanship, such as a set of propellers, showing them in different stages of manufacture.

Messrs. Handley Page.

They will be showing their 50-h.p. Gnome-engined two-seater monoplane, which is a well-known machine at Hendon and Brooklands. It will be the identical machine that the late Mr. Edward Petre flew from Fairlop, through London, over the river Thames, to Richmond, and then on to Brooklands. The machine is distinctive by virtue of its gull-shaped wings which have negative incidence tips. Since it was constructed this monoplane has flown upwards of 2,000 miles and has carried scores of passengers. An interesting appliance

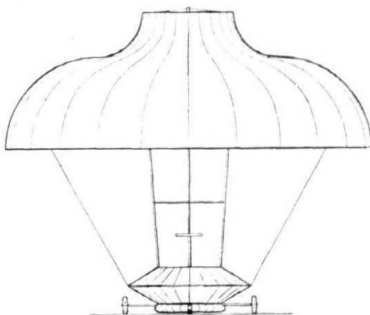


The 50-h.p. Handley Page monoplane.

with which it is fitted is a Stolz Electrophone by which the pilot and passenger are able to carry on a conversation quite easily, undisturbed by the noise of the engine exhaust. Reports have been current that Messrs. Handley Page would be exhibiting a biplane. The hydro-biplane to which these reports referred, however, is not yet in a sufficiently advanced stage of construction, and wisely enough, this firm of constructors have decided to show a well-tried machine rather than one which would have to be unduly hurried through the works. Their hydro-biplane, by the way, when it appears will be of the tractor type. Its planes will be of similar design to the wings of their monoplanes, and it will be driven by a 100-h.p. Green motor.

Mr. J. R. Porter, A.M.I.C.E.

A helicopter will be shown on this stand, a general idea of which can be gathered from the sketch we publish. The machine will consist of two parachute surfaces, one above the other, with a centrifugal propeller, driven by a 50-h.p. Gnome motor, mounted between them. The engine will be provided with gearing, so that



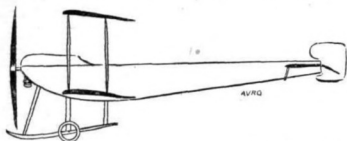
The Porter 50-h.p. Helicopter.

the propeller may be reversed. Means will be provided to produce a forward motion by the use of flaps, which, the inventor states, control the air travelling between the two surfaces. The diameter of the outer parachute will be 14 ft., and the machine will stand about 11 ft. high. Accommodation is provided for the pilot in a small boat or coracle swung some distance below the parachute surfaces.

Messrs. A. V. Roe and Co., Ltd.,

Will be exhibiting on their stand one of the 50-h.p. Gnome-engined passenger-carrying biplanes that have given the War Office such satisfaction. It is interesting to recall, too, that a similar machine was recently supplied to the Portuguese Republic. Light, but strongly-constructed, fast, able to carry weight well, the 50-h.p.

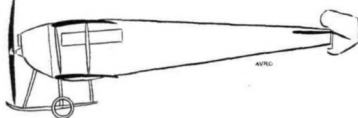
Avro biplane has proved itself one of the most successful machines of the day. And it reflects great credit on its designer, Mr. A. V.



"Flight" Copyright.

The 50-h.p. Gnome-Avro biplane.

Roe who, having tasted the bitter sweetness of the pioneer, has gone doggedly ahead to such success. Mr. Roe has the distinction



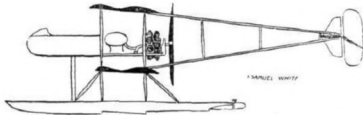
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The Avro all-enclosed biplane.

of being the only constructor, we believe, in the world who has designed and constructed successful monoplanes, biplanes, and triplanes.

Messrs. J. Samuel White and Co., Ltd.

On the stand of this famous firm of Government contractors and shipbuilders, who have lately opened an aviation department under the control of Mr. Howard T. Wright, will be shown a two-seater hydro-biplane driven by a 160-h.p. Gnome motor. From our silhouette it will be seen that this interesting machine is devised somewhat on Farman lines. Unlike that machine, however, its main planes are of a special design, patented by Mr. Howard Wright, and are arranged at a slight dihedral angle. The planes are retarded and have negative tips, while double-acting ailerons are employed to



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The 160-h.p. Samuel White hydro-biplane.

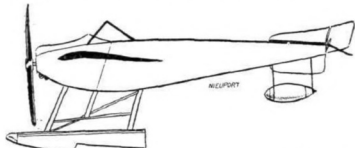
correct lateral roll. The main feature of the special type of aerofoil that is used on this machine is that it gives a wide speed range, and that its centre of pressure does not vary more than two per cent. for angles of incidence between such a wide range as 3° and 15° . The machine is supported on two floats, built in accordance with Messrs. J. S. White & Co.'s patents covering their construction and design. Each has three steps, and each is provided with a rudder at the rear extremity, so that the machine may be easily guided over the surface of the water. The weight of the machine fully loaded is 2,000 lbs., and it has a supporting area of 500 sq. ft. It has been designed to have a speed range of from 34 to 70 miles an hour. A non-lifting tail is used, supported by triangular outriggers.

Société Anonyme des Etablissements Nieuport.

The well-known French Nieuport firm, who are represented in this country by M. Marc Bonnier, will be exhibiting a 100-h.p. Gnome-engined hydro-monomplane—the identical "Hydravion" that was to be seen on the Nieuport stand at the last Paris Aero Show. Since that function, by the way, this same machine has been on show at the Brussels Exhibition, and it will be coming direct from that show to Olympia. Four similar machines have been acquired by the French Navy, and within the last fortnight three

identical models have been supplied to the Japanese Navy. These latter machines were, it may be interesting to remark, tested on behalf of the Japanese Government by M. Bonnier.

In its design there is no great difference from the Nieuport monoplanes for overland work with which we are familiar in this country, excepting, of course, that the "Hydravion" is fitted with floats in place of its usual wheelbase. These floats—there are two



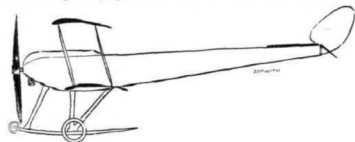
"Flight" Copyright.

The 100-h.p. Nieuport hydro-monomplane.

main catamaran floats and an egg-shaped small float for the tail—are constructed to the designs of Lieut. Delage of the French Navy, and are peculiar in that each main float is fitted in front with miniature wings that prevent the nose of the float burying itself in the water and which assist in keeping spray clear of the propeller. The 100-h.p. Nieuport hydro-monomplane seats three—the pilot in front and his two passengers side by side behind. A self-starting device is fitted.

The Sopwith Aviation Co.

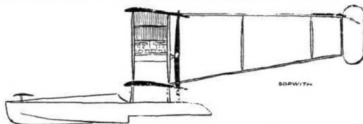
Here, on Stand No. 22, will be shown two biplanes, one a water flyer and the other a land machine. Let us take the hydro-biplane first. It is, at the moment, receiving its finishing touches at the firm's works at Kingston, and, as soon as the show is over, Mr. T. O. M. Sopwith proposes to take it out to Monaco to compete in the



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The 80-h.p. Sopwith tractor biplane.

hydro-aeroplane meet there in April. It is driven by a 90-h.p. Austro-Daimler mounted on exceedingly strong ash and hickory supports, midway between the main planes. The main planes are arranged at a slight dihedral angle to one another. The machine's alighting gear consists of a double-skinned hydroplane hull built by Messrs. Saunders, the well-known yacht builders of Cowes. Tremendously



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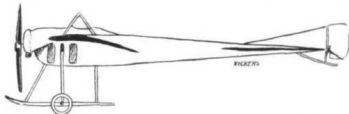
The 90-h.p. Austro-Daimler-Sopwith hydro-biplane.

strong, the hull only weighs 180 lbs., and it is wide enough ample to seat pilot and passenger side by side. The tail is supported by tapering Farman-type outriggers, and an auxiliary elevator is arranged in front, over the bow of the hydroplane hull.

The Sopwith Co.'s second machine will be the tractor biplane, similar to the one they have supplied to the Admiralty, fitted with an 80-h.p. Gnome. It is a three-seater, two observers being accommodated side by side, well forward on the body, where they have a good view. The pilot sits behind them. Control in the case of both machines is operated by a warp wheel, mounted on a vertical elevator column. Steering is done by a foot-bar.

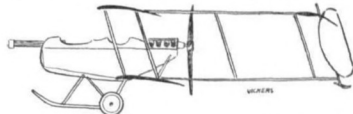
Vickers, Ltd.

Two machines, of excellent design and construction, will represent Messrs. Vickers, Ltd., at the Olympia Show. One will be a military biplane, driven by one of the new Wolsley 60-h.p. semi-air-cooled semi-water-cooled motors. Their other machine will be a monoplane similar in almost every respect to the one which flew in connection with the Military Trials at Salisbury Plain. Unlike that machine, however, it will be driven by a 70-h.p. Gnome motor. From the side elevation sketch we print can be gathered an idea of the arrangement of the new Vickers biplane. It may be considered as an all-steel machine, for wood only enters into its construction.



"Flight" Copyright.

The 70-h.p. Gnome-Vickers monoplane.



"Flight" Copyright.

The 60-80-h.p. Wolsley-engined Vickers biplane.

tion for the manufacture of ribs and skids, and for the "stream-lining" of steel tubular struts. The planes, which are staggered, are each built about two wood-filled tubular steel spars, over which the ribs are loosely threaded in such a way that it is impossible for the plane skeleton to become fatigued through continual warping. For this reason also the rear spars in the sections of the planes which warp are hinged to the spars of the rigid central section. The upper and lower planes span 40 and 30 ft. respectively. They are separated by steel struts, which are assembled to the planes by means of a special design of socket, by which the planes can be dismantled in a very short space of time. The body of the machine is of steel construction, covered by a "stream-lining" of Duralumin. Projecting in front of the machine, as it does, it affords the observer, who occupies the front seat, an uninterrupted view. More important than that, this design makes it possible for the biplane to be used as a machine for offence purposes. On the

too, the Vickers biplane may easily be steered at slow speeds over the ground. A Vickers-Levasseur propeller will be used.

As for the monoplane they will be showing, we have already mentioned that it will be almost identical to the one that figured in the Military Trials at Salisbury, excepting that the Show machine will be fitted with a 70 h.p. Gnome motor. With an engine of this power and type, the monoplane has been timed to do 63 miles an hour, and to lift a useful load, consisting of passenger, pilot, and fuel sufficient for a 3½ hours' flight, at the rate of 250 lb. per minute. Pilot and passenger will be seated side by side, and they will be provided with duplicate controls. Although it is a moderately fast machine, it can be flown in perfect comfort without the necessity of the occupant wearing goggles. This is obtained by the fitting of transparent wind screens in front of pilot and passenger. A similar machine to this one, but fitted with an 80-h.p. Gnome motor, has attained over 70 miles per hour.

FLIGHT ENGINES AT OLYMPIA.

The Aircraft Manufacturing Co., Ltd.

On their stand in the Motor Section will be shown two Gnome motors, an 80-h.p. 7-cylinder and a 100-h.p. 14-cylinder model. Perhaps we could not pay a higher compliment to this make of engine when we say they are so well known as to need no further description.

The Austro-Daimler Motor Co.

The motors shown by this firm will be of special interest, for it must be remembered that it was with the assistance of their 120-h.p. 6-cylinder model that Mr. S. F. Cody carried off the first prize of £5,000 with his biplane at the recent British Military Aeroplane Trials. The firm have, by the way, supplied motors to the War Office and the Admiralty and, besides, to private customers including Messrs. Grahame-White and Sopwith. Three models will be shown by the firm, a new 65-h.p. motor and their familiar 90-h.p. and 120-h.p. engines. The 65-h.p. is a four-cylinder engine and the others shown will be six-cylindered. All three are fitted with double independent ignitions and may, in consequence, be started from the pilot's seat. The arrangement of the new 65-h.p. engine, is slightly different from the other models, for the lubricator, magneto, water pump, and revolution counter are disposed at the end of the motor opposite to the propeller boss taper, in which position, whether the motor is used for either a tractor or an engine-behind machine, these fittings will always be readily accessible. These motors are listed at £495, £625, and £850 respectively. The firm also list a 40-h.p. four-cylinder model which they will, however, not be showing, priced at £315.

British N.A.G. Motor Co., Ltd.

Two motors will be shown on this stand, their model F2, rated at 50-h.p. and their model F4 rated at 150-h.p.

Although the N.A.G. firm market four types of motors for aeronautical purposes, these aviation motors of 50, 100, and 150-h.p. respectively, and one intended for dirigible balloon work, rated at 110-h.p. The F2 50-h.p. model that will be shown is a four-cylinder motor, its cylinders being mounted on an aluminium crank-case. The cylinders are turned inside and outside so that they may suffer no perfectly even in their thickness, and that they may suffer no distortion. Five bearings support the crank-shaft. Forced

lubrication is employed. All valves are mechanically operated, and H.T. magneto ignition is fitted. This model can develop 55-h.p. at 1,600 r.p.m. The F4 model is a six-cylinder motor having similar characteristics to the F2. Its maximum output is 150-h.p., this being developed at 1,250 r.p.m.

As an indication of the popularity of the N.A.G. aviation motor on the Continent, it may be interesting to remark that the makers claim that no fewer than a hundred engines of their manufacture are in constant use on aeroplanes, especially those used in military service.

The Brompton Motor Co., Ltd.

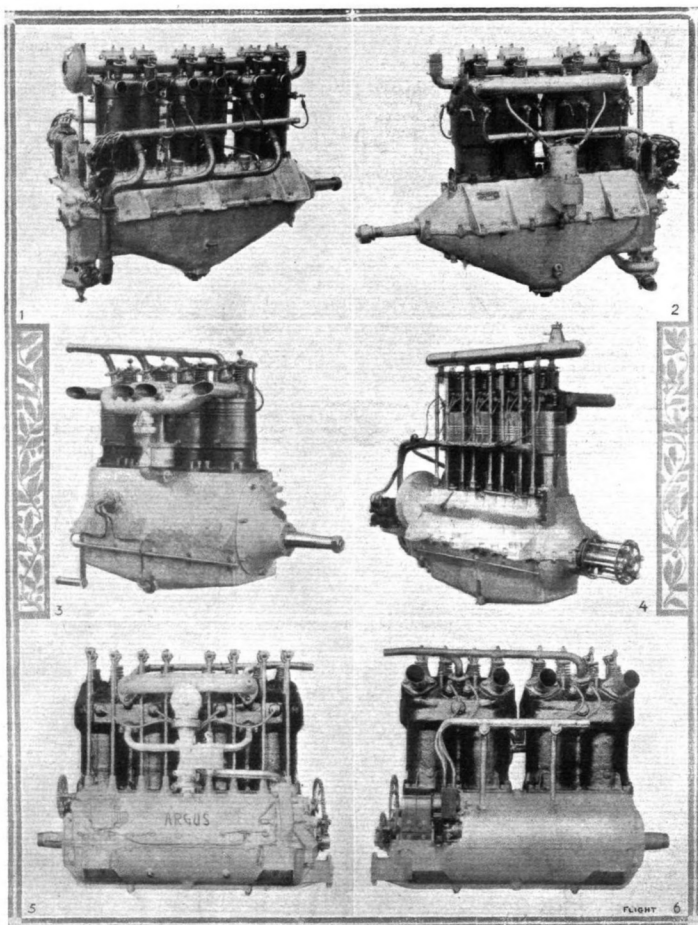
Here will be shown the 100-h.p. Benz aero engine, made at the Benz works in Mannheim, which recently gained the Kaiser Prize for aeroplane engines. It is a 4-cylinder water-cooled, developing its rated power at from 1,250 to 1,300 revolutions per minute. In the build of this engine reliability and low petrol consumption have received special attention from the designers. Thus, when we see the engine at Olympia we shall find that two magnetos are fitted, driven by separate gears, both firing two distinct sparking-plugs in each cylinder at the same time. The oil-circulating pump and the fresh oil pump will be found to be driven from two different directions. Its cylinders are turned from a special grey casting, as the Benz people find that cast iron is a rather more advantageous metal to use than steel. The water jackets are of steel, and are welded to the cylinders by the Autogenous process.

Probably the motor's low petrol consumption is partly accounted for by the fact that this carburettor is embodied in the crank-case where it is warmed, a physical condition which leads to more perfect atomization of the petrol.

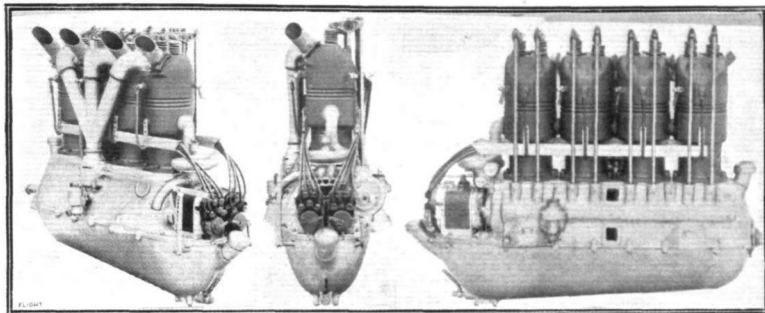
In the tests for the Kaiser prize, the petrol consumption of this motor was found to be less than 210 gr. per h.p. hour. The water circulation is carried out by a centrifugal pump of ample dimensions, and such is the statical and dynamical equalisation of all moving parts, that the motor exhibits remarkably little vibration, even when run at top speed.

General Aviation Contractors, Ltd.

In all probability eight different motors will be shown on the stand (No. 41). Five of them will be air-cooled Anzani motors, and the remaining three will be of Laviator manufacture, built on the



OTHER COMPETITORS IN THE GERMAN AERIAL MOTOR COMPETITION.—1. The 75-85-h.p. Mercedes motor which won the Imperial Chancellor's prize of £1,500, and was placed second. 2. The 85-95-h.p. Mercedes. 3. The 60-h.p. N.A.G. 4. The 95-h.p. N.A.G. which won the War Minister's prize of £1,250 and was placed third. 5 and 6. The 100-h.p. Argus which won the Minister of the Interior's prize of £500 and was placed fifth.—*Allgemeine Automobil-Zeitung.*



Three views of the 100-h.p. Benz motor which won the Kaiserpreis of £2,500.—*Allgemeine Automobil-Zeitung.*

Danette-Gillet system. Since Blériot made his historic cross-country flight with an Anzani motor, engines of this make have had an extensive sale. At first they were chiefly employed for school work, as the motors Anzani made in those days were of relatively low horse-power. For over two years now, however, the Anzani works have been turning out, as well, air-cooled motors of much higher power, which have proved themselves eminently reliable for cross-country work. Perhaps their most popular model is the 35-h.p. V-type, which will be on exhibition at Olympia. In addition, the General Aviation Contractors intend to exhibit the 40-45-h.p. six-cylinder, the 50-60-h.p. six-cylinder, the 80-h.p. ten-cylinder, and the 100-110-h.p. ten-cylinder models of Anzani motors. Of the water-cooled Laviator motors, they will probably be showing the 80-h.p., the 120-h.p., and the 200-h.p. models, all eight-cylinder "V" type motors.

The Green Engine Co., Ltd.

Here, on Stand 31, various types of the celebrated Green engine will be shown. They will have the 100-h.p. 6-cyl. Green engine, the identical engine which drove the Cody biplane to victory in the cross-country Michelin competition of 1912. Two other motors of the same type, but quite new from the works, will be exhibited. Both these motors have already been sold. One has been constructed to the order of the British Admiralty, and the other will go to a private customer, who intends to install it in a hydro-aeroplane. Of the 65-h.p. 4-cyl. model, two will be shown. One of these will be the actual engine that took Cody through the *Daily Mail* Circuit of Britain, a distance of 1,010 miles, and that helped him win both the Michelin competitions, for Cross-country and Duration in 1911. Altogether that engine has flown upwards of 7,000 miles. The other 65-h.p. motor that will be shown will be the one that won the Patrick Alexander competition by a non-stop run of 26 hrs. 7 mins. It is interesting to record that during this run the motor, rated at 65-h.p., developed 62.5-h.p. for 26 hours continuously, and was then speeded up, giving 68-h.p. for the last seven minutes of the run. During the whole performance it made two million revolutions without a single misfire. A 4-cylinder 35-h.p. motor will also be on view, which will be the engine that was the only one to complete the Patrick Alexander test in the year 1910. It ran, untouched, for 24 hours, except for a stop of eight minutes, during the first hour of running, when a faulty plug had to be replaced. In addition to these exhibits various spare parts of different models of Green engines will be shown.

The Hart Engine Co.

We have received from the Hart Engine Co., in confidence, particulars of the 120-h.p. aviation motor that they will be exhibiting at Olympia. These details, however, we are not yet able to publish owing to the fact that the patents covering the special design of the motor are not yet completed.

Milnes, Daimler, Mercedes, Ltd.

On their stand at Olympia will be exhibited three aeroplane motors, one a 70-h.p., one a 90-h.p. and the other a 100-h.p. The particulars of the 70-h.p. motor are, four cylinders, 120 mm. by 140 mm. bore and stroke, giving 70-h.p. at 1,400 revs., petrol consumption '975 gallons per h.p. Weight of motor including magneto, water pump,

oil pump, all piping and connections, but without radiator or auxiliary oil tank, 348 lbs. The price of the motor is £385.

Their 90-h.p. aeroplane motor will be a similar four-cylindered engine, the cylinder dimensions of which are 140 mm. bore by 150 mm. stroke. Including all necessary fittings, but without radiator, the motor weighs 400 lbs. £510 is the listed price of this model.

For the 100-h.p. motor that Messrs. Milnes, Daimler, Mercedes, Ltd., will be showing, its main characteristics are, six cylinders, of the same bore and stroke as the 70-h.p. model, giving 105-h.p. at 1,350 revs., with a like petrol consumption. Its weight, with similar fittings to the 70-h.p. model, is 440 lbs. It is listed at £585.

This firm are, by the way, listing in addition to these motors an 80-h.p. six-cylinder model weighing 312 lbs., priced at £485.

Renault, Ltd.

Here will be shown three models of the well-known Renault aviation air-cooled motors, a 40-h.p., a 70-h.p., similar to those used with success by the British Government, and one of the new 90-100-h.p., 12-cylinder models.

The Wolsley Tool and Motor Car Co., Ltd.

On Stand No. 39 this firm will be showing three aero engines. The largest of these is an 80-h.p. eight-cylinder vee-type engine of 120-h.p., similar to the engines recently supplied by this company to the Italian Government for use in dirigibles. The cylinders, which are of the separate type, are 5 ins. bore by 7 ins. stroke, and are mounted on an aluminium crank-case at an angle of 90°. The engine is water-cooled, the jackets being of spun aluminium. Induction and exhaust valves are both mechanically operated, and the cam-shaft is driven by gearing from the crank-shaft. The carburettor is of the float-feed and spray type, pressure fed; and lubrication is of the forced type.

Another notable engine will be the 60-h.p. which is very similar to the light hydroplane engine with which this firm have been so successful. It has eight cylinders, 3½ ins. bore by 5½ ins. stroke, water-cooled by a gear-driven positive-pump. All the valves are underneath and on the inside, and are operated by plungers from a central cam-shaft driven by steel gears of the crank-shaft. The cylinders are cast in pairs, and the water-jackets are of aluminium. The weight of this engine, with magneto, water and oil pumps, exhaust pipes, &c., is approximately 350 lbs.

The most striking novelty on the Wolsley stand, however, will be a 60-80-h.p. aero motor of an entirely new design. This engine which exhibits a combination of air-cooling and water-cooling, has already given very good results on the test bench. It has eight cylinders, arranged vee-type, with all valves arranged on the head, and mechanically operated. The cylinder-heads, water-cooled valve-boxes, and pistons are all of forged steel, giving an exceedingly light and strong construction. The radiator, which, owing to the air-cooled cylinders, is exceedingly small, is circular in shape, and surrounds the nose which carries the propeller, thus taking advantage of the draught from the propeller, without increasing the head resistance of the power unit.

This engine will doubtless be one of the centres of attraction at Olympia, as the Wolsley firm have a reputation for never producing a new article until it has passed and been proved by most exhaustive tests.

FLIGHT ACCESSORIES AT OLYMPIA.

Aeros, Ltd., of 39, St. James's Street, London, S.W., will show an extensive stock of aviation accessories, such as eyebolts, strainers, control cables, all kinds of hangar requisites, fabrics, ropes, and lebrants. They will also display the various instruments that form an important part of an aviator's equipment, such as compasses, barographs, inclinographs, and speed indicators. Clothing is another speciality, and includes, amongst many items, the well-known Warren helmets, safety belts and jackets, goggles, and soft leather boots.

Bowden Wire, Ltd., of 37-41, Pratt Street, Camden Town, London, N.W., will have on exhibition numerous examples showing how their well-known system of control can be applied to aeronautical work, as well as a selection of fittings such as petrol strainers, throttles, and air-valves. The Bowden wire control is almost indispensable in aeroplane construction. It is positive in action, never goes wrong, and is quite easily fitted.

The British Petroleum Co., Ltd., of 22, Fenchurch Street, London, E.C., will have a display of packages used in the distribution of Shell motor spirit. Shell, as most of our readers must have noticed, is almost universally used by aviators, and has made a name for itself in aviation as it has in motoring.

Burroughs Wellcome and Co., Snow Hill Buildings, London, E.C., of "Tabloid" fame, will make a special display of their first-aid equipments. One of these is of very compact form, being about the size of an ordinary cigarette case, yet containing sufficient dressings, plasters, &c., for alleviating slight injuries. Larger outfits, suitable for use on aerodromes, and carrying on aircraft will also be shown.

The Cellon Co., of 49, Queen Victoria Street, London, E.C., will be exhibiting their Cellon specialities, consisting of various kinds of Cellon dope for aeroplane wings, and also their non-inflammable, transparent sheets of Cellon. This is made in various styles to suit requirements, such as wind-screens, windows for enclosed types of machines, &c., and it is also made to represent tortoise-shell, in which style will be shown numerous novelties.

W. F. Dennis and Co., of 49, Queen Victoria Street, London, E.C., will exhibit a full range of wire cables and springs. The former will include a large selection of the "Neptune" brand of steel flexible strands and ropes for aviation, manufactured by Messrs. Felton and Guillaume Carlswark, A. G., Mülheim-on-Rhine. These strands are composed of special galvanised piano wire, having a breaking strain of 140 to 145 tons per sq. in.

Dover, Ltd., of Northampton, will have an interesting show of aero-fittings, comprising:—The Dover Patent Exonite steering wheels, with registered ribbed grip, made specially for aeroplanes; Exonite lever handles, &c.; Non-flam transparent Exonite sheets and wind screens; Exonite dopes, lacquers and varnishes for aeroplanes; Exonite covered stranded wires, and Exonite tubes and rods.

Alfred Dunhill, Ltd., of 359-361, Euston Road, London, N.W., will show a large selection of clothing and other accessories for aviation. These will consist of a full range of instruments such as compasses—including the Alexander Gross "Anti-drift" compass—barographs, &c. Maps, various types of helmets, and a pneumatic helmet of their own design will also form a part of the exhibit.

The Garuda Propeller Co., of Berlin, will exhibit on their Stand (No. 6), a selection of Garuda aviation propellers. This firm claims for their propellers that they are of perfect shape, that the flexibility of their blade construction relieves the propeller from strain and allows it to adapt itself to changes in the speed of a machine without giving rise to vibration, that, whatever the type of machine or power of engine they are intended to be used with, they would always give the greatest efficiency. Garuda propellers are used on the military aeroplanes of various European countries, and they seem to have given every satisfaction.

The General Aviation and Contractors, Ltd., of 30, Regent Street, London, S.W., will be showing numerous aeronautical components on Stand No. 19. Perhaps the most important of these will be a varied selection of "Rapid" propellers, including a new laminated type, half of each blade being copper covered. Other exhibits will be Hot's aero instruments—altimeters, barographs, combination watches; the Monopod compass; Road outfits, including helmets, andiphones, suits, eye-protectors, map-cases, &c. G.A.C. aviator's black leather combination suits; the well-known Emallite dope and specialities; Aviol, which is a new cylinder oil for water-cooled engines, having an exceptionally low cold-test; Gnomol castor oil, and many other G.A.C. accessories.

"Geographia" Designing and Publishing Co., Ltd., of 33, Strand, London, W.C., will exhibit all those necessary accessories

for the touring aviator, such as maps, map-cases and holders, barographs, and "Saf" speed indicators. They will also have on exhibition the Alexander Gross "Anti-drift" compass, and a new form of bearing-finder.

A. M. Hart, of 21, Liverpool Street, London, E.C. will exhibit a varied selection of their aero fabrics, which are well known for their strength, durability and lightness.

Hewlett and Blondeau, of Omnia Works, Vardens Road, Clapham Junction, London, S.W., will be showing on Stand No. 45 specimens of oxy-acetylene welding—rudder, empennage, air-control lever, elevators, sockets, &c. They will also be showing sets of engine plates for a monoplane and a biplane; a complete assortment of accessories, viz.: Bolts and nuts, eye-bolts, strainers, cable fasteners, tanks—fitted with fire-proof Securitas tube—and specimens of different metals treated by a new process—the Ruzlek process—by which they are rendered proof against rust and atmospheric deterioration.

The Hoyt Metal Co., Ltd., of 26, Billiter Street, London, E.C., are exhibiting samples of Hoyt's Standard Babbitt or Antifriction Metal, the I.C.E. quality (formerly called copper hardened), and which is being used for internal-combustion engines for aero work with complete satisfaction by a number of the leading aeroplane engine makers.

The Integral Propeller Co., Ltd. (L. Chauviere), of 307, Euston Road, London, N.W., are making a special feature of propellers for hydro-aeroplanes as well as for aeroplanes.

In order to demonstrate to the flying man the very excellent construction and durability of the "Integral" propeller, an aquarium on their stand will contain one of these propellers submerged in water. This should prove particularly interesting, as it will go to prove that the "Integral" is absolutely waterproof, and does not suffer in the least from complete submersion even over a period of several weeks.

The London Aerodrome. On their stand will be shown various objects that have bearing on the exhibition flying that has taken place at the London Aerodrome during 1912. The chief exhibit will be a scale model of the ground showing the hangars, the pylons, and buildings in the vicinity in their proper proportion. To the onlooker the model will appear much the same as the aerodrome, except that it is a pilot flying two or three thousand feet up. There will also be shown a large selection of trophies that were won there last year. Photographs, too, will be on exhibition, of all the machines that have flown there, and the machines that are flying there at the present time.

Joseph Lucas, Ltd., of Great King Street, Birmingham, will exhibit on Stand No. 8, the Lucas Dynamo-Lighting systems, complete with dynamos, accumulators, switchbox, lamps, &c.

Wm. Mallinson and Sons, Ltd., of 130-138, Hackney Road, N.E., will be exhibiting selected timbers for aircraft construction. Amongst the great variety of woods shown will be the following: silver spruce, ash, hickory, cypress, poplar, elm and yellow pine. For propellers they are making a speciality of French walnut, American walnut, teak and mahogany. For the floats of hydro-aeroplanes they recommend and will show samples of cedar, mahogany, three-ply, and different veneers.

R. Melhuish, Ltd., of 50-51, Fetter Lane, London, E.C. On their stand will be shown a wide assortment of tools, sheet metals, and different wood- and metal-working machinery, more especially that applicable to aeroplane construction. The propeller selection of metal sheeting will include steel, iron, magnalium and aluminium. Their metal-working plant will include brazing forges and welding outfits. A speciality that Messrs. R. Melhuish, Ltd., have made just recently is a brand of aeroplane high-tension steel wire, which they call "R.M." wire. While being of fine manufacture and particularly tough, it is very easy to work. So pleased have different firms been with samples of this wire that many of them have entered into big contracts with Messrs. Melhuish for its supply.

The Motor Radiator Manufacturing Co., of Park Side, Coventry, will show different patterns of the Zimmermann radiators for aircraft. It is this type of radiator that has given such excellent results on many well-known machines, including the Cody biplane.

Navaltum, Ltd., of Jubilee Place, Chelsea, London, S.W., will exhibit numerous samples of the new metal "Navaltum." This metal is an aluminium alloy, having a specific gravity of 2.2 to 2.8, and a tensile strength of from 9 to 25 tons per sq. in., according to the different grades. It is easily drawn or rolled, and it makes clean castings; it can also be soldered, it takes a high permanent polish, and is impervious to the action of sea water. We understand

that this metal has been under test in every possible way for a considerable period and has given very satisfactory results.

Owen and Sons, of 190A, Borough High Street, London, S.E., will have on exhibition all kinds of timber necessary for the construction of aeroplanes and hydro-aeroplanes. Skids and built-up propellers will also form a part of the exhibit.

Pettett's Patent Safety Filler Co., of 46A, Regency Square, Brighton, specialize in safety petrol-fillers, various kinds of which will be shown. These devices avoid the use of the funnel, which, as a rule, leads to waste of petrol, and which very often cannot be found when it is most wanted.

Price's Co., Ltd., of Battersea, London, S.W., will display—their stand, No. 80, will be found adjoining the Post Office on the left of the main entrance—a complete range of oils.—*Motorline*, *Oleogene* and a special aero castor oil for Gnome engines.

Ruberoid Co., Ltd., of 81-83, Knightbridge Street, London, E.C., will show different qualities of "Ruberoid" roofing material. This material is light, pliable, and non-absorbent, and is machine-made—by a special process—in the form of sheeting. It has for its base a fibrous material, which is thoroughly saturated with Ruberoid, a secret composition containing no oxidizing ingredients, such as tar, asphalt, paper, &c. We need only give the following list of hangars, sheds, &c., taken from a long list of other buildings using this material, to show that it is particularly applicable to aeronautical work. Aeroplane hangars at Ranelagh, Rainham, Essex, Folkestone, Officers' Quarters at Eastchurch flying ground; Zeppelin Halls at Friedrichshafen, Gotha, Königsberg, Thorn, Bickendorf, and Dueseldorf. Other airship hangars at Lucern, Antwerp and Voliers.

Rubery, Owen and Co., of Darlaston, South Staffs, who specialize in all kinds of steel work appertaining to aeronautical construction, will show the following items: eyebolts, all kinds of wire strainers, bolts of various patterns, quick-release bolts, wire-bending pliers, steel cable ends, and a variety of pressed steel work. The latter is a special feature of this firm, and includes such articles



Brooklands Aero Club Annual Dinner.

FEBRUARY 21ST has been fixed as the date for the Annual Dinner of the Brooklands Aero Club, the sporting body which has done so much to promote competitions on the Weybridge track. It will be held at the Trecorder and it is hoped that every member will do his utmost to be present in order to welcome the distinguished gentlemen who have promised to be present.

The date has been purposely fixed in Show week in order that gentlemen coming to town for the Show may be able to come on to the dinner afterwards. A hearty welcome will be extended to all present and past Brooklands pupils, who would thus have an opportunity of meeting and exchanging views with their instructors.

Full particulars may be obtained upon application to the Hon. Secretary, Mr. Frank Wright, "Glendale," Osborne Road, Walton-on-Thames.

as engine plates, channels, angle-plates, tubes, struts, sockets, lugs, and ribs for planes. Another important item is the patent release gear for aeroplanes, which enables an aviator to get away on his machine without the aid of mechanics.

Samuel Brothers, Ltd., of 65-67, Ludgate Hill, London, E.C., besides exhibiting a selection of clothing, will have an interesting "actual rain" demonstration of the waterproof qualities of their "Omne Tempus" cloth, which is similar in appearance to an ordinary tweed.

S. Smith and Son, Ltd., of 9, Strand, London, W.C., will have an interesting exhibit in the form of a powerful electric "Goldenlyte" search light, mounted on an ingenious and easily operated swiveling bracket, which is secured to some convenient part of the aeroplane; it is operated from the passenger's or pilot's seat by a single lever. Their other exhibits will consist of the renowned Smith instruments, including revolution indicators, adapted to suit various makes of engines, compasses, and watches; mascots, and the Smith carburettor.

The Spiral Tube and Components Co., of 61, Northdown Street, King's Cross, London, N., will exhibit spiral tube patent aero-radiators of various patterns and also oil, petrol, and water tanks, and welded steel fittings.

Stern Sonneborn Oil Co., Ltd., of Royal London House, Finsbury Square, London, E.C., will be showing their large variety of "Staerol" and "Sternol" oils and greases.

Vacuum Oil Co., Ltd., of Caxton House, Westminster, London, S.W., will be showing a full range of their much-used Vacuum Mobil oils and greases for the lubrication of various types of aeroplane engines.

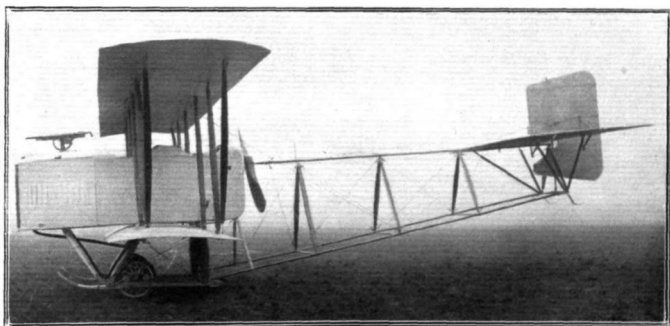
C. C. Wakefield and Co., Ltd., of 27, Cannon Street, London, E.C., will be exhibiting, on Stand No. 7, their "Castrol" Motor Oils (Registered brand), especially suitable for aeroplane engines. Wakefield's "Castrol" has been used by the most prominent aviators since the very early days of aviation in England, and many have been the important events that have been won by its users.



Macdonald's Machine Recovered.

JUST before midnight on Tuesday, two Gravesend fishermen, who had spent some time in dragging the river, located the Vickers biplane which sunk in the river off Erith on January 13th. Eventually the wreck was broken at Crayford Ness; the wings were gone and the tail was broken, probably by the action of the water. We understand that an examination by Mr. Lowe, of Messrs. Vickers, Ltd., Aviation Department, showed that all the engine valves were intact, and the engine was practically undamaged except for slight deflections which would arise from contact with the bed of the river. All the tail control wires were intact. The left pin of each safety belt had been released.

The bodies of Mr. Macdonald and Mr. England had not been recovered up to the time of going to Press.



THE NEW 90-H.P. MILITARY GRAHAME-WHITE BIPLANE.—It will be seen that a quick-firing gun is mounted on the nose of the body. It can operate throughout a range of 50° vertically and 90° horizontally.

ARMY MONOPLANES REPORT.

THE report is now published, dated December 3rd, 1912, of the Departmental Committee appointed to inquire into and report upon the causes of the certain accidents to monoplanes of the Royal Flying Corps and upon the steps, if any, that should be taken to minimise the risk of flying in this class of aeroplane.

The following is the report:—
To the Secretary of State for War.

1. The Committee appointed in the early part of October '12 to inquire into and report upon the causes of the recent accidents to monoplanes of the Royal Flying Corps and upon the steps, if any, that should be taken to minimise the risk of flying in this class of aeroplane, submit the following report:—

2. The specific fatal accidents to which the terms of reference were understood to relate occurred in September of this year to Capt. Hamilton, with Lieut. Wyness-Stuart as observer, at Gravelly, near Hitchin, and to Lieut. Hotchkiss, with Lieut. Bettington as observer, at Wolvercote, near Oxford. Particulars of the accident to Major Gerrard on September 13th, 1912, were, however, laid before the Committee, and inquiry was also made into the circumstances of this accident, which, fortunately, was not attended with serious consequences to the flyer.

3. The Committee had before them the reports on the first two accidents, made very shortly after their occurrence, by Maj. Sykes, Commanding the Military Wing of the Royal Flying Corps, and the report on the accident to Maj. Gerrard made by Capt. Paine, Commandant of the Central Flying School. A report on the Oxford accident was made on October 8th, after careful investigation, by the Public Safety and Accidents Investigation Committee of the Royal Aero Club, and copies of this report were kindly furnished by the Club. Col. Holden, Chairman of the Accidents Investigation Committee, also attended before this Committee and gave valuable information as to the evidence on which the report of the Accidents Investigation Committee was founded.

4. The Committee also visited Larkhill and examined there a number of the monoplanes in the possession of the Royal Flying Corps. Officers and members of the Corps attended and gave evidence as to the accidents, and as to questions which arose in connection with the examination of the machines and other matters.

The evidence of a number of other witnesses,* some of whom were eye-witnesses of the accidents, while some had inspected the wreckage of the machines after the accidents, has been taken. Representatives of the British and Colonial Aeroplane Co., the Deperdussin Co., and the Gnome Engine Co., attended and gave assistance to the Committee in regard to the objects of the inquiry.

5. In pursuance of the chief purpose of the inquiry, as set out in the terms of reference, the Committee have given careful consideration to special features characteristic of the monoplane which may affect its safety. The conclusions and recommendations of the Committee with regard to these follow later; it will be convenient first to deal with the three accidents investigated.

6. **The Gravelly Accident.**—The machine destroyed in the accident at Gravelly was the Deperdussin monoplane which received the 2nd prize in the Military Aeroplane Competition. It was fitted with a 100-h.p. Gnome engine. Some particulars as to the earlier part of its flight on the morning of the accident are given in Major Sykes' report. From this it would appear that over Stevenage the engine had been stopped, and the machine was planing down. A few moments before the accident it is stated by an eye-witness that he saw it make a somewhat steep dive and then flatten out again with the engine running. Almost immediately afterwards pieces were seen to fall from the machine, which, from the description given of their appearance, are inferred to have been portions of the cowl. The next moment the left wing collapsed, and the machine fell, apparently nearly vertically. The collapse of the machine was accompanied by a loud noise.

7. The parts of the machine found in or near the line of flight included:—

Some broken tappet-rods.
An aluminium packing piece from between the plate by which the outside left wire is attached and the main spar of the wing.
Portions of the engine cowl. Two front chassis struts.

* The following is a list of the witnesses examined:—

<i>Gravelly accident.</i>		<i>Oxford accident.</i>	
Mr. R. L. Charteris.	Col. H. C. L. Holden, C.B.	Maj. Gerrard.	
Mr. C. L. Whigham.	F.R.S.	Lieut. C. Randall, R.N.	
Maj. H. R. M. Brooke-Popham.	Maj. H. R. M. Brooke-Popham.		
Popham.	Capt. C. R. S. Allen.		
Lieut. G. de Havilland.	Capt. R. R. S. Howell.		
Serjt. F. Kidd.	Lieut. G. de Havilland.		
	Serjt. F. Kidd.		

The following also gave evidence:—

Lieut. Fox.
Mr. L. Coanda, representing the British and Colonial Aeroplane Co.
Lieut. J. C. Porte, representing the British Deperdussin Aeroplane Co.
Mr. K. Bertaux, with Mr. G. Holt Thomas, representing the Gnome Engine Co.

8. On examination of the machine on the ground it was found that the upper wire, on the left wing, carried to the furthest point of attachment from the body had been drawn from its ferrule and was loosely coiled nearly twice round the engine; the corresponding lower left wire had come away, the bolts in its attachment to the spar having been sheared through. Seven or eight tappet-rods, in series, were found to be broken, and the valve rockers and brackets were bent backwards, as if while the engine was revolving they had struck some fixed part of the framework, some of them being fractured. The star-shaped frame in front of the engine, carrying the third, front, bearing had been torn away. One blade of the propeller was embodied in the ground nearly to the boss. The engine could not, therefore, have revolved after it struck the ground, and the damage to the engine above described must presumably have occurred in the air. The other blade of the propeller was broken, and a V-shaped piece, some 2 ft. long by 3 to 4 ins. wide at its widest part was missing. In spite of inquiry and diligent search along the route followed this piece has never been found.

9. From the information before the Committee it has not been possible to determine definitely the primary cause of the accident, but all the evidence points to the probability that it arose from some damage to the engine or its mounting, or to the propeller. It may have originated in fracture of some part of the engine, possibly a tappet rod. The valve rocker may then have swung out and fouled the cowl, the clearance being small.* Parts of the cowl found were scored heavily on the inside, and in one place there was a hole right through it. Assuming that from some cause the cowl was caught by the rotating engine, the remainder of the accident admits of explanation. Stays to the mast to which the upper wing wires were attached came forward in this machine to points immediately above the cowl. One of these forward stays may have been forced back, putting a strain on the outer wire above the wing and drawing it out from its attachment. The shearing of the bolts of the attachment of the outer left wire may have occurred immediately after, or may have followed owing to flapping of the wing. From the National Physical Laboratory report, and from the evidence of the representative of the Deperdussin Co., it was clear that the wing would not then be able to bear the stresses falling on it. The wing would thus give way and the machine fall. The noise heard was probably caused by the tearing away of the cowl or the breaking of some part of the engine, or the wire at some period became coiled round the engine.

10. A possible alternative explanation is that vibration of the engine may have been set up, whether from fracture of the propeller or other cause, such as the method of supporting the front bearing. The detachment of a piece of the propeller of the size above indicated would give rise to considerable vibration in the engine and its supporting framework, which would probably be quite sufficient to do serious damage to the light frame carrying the front bearing and to account for the tearing away of the cowl and the subsequent collapse of the machine. No reason for the initial fracture of the propeller can, however, be suggested from the evidence before the Committee.

The method in which the engine was mounted in this machine has also been carefully investigated. This more general question is dealt with later.

11. Such parts of the engine as were available were sent to the National Physical Laboratory for examination. These did not include, however, the fractured tappet rods. The engine was much damaged, and it was impossible to determine what part of it might have fractured first.

12. **The Oxford Accident.**—The inquiries of the Committee have confirmed the account of this accident given in the report of the Royal Aero Club. The circumstances may be briefly stated. The aeroplane was one of two Bristol monoplanes which passed through the military trials and obtained a prize of £500. The engine was an 80-h.p. Gnome. The aeroplane was seen flying over Port Meadow, Oxford, at a height of about 4,000 ft. The engine was then shut off, and it began to plane down, apparently in a normal manner. When it reached a point distant about 600 ft. from some trees bounding Port Meadow, and at a height estimated by an eye-witness as about 700 ft. (500 ft. in Royal Aero Club report), the descent became much steeper, and at a height of about 200 ft., almost over the trees, the fabric of the right wing burst, or the rear portion of the wing gave way, and the machine fell.

13. A steel strap from the machine was picked up in Port Meadow, about 330 ft. from the point where the aeroplane struck the ground. A number of pieces of wood, fragments of the wing, were also found in Port Meadow in the vicinity of the strap. Some

* The minimum amount of clearance on the machine is stated by the Deperdussin Co. to have been 1½ ins. between the lower wire and the engine on the similar machines at Larkhill, in which the clearance between the valve-rocker and the bottom strut of the noseplane is 1½ ins. The valve-rocker strikes this strut when swinging free from the tappet rod.

pieces seen by the Committee appeared to have come from the trailing edge of a wing, and others to be fragments of the strips used in fastening the fabric to the ribs. It was not clear where these were picked up. The strap had holes for nine wood screws to fix it to one of the lower cross members of the fuselage. Two brass screws only, at the two extremities of the strap, had been in use.

14. The steel strap was provided for the attachment of the lower ends of the two inner lift cables, one to each wing. These lower ends of the cables were fitted with quick-release devices. On examination of the cables after the accident it was found that the thin tubular ferrule, intended to secure the quick-release attachment, was missing from the cable to the right wing. It could not pass over either of the fastenings at the ends of the cable, and therefore could only have been lost by breakage.

15. The Committee have examined the quick-release device, and the ferrule of the quick release to the left wing cable, which was found on the cable. This ferrule appeared to have been made by flattening circular steel tubing to the shape required, and was cracked along almost its whole length. The representative of the British and Colonial Aeroplane Co. stated that oval tubing was ordinarily employed, but that the circular tubing had been used by their employees at Salisbury Plain when preparing the machine for the military trials, at a time when the oval tubing was not available. The iron strap above referred to was also refitted at the same time.

16. The ferrule was held in place by the pull on one side of the cable, and on the other side of the lever of the quick release. It was not otherwise secured, and when the tension in the cable was relaxed could be shaken from its position, allowing the quick release to open.

17. The Committee are of opinion it is probable that in the first instance the ferrule in the right wing cable broke. The tension of the left wing cable was then sufficient to pull out shortly afterwards, the two screws holding the steel strap in position. Blows from the steel strap, hanging from the left wing cable, may have damaged the trailing edge of the left wing before the strap fell off, and the loose right wing cable may also have caused damage to the fabric of the right wing.

18. The flyer probably switched off his engine on finding something was wrong and commenced to plane down. The increase to a steeper angle of descent may have been due to the injury done to the wings, or possibly to the flyer's desire to land within Port Meadow. The augmented velocity due to this steep descent may have occasioned the rupture of the already damaged fabric, and have caused it to pull away from the ribs to which it was fastened, or, alternatively, may have led to the failure of the rear structure of the wing. It should be noted that in this machine the loading on the wings was high, about 9 lbs. per sq. ft., compared with the more normal monoplane loading of 6 to 7 lbs. per sq. ft., and between 4 and 5 lbs. per sq. ft. in the high-speed biplane BE 2.

These figures refer to the average loading in steady flight. It should, of course, be borne in mind that the loading on parts of the wings will be greatly in excess of them, while the average loading will be increased by the effect of sudden gusts, warping, change of attitude, &c.

19. Experiments and calculations made at the National Physical Laboratory have led to the conclusion that it is improbable fabric of good quality would have ruptured, even on a machine of such high normal loading and under the increased stress due to the greater velocity, unless already damaged from some other cause. The Committee regret that portions of the actual fabric from the wings of the machine destroyed were not preserved for examination, but fabric supplied by the Company and stated by them to be similar to that used on this machine has been tested and found satisfactory.

20. Calculations have also been made at the Laboratory to determine the distribution of stress in the main spars of the wing under the abnormal conditions which prevailed when the wing finally gave way. The stresses on the back spar under such conditions would have been unusually high, and the possibility that this spar may have failed before the fabric cannot be regarded as entirely negated by the results of the investigations made. The actual factor of safety depends, of course, on the breaking stress of the material of the spar, and the Committee are of opinion that the similar machine now at Larkhill (Bristol Monoplane, No. 262) ought not to be used without further investigation.

21. **Accident to Major Gerrard's Machine.**—This machine was a Nieuport monoplane, fitted with a 50-h.p. Gnome engine. The accident in this instance resulted in no serious damage except to the engine. When at a height of about 1,000 ft. a loud noise of breakage was heard from the engine. The flyer at once switched off and planned down, first at a small gliding angle, which was increased of necessity later. In the opinion of the Committee he owed his life to his prompt action and sound judgment.

On subsequent examination of the engine, one connecting-rod was

found to be broken in two places; the gudgeon-pin* and its bush were also fractured. Other damage was done to the engine, which is described in Capt. Paine's report.

22. In the course of their inquiry into this accident, the Committee learnt that several cases had occurred of fracture of both gudgeon and big-end pins in Gnome engines. A number of broken big-end pins from different Gnome engines were sent to the National Physical Laboratory for examination, as well as the broken connecting-rod and other parts of the engine of Major Gerrard's machine.

23. Tests on the bent connecting-rod proved the material of which it was made to be quite satisfactory. Some reference to the design is made later. Examination of the broken big-end pins showed them to be made of fairly soft steel, case-hardened on the outside to the depth of about 1 mm. A groove for an oilway had been ground out on one side of the pin after hardening, extending into the soft material, and very appreciably reducing the section on that side of the pin. It was at once evident that repeating bending stresses would be very likely to cause fracture at the groove, where all the fractured big-end pins submitted had broken. Tests showed that the case-hardening had weakened the resistance of the material to impact. Photomicrographic examination of one of the broken pins indicated, further, that the hardening had been carried out from too high a temperature, producing cracks in the material.

24. **General Conclusion as to the Three Accidents Investigated.**—In the course of their inquiry into these three accidents, and their inspection at Larkhill of the monoplanes in the possession of the Royal Flying Corps, the Committee have had under consideration a number of special points in which improvement appears to be desirable, and of general questions requiring investigation. These are dealt with below, and the Committee venture to hope that the suggestions they have to make may be of assistance towards diminishing the risk of flying, not the monoplane alone, but both classes of aeroplane. With regard to the three cases specially investigated, however, they are of opinion that it has been clearly demonstrated that these accidents were not primarily due to causes dependent on the fact that the machines were monoplanes.

The investigation into these accidents has, however, raised a number of important questions of a more general character which may now be considered.

25. **Engine Breakages.**—Of the three accidents specially investigated, one was due to the fracture of a gudgeon-pin and a connecting-rod in the 50-h.p. Gnome engine. There is a possibility that one of the other accidents may have been primarily caused by fracture of some part in the 100-h.p. Gnome engine.

A recent case of importance has also been brought to the notice of the Committee. A 70-h.p. Gnome engine was opened up after running 18 hours to remedy a slight defect to a valve. On examination two big-end pins were found to have fractured at the groove, and a crack had begun to develop in the head of the connecting-rod into which one of these pins fitted.

26. It has further been established that in a number of other cases fracture of gudgeon and big-end pins in Gnome engines has occurred. As has been already stated, some of these pins have been carefully examined and tested at the National Physical Laboratory. The reports made by the Laboratory show clearly that the big-end pin needs modification in design, while, in addition, the heat treatment in the pin submitted to photomicrographic examination was faulty.

27. The material of the connecting-rod tested was found to be satisfactory. In certain respects the design of the rod is capable of improvement. The evidence showed also that the arrangements for locking the valve into position in the piston were such that it was possible for a careless or inexperienced workman to put considerable torsion on the connecting-rod. This would give rise to abnormal stresses in the connecting-rod during the subsequent running of the engine, and it appears possible that the fracture of the rod was due to this.

28. The view taken by the representative of the Gnome Engine Co., who gave evidence before the Committee, was that the latter explanation was the more probable.

After the interview with this representative a number of questions were submitted, in writing, to the Company.

In reply to one of the questions relating to the accident to Maj. Gerrard's engine, the Company write:—

"It is probable that the cause of the accident is the fracture of the gudgeon-pin at the piston end of the connecting rod."

It also appears from the replies that the design of the big-end pin has been modified lately.

29. The Committee are of opinion that it is of great importance that the attention of the Company should be called to the two sources

* In view of the similarity of the pins in the Gnome engine, it is desirable to explain precisely the terms used in this Report in referring to them. The term gudgeon-pin is used to denote the pin at the piston end of the connecting-rod; the pin at the other end of the connecting-rod is termed the big-end pin. The latter has an oil groove in it; the former has no groove.

of weakness in the Gnome engine above mentioned, in order that a remedy may be found.

30. The breakage of any part of an engine on an aeroplane in flight is clearly fraught with great danger to the flyer. In the present instance examination into the cause of breakage has led to valuable information. The Committee are of opinion that it is desirable systematic investigation should be made into all cases of engine breakage on aeroplanes of the Royal Flying Corps, and reports prepared. They recommend that copies of these reports should be presented to the Advisory Committee for Aeronautics, who should direct, when they considered it desirable, that a complete examination into the cause of failure should be carried out at the National Physical Laboratory.

It would be necessary, of course, in such cases, that the broken specimens should be carefully preserved and identified.

31. The Committee also recommend that arrangements should be made for the periodical inspection of all engines in use on aeroplanes.

32. **Engine Mountings.**—The evidence laid before the Committee has also led them to the conclusion that careful attention should be given to the question of the mounting of the engine. Insufficient strength and rigidity may easily have serious consequences in the event of any want of balance in the engine or propeller, or of sudden arrest of the rotation of the engine. The method of support, and of securing the engine to the framework, demand serious consideration, especially in the case of the heavier Gnome engines.

The representative of the Gnome Engine Co. expressed the opinion that the 100-h.p. engine should not be mounted without a front bearing arranged to take a full share of the weight, and the Company in their replies confirm this statement. A copy of the Company's catalogue was submitted in which the engine is shown supported between two bearings. The mounting provided for the engine is designed and constructed by the aeroplane builder, and firms manufacturing aeroplanes should give the matter attention. In the case of the Deperdussin machine, the representative of the Deperdussin Co. agreed to the statement that the front bearing is not intended to take any serious part of the weight of the engine in flight, and in reply to the question: "The 50-h.p. usually has two bearings and the 100-h.p. three?" he said, "But you cannot call the front one a bearing, because it has only to take the shock on landing." This answer, which it will be seen is not in agreement with the view taken by the Gnome Co., is confirmed by the Deperdussin Co. in a subsequent letter, where the question is of great importance, and the Committee consider that existing machines, whether monoplanes or biplanes, should be carefully examined to ensure that the mounting of the engine is satisfactory.

33. In their replies with regard to the Graveley accident, the Gnome Engine Co. indicate that they can say nothing as to the cause of the accident, being ignorant of the machine and the method of mounting the engine; but they express the opinion that the rocking lever might damage a light aluminium cowl, but could not break a framework such as ought to support the motor, unless it passed too close to the supports.

It is important that means should be taken to ensure that in the event of small breakages in the engine, it should not be possible for parts which may become loose to swing out far enough to do damage to the cowl, or other neighbouring parts of the machine. More generally, it is desirable that the neighbourhood of the engine should be kept as clear as possible from essential members of the main structure, injury to which may involve the destruction of the aeroplane.

34. **Strength and Details of Construction.**—Considerable attention has been given to the consideration of the relative structural strength of the monoplane and the biplane. It will be generally agreed that the biplane possesses certain obvious advantages. The bridge girder construction possible in its main spars and struts admits of ample strength. Neither the main wires nor the warping wires need be brought to a point so near the ground as to incur risk of damage in starting or alighting. The Committee are, however, of opinion that it is quite possible to construct a monoplane so that it shall have adequate strength. At the same time there are certain points to which they desire to call attention: some of these are common to both types of machine. The wing skeleton should be so designed as a complete structure with diagonal members that it will stand up against the drift forces and will not fail after rupture of a drift cable. This has been done in some, but not all existing types of machine. The main wires should not lie either the monoplane or the biplane be anchored to a part which is severely stressed every time the machine alights. Both the main spars and the warping wires should be secured in such a way as to minimise the risk of accidental damage. As already pointed out, this is more easily secured in the biplane. The control wires should be stranded. In the construction of future machines, it is advisable that main wires, and their attachments, should be duplicated. Certain of the machines inspected at Larkhill were not free from criticism in respect of some of the matters here mentioned.

35. By request of the Committee, a calculation has been undertaken at the National Physical Laboratory of the stresses in the main spars of the wing for typical Deperdussin and Bristol machines. The factors of safety found is lower than that given by the manufacturers, the difference depending chiefly on the figure assumed for the strength of the material used. The Committee recommend that with every machine purchased, stress diagrams or calculations should be required, which should be carefully checked. They would suggest that the Advisory Committee for Aeronautics be asked to report on the best method of carrying out these calculations.

36. The use of a quick release is one of the details of construction to which the attention of the Committee has been called. In their opinion, such devices require most careful consideration and testing before their use is permitted.

37. In tightening up the wires of an aeroplane, it appears possible that a strain considerably greater than is desirable may be put on some of the wires. Care should be taken to avoid this, and the use of some simple form of tautness indicator, such as that employed at the Royal Aircraft Factory, is recommended as an aid to the training of skilled mechanics.

38. **Strength of Fabric and Attachment of Fabric to the Ribs.** Unfortunately, no specimens of the torn fabric, in the Oxford machine, were preserved, but samples of similar material have kindly been furnished by the British and Colonial Aeroplane Co., and have been tested at the National Physical Laboratory. The samples tested gave a high value for the tensile strength, with low extensibility. Calculations to determine the maximum stress in the fabric, and on the attachments to the ribs, having also been made. Assuming that one layer of fabric had been torn away, and that the velocity of the machine had increased to 100 miles per hour, it yet does not appear that the fabric would have been in danger of rupture unless already damaged. From previous experiments at the Laboratory it was known that if a small cut, half-an-inch in length, were made in the fabric, the fabric would tear at one-fourth or one-third the maximum stress of un wounded material. With larger wounds, the bursting of the fabric under the conditions which obtained in the accident might perhaps be explained.

39. Attention is called to the fact that the maximum air pressure in normal flight may be three or four times the mean loading, a fact not always recognized; this follows from the figures obtained for the pressure distribution both by Eiffel and at the National Physical Laboratory.

40. The Committee are informed that the Advisory Committee for Aeronautics have already had a number of investigations with regard to aeroplane fabrics carried out at the National Physical Laboratory, and that data have been collected as to the strength and extensibility of various fabrics, treated and untreated, the effect of deterioration, with use and exposure, and of the weakening caused by small initial damage. The Royal Aero Club, in their report, recommend that experiments of this nature should be made.

41. The Committee desire to call attention to the necessity of fixing down the fabric, especially the upper fabric, to the ribs more securely than is perhaps usual, and to the possibility that a satisfactory method might be found of preventing a tear from spreading.

42. **Inspection during Manufacture.**—With a view to securing that in new machines effect is given to the recommendations of the Committee as to construction and strength, a system of inspection of machines under manufacture similar to that generally adopted in the Services should be enforced.

43. **Stability.**—The Committee desire to urge the importance of the general investigation into the stability of aeroplanes, whether monoplanes or biplanes. The experimental data at present available are not sufficient to allow a complete theory to be formulated. It is understood, however, that the work of the Advisory Committee has now been carried to the stage at which this problem can be attacked with hope of success, provided that the necessary facilities—a large wind channel in a sufficiently big enclosed space—be put at their disposal, and the Committee recommend that the Advisory Committee be asked to continue the further investigation into the stability of the aeroplane as a matter of great urgency, and more especially to examine the question of inherent lateral stability, suggestions towards the solution of which have been given by the experiments of Lanchester and the calculations of Bryan.

44. As regards the present inquiry, the Committee have no information before them which would lead them to conclude that the monoplane as such is less stable than the biplane. Evidence given by a number of flyers, the majority of whom were, however, more accustomed to monoplanes, shows a preference for the high speed machine, as being less disturbed by gusts in high winds, and as responding to smaller movements of the controls. This greater ease of control involves less fatigue to the flyer, an important consideration in a long flight. It is, however, distinct from stability.

* Eiffel: *La Résistance de l'Air et l'Aviation*, p. 72. Technical Report of Advisory Committee for Aeronautics, 1911-12, p. 66.

45. To one special point the Committee desire to call attention. It is, unfortunately, a somewhat common practice for flyers to descend intentionally in a *vol piqué*. Owing to the serious nature of the stresses induced, the Committee are of opinion that this involves an unnecessary risk, and recommend that flyers be cautioned as to the danger of the manoeuvre.

Further, there are certain considerations that point to the desirability of an investigation into the special conditions attending this attitude in flight, and the Committee recommend that the Advisory Committee be asked specially to examine the questions of *vol piqué* flight and recovery therefrom.

46. **Gyroscopic Effect of Rotating Engine and Propeller.**—Calculations and experiments have been made at the Royal Aircraft Factory to determine the amount of the gyroscopic action of the rotating engine (100-h.p. Gnome) and propeller. The engine is assumed to be running at 1,200 revolutions. The amount of the gyroscopic effect depends also, of course, on the rate at which the machine is being turned. In the calculation made it is supposed that this is such that a complete circle would be described in 20 seconds. Consideration of the maximum rate probable in a sudden dip leads to a nearly equal result. The moment due to this cause is then of the order of magnitude of that which would be produced by a force of 20 lbs. acting on the horizontal or the vertical rudder.

47. The couple due to gyroscopic action will have an effect as regards (a) increase of stress, (b) steering. There is no reason to anticipate serious consequences on either ground. There is no difficulty in taking up additional stress of the amount indicated. Probably the most important consequences would arise in the event of any insecurity in the mounting of the engine. This is a further reason for attention to this matter. In its relation to steering, the effect may be compared with that of a small gust, of known direction, and should cause no difficulty to the flyer.

48. **Testing and Inspection of Machines.**—The Committee desire to lay stress on the importance of the careful testing, and periodical inspection, of machines. No machine should be taken into use until after thorough examination and approved test.

49. The exact tests to be applied require some closer investigation. The Committee have, by the kindness of the Military Attaché to the British Embassy in Paris, received particulars as to some of the tests laid down by the French authorities, and a memorandum presented by one of the witnesses gives some useful suggestions. The Committee recommend that the Advisory Committee be requested to take the matter into careful consideration.

50. The advisability of testing machines has been questioned on the ground that the test load may overstrain some part. This, however, is only a matter of properly proportioning the test load at each point to that which will produce rupture, and would no doubt be considered by the Advisory Committee in their report.

51. The Committee are agreed that it is desirable arrangements should be made for the regular inspection of machines and of their engines. For this purpose it is desirable that a sufficient number of permanent officials should be appointed—

(a) To inspect and report on the machines at regular intervals to the officer directing the work in the air.

(b) To examine and report on every accident and repair.

52. The Committee are of opinion that the condition of the engines is of such paramount importance to the safety of pilots and observers in aeroplanes, and the engines, in the present state of development of the aircraft industry, are so various in design, requiring careful and frequent expert inspection, as to justify the appointment of an engineer of extensive technical experience as an Inspector of Engines, with the rank of an officer in the Military Wing of the Royal Flying Corps.

53. The Committee feel also that the lives of those who fly aeroplanes depend to an important degree on the skilful and conscientious manner in which the mechanics of the Royal Flying Corps carry out their work of examination and adjustment of the various parts of an aeroplane, and they wish to bring to the notice of the Lords Commissioners of the Admiralty and the Army Council the importance of ensuring that as large a number as possible of the mechanics of the Royal Flying Corps are adequately trained without delay to perform their duties in an efficient manner.

The Committee realise that the organisation of the Royal Flying Corps, when matured, will render possible the training of the requisite numbers, but they suggest that, during the present stage of its development, to supplement the training establishment of the Royal Flying Corps, two or three skilled mechanics for each squadron should be specially engaged for a time to act as instructors, and to set a standard of technical workmanship, while advantage should be taken of the facilities afforded by private firms, both at home and abroad, for teaching men in their workshops.

54. **Chief Conclusions and Recommendations.**—The main conclusions arrived at by the Committee and their recommendations in connection therewith may be briefly summarized.

(i.) The accidents to monoplanes specially investigated were not due to causes dependent on the class of machine to which they occurred, nor to conditions singular to the monoplane as such.

(ii.) After consideration of general questions affecting the relative security of monoplanes and biplanes, the Committee have found no reason to recommend the prohibition of the use of monoplanes, provided that certain precautions are taken, some of which are applicable to both classes of aeroplane.

(iii.) The wings of aeroplanes can, and should, be so designed as to have sufficient strength to resist drift without external bracing.

(iv.) The main wires should not be brought to parts of the machine always liable to be severely strained on landing.

(v.) Main wires and warping wires should be so secured as to minimise the risk of damage in getting off the ground, and should be protected from accidental injury.

(vi.) Main wires and their attachments should be duplicated. The use of a tautness indicator, to avoid over-straining the wires in "tuning up," is recommended. Quick-release devices should be carefully considered and tested before their use is permitted.

(vii.) In view of the grave consequences which may follow fracture of any part of the engine, especially in the case of a rotating engine, means should be taken to secure that a slight damage to the engine will not wreck the machine. Structural parts, the breakage of which may involve total collapse of the aeroplane, should, so far as possible, be kept clear of the engine.

(viii.) The fabric, more especially in highly loaded machines, should be more securely fastened to the ribs. Devices which will have the effect of preventing tears from spreading should be considered. Makers should be advised that the top surface alone should be capable of supporting the full load.

(ix.) The makers should be required to furnish satisfactory evidence as to the strength of construction and the factor of safety allowed. In this special attention should be paid to the manner in which the engine is secured to the frame.

(x.) Engine breakages should be systematically investigated and reported on, and the reports should be submitted to the Advisory Committee for Aeronautics.

(xi.) No machine should be taken into use until after examination and approved test, and all machines should be regularly inspected, especially after any serious damage or repair. Parts of machines in course of construction should be inspected and passed before being assembled.

(xii.) Two or three skilled mechanics for each squadron should be specially engaged for a time to act as instructors and to set a standard of technical workmanship.

(xiii.) In case of any serious accident, care should be taken to preserve and identify damaged portions of the machine which may help to account for the cause. It is desirable to obtain the assistance of the police authorities in this matter.

55. With regard to the machines already in use at Larkhill, the Committee recommend that they be carefully inspected by a skilled engineer, and, if necessary, modified so as to bring them as far as possible within the recommendations of this report, regard being had particularly to the points dealt with in clauses 20 and 32.

56. The Committee also desire to recommend that the following questions be specially referred to the Advisory Committee for Aeronautics for further investigation and report.

(a) The general question of the stability of aeroplanes.

(b) Detailed investigation of the strains and stresses in aeroplane wings, especially monoplane wings. Tests on the strength of wooden struts and beams as used in aeroplane work.

(c) Aerodynamic investigation of aeroplane wings designed to have sufficient strength without external bracing.

(d) Investigation into the strength of aeroplane fabrics, wounded and unwounded; and into the effect of the application of dopes and of exposure.

(e) Investigation of engine breakages.

(f) The methods of testing a complete machine and the test conditions to be fulfilled.

(g) Investigation into the conditions of the *vol piqué* in respect to monoplanes and biplanes.

In conclusion the Committee desire to place on record their high appreciation of the valuable services rendered to them in the course of their enquiry by their secretary, Mr. F. J. Selby. They wish also to thank those members of the staff of the National Physical Laboratory whose investigations have contributed so greatly to the elucidation of the causes of the accidents.

(Signed) R. T. Glazebrook (Chairman); A. E. Berriman; R. Brooke-Popham, Major; Spenser Grey, Lieutenant, R.N.; David Henderson, Brigadier-General; F. W. Lanchester; Mervyn O'Gorman; J. E. Petavel; F. H. Sykes, Major; F. J. Selby (Secretary).

FROM THE BRITISH FLYING GROUNDS.

Brooklands Aerodrome.

Bristol School.—Merriam was out on Monday morning last week for a solo, Mr. Archer then ascending for four straights, landing well each time, Lieut. Crawford Kehrman being also out for various solos. Messrs. Lane and Neville were both out for solos with fine figures of eight. The latter pupil's engine did not pull properly when at the bottom of the aerodrome, where the ground is rather unfit for landing, but nothing daunted, Mr. Neville made a clever curved *vol plane* to decent landing ground. This speaks well for the excellent system of teaching pupils spiral *vol plane* by the instructors at this school. Bendall out for a test of this engine, and finding same all right, Lieut. MacLean made a really good solo, with half right-hand turn.

After breakfast, Mr. Neville, who has progressed splendidly and flies excellently, ascended for a test of the conditions at his own request. This same pupil then set out for the tests for his certificate, which he passed in great style, finishing each flight with a *vol plane*, the second part of the test being carried out in quite a strong wind. The way in which this pupil took his *brevet* reflects great credit upon Messrs. Merriam and Bendall. Merriam out later for a test, then Lieuts. Blatherwick and Crawford Kehrman were both out for several straights, the rising wind stopping further work.

Merriam was out in the afternoon for solo, after which Lieut. Crawford Kehrman went for his first circuit, flying rather low, his second being rather better. Lieut. MacLean was up for a solo whilst Merriam was passenger to Lieut. Lee for six straights. Bendall again out for trial but wind much too strong.

On Tuesday, Merriam was out for test after wind had dropped, Lieut. Crawford Kehrman afterwards ascending for two good circuits, followed by Mr. Archer, who did several good right-hand turns. Mr. Lane was also up for a good circuit. Bendall made a test, and then Lieut. Crawford Kehrman made a couple of good circuits, and Mr. Archer carried out several fine figures of eight, this latter pupil being now almost ready for his *brevet*. Wind and rain prevented any flying after breakfast.

On Wednesday, rain and wind completely baffled all attempts at flying, and instruction was given in the hangars.

By 10 o'clock Thursday the fog had cleared somewhat, and

Merriam set out for test, Mr. Lane following with a solo, and Lieut. Crawford Kehrman for circuits. Mr. Archer practising for his *brevet*. Lieut. Blatherwick was away for four good straights, but fog caused work to be abandoned. Fog did not clear during the afternoon and outdoor work was impossible.

Rain and wind prevented flying all day Friday, and pupils were busily occupied on the machines in the hangars.

On Saturday Merriam was up for a solo, and then sent Mr. Lane for his *brevet*, but after completing figures of eight came down owing to wind being bad. Merriam later tested and then Mr. Archer set out for his *brevet*, but found the weather becoming too unfavourable and landed after completing half of the first part of the tests. Wind was too bad in the afternoon for flying.

Vickers School.—Barnwell was out Monday last week doing circuits on No. 5 mono. before breakfast. Knight and Barnwell testing No. 3 mono. Col. Hoskins doing several straights on No. 3. Tuesday, early in the morning, Maj. Cameron was out for the first time in a monoplane, doing some good straights on No. 3. Barnwell out Sunday on No. 5 before breakfast, solo, and then with a passenger behind. The extra weight made very little difference, the machine climbing to 1,000 ft. in less than 10 mins., with a 15 to 20-mile wind blowing. Rain prevented any flying in the afternoon.

Eastbourne Aerodrome.

On Wednesday, last week, there was no wind all day, but a thick fog prevailed in the morning and prevented any work being done before noon, when Fowler made his usual test flight. On cutting down he took up in turn Messrs. Roberts and Hassler for instruction and was up a considerable time with both of them. In the afternoon fog again stopped flying for some time but by 3.30 it had cleared off. Lieut. Minchin was out first and made a very good flight, his figure eights being particularly well judged. Second Lieut. Lerwill was also practising, flying very steadily at about a thousand feet. On Thursday the weather was not so fine but in the afternoon the wind went down sufficiently for Fowler to make one or two flights.

London Aerodrome, Collindale Avenue, Hendon.

Grahame-White School.—A heavy mist Monday, last week, prevented pupils from getting practice until the afternoon, when at 3.45 school instructor Manton took out Bayetto for passenger flight for 10 minutes, giving him instruction on No. 5, whilst Cheeseman was himself doing straights on one of the school monoplanes; later at 4.35 Manton was again out with Bayetto for 15 minutes. Two interested spectators then went for passenger flights with Manton, which terminated the day's work.

On Tuesday and Wednesday the now proverbial wet weather and strong wind prevailed with unwonted consistency, this confining pupils to the hangars. On Thursday, Bayetto came up at 10 o'clock, just as conditions were good and put in a lot of practice all day, as did Cheeseman, both on monoplanes, but owing to no biplane pupils turning up good opportunity for practice was thus missed. Manton was out with the school biplanes in turn keeping them up to scratch.

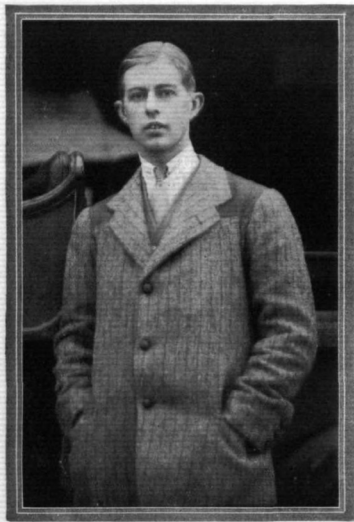
Very bad weather prevailed on Friday and Saturday and no practice was got in.

During the week some good exhibition flights were witnessed. On Thursday, although owing to the unsettled weather conditions the attendance was not large, those who spent the afternoon at the aerodrome were well rewarded. Manton was taking passengers and flying the *brevet* biplane, while Desoutter was on the 50-h.p. Blériot giving his usual fine demonstration of banking, terminating each flight with good landings, but owing to engine trouble was not able to make more than two flights; Cheeseman was flying a Grahame-White biplane circuiting the aerodrome for about a quarter of an hour. Sydney Pickles, who has now taken to the Handley Page monoplane, was testing his new 50-h.p. Gnome machine and, on this, his first flight with this type of machine, he made a very good show and seemed pleased with his new craft.

On Monday last, Mr. Verrier intended making a trip to Farnborough with another new Maurice Farman and was to have been accompanied by Mr. R. T. Gates, but owing to the direct head wind of about 40 m.p.h., it was decided to postpone the delivery until Tuesday, in the hopes of a following or less wind and thus avoiding being nearly four hours on the journey.

Blériot School.—The opening days of last week were foggy and sometimes windy in addition, but on Thursday morning, although there was an appreciable wind, the school was enabled to do some work before the wind became too strong. M. R. Desoutter was out doing good straights on No. 2, and Mr. Williams was at rolling practice and is making good progress.

Friday was windy but Saturday morning provided two hours of calm from 8 a.m., during which period MM. Teulade and Desoutter were enabled to put in some good work, the latter doing excellent



Mr. C. Neville, who took his *brevet* in very good form at the Bristol School at Brooklands on January 27th.

straights on No. 2 and the former, having been promoted to the *brevet* machine did a flight prior to attempting figure eights which, however, could not be attempted at the time owing to the increasing velocity of the wind.

British Deperdussin School.—Tuesday and Wednesday last week fog, wind and rain prevented all school work.

Thursday, Mr. Spratt in charge of school at 11 a.m. Mr. Valazzi circuits on No. 4 machine after Mr. Spratt had tested her. Mr. Whitehouse circuits on same machine followed by Mr. Spratt. Mr. Phelps straights on No. 3. Blowing hard all day again Friday so no school, but at 9 a.m. Saturday school opened under Mr. Spratt's supervision. After testing machine, flying two circuits, handed over to Mr. Valazzi, who had three turns of circuits each. Lieut. Hawker light half circuits on same machine. Wind rose about 11 and stopped further work. Rest of day wet. Sunday, Mr. Spratt made two circuits on No. 4, but found wind too bad for pupils, and on Monday it was blowing half a gale all day.

W. H. Ewen School.—Patchy is the best word to describe the weather conditions prevalent during last week at Hendon. On Monday afternoon a favourable spell was taken advantage of and Messrs. H. Stewart, E. T. Prosser and J. H. Torr were out practising on No. 2 monoplane under the instruction of M. E. Baumann. During the afternoon Mr. Ewen had out the 60-h.p. two-seater Caudron biplane on which he took up for a passenger flight Mr. J. R. Renwick, the Company's secretary, who was here on a visit from Glasgow.

Tuesday and Wednesday work was confined to the hangars, but on Thursday the school machines were again out. At 10 a.m. Mr. Lewis Turner went up for a test flight on the 35-h.p. Caudron biplane after which he handed the machine over to Lieut. M. W. Noel who made several good straight flights handling the little biplane with confidence and landing well. M. Baumann had out monoplane No. 2 and under his instruction Mr. J. H. Torr was making good progress in straights.

Work on Friday was again confined to the hangars on account of the unfavourable weather conditions, but on Saturday morning Mr. Lewis Turner had the school machines out at 7.45 a.m. After testing the air on the 35-h.p. Caudron biplane he handed the machine over to Lieut. M. W. Noel, who flew some very fine circuits at an average height of 300 ft. and finished up with a very well-judged landing. Lieut. McMillen and Lieut. Bayly were then out on the same machine, the former flying half circuits and landing nicely, while Lieut. Bayly was doing straights in good style. Mr. J. H. James was instructing Mr. J. H. Torr on monoplane No. 2, and the latter was making good progress in straights.

Salisbury Plain.

Bristol School.—Jullerot was first out on Monday last week, making a solo in an 80-h.p. Bristol monoplane, which he is flying quite well, going over Shrewton, Bulford, Netheravon and back. Conditions seemed too bad for pupils. England was giving tuition to Capt. Landon and Lieut. Vaughan. Jullerot also taking Capt. Landon on a biplane. Mr. Tod was out for useful practice taxiing in a single-seater monoplane. Jullerot was out for a test in the afternoon for ten minutes, the wind being fully twenty miles per hour. Later England and Harrison both made tests, but gusty state of the weather rendered it impossible for the pupils.

The rain was torrential all day Tuesday, and useful instruction was given the pupils in the erection of new machines and tuning up of others in the hangars.

On Wednesday, Jullerot was first out for a test on a tractor biplane, afterwards taking Capt. Landon for tuition on a biplane. Later out for a trial of the tractor biplane, then for a quick climb to 1,000 ft. in an 80-h.p. monoplane, and then again out with England as passenger in the tractor biplane. Jullerot took Capt. Landon for a flight in the 80-h.p. monoplane, England taking this same pupil in a biplane, afterwards going for a solo in an 80-h.p. monoplane, later taking Mr. Tower in the same machine. Lieut. Vaughan and Mr. Tower each made good solos in a biplane, Mr. Tod putting in some good practice in taxiing.

Harrison was first up in the afternoon, making a solo of half an hour in a 50-h.p. tandem monoplane. Jullerot took Lieut. Vaughan for a flight of half an hour reaching 1,200 ft. in an 80-h.p. Bristol monoplane. England took Col. Smeaton, who has returned to the school, in a biplane, Harrison taking Capt. Landon in another machine. Mr. Tower put up a good flight in a biplane, England finishing up the day's work by ascending to 1,000 ft. for 10 mins. in the 80-h.p. Bristol monoplane.

Fog was very thick all day Thursday. Jullerot made a flight in an 80-h.p. Bristol monoplane with Lieut. Vaughan as passenger but fog was too thick later for further flying. Fog cleared in the afternoon, but only to be replaced by a wind of quite 30 miles an hour, work having to be confined to the hangars.

On Friday one of the worst gales experienced for some time developed, the velocity of the wind being anything over 60 m.p.h.

Any thought of flying was abandoned, and things were kept very brisk in the sheds on the machines and motors.

Royal Flying Corps.—Owing to the unsettled weather, work has been mostly confined to sheds during the past week. On Saturday Lieut. Cholmondeley made a 14-min. trial on Maurice Farman 214, and afterwards took Lieut. Anderson for a 6-min. trip. Then Lieut. Anderson made two solo flights of 16 and 20 mins. duration respectively, after which Lieut. Cholmondeley made two more 20-min. trips, in one taking Serjt. Bruce up to a height of 1,800 ft. Major Brooke-Popham made a couple of trials on BE biplane 205, which flies a great deal better after its recent overhauling.

Shoreham Aerodrome.

Avro School.—Wednesday last week the 35-h.p. Green machine being temporarily hung up, Batty-Smith and Wynne-Roberts put in rolling practice on E.N.V. Avro 1. Thursday, the school bus being in order again, Batty-Smith was out several times during the day, getting used to the machine on the ground, as also was Wynne-Roberts. Wind too strong for pupils to attempt straight flights. Wet and windy weather all week-end put a stop to school work. On Tuesday of this week Simms had Iantoson engine machine out but could do no trade, on account of propeller trouble, although engine was running splendidly. Later, Powell took out the 60-h.p. E.N.V. machine in stiff breeze, the machine flying easily, having apparently regained its old form.

South Farnborough.

Royal Flying Corps.—Although expecting to start on the flight to Montrose any time now, the four Maurice Farman and four BE machines have, up to the present time of writing, been prevented from setting out for the long journey of five hundred odd miles through unsuitable weather conditions. Only a few air mechanics, however, belonging to No. 2 Squadron, now remain at Farnborough in readiness to follow up by road the moment the machines start for the North, the remainder of No. 2 Squadron, with all stores, &c., being already in their new quarters. The weather at Montrose is a sample of winter, which the men from Farnborough have seldom experienced here in the South, and work is welcomed as a means of keeping warm with the snow several inches thick over everything. General satisfaction rules with the report of the Special Committee appointed by the War Office to inquire into the recent "Army Air Tragedies," allowing monoplanes to be again flown by Army air pilots. Now that the lan has been officially removed, some fine flying will no doubt be witnessed with high-speed machines during the coming



Mr. E. R. Whitehouse, a pupil at the British Deperdussin School, Hendon, who obtained his Royal Aero Club certificate on the 35-h.p. Deperdussin monoplane on January 18th.

spring and summer. High-speed machines are certainly less affected by gusts in strong winds. The Royal Flying Corps is now in possession of its second 120-h.p. Cody biplane with which some fine flights have been made, both by Col. Cody himself and Lieut. Rogers Harrison, who handles the machine in the same masterly style as its designer and constructor, which is certainly saying a good deal. The new type of Cody biplane is constructed with the rudders placed in the slip stream of the propeller. Its manoeuvring qualities on the ground have thus been considerably improved, in fact the machine is capable under its own power of turning in a circle of less radius than its span, as anyone can vouch for, who have witnessed Cody handle his machine on Farnborough Common. The elevators are now placed slightly higher than in his previous machine, which was used in the Military Competition, and a slight increase of the dihedral angle in the planes has improved and increased the natural lateral stability of the machine.

Wednesday last week was misty, raw and cold. De Havilland, on BE 2, kept appearing and vanishing again and again in the mist which hung over the Common like smoke, and what glimpses one could occasionally get of the machine when at a low altitude showed that De Havilland was manoeuvring in his usual fine style. He also put one of the BE type of machine with staggered planes through some tricky turns during the morning. The Breguets belonging to No. 4 Squadron were also out, and Major Raleigh did some of the finest banked turns seen for some time on Farnborough Common. Taking things all round, however, there was not much flying last week, owing to weather conditions. Lieut. Herbert, on Maurice Farman 266, was out on Saturday morning for a 10-mins. trip round the aerodrome, and afterwards took up 1st Air Mechanic Baughan for a fine flight of about 30 mins., during which an altitude of 3,200 ft. odd was reached. The machine was out over Ewshott, and came over the Bleanheim Barracks at a fast pace. Cody was out at a good altitude over the same district, and was flying well. Sergt. Hunter, of No. 4 Squadron, was out also last week, handling the 100-h.p. Breguet in his usual style, and, when flying with the monoplanes commence, will no doubt be much heard of in the future as a pilot of high-speed machines. An accident which took place on Saturday with two of the Breguets belonging to No. 4 Squadron was rather exaggerated in the daily Press, and somewhat inaccurate reports appeared in several papers. This is to be deplored, as a statement of the true facts in the case of an accident to airship is certainly not to be objected to, and highly varnished and inaccurate accounts produce a false impression in the public mind. The establishment and organisation of aviation from a military standpoint, will make rapid strides once the public becomes firmly convinced of the actual necessity of the Empire possessing a well-trained and efficient air corps. Wrong impressions born of inaccurate reports of slight accidents are therefore to be deprecated in the interests of national security.

Airship Squadron.—Last week in misty weather the "Gamma" was out on Wednesday manoeuvring round the district. She was handled in a skilful manner and gives one the impression of being more useful than the exponents of "heavier-than-air-machines" care to admit. Some of the disadvantages peculiar to this type of aircraft appear to be, on second thoughts, outweighed by their better qualities, and the construction and equipment of small, handy dirigibles would by no means be a step in the wrong direction.

Upavon (Central Flying School).

Royal Flying Corps.—On Monday, January 27th, Maj. Gerrard, on Short biplane 401, up with Sergt. Spencer for tuition, 9 mins. Lieut. Bowhill then made flight of 12 mins. on same machine. Maj. Gerrard again took machine and gave tuition to Sergts. Spencer and Vagg, also instruction to Lieut. Oliver, Capt. Lithgow and Leading Seaman Ashton. On Short biplane 402, Lieut. Roupell made a flight of 20 mins., and Lieut. Bowhill two flights of 15 mins. each. On Maurice Farman 403, Lieut. Marix made a flight of 26 mins. and Lieut. Harvey one flight of 13 mins. On Maurice Farman 415, Maj. Trenchard made one flight of 19 mins., Lieut. Randall one flight of 22 mins. and Assistant-Paymaster Lidderdale a flight of 15 mins. Lieut. Harvey made three flights of 6, 9 and 11 mins. respectively on Maurice Farman 418. Then Lieuts. Marix, Warter, Boyle and Burroughs all made flights of 10 to 18 mins. duration on same machine. On Avro 404, Capt. Fulton made one flight of 8 mins. He then took over Avro 406 and made two flights of 8 mins. Lieut. Arthur made two flights of 17 and 30 mins. each on BE 416, Capt. Salmond a flight of 6 mins. on BE 417, and then Lieuts. Soames and Vernon flights of 17 mins. and 8 mins. with Capt. Salmond in the pilot's seat.

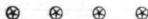
On Tuesday the weather was altogether unsuitable for flying.

Wednesday was a busy day, all machines doing a good amount of work. Maj. Gerrard took Capt. Lithgow on Short biplane 401 on to practice ground. Then Capt. Lithgow went for his *brexit* and in good style doing each series of eight and landing in exactly

18 mins. Sergt. Vagg received 5 mins. instruction from Maj. Gerrard on same machine. While Sergt. Vagg was practising landing his propeller hit a partridge, feathers being scattered in all directions. On Henry Farman 420 Maj. Gerrard made a flight of 6 mins. and Capt. Tucker one of 5 mins. Lieuts. Watkins, Uwin and Glanville each made a flight of 10 mins. duration on Short biplane 402, and then Capt. Tucker one flight of 10 mins. on same machine. On Maurice Farman 411 Lieut. Longmore gave tuition to Lieuts. Ross and Kennedy. Maj. Trenchard made a good flight of 25 mins. on Maurice Farman 415, and Assistant-Paymaster Lidderdale then took machine in the air for 13 mins. Master Mechanic O'Connor made a flight of 10 mins., and Lieut. Randall one of 18 mins. Air Mechanic Collis made a good flight of 40 mins. with Lieut. Kennedy as passenger. On Maurice Farman 425 Lieut. Longmore took a passenger for 12 mins. Capt. Millar made two flights of 10 and 11 mins. on Maurice Farman 418. Lieut. Conran two flights of 11 and 7 mins., Lieut. Boyle two flights of 12 and 10 mins., Lieut. Marix two flights of 12 and 16 mins., Lieut. Warter two flights of 7 and 4 mins., and Lieut. Harvey one flight of 11 mins. On Avro 404 Air Mechanic Higginbottom took Leading Seaman Marchant for instruction, being 95 mins. in the air altogether. On same machine, Capt. Fulton took Lieuts. Rathbone and Marks, for 15 mins. each, and Capt. Mellor on practice ground for 40 mins. Capt. Fulton took Sergt. Goodchild for instruction for 30 mins., and then Lieuts. Reed and Holt. Air Mechanic Higginbottom took Leading Seaman Marchant for 20 mins. instruction. Capt. Fulton again took over machine and took Lieuts. Littleton and Small for 20 mins. each. Air Mechanic Higginbottom then took Sergt. Goodchild for instruction 25 mins. Lieut. Arthur made a flight of 25 mins. reaching a good height, and Lieut. Burroughs one flight of 15 mins., both flights on BE 416. On BE 417 Capt. Salmond was very busy giving instruction to Lieuts. McDonnell, Vernon, Foigsworth, Burroughs, Gibson, Soames, and Dawin.

On Thursday and Friday there was no flying at all, a heavy mist hanging over the Plain on Thursday, and on Friday the wind was too strong.

On Saturday all machines were out again, Maj. Gerrard on Short biplane testing the air for 3 mins., then giving instruction to Leading-Seaman Ashton for 30 mins., and with Lieut. Oliver in the passenger seat for 30 mins. Lieut. Bowhill and Lieut. Uwin each made a flight of 15 mins. duration. Maj. Gerrard on Henry Farman 420 took Lieuts. Yorkston and McDonald for 10 mins. each. Capt. Tucker made two flights of 12 and 10 mins. each on the same machine. On Short biplane 402 Maj. Gerrard 5 mins., and Lieuts. Roupell, Glanville, and Bowhill each for 10 mins. Maj. Trenchard on Maurice Farman 425 made a good flight of 30 mins., and Lieut. Randall one flight of 37 mins. On Maurice Farman 411 Lieut. Longmore, with Lieut. Ross as passenger, for 38 mins., and with Capt. Salmond for 20 mins. Lieuts. Conran, Kennedy, and Ross, all made good flights of 20 mins. on Maurice Farman 415. On Maurice Farman 418 Lieut. Harvey made two flights of 13 and 20 mins. Capt. Millar made two flights of 13 mins. and 21 mins. Lieuts. Boyle, Marix and Conran all made good flights of 12 mins. duration. On Avro 404 Air Mechanic Higginbottom giving instruction to Leading-Seaman Marchant for 30 mins., Capt. Fulton with Lieut. Small 20 mins. Then Lieut. Small took machine and made two flights of 5 and 8 mins. on practice ground; Capt. Fulton with Lieut. Rathbone for 15 mins. Capt. Fulton with Sergt. Jarvis for 15 mins. Capt. Salmond on BE 417 tested air on Monday and found it too bumpy for instruction, so work confined to sheds.



Another Cody for British Army.

HAVING completed all the specified tests, including climbing 900 ft. in 3 mins., Col. S. F. Cody's new biplane has been taken over by the Army.

Badge for Military Airmen.

IN the February Army Orders it is announced that the King has been pleased to approve of a badge to be worn on the left breast above any medals or decorations by officers and men of the Royal Flying Corps. The badge will be of gilt metal, fastened with a brooch-pin for full dress and embroidered on blue cloth for service dress. It will be worn by military officers of the corps as long as they remain efficient pilots, and by non-commissioned officers and men as long as they remain efficient as first or second class pilots.

Crossleys for Royal Flying Corps.

AN order of which Crossley Motors, Ltd., are very proud, is that just received from the War Office for six 20-25-h.p. Crossley chassis which are to be fitted up for use with the Royal Flying Corps. Three Delahaye travelling workshops fitted with tools, &c., for aeroplane repair have also been supplied by Messrs. H. M. Hobson, Ltd.

STABILITY DEVICES.

By MERVYN O'GORMAN.

Paper read before the Aeronautical Society on Wednesday, January 29th, 1913, Brig. Gen. D. Henderson, D.S.O., C.B., in the Chair.

(Continued from page 127.)

13. The Wright Stabiliser, the "Doutre" and other more usual Speed Maintainers.—Among the known devices which purport to keep an aeroplane within its safe limits of speed we may name: (1) the Wright Bros.' automatic elevator control, (2) the "Doutre" (see Appendix), and (3) more important than either, the almost universally used longitudinal Vee, (4) the duck or "S" type aeroplane, (5) screw propulsion, (6) small fly-wheelage.

14. The Longitudinal V as a Speed Maintainer.—It is not usual to ascribe to the longitudinal V, open upwards between main and tail planes, the function of a speed maintainer, but that speed maintenance is one of the chief and most valuable effects of this disposition of planes has been elegantly shown by Mr. Alexander Stee in six steps, somewhat as follows:—

(a) If the speed falls off, the supply of supporting air fails, and the aeroplane comes downwards.

(b) Owing to this descent, the angle of incidence on the air is increased.

(c) The increase of angle of incidence causes the centre of total pressure of a Vee aeroplane to travel backwards, and gives rise to a diving couple.

(d) This dive having been started, the angle of incidence is thereby made normal again, but the travel being downwards, the machine accelerates.

(e) The speed being increased by the acceleration, the support derived from the air is increased, and the descent ceases.

(f) The descent having ceased, the angle of incidence is diminished, the centre of pressure of the whole travels forward, giving rise to a "nose-up" couple, which sets the aeroplane level again.

15. If the speed had at first increased instead of falling off as assumed at (a), the converse of all this is true. Thus, we find it helpful to restate the working of the Vee between main and tail planes by saying that an "aeroplane is guarded from risky longitudinal movement *not* when it opposes itself to any pitching, but, on the contrary, when it takes on by itself such pitching up or down as shall secure a constancy of speed 'within limits.'"¹ We may add that the more sensitively it responds, the less time is there for the speed change to be felt, the less the amplitude of the movements, and the less likely are oscillations to occur. The characteristic

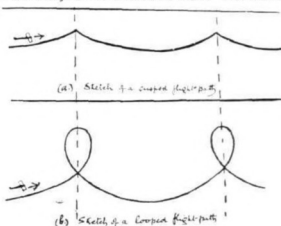


Fig. 3.

increase and decrease of speed of the two dangerous flight paths or phugoids (Fig. 3) (the cusped and the looped) are to be combated all along the line by a really good device.

16. The "Tail First" or "S" Type Aeroplane as an Improved Speed Maintainer has for some years been more particularly studied of the makers of small models, and I know of no effect of scaling up which precludes the belief that for large craft also the maintenance of air speed automatically is improved by the "duck" form, at least in horizontal gusts.

¹ Much on the lines of the Wright stabiliser is that described in Pat. 10474, April 29th, 1900. (Motorluftschiff.) The speed of the aeroplane is regulated by an elevator controlled by the air pressure acting on a membrane to steer up when speed rises and down when it diminishes.

² Whether this swing back is accompanied by oscillations or not, is, it will be observed, entirely overlooked in this—as was indicated in para. 1, p. 126.

³ Alternative methods of looking at this are to be found everywhere, e.g., the author's paper on Aircraft Problems. Proceedings Inst. Autom. Engineers, March 1911, p. 285, where the righting couples are calculated for various cases which have been kept simple by assumptions which are set forth.

⁴ I ventured in 1911 to call this "S" type after Santos Dumont, the originator, or at least, the first successful flyer with this type.

17. The small forward plane is the first to enter the region of altered air speed, and if the gust makes the air speed fall off, this plane dives in anticipation of the loss of air speed by the main wings. It thereby causes the main mass to rotate on an axis roughly parallel to and located somewhere near the main wing spars. This rotation of the main mass for a dive is effected the more quickly because it is accompanied by less air damping than the downward acceleration of the main mass itself.

(In the case of the "B" type or "F" type of aeroplane where the large mass is in front the damping is greater since the wing loading is necessarily less than that of the front plane of the "S" type.) I give 8 diagrams (Fig. 4) borrowed from the *Aerophile* of

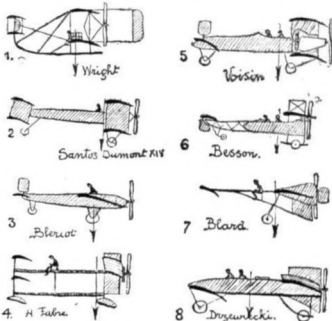


Fig. 4.—Diagrams of Duck or "S" Type Aeroplanes with Arrow to show the position of centre of gravity.

machines of this type which have flown, and in addition there are those of Mr. Curtiss, and those who follow in his earlier footsteps, Mr. Barber's Valkyrie, the R.A.F.'s aeroplane S.E. 1, the new Blériot Canard, &c. I see no objection to the type on the score of uncontrolled pitching.

18. In the opposite event of a head-on gust which increases the air speed for the moment, the front plane gets the extra lift first and quickly rises, tilting the aeroplane, and speaking colloquially, it checks an increase of air speed of the aeroplane by setting it forth for a climb.

It is probably because so much of the work of a model is effected with a small margin of power and so much gliding comes into the performance that the "duck" type has had so great a vogue with model makers. It was noticed at the Aero Show this winter that in France there is a recrudescence of the "duck" in the full-size machine just now. It may survive and I think it may even be important. If it fails it does so on other considerations than the above.

19. In paragraph 7 we have only regarded horizontal gusts, and the up and down directions of travel have been treated as the only remedies for speed fluctuations. The treatment is incomplete unless we can reckon with or utilise the effect of vertical gusts and engine speed variations.

20. Some merit may be found in relation to up-gusts in the "S" type. If we refer to the diagrams of "lift and drag" of wing shapes and select the wing shape for best efficiency for the main wings we may, I think, so choose the loading and wing shape of the front plane that it will be sensitive to changes of speed but less sensitive to changes of angle of attitude. This is possible because we can select with much freedom the angle of attack of the small plane when it is in front, whereas we are restricted to narrower limits of positive angle when the small plane is behind.

(To be continued.)

FOREIGN AVIATION NEWS.

Buc to Douai on a Farman.

OBEYING an order by General Hirschauer, the Marquis de Lareinty Tholozan started on his M. Farman, with a passenger from Buc on Monday at 11 a.m. and flying against a very gusty wind made his way to Douai where he landed at 1.10 p.m. The average height maintained was 1,000 metres.

2 hrs. 40 mins. Through the Rain.

DESPITE the strong wind and beating rain, Corporal Foulquier and Sapper Treille made a splendid trip on Monday on a 50-h.p. Henry Farman biplane from Rheims to Toul, the journey taking 2 hrs. 40 mins., which was very good considering the bad weather.

A Deperdussin Hydro at Nice.

FLIGHTS are made practically every day by Laurens on the Deperdussin hydro-monoplane which he has at Beaulieu-sur-Mer. On the 1st he took a lady passenger over to Nice, so that she might take part in the battle of flowers from above. Passenger flights are in great demand, and on Monday ten persons were taken up in the afternoon.

More Hanriot for French Army.

FOUR more Hanriot monoplanes have been bought for the French Army by the National Fund. They are to be called *Le Vétéran*, *Le Ventôse*, *Le Drapeau*, and *Le Jeanne d'Arc III*.

Long Flights on New Clement-Bayard.

ON the latest Clement-Bayard monoplane with 50-h.p. motor, Guillaux, on the 31st ult., made a flight of over an hour at Issy. Two days previously he made a similar flight at a height of 1,000 metres.

Touring on Blériots.

ACCOMPANIED by Mme. Giraud, M. Etienne Giraud, on the 30th ult., flew from Buc to Etampes via Rambouillet and Beaune, and later in the day returned to Buc over the same route. He was using the same Blériot monoplane on which he has made so many long trips lately.

Activity at Morane School.

ON Saturday last, the Russian pilot Efimoff was at Villacoublay, testing one of the height-record Morane monoplanes. Subsequently Audemars took delivery of and was flying one of these machines. Legagneux was testing a new 80-h.p. single-seater Morane which later was tried by Leon Morane and Brindejone des Moulinais.

Caudrons for China.

A DOZEN Caudron biplanes of the latest type have been ordered by the Chinese Government, some to be fitted with 50 h.p. and some with 80-h.p. engines. Obre has gone to China, where he will assist Lieut. Bon, of the French colonial forces, in organising an aviation centre at Peking.

At the Hanriot School.

ON Monday, Favre and Raulet each made a flight of an hour's duration on their Hanriot machines over the Betheny aerodrome, and later Favre took Lacomblez and Boyer for an excursion on the 100-h.p. three-seater to just by Bazancourt. "Biolo," returned from his Alpine trip, was testing several machines.

Testing a Farman Transport.

THE M. Farman biplane built for the Italian Government for carrying supplies was tested by Fourny at Buc on the 28th ult. With a load of 400 kilograms, it flew for over an hour at a height of 200 metres and made satisfactory landings on stubble, grass and ploughed land. With the same load it landed in a distance of 50 metres and got off in less than 75 metres.

Cross-Country on Farmans.

ON the 29th ult., Lieut. Combette left Etampes on his Henry Farman and flew over to Ablis, circled above the town and returned to Etampes. Marc went to Chartres where he had to wait until the rain gave over before returning, and Capt. de St. Quentin went over to Buc. Van Steyn made a flight of an hour and a half at an altitude of 900 metres.

Three Hours Across Country.

A FINE flight was made by Sapper Irat, who started from Villacoublay on a biplane at 11 a.m. on the 28th ult., and flying by way of Etampes, Pithiviers and Montargis landed just by the station at Auxerre at 2 p.m.

Vedrine Goes to Bulgaria.

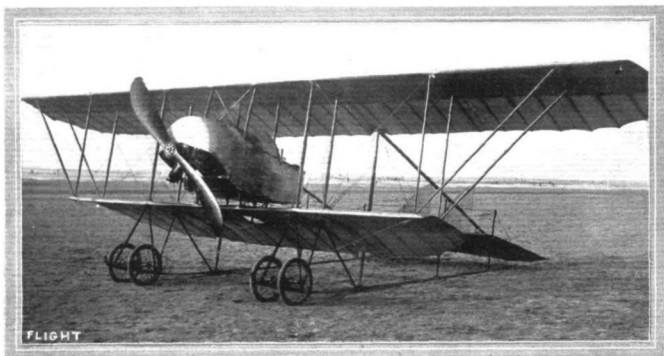
ON the 29th ult., Jules Vedrine left Paris for Bulgaria in order to deliver some Deperdussin-Gnome monoplanes. He expected to be away for three weeks.

Good Work on Borels.

LIEUTS. VERGNETTE and Ronin, on the 28th ult., each made a trial of over an hour's duration, at Buc, on their Borel machines. The next day Lieuts. Ronin and Personne flew from Buc to Epinal, in order to rejoin their *escadrille*, making a stop on the way at Mailly. One of the pupils at the school made a flight of over an hour.

Testing the Caudron Hydro.

RENE CAUDRON, at Crotoy, on the 28th ult., was busy testing a 70-h.p. hydro-aeroplane fitted with wheels as well as floats. With a passenger and full load it climbed 500 metres in ten minutes and landed on the sand. It subsequently went through tests of alighting on and rising from the sea in excellent style.



The latest Caudron Biplane, twelve of which have been ordered by the Chinese Government. It will be noticed that a cowl is now fitted over the engine, while the rudders are slightly different in shape. With 50-h.p. Gnome and 4½ hours' supply of fuel and oil, the machine climbs 500 metres in 5 mins., and a speed of 100 k.p.h. is guaranteed. The dimensions are: Span, top plane, 9'80 metres; bottom plane, 5'70 metres; length, 6'90 metres.

Fast Flying on a Caudron.

ON a 50-h.p. Caudron, Lieut. Le Bihan started from St. Cyr at 1.55 p.m. on the 28th ult., and at 3.25 landed at Crotoy, having made the trip at 110 kilom. per hour. Owing to the rain and the mist, he had to rely upon his compass for the greater part of the distance.

A Prize for Landings at Lille.

M. MONTIGNY, who is prominently identified with aviation at Lille and in the north of France, has offered a beautiful trophy to be awarded to the aviator who makes the greatest number of landings at Ronchin aerodrome, close by Lille.

Buc to Etampes on a Blériot.

ON the 29th ult., Capt. Faure started from Buc, and flew over to Etampes on his Blériot. A thick mist prevailed all the time he was flying.

A Long Reconnaissance.

IN very changeable weather Lieut. Vergnette, on the 30th ult., starting from Buc made a fine flight of two hours on his Borel machine, scouting over the country in the direction of Chartres and Rambouillet.

Marine Work in Austria.

ON the 24th ult. three Austrian officers, Banfield, Klobucar and Wosetschek, each piloting an hydro-aeroplane, flew from Pola to Trieste, a distance of 70 kilom., in 1 hr. 2 mins.

The Prince Henry Circuit.

FOLLOWING the example of Wiesbaden and Cassel, the town of Coblenz has offered £500 to the organising committee on condition that the competitors make a stop at the town, and this offer has been accepted.

New Law in Germany.

ON February 1, a new law affecting aircraft came into force, and it is announced that it will be rigorously enforced. It prohibits flying over explosive factories, petrol depôts, gas and similar works, high tension electric stations, Royal Palaces and parks, and fortifications (unless written authority has been obtained). It also prohibits flying over enclosures at race meetings, aviation competitions, public gardens and bathing places which are frequented by spectators.

A New German Naval Station.

A NEW station for hydro-aeroplanes is being started at Breitingen, a large sheltered bay between Warnemünde and Rostock, in Mecklenburg, which is a depôt for torpedo boats. The enclosed nature of the bay makes it a very suitable place for experiments with naval aircraft.

Fatalities in Italy and Germany.

GIUSEPPE NOSARI on Monday fell from a height of 100 feet while flying at the Mirafiori aerodrome near Turin, and received fatal injuries.

AT Aix-la-Chapelle on the 28th, Robert Hild fell with his machine from a height of 30 feet and was instantly killed.



The Blériot hydro-monoplane in flight over the Seine.

The German Motor Competition.

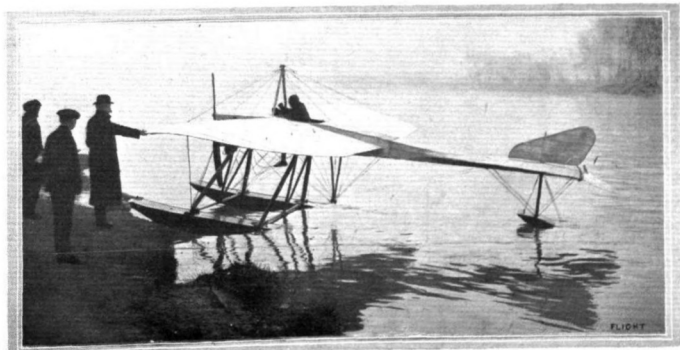
IT has been decided that the prize-giving in connection with the second competition for German aerial motors shall be held on January 27th, 1915. The prize-winners in the first competition received their awards from the Minister of the Interior on the 27th ult., and were invited by the Kaiser to be present at the gala performance at the Opera House in the evening.

Borel Hydro-aeroplanes in Italy.

ON the 31st ult., Chemet delivered a third Borel hydro-monoplane to the Italian Government. Before handing the machine over he made a flight of 130 kilom. over the sea with a passenger. On Monday took a dozen Italian naval officers for trips of varying duration above the Adriatic.

A Waterplane on Italian Warship.

THE Italian warship, San Marco, which has been sent to Turkish waters, has been equipped with one of the Paulhan-Curtiss hydro-aeroplanes which have been purchased recently by the Italian Government. The pilot appointed to the machine is Commander Filippi.



The new Blériot hydro-monoplane returning to its slipway after an experimental flight by Perryon. M. Blériot, its designer, may be seen holding on to the machine's left wing tip.

A FLOURISHING BUSINESS.

It is now some weeks since Messrs. Whiteman and Moss, Ltd., moved to new and larger headquarters at 15, Bateman Street, W., for their business in aviation and general accessories has grown to such proportions, that their old premises did not afford them sufficient room. A fortnight or so ago, one of our representatives called on Mr. William Moss, the manager of the firm, and had a very interesting chat with him relative to the work of the firm.

The conversation turned to the time before aviation was generally thought of, and he was rather surprised to learn that Mr. William Moss had the distinction of supplying the London General Omnibus Co. with their first motor omnibuses. That vehicle was driven by a twin-cylinder horizontal motor of Swiss manufacture, the agency for which Mr. Moss had previously obtained, and it plied between Hammersmith and Highbury Barn. Even previous to this, Mr. Moss was connected with the motor bus industry, for he managed the first service of public motor vehicles, a number of 54-h.p. tube ignition Daimler char-a-bancs, running between Cricklewood and Oxford Circus. Such good results did the London

was turned into a private limited company. Now their business is world wide. They supply fittings of all descriptions, to every part of the world where aeroplanes are made. Calling on Mr. Moss that morning, our representative found him looking out a batch of goods that had been wired for from Sweden. His firm's home trade is equally extensive, for they supply all the principal manufacturers in this country with the miscellaneous fittings, such as strainers, eyebolts, stranded cable, couloons, cable eyes, U-bolts, piano-wire, shock absorbers and the like.

Being shown the stores, it was understood why Messrs. Whiteman and Moss are able to supply almost any kind of fitting at a moment's notice. There, packed neatly on shelves, were several hundred pounds' worth of all manner of fittings. Wire strainers, were there in every size, from the tiniest used by modellers breaking at a strain of 165 lbs. to the heavy 6 in. *tendons*, used for the bracing of monoplane wings. The variety of fittings was surprising, for the firm do not only cater for motor and aeroplane supplies. "These little things," said Mr. Moss picking from an envelope two



Messrs. Whiteman and Moss, Ltd., new premises, showing one of the store rooms and offices.

General Omnibus Co. obtain with the vehicle that they shortly afterwards handed Mr. Moss an order for 12 of them, an order which was considered an exceptionally big one in those days.

His experience in the motor trade, especially concerning the running of these buses, brought home to him how difficult it was to obtain special screwed fittings, especially if metric threads were wanted. Severing his connection with motor buses he opened an establishment for dealing in such fittings. Shortly afterwards, in 1909, there commenced to be a demand for fittings for aeroplane construction, and Mr. Moss, fully awake to the possibility of the new industry, set himself out to supply, in addition, fittings that would be required in aeroplane manufacture. The business progressed rapidly, and in April of 1912, Messrs. Whiteman and Moss

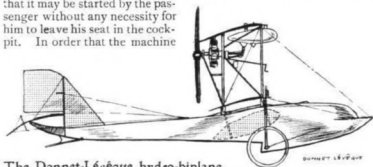
dozen or so little brass nuts between his thumb and forefinger, "we supply in large numbers to electrical instrument manufacturers." "Those screws there," he continued, indicating a box in the next rack "will eventually be used for assembling concertinas." In another part of the store, our representative was shown one of a number of envelopes, containing minute pivot points, turned from steel and afterwards hardened and polished. There were one thousand in an envelope that was little bigger than a tram ticket. Five pounds was the value of its contents. Mr. Moss attributes his success to the fact that every article he manufactures before it is placed on the market, is submitted to a severe testing at the hands of an independent firm of testers, Kirkcaldy's to wit. "That is why," he said, "we very rarely get complaints."

BRITISH-BUILT DONNET-LÉVÊQUE MACHINES.

The representatives of the Donnet-Lévêque Hydro-aeroplane Company in England, Aëros, Ltd., of St. James's Street, W., are, we learn, forming a company to manufacture these well-known water flying machines over here. On the Continent they have met with a considerable measure of success, as is evident by the fact that, not long since, eight of these machines were ordered by the Austrian Government. One was delivered some few months ago to the British Admiralty. From the number of machines built for water flying that will ultimately be required for the defence of our country's coast we feel inclined to think that the proposed company should enjoy good business in a craft of this nature. When all details have been settled we hear that they intend to commence operations by establishing works and a flying school at Shoreham.

Our sketch gives an idea of the general arrangement of the Donnet-Lévêque hydro-biplane. The float, which supports the machine on the water, is extended right back to the tail, so fulfilling the double purpose of float and fuselage. It is built throughout of mahogany, and, inside it is divided into a number of watertight compartments in order that, should the coque become punctured by coming into contact with any hard obstacle it will not become flooded out with sea water. A peculiarity in the construction of the coque is that the hydroplane surface is concave on the under side, a feature which makes it particularly efficient as a skimmer over smooth water. The planes of the machine are built up cellule fashion and are mounted above the body at about one-third of its length from the nose. High up between them the engine is mounted, driving direct a propeller

which, mounted in that position runs no risk of being broken by spray thrown up by the passage of the machine over the water. A special magneto and starting handle are fitted to the motor, so that it may be started by the passenger without any necessity for him to leave his seat in the cockpit. In order that the machine



The Donnet-Lévêque hydro-biplane.

may be capable of landing on land as well as on water a special form of disappearing wheelbase is fitted, which, after the machine has left the ground may be wound up out of action by a handle operating a drum, arranged conveniently within reach of the passenger. Although the machine is strongly constructed, yet it is of quite light weight, for the 50-h.p. model does not weigh more than 682 lbs., while the 80-h.p. machine turns the scale at only 836 lbs.



Edited by V. E. JOHNSON, M.A.

A 12-oz. Tractor Monoplane.

We publish this week particulars and scale drawings (kindly supplied us by Mr. A. B. Clark, Hon. Sec. of the South Eastern Model Club), of a rubber-driven tractor model of a somewhat heavier weight than those in general vogue. The model was partially constructed by Mr. J. H. Dollittle (who is well-known for his work in connection with this type of model), and completed by Mr. C. A. Rippon, the present owner and flyer of the model; both being members of the above-mentioned club. As Mr. Clark says: "twelve ounces is considerably in excess of the *average* rubber-driven model, and judging by the monthly reports in FLIGHT there appears to be only a few models (excluding, of course, power-driven ones), which exceed 10 or 12 ozs. in weight and which are actually capable of flying a fair distance and for a sufficient time to allow of careful observations being made."

If model flying is not indulged for purposes of observation and careful deductions therefrom, why trouble about it at all; we have more than once referred to the subject of the flying of larger models. In a postscript to his communication, Mr. Clark says: "I think we shall have quite a number of rubber-driven models in use in the S.E.M.Ae.C., weighing between 2 lbs. and 3 lbs., but details will not be available for some months." We certainly trust that such will be the case, and when details are available we shall be very pleased to publish them, for it is experiments with larger and

heavier models than those now in average use that are so much needed.

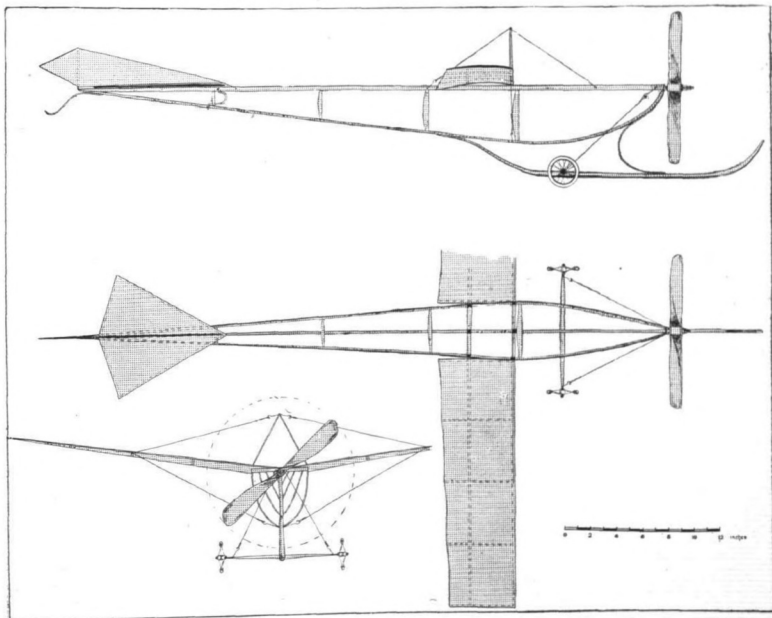
To return to our model: The *Fuselage* is 46 in. in length—the maximum depth and breadth is 4½ in. and is situated about 12 in. from the propeller bearing. The three main longitudinals are constructed of straight-grained silver spruce, and the distance pieces (or struts) are made of *yellow* bamboo (which is more reliable than the mottled). The joints are bound with strong thread and glued—being afterwards again bound with silk ribbon 0·5 in. wide.

The *Main-plane* spars are built of ash 1 in. by ½ in. section, and the ribs of birch ½ in. by ½ in. section. The ribs are joined to the spars by small pins or fretwood nails. The plane has a camber of about 0·5 in. near the centre with a gradual reduction towards the tips—the outside rib having a camber of only 0·25 in.

The trailing edges of this plane are flexible. The chord at the fuselage (centre) is 6 ins., tapering to 5 ins. at the tips.

The *Tail* is constructed of ½ in. × ½ in. cotton wood (should cotton wood not be procurable, straight-grained poplar can be used). It has a maximum chord and span of 15 ins. and 10 ins. respectively. This plane is laid quite flat on the top frame-members, and is wired in place.

The *Rear-fin* is made of 18 S.W.G. piano wire. The covering fabric used for all these surfaces is Hart's proofed silk. The main plane (and we presume the others as well) is only single surfaced.



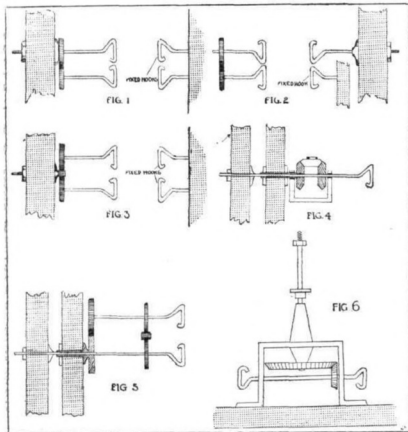
A 12-oz. Tractor Monoplane.

The *Tractor-screw* is 12 ins. in diameter and 18 ins. pitch—it is laminated, being built up of cotton wood. The one shown in the drawings is two bladed—but Mr. Rippon proposes to fit on a four-bladed one at an early date.

The *Landing-chassis* is of the simplest, but is found quite adequate in practice. The large central skid is composed of cotton wood reinforced on the underside with a strip of $\frac{1}{8}$ in. clock-spring. The semi-circular connecting place between the lower longitudinal and the central skid is also made of clock-spring. The bamboo axle is rigidly bound to the skid and has two radius wires on either side, one is clearly shown in the drawings, but the other is attached to the skid immediately beneath the propeller and joins the axle near to each wheel.

These wheels (of aluminium), are 2.5 ins. in diameter, they were supplied by Messrs. J. Bonn and Co., where a suitable tractor-screw can also be purchased.

The *Motive-power* is 14 strands of $\frac{1}{4}$ in. strip rubber (best quality) weighing 24 ozs. The number of turns given varies between 250 and 280, and the model is capable of making average flights of 90 to 100 yards. The best duration to date is 22 secs., i.e., 20 secs. power flight and 2 secs. glide—this refers to a hand-launched flight, the model so far not having been thoroughly tested for rising off the ground—on the few occasions when the model has been



Geared Rubber Motors.

so tried: the average duration of run before rising was 5 secs. No doubt with further tuning up both duration and distance will be improved.

The following weights may be useful: *Fuselage* (complete with chassis), 6.5 ozs.; main plane with *cabane*, 2 ozs.; tractor screw and shaft, 0.5 ozs.; tail plane and fin, 0.75 ozs.; rubber, 2.25 ozs.

Geared Rubber Motors. By F. MAYER.

As some exceedingly interesting and useful articles on rubber motive power for models have appeared in these columns, a few words on gearings for use with these motors may not be out of place. Having during the last five years made about 1,000 of these gearings of all sizes and forms for use with every form of aero model helicopter, with its 8-ft. screw, I can claim some knowledge of them.

To be of any use they must be well made and designed. Some of those offered for sale have ratios as high as 8 to 1, and the wheels are merely screwed on cycle spoke hoods. Needless to say, when any attempt is made to wind up the motor the wheels spin off the hoods. Geared motors get a bad name in consequence, yet I could mention many instances whereby the use of a gearing, an otherwise unsuccessful model has been made to fly, or its flights have been improved, and lengthened.

The following short descriptions and sketches of some different types of gearing, with their respective good and bad points should be of use to those who are not already familiar with them.

I. Parallel Gearings.

This type, Fig. 1, is perhaps the most useful, as it possesses many advantages over a single strand motor. It can be made with any number of strands; as a rule two strands are enough for models up to 4 ft. span, and three strands for models up to 6 ft. By its use more than twice the number of turns can be put into the motor, it also does away with the twisting of the motor-rod or *fuselage*, with its evil effect on the stability of the model; this is particularly noticeable in the single-tractor model. In the case of large bundles of rubber the outer strands get stressed much more than the inner ones. By using two smaller bundles this excessive stressing is partly avoided. Since this type of gearing practically does away with rubber torque, a lighter *fuselage* can be employed.

II. Series Gearing.

In this type, Fig. 2, the gearing is placed at the opposite end to the propeller and the fixed hook is placed by the side of propeller hook. This system can be used with advantage on scale models of Blériot, Farman, &c., as it allows a large number of turns to be got into a short length of rubber. In the case of tractor monoplane or biplanes, the rubber can terminate half-way along the *fuselage*, thus keeping the weight forward and allowing the planes to be fixed in a more forward position with a better resemblance to their prototypes.

III. Geared-up Type.

There are very few models on which this system can be used with any advantage (Fig. 3). Many model makers are under the impression that by gearing up the propeller it will run faster. This is not so, in fact it will run slower. Its speed in relation to the rubber will increase, but its revolutions per minute will decrease, owing to the power, or rather torque, having been divided in the process of gearing up. Those who wish to use this system should not try a gear ratio higher than 2 to 1.

IV. Concentric Spindles Gearing.

In this type, Figs. 4 and 5, two propellers are used, one being placed close behind the other, and usually running in the opposite direction. As will be seen from the rough sketches the back propeller fits on a sleeve which is a running fit on the spindle that carries the front propeller. The sleeve is rotated in the opposite direction to the spindle by means of the gearing. Fig. 4 is for use with one bundle of rubber and Fig. 5 for two bundles.

V. Vertical Spindle Gear.

This type, Fig. 6, is chiefly used by experimenters with helicopters, as it allows the vertical height of the model to be reduced. Both gearings shown in Fig. 4 and 5, are particularly adaptable to helicopters, by their use two large propellers can be run one beneath the other in opposite directions.

General Remarks.

In the rough sketches no attempt is made to show any method of mounting as this depends on the construction of the model. In mounting the wheels care must be taken that the teeth do not crowd or bind on each other. The best form of teeth is the involute.

Clock cogwheels as a rule are unsatisfactory for this purpose. Model makers who do not possess the necessary tools or skill should consult a firm who understand the requirements. I should be pleased to advise any model makers who wish to use any form of gearing on their models. A letter to J. Bonn and Co., Ltd., 97, New Oxford Street, will receive attention.

There is no doubt that the subject of gearings is a very important one and in the main we agree with Mr. Mayer's remarks, it is a subject, too, in which we have made many experiments and hope to make some more. Referring to "parallel gearings" we have not personally found it any advantage to split the rubber up into more than two strands, rather the reverse. How this might work out in the case of heavier models, i.e., models weighing between two and three pounds remains to be seen, the models we experimented with were about 10 ozs. Any geared-up type is absolutely useless.

Concentric spindles are of especial interest, and we know of two or three very successful models that have been built in this manner, it is well worthy of experiment. As Mr. Mayer says, the gearing must be of the correct kind and properly mounted, unless this is done, failure is certain. We have seen many geared motors which would just "not" fly their machines. Vaseline should be used as a lubricant for the cogs, not of course for the bearings.

Replies in Brief.

H. HUCKLE.—You do not state in your query for what type (hand-launched, r.o.g., &c.) of model you require the information asked for—it is impossible to supply it unless you do this. There is, however, considerable information re your second and third queries in recent back numbers of FLIGHT.

KITE AND MODEL AEROPLANE ASSOCIATION.

Official Notices.

British Model Records.

Hand-launched	Distance	...	A. E. Woolford	...	477 yards.
	Duration	...	A. F. Houlberg	...	89 sec.
Off ground	Distance	...	G. Rowland	...	230 yards.
	Duration	...	A. F. Houlberg	...	31 sec.
Hydro, off ground	Duration	...	G. P. Bragg-Smith	...	25 sec.
Single-tractor screw,	Distance	...	F. G. Hindley	...	173 yards.
hand-launched	Duration	...	F. G. Hindley	...	36 sec.
Do, off ground	Duration	...	H. R. Weston	...	21 sec.

Death of the President.—It is with great regret that we have to officially announce the death of our President, Col. F. C. Trollope (late Grenadier Guards), who died on Tuesday, January 8th, from pneumonia. He attended a Council Meeting of the Association on Thursday, 3rd, when the Council presented him with a small memento for the work he had done during his term of office. There is no doubt that he caught a chill on his way home from the office. He never went out again. He was buried, by the wish of Lord Kesteven, in the family vault at Tallington Church, Stamford, on Saturday, February 1st. Lieut. T. O'B. Hubbard, of the Royal Flying Corps, represented the Association. Col. H. S. Massy, C.B., and Col. J. Temple, late Superintendent Government Balloon Factory, represented the Association at a most impressive memorial service held at St. Thomas's, Orchard Street, W. He will ever be remembered for his work in connection with balloons and kites, as well as the work he has done in raising the War Kite Squadron, which he did not live to see equipped with their outfit, but it was his last wish to see the first squadron complete. It would therefore be a good memorial to him if his friends would fulfil his wish, by subscribing towards a section of the

squadron and name it after him. This is the memorial he himself would have liked. His personality will be greatly missed. The Council and members of the Association tender their sympathy to their late President's relations and friends in the sad loss they have sustained.

Aero Show.—The entries received to date of going to press (Tuesday, 4th) show that the Model Section will be the finest model exhibit ever arranged in the world. It includes French and Chinese entries, and it will be worth visiting the exhibition if only to see this section, which will show the scientific use of models. It is the object of the Association to prove and educate the public of their great use besides simply being a pastime or sport only.

27, Victory Road, Wimbledon, S.W.

W. H. AKEHURST, Hon. Sec.

MODEL CLUB DIARY AND REPORTS.

CLUB reports of chief work done will be published monthly for the future. Secretaries' reports, to be included, must reach the Editor on the last Monday in each month.

Sheffield Model Aero Club (35, PENKHYN ROAD, SHEFFIELD).

FEB. 10TH. Special meeting, 7 p.m., at Broomhead's Dining Rooms, Leopold Street. Every member should make an effort to attend. Flying every Saturday, weather permitting, at Standhouse aerodrome, Intake.

S Eastern Model Aero Club (1, RAILWAY APPROACH, BROCKLEY).

FEB. 8TH, at Kidbrooke, 2 p.m. to 5 p.m. Feb. 9th, at Blackheath, 7.30 a.m. to 10 a.m. Feb. 9th, at Lee Aerodrome, 10.15 a.m. to 12.15 p.m. Feb. 9th, at Mitcham Common, 2 p.m. to 3 p.m. Feb. 9th, at Chislehurst (cricket ground), 2 p.m. to 5 p.m.

THINGS WE SHOULD LIKE TO KNOW.

Shall we one day see policemen on point duty aloft? A correspondent in the *South Wales Daily News* says no airship or aeroplane ought to be allowed to fly without the consent of the police authorities.

Wouldn't it be rather sport to watch two or three police machines chasing a fast monoplane to inspect the pilot's licence.

Is there any particular reason why a lady should not blow her nose when at an altitude of 5,000 feet, if she wants to. And why should the desire be "prosaic."

Who says a lady cannot do more than one thing at a time. Miss Davies, in her recent flight with M. Legagneux, is stated to have held a pencil in one hand, and a height indicator in the other, when writing her notes in a pocket book.

Do pilots in general know just how their life insurance policies stand with regard to flying accidents. The coming action of Mrs. Mason v. The Ocean Accident Co. suggests that it would be better to get policies endorsed to cover these.

What's in a name? The pilot and passenger of the naval biplane which came down at Ninfeld are variously stated in the lay press as, Bobbet and Lea, Tobbett and Lee, and Balbiett and Leigh.

Is it necessary to have a game licence to kill partridges with a propeller. And won't Mr. Bendall find this rather an expensive sport.

Whether Mr. Grahame-White intends to remain long abroad, or is it just a "flying" visit.

Whether it is not a fact that the Dep. people have got something up their sleeve to surprise us with at the Show.

What is taking place at Portholme, and whether there is not quite a lot of material going up there just now.

CORRESPONDENCE.

The Aeros Inclino-graph.

[1717] With reference to the paragraph *re* our patent Inclino-graph, which appears in the last issue of your interesting paper, we should like to point out that the sectors are cast in aluminium, and that as our instrument varies the pressure of the circuit by introducing a resistance into the circuit, the indicator must be similar to a voltmeter, which measures the variation in the pressure of a circuit. Trusting you can find a small space in your paper for these corrections,

AEROS, LTD.,

E. C. MIDWINTER, Managing Director.

39, St. James's Street, S.W.

Stability.

[1718] Replying to Mr. A. R. Pearson's letter (1707) under this heading, Mr. Pearson's method of obtaining stability is so shrouded in mystery that it is difficult to form an opinion as to its possibilities. However, the right person to test the idea in its early stages is the inventor, not the N.P.L., unless he wishes to make a present of it to the public.

Is it a fact that a well-known propeller expert in this tight little island of ours designed a windstick which blew the aeroplane it was fitted to backwards.

Why did a certain pilot at Shoreham make such a magnificent pancake landing on Shrove Tuesday.

The date when the ban was officially taken off monoplanes, and what has occupied the time between that date and the date of publicity.

Whether the waiting game is only a good game when one holds trumps.

Have they a trump?

If, as stated, our aerial fleet consists of 13 machines or there about, and 8 are going to Montrose, won't there be a scramble for the "left overs," and suppose anything did happen "over there."

Isn't it a comfort to think it will be all right in a hundred years or so.

Did you know? A provincial paper says, "We are much behind in this country as regards military aviation. Other countries have given us the go by." Just fancy, now.

Re the collision at Farnborough, did the Hunter pitch into the Boar or the Boar into the Hunter.

Was it the sort we shall get one day if we don't wake up? The *Globe* says, "America's first aerial parcel post man carried a cargo of baked beans."

Whether the newly-arrived pupil at Brooklands who was given a joy ride the other day, and who, afterwards, in fun, was sent a bill for the same, has paid his two guineas yet.

"WILL O' THE WISP."

Working models of various sizes should be made and tested either by long glides or flights of several hundred feet.

The invention can be provisionally protected for six months at a cost of 20s., which should allow ample time for approaching aeroplane companies.

An ounce of influence from the "authority" cited would be worth a pound of his good advice.

The concluding paragraph of Mr. Pearson's letter is illogical. There is no reason why an infinite number of methods should not be "sound."

"AEROLITE."

Balancing a Glider.

[1719] I am constructing a glider of my own design, and I should be pleased if any reader could settle the question whether it should be fitted with ailerons or balancers between the planes on each side and in a line with the leading edge of the planes, or whether it is preferable to place them at the rear edges of the planes, as in the Farman aeroplanes.

Canterbury.

E. SIMS.

[Other Correspondence and the continuation of "Aeronautical Engines" held over.—Ed.]

