

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.

Air Raids and Internment.

At last the Government have taken heed of the writing on the wall. Even as our last issue was publishing, in which we advocated the internment of alien enemies forthwith, both as a protection to themselves and as an effective preventive of co-operative action on their part, should the Germans carry through a successful air-raid on London, the Cabinet was, in Parliament, announcing their decision to put this very natural and necessary measure into force. Although the none too early steps which are being taken, leave the question of naturalised enemy-born subjects pretty widely open, it is something achieved to have brought the unattached army of enemies in our midst into safe keeping. That it should have been necessary, however, before those in authority could be brought to move, for the regrettable mob-law scenes to have been perpetrated by the public, which have in a measure disgraced our better reason, is suggestive of there being a good deal in the accusations which have been so widely circulated, as to the bias of certain members of the Government, both in their personal views and in their anxiety for many wealthy friends of "the party." This is no time for party politics, or for consideration of any individuals, however highly placed they may be. There can be but one aim and that the winning of the war. The long

made suggestion of a Coalition and National Government which appears this week to be bearing fruit, will, it is hoped, make the path easier, whereby any weak spots in our armour may be speedily eliminated and our enemies left to take their own chances on land and sea and in the air. There can then be little chance of "inside" help under the new conditions, and the conduct of our share of the war may be all the better for the precautions. What an army of Germans has been free in our midst, may perhaps be gauged from a statement which has been made by one of the irreconcilables, to the effect that the delay in attacking London by Zeppelins has mainly been for fear of killing the thousands of Germans scattered all over the Metropolis! By the way German militarism has sacrificed its own people during the hopeless land attacks which they have made, we hardly think the powers that be would have much consideration for the lives of their citizens in Britain if they thought they could instil the fear of God into the breasts of London's millions. But the fact remains that such a suggestion can be made by reason of the enormous colony of alien enemies residing in the heart of our Empire. Although the Marquis of Crewe, speaking in the House of Lords on Tuesday upon the subject, said that the military authorities attached no great importance to the statement that in the event of an aircraft attack being made in London, it would be possible for untrained enemy aliens, in pursuance of some secret organisation, to combine for purposes of incendiarism or some form of attack, we think that there is at least less risk of the military authorities having to change their opinion presently, if all the possible German patriots over here are safely under lock and key. No doubt the taste of counter-attack which the visitors last Monday morning received may remind them that they must not expect to continue to have things all their own way. Certain well-known centres of our aerial concentrations are no doubt well known to the Zeppelins. There are, however, others, of which they know little or nothing, and the recent raids have without much question been, amongst other objects, aimed at drawing our fire, so that they may map out a reasonably safe course for their long-promised massed air attack. So far their efforts in this direction have met with scant success, so that when they come with their great air fleet, they should meet with so warm a reception that they are not all likely to get clear again of this little Island, even with tail down. Their latest "Nebel-

bomben" scheme, has some possibilities in it, but in this connection we must be content to wait and see. That a few of these new time-fuze fog bombs are capable of diffusing their chemical contents in dense clouds of smoke over an area of some 20 kilometres square, or every 20 sq. kiloms., and form so thick a fog screen as to completely cloak the movements of half a score of the biggest Zeppelins, we beg leave to doubt. Even if the anticipations in this direction are in part realised, we fail to see that it should afford such complete protection, as to preclude operations upon our part. It may be assumed that, if it be possible, these would-be rulers of the universe will see that such combinations of chemicals are present in their air bombs as to render the artificial clouds poisonous as well as the vision-proof. We shall, in spite of all this and of the evil prophecies, look forward to such effective work by our home air-defences as to render any big incendiary air-attack an event of which those of the enemy who survive will have good reason to remember for all time.

In the meantime, the visits of the German dirigibles to Ramsgate and other south coast towns on Monday

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The Roll of Honour.

THE following casualties have been officially announced by the Secretary of the Admiralty:—

Under date May 11th:

Killed.

Flight Sub-Lieutenant Harold J. Batchelor.

Under date May 14th:

Missing.

Lieutenant-Commander Hubert Dolell, R.N.V.R.
Probationary Flight Sub-Lieutenant John O. Groves, R.N.A.S.

The following casualties have been officially announced by the War Office:—

Under date May 9th:

Wounded.

Second Lieutenant W. L. Robinson, Worcester Regt., attached R.F.C.

Under date May 10th:

Killed.

Second Lieutenant Hon. W. F. Rodney, Rifle Brigade and R.F.C.
Lieutenant C. B. Spence, Royal Field Artillery and R.F.C.

Died of Wounds.

Capt. A. G. Fox, Royal Engineers and R.F.C.

Wounded.

Lieutenant H. F. Glanville, West India Regt. and R.F.C.

Missing.

Lieutenant F. H. Eberli, Royal Field Artillery and R.F.C.
Lieutenant S. A. Sanford, 7th Dragoon Guards and R.F.C.

Under date May 11th:

Missing.

Lieutenant D. Corbett Wilson, R.F.C.
Second Lieutenant L. M. Woodlark, Lincolnshire Regt., attached R.F.C.

According to a Reuter message from Paris on May 18th, Lieut. Braithwaite met with an accident at Auffargies, near Versailles, his machine falling to the ground. He received serious injuries, from which he died in hospital.

Gibraltar Presents an Aeroplane.

THE following announcement was issued by the Secretary of State for the Colonies on Wednesday:—

"On the suggestion of the Gibraltar Chamber of Commerce and Exchange Committee, as representing the civil population of the Colony, a sum of £2,250 has been presented to the Army Council by the Government of Gibraltar, to be devoted to the construction of a military aeroplane."

have a special interest of their own. They have "made history," in a sense, as one of them was concerned in a regular air-fight with British naval planes, after having been chased off these shores by our home "hornets" from the Eastgate and Westgate stations. This the first officially recorded aeroplane *versus* airship fight, was described in the Admiralty announcement subsequently issued, in quite thrilling terms, having regard to official documents as usually presented. Thus another little Jules Verne phantasy has been marked off as reality for inclusion in the world's history of progress—or the reverse.

As to the firing of one of the compartments of the airship, and her subsequent quitting of the scene "tail-down," this raises a point of very great interest. If by "compartment" one of the ballonets is meant, an advance of vast import must indeed have been made by the Zeppelin builders, if this upon ultimate investigations is found to be a true bill. But again in this case, we are inclined to withhold comment, preferring to "wait and see," if coming events are capable of supplying corroborative evidence of so remarkable a phenomenon.

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More Aeroplanes from Overseas.

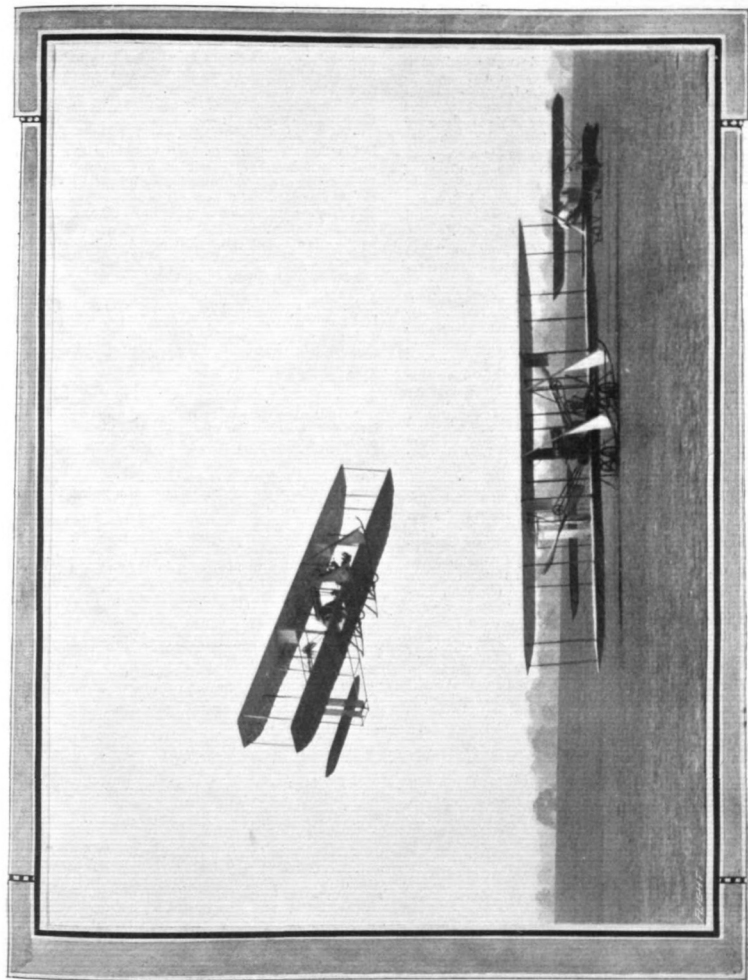
By way of celebrating Empire Day in a practical manner this year, the members of the Overseas Club, of which H.M. the King is patron, have presented an aeroplane of the latest type to the Royal Flying Corps. A sum of £1,500 has been handed to the Secretary of State for War by the Central Committee of the Overseas Club, and the gift has been gratefully acknowledged by the Army Council. Some 5,000 members of the organisation in all parts of the world outside the British Isles have sent in contributions, and Overseas No. 1, as the machine is to be called, forms a concrete expression of the admiration which Britons overseas feel for the splendid deeds of our flying officers in the present war. The machine, we understand, makes its first flight this week, and it is hoped that before long it will be on active service.

It is hoped that a second machine will be provided shortly and a scheme is now proposed for certain sections of the Empire to be responsible for the provision of an aeroplane to bear its name.

Nova Scotia has already promised its support, and having received several substantial amounts, the Halifax N.S. branch of the Overseas Club is inviting donations from Nova Scotians to enable the sum required to be completed as soon as possible. Subscriptions may be sent to the various branches of the Royal Bank of Canada. All those who have friends overseas likely to help on the scheme are asked to write for collecting sheets and propaganda matter to the Overseas Club Headquarters, General Buildings, Aldwych, London, W.C.

Police Precautions Against Aircraft Raids.

LOCAL authorities in London have received from the Commissioner of Police a letter in connection with the measures to be taken in the event of hostile attacks by air. The Commissioner points out that if bombs are dropped on buildings the latter may collapse entirely, but they are more likely to remain in a shaken and dangerous condition, and in that case the occupants would be removed, and all traffic stopped in any thoroughfare adjacent to guard against the risk of walls collapsing on passers-by. He therefore asks if the Borough Councils could supply the police with the tripods and poles ordinarily used for preventing traffic from entering roads which are under repair.



AT THE BEATTY SCHOOL, HENDON.—Mr. Roche-Kelly on a Beatty-Wright "jumping" over a similar machine on the ground.

AIRCRAFT WORK AT THE FRONT.

OFFICIAL INFORMATION.

THE following announcement was made by the Admiralty on Monday afternoon :—

"The Zeppelin that attacked Ramsgate early this morning was chased off by Eastchurch and Westgate machines as far as the West Hinder Lightship. When off Nieuport she was attacked by eight naval machines from Dunkirk. Three machines were able to attack her at close range by fire. Flight Commander Bigsworth dropped four bombs when 200 ft. above the airship. A large column of smoke was seen to come out of one of her compartments. The Zeppelin then rose to a great height, 11,000 feet, with her tail down, and is believed to be severely damaged. All our machines were exposed to a heavy fire from the Zeppelin. No casualties."

In the despatch dated May 11th from an "Eye-witness" present with the British General Headquarters, there was the following :—

"During the day, May 9th, also, our aeroplanes attacked several points of importance. One of our airmen who was sent to bomb the canal bridge near Don was wounded on his way there, but continued and fulfilled his mission. Near Wytschaete one of our aviators pursued a German aeroplane, and fired a whole belt from a machine gun at it. The Taube suddenly swerved, righted itself for a second, and then "nose-ended" from a height of several thousand feet straight to the ground. On the other hand, a British machine was unfortunately brought down over Lille by the enemy's anti-aircraft guns, but it is hoped that the aviator escaped."

"Allusion has already been made to an absurd story printed in the *Frankfurter Zeitung* of December 18th, according to which one Erich Callies, volunteer, in hospital at Leipzig-Plagwitz, stated that when a prisoner of war with the British he had been forced to make flights on an aeroplane, to identify the German troops, and to throw bombs upon them. Lies die hard, however, and this one has cropped up again in another form. A vague statement to the same effect has been officially circulated amongst some of the British officer prisoners in Germany, and those of the Royal Flying Corps have been warned that any recurrence of this—imaginary—behaviour on the part of their comrades will entail severe measures being taken against those in captivity."

"It is difficult to say whether the authorities in Germany really believe that we have been taking prisoners up in aeroplanes or whether they are merely making use of the newspaper article as an excuse for future ill-treatment of our officers."

In the despatch dated May 14th from "Eye-witness" there was the following :—

"On the same day (Monday, 10th) one of our airmen had a thrilling experience. He was alone in a single-seater aeroplane, in pursuit of a German machine. While trying to reload his machine-gun he lost control of the steering gear, and the aeroplane turned upside down. The belt round his waist happened to be loose, and the jerk of the turn almost threw him out of the machine, but he saved himself by clutching hold of the rear centre strut—the belt slipping down round his legs. While he hung thus, head downwards, making desperate efforts to disengage his legs, the aeroplane fell from a height of 8,000 ft. to about 2,500 ft., spinning round and round like a falling leaf. At last he managed to free his legs and reach the control lever with his feet. He then succeeded in righting the machine, which turned slowly over, completely "looping the loop," whereupon he slid back into his seat. This constitutes a record, even in a service where hairbreadth escapes are of daily occurrence."

"There have been many duels in the air which have invariably resulted in our favour, several German machines having been brought down either by our aeroplanes or anti-aircraft guns. A few of our machines have also been hit and forced to descend, though this has not been brought about by the enemy's airmen, but by gun and rifle fire from the ground."

In the official *communiqué* issued in Paris on Sunday evening there was the following :—

"We captured more houses in the northern part of Neuville, and blew up a German captive balloon to the east of Vimy, while our aeroplanes bombarded the station of Somain."

In an official statement issued in Cetinje on May 15th it was stated :—

"An Austrian aeroplane flew over the Montenegrin positions on Mount Lovtchen and threw six bombs, without, however, doing any damage."

THE BRITISH AIR SERVICES.

UNDER this heading are published each week the official announcements of appointments and promotions affecting the Royal Naval Air Service and the Royal Flying Corps (Military Wing) and Central Flying School. These notices are not duplicated. By way of instance, when an appointment to the Royal Naval Air Service is announced by the Admiralty it is published forthwith, but subsequently, when it appears in the LONDON GAZETTE, it is not repeated in this column.

Royal Naval Air Service.

THE following appeared in the Admiralty announcements of the 13th inst. :—

The following temporary Lieutenants, R.N.V.R., have been promoted to the rank of temporary Lieutenant-Commanders, R.N.V.R. : B. Kerr and A. Congreve. To date April 27th.

The following temporary Sub-Lieutenants, R.N.V.R., have been promoted to the rank of temporary Lieutenants, R.N.V.R. : A. Hansford, J. F. Hedley, and E. N. G. Morris. To date April 27th.

The following have been entered as probationary Flight Sub-Lieutenants and appointed to the "President," additional, for R.N.A.S., to date as stated : C. C. R. Edwards, May 17th ; N. G. H.

Sturt, May 12th ; as well as N. Blackburn and C. C. Wyllie, for temporary service, to date May 17th.

Capt. Royal Flying Corps, W. F. MacNeece transferred to R.N.A.S. as Flight Lieutenant, and appointed to the "President," additional, for R.N.A.S. To date April 19th.

Flight Sgt., R.F.C., H. MacGrane transferred to R.N.A.S., as Warrant Officer, Second Grade, and appointed to the "President," for R.N.A.S. To date May 19th.

The following appeared in the Admiralty announcements of the 14th inst. :—

Temporary Sec. Lieuts. T. A. Moncton and R. V. Southwell granted temporary commissions as Lieutenant R.N.V.R., and appointed to the "President," additional, for duty with R.N.A.S. To date May 12th.

T. C. B. Hoake and C. F. Abell entered as Lieutenants R.N.V.R., and appointed to the "President," additional, for duty with R.N.A.S. To date May 13th.

T. S. Sharatt entered as Sub-Lieutenant R.N.V.R., and appointed to the "President," additional, for duty with R.N.A.S. To date May 13th.

The following appeared in the Admiralty announcements of the 17th inst. :—

Temporary Lieut. (R.N.V.R.) I. Fraser, promoted to temporary Lieutenant-Commander, with seniority of May 13th.

Temporary Sub-Lieuts. (R.N.V.R.) H. G. Squires, A. L. Rogers, J. W. Lintott, and A. H. Protheroe, all promoted to temporary Lieutenants, with seniority of May 13th.

Chief Petty Officer A. S. Hellawell, promoted to Warrant Officer (Second Grade), for temporary service, with seniority of May 14th, and appointed to "President," additional, for R.N.A.S.

C. C. Carlisle and V. Nicholson have been entered as Probationary Flight Sub-Lieutenants, for temporary service, with seniority of May 16th, and both appointed to "President," additional, for R.N.A.S.

The following appeared in the Admiralty announcements of the 18th inst. :—

The unmentioned have been entered as Probationary Flight Sub-Lieutenants for temporary service, and appointed to the "President," additional, for R.N.A.S., to date as stated: O. Butcher and H. E. Crawford, May 17th, and N. V. Wrigley, May 24th.

The following appeared in the Admiralty announcements of the 19th inst. :—

Flight Sub-Lieut. (acting Flight Lieut.) G. H. Scott, specially promoted to the rank of Flight Lieutenant, with seniority of May 4th.

Temporary Sub-Lieut. (R.N.V.R.) P. C. D. Douglas, transferred to R.N.A.S., as Probationary Flight Sub-Lieutenant, for temporary service, with seniority of May 15th, and appointed to "President," additional, for R.N.A.S.

Temporary commissions have been granted as follows: C. F. Pollock as Flight Lieutenant, with seniority of April 15th; D. Gordon and G. H. Major, as Lieutenants (R.N.V.R.), with seniority of May 18th; F. H. Mitchell, F. A. Baldwin, and V. E. Dean, as Sub-Lieutenants (R.N.V.R.), with seniority of May 18th, and all appointed to "President," additional, for R.N.A.S.

G. Weaver entered as Warrant Officer (Second Grade), with seniority of May 18th, and appointed to "President," additional, for R.N.A.S.

Royal Flying Corps (Military Wing).

The following appeared in a supplement to the *London Gazette* issued on the 13th inst. :—

Flying Officers.—April 30th, 1915: Lieut. Gerald Allen, Connaught Rangers, and to be seconded; Lieut. Charles C. Darley, R.A., and to be seconded; Second Lieut. Louis W. Yule, Special Reserve; Second Lieut. Vyvyan A. H. Robeson, Special Reserve; Second Lieut. Melville R. H. A. Allen, Special Reserve.

Assistant Equipment Officer.—Second Lieut. D. J. MacDonald, North Scottish R.G.A., T.F. May 1st, 1915.

Supplementary to Regular Corps.—Second Lieutenant (on probation) Frederick H. Jenkins is confirmed in his rank.

The following appeared in the *London Gazette* of the 14th inst. :—

Flying Officers.—April 28th: Capt. D. W. Fowell, Northants, and seconded; Second Lieut. H. K. Nicholl, S.R.; Second Lieut. A. R. H. Browne, S.R.; Second Lieut. H. MacD. O'Malley, S.R.

Supplementary to Regular Corps.—Second Lieutenants to be Lieutenants: April 24th: W. B. Rhodes-Moorhouse (since died of wounds), H. Blackburn, W. C. Adamson, H. C. Tower, M. B. Blake, Hon. W. F. F. Sempill, Master of Sempill; R. M. Pike, E. F. Norris, M. McEl. Bell-Irving, G. C. N. Nicholson, F. W. Polehampton (since killed in action), E. G. S. Walker, M. G. Christie, E. E. Hodgson. Second Lieutenants (on probation) confirmed in rank: A. R. H. Browne, H. K. Nicholl, H. MacD. O'Malley, and C. H. Pixton.

The following appeared in a supplement to the *London Gazette* issued on the 17th inst. :—

Supplementary to Regular Corps.—Second Lieutenants (on probation) confirmed in their rank: Hamilton S. Coles, L. W. F. Turner. Donald A. L. Davidson to be Second Lieutenant (on probation); April 30th, 1915.

The following appeared in the *London Gazette* of the 18th inst. :—

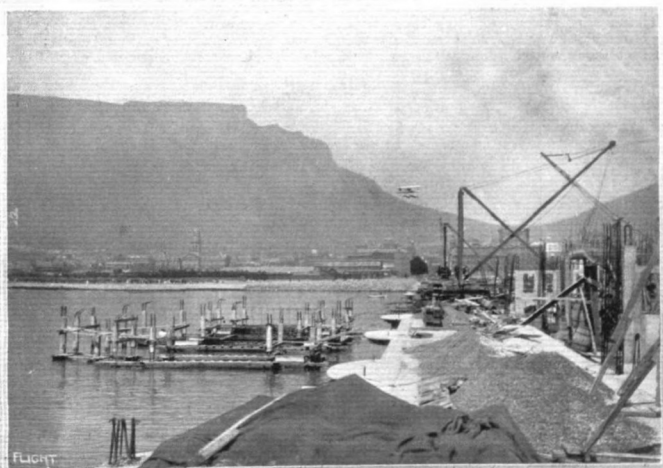
Flying Officers to be Flight Commanders. — Capt. H. C. MacDonnell, R. Irish; April 27th. Second Lieut. R. M. Pike, S.R., and to be temporary Captain; May 4th.

Flying Officers.—April 12th: Second Lieut. C. D. Fuller, S.R.; Second Lieut. J. C. H. Barfield, S.R.; Second Lieut. L. A. Tilney, D. of Lancaster's Own Yeos, T.F.; Temporary Second Lieut. O. G. Hake, 12th Hants., and transferred to General List.

Central Flying School.

The following appeared in the Admiralty announcements of the 17th inst. :—

Flight Sub-Lieut. C. E. Wood, to be lent to the Central Flying School, as Assistant Instructor.

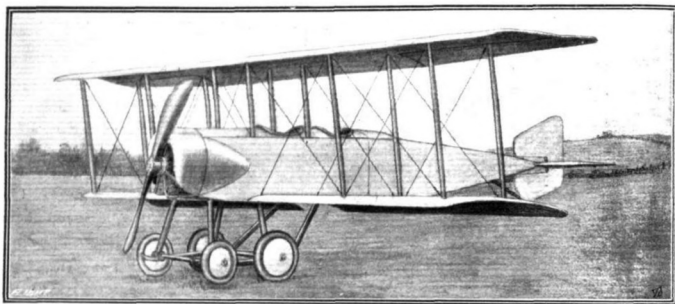


FLYING OVER THE PROMENADE AT CAPE TOWN.—A reminiscence of the work in South Africa of Mr. Compton Paterson.

THE SLOANE TRACTOR BIPLANE.

ANOTHER American firm which has produced a tractor biplane on more or less standard lines for military purposes is the Aircraft Company, of New York, U.S.A., the manufacturers of the Sloane aeroplanes. The main planes, both in design and construction, are similar to

two parts, and is attached to the lower longitudinal of the body. A pair of balancing flaps, each 10 ft. span, and of greater chord at the tips, where they are slightly upturned, are hinged to the rear spar of the upper plane only. The gap is 6 ft., and the supporting surface is

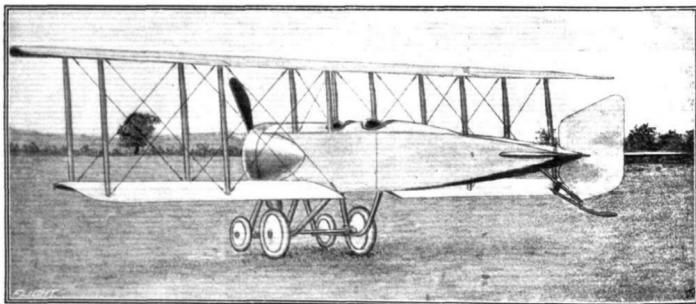


THE SLOANE TRACTOR BIPLANE.—Three-quarter view from the front.

those obtaining in monoplanes, and have the popular Morane-Saulnier plan form. The front spar, which measures $2\frac{3}{4}$ ins. by $1\frac{1}{2}$ ins., is situated some 10 ins. from the leading edge, whilst the rear spar is 1 ft. 8 ins. from the trailing edge, so that there is a fair amount of flexibility. Ash and spruce are employed in the building up of the frame, all joints being securely mortised. The frame is internally braced with heavy wire and covered with unbleached linen doped with Naiad aero varnish. The

400 sq. ft. A divided elevator of the Morane-Saulnier type and a balanced rudder make up the tail.

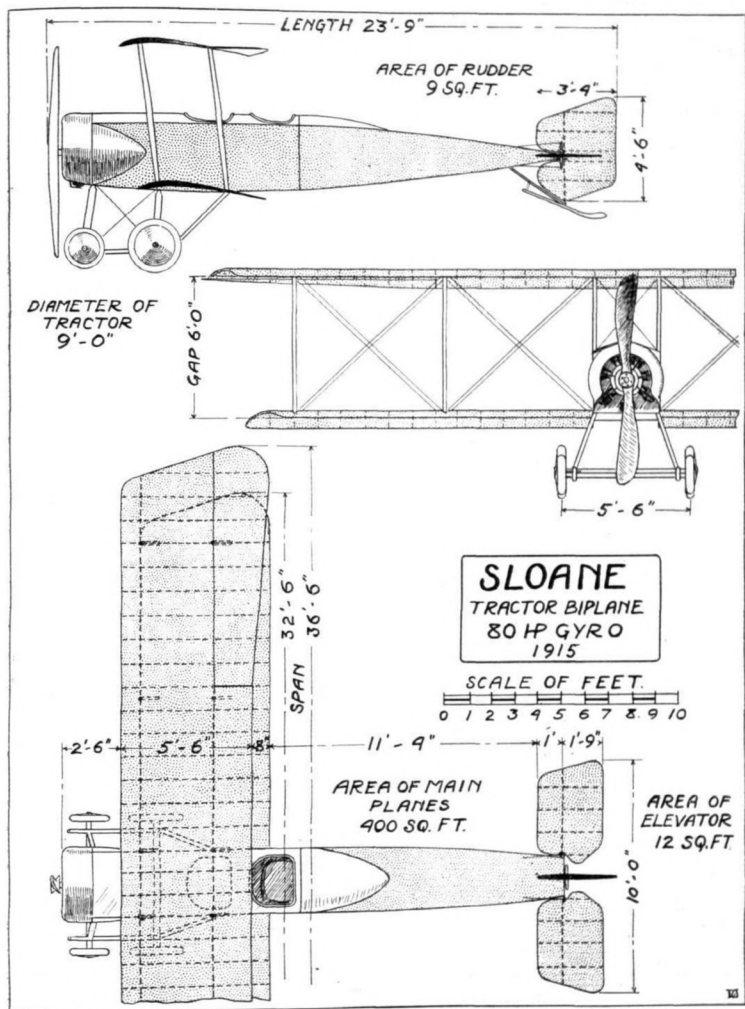
The body is of rectangular section tapering to a horizontal knife-edge at the rear. It is built up of four ash longitudinals, $1\frac{1}{4}$ ins. square in front tapering to 1 in. square at the rear, and braced by eight sets of struts joined by clamps which have been specially designed to obviate any weakening of the longitudinals; it is further cross-braced with wire and wooden diagonals at points



THE SLOANE TRACTOR BIPLANE.—Three-quarter view from behind.

upper plane, which is staggered forward 10 ins., has an overall span of 36 ft. 6 ins., and overhangs the lower plane by 2 ft. on either side. Six pairs of stream-lined struts separate upper and lower planes, the two innermost pairs being mounted on the body. The lower plane is in

of greatest stress. At about mid-length the body is divided, at a point just behind the pilot's cockpit, which is immediately at the rear of the trailing edge of the upper plane. In front of the pilot's cockpit, is one for the passenger; at this portion of the body it measures



THE SLOANE TRACTOR BIPLANE.—Plan, side and front elevations to scale.

2 ft. 6 ins. by 2 ft. 11 ins., and is provided with a turtle deck. The whole of the body is fabric covered, and the nose, in which the engine is mounted, is almost totally enclosed by a round aluminium cow, thus presenting a good streamline form. The engine is an 80 h.p. rotary Gyro, supported by special ball-bearing brackets.

The landing carriage is of the four-wheeled type, consisting of two skids connected to the body at their rear extremities, and by a vertical strut at each axle mounting. The larger pair of disc wheels are situated under the front spar of the lower plane, and the smaller pair come under the engine. Both axles are attached to the skids by rubber shock absorbers. We believe a modified chassis consisting of two pairs of V struts carrying a pair

of disc wheels with axle, and a small wheel mounted well forward, will be fitted. The tail is supported by a "hockey-stick" ash skid sprung by means of rubber shock absorbers.

A Deperdussin type of control is fitted consisting of a wheel, operating the balancing flaps, mounted on a column, a fore-and-aft movement of which actuates the elevators, and a foot bar operating the rudder. The control wires for the rudder and elevator are taken through the body. If required dual control can be fitted.

The speed range of this machine, which is known as type E-2, is said to be 40 to 70 m.p.h., whilst a climbing speed of 4,000 ft. in 10 mins., with full load, is guaranteed. It can also be readily adapted for use as a seaplane.

FLYING AT HENDON.

RAIN, rain, and nowt but rain all Thursday afternoon of last week, so flying had to go by the board, but on Saturday things improved, when it was decently fine, with just a moving breeze. The proceedings opened with a few practice flights by some of the pupils of the Grahame-White school, and an exhibition flight by M. Osipenko on one of the 50 h.p. school 'buses. A somewhat exciting incident then came along, a pilot of the R.F.C. having a narrow escape when starting for a flight on a new Morane-Saulnier monoplane. The machine had barely left the ground, when it took to trying a bit of banking on its own, and turned to the right, the wing tip on that side eventually striking the ground. This caused the machine to heel over to the left, bringing the other wing tip and left-hand running wheel into contact with the ground until the wheel, unable to stand the strain any longer, just buckled. The mono. then took charge, did a semi-cartwheel, and finally landed on its back, a piece of the tractor screw flying into the air to a height of quite 100 ft. We could just discern the pilot under the wings, but as he did not immediately make a move visions of a nasty mess began to rise up. However, with help quickly on the spot, the machine was turned over on its chassis again, and the pilot emerged perfectly safe and sound to everybody's relief. After this E. Baumann went up on the 60 h.p. Ruffy-Baumann Caudron and made a high flight. W. Roche-Kelly then put up an exhibition of steep banking on the 50 h.p. (Gnome) Beatty biplane, whilst J. S. B. Winter

took up a passenger on the 50 h.p. G.-W. 'bus. Both the last-named pilot and Osipenko carried many passengers during the afternoon. J. L. Hall, now recovered from his recent illness, made one of his usual high flights on the 45 h.p. (Anzani) Caudron, finishing up with a pretty spiral glide to earth with the engine stopped. Baumann also got away on another high flight on the 60 h.p. Caudron, and afterwards G. Virgilio made a trip on the other 60 h.p. Ruffy-Baumann biplane. Kelly next took up a lady passenger on the 50 h.p. Beatty biplane, following which Geo. W. Beatty put up some stunts on the 60 h.p. Beatty biplane which were brought to an abrupt conclusion by the breaking of a wire. Fortunately Beatty noticed immediately what had happened, and without ado switched off, making a prompt but nevertheless excellent landing—quite one of the best examples of coolness it has been our lot to witness. Congratulations, Mr. Beatty. W. T. Warren, of the London and Provincial School, also made a flight on the 45 h.p. L. and P. biplane. A fine flight by an unknown pilot on a B.E.2 C. was the only other incident worth recording, for the rest of the afternoon was devoted to school work.

On Sunday most of the previous day's pilots were in the air. M. Osipenko and J. S. B. Winter were very busy throughout the afternoon with passengers on the 50 h.p. G.-W. school 'buses. W. Roche-Kelly gave another demonstration of banking on the 50 h.p. Beatty biplane, and both E. Baumann and G. Virgilio were up on the two 60 h.p. Ruffy-Baumann Caudrons.

The Last Raid on the Kent Coast.

THERE seems to be some doubt as to the actual number of German airships which took part in the raid on the Kent coast on Monday, as while one was sighted at Deal at 1.30 a.m., another was at the same time raining bombs on Ramsgate and the vicinity.

The visitor to the Deal district dropped between 30 and 40 incendiary bombs while over St. Margaret's Bay, about a score falling at Oxley, three miles from Deal. Except for the tearing of large holes in the ground, no damage appears to have been done. The airship went away in the direction of Dover, and was driven off by the guns.

About 20 bombs were dropped at Ramsgate, and several houses and shops were damaged. One bomb which fell on the Bull and George Hotel in the High Street passed right through the premises to the cellar before exploding. Two guests, Mr. and Mrs. J. Smith, were seriously injured, the former so badly that he died from the shock on Tuesday. A barmaid at the hotel also had to be taken to hospital. There were no serious fires resulting from the incendiary bombs.

In the German "wireless" news sent out from Berlin on Monday there was the following:—

"Our airships have made successful attacks on the Straits of Dover."

The Admiralty announcement regarding the aeroplane attack on one of these hostile aircraft will be found on p. 352.

At the inquest on Mr. J. Smith on Wednesday, the jury returned a verdict of "Wilful Murder" against the Kaiser, the third time a verdict in these terms has been recorded.

Alien Enemies and Aircraft Raids.

IN the debate in the House of Lords on Tuesday on the Alien Enemy question the Marquis of Crewe stated it had been said that in the event of an aircraft attack being made on London it would be possible for untrained enemy aliens, in pursuance of some secret organisation, to combine for purposes of incendiarism or some form of attack. That was not an argument to which the military authorities had attached great importance.

The Air Raid on Southend.

REPLYING to question put in the House of Commons by Mr. Pennefather, Dr. Macnamara (Secretary to the Admiralty) stated that the Zeppelin which bombarded Southend was first seen at 2.45 a.m. and last seen at 4.30 a.m. News of its arrival was received at the Admiralty in a few minutes. A number of aeroplanes ascended from the various air stations in the regions affected. A thick belt of clouds baffled the pursuers.

Mr. Pennefather asked whether the coast look-outs were in direct connection with the aerial base, and whether delay was caused through inability to get connection through the telephone exchange. Dr. Macnamara asked for notice of the question.

The Royal Aero Club of the United Kingdom

SPECIAL COMMITTEE MEETING.

A SPECIAL MEETING of The Committee was held on Tuesday, the 18th inst., when there were present: Prof. A. K. Huntington, in the Chair, Mr. Ernest C. Bucknall, Mr. C. F. Pollock, and the Assistant Secretary.

Election of Members.—The following New Members were elected:—

Capt. Philip Babington, R.F.C.
Major Edward Mervyn Baker.
Lord Hugh Cecil, M.P.
Frederick Richard Davenport.
Midshipman David Sigismund Don, R.N.
Sub-Lieut. Walter Prebble Donne, R.N.V.R.
Major R. E. T. Hogg.
William Alban Jepson.
Augustus Bernard Dashwood Lang.
Lieut. Wilfred John Maybery, R.N.V.R.
Flight-Lieut. R. E. C. Peirse, D.S.O., R.N.A.S.
Lieut. Waldo Alexander Ross.
Lieut. W. L. Samson, R.N.V.R.
Lieut. Charles Bramwell Fairer-Smith, R.N.V.R.
Flight-Lieut. G. L. Thomson, R.N.A.S.
Surgeon N. V. Williams, R.N.

Temporary Honorary Member.—Mr. Roger Morin was elected an Honorary Member of the Club for two months, viz., to July 18th, 1915.

Aviators' Certificates.—The granting of Aviators' Certificates Nos. 1195-1217 was confirmed.

The granting of the following aviators' certificates was confirmed:—

- 1218 2nd Lieut. William Hodgson Sugden-Wilson (West Somerset Yeomanry, T.F.) (Maurice Farman Biplane, Military School, Farnborough). April 22nd, 1915.
1219 Lieut. Robert Arthur Chalmers, R.N.V.R. (Short Biplane, Royal Naval Flying School, Eastchurch). April 30th, 1915.
1220 Flight Sub-Lieut. Frank Fowler, R.N.A.S. (Bristol Biplane, Royal Naval Air Station, Eastbourne). April 30th, 1915.
1221 Flight Sub-Lieut. Roy Bingley Pullin, R.N.A.S. (Short Biplane, Royal Naval Flying School, Eastchurch). May 1st, 1915.
1222 Reginald Watson Kenworthy (Caudron Biplane, Ruffy-Baumann School, Hendon). May 4th, 1915.
1223 2nd Lieut. Cuthbert Ambrose Anthony Hiatt (2nd Batt. Norfolk Regt.) (Maurice Farman Biplane, Military School, Shoreham). May 5th, 1915.
1224 2nd Lieut. Harold Foster Moore, A.S.C. (Maurice Farman Biplane, Military School, Farnborough). May 10th, 1915.
1225 2nd Lieut. Thomas Smith Impey, R.F.A. (Maurice Farman Biplane, Military School, Farnborough). May 11th, 1915.
1226 Lieut. William Dickson Long, A.S.C. (Maurice Farman Biplane, Military School, Shoreham). May 6th, 1915.
1227 Douglas Archibald Colquhoun Symington (Maurice Farman Biplane, Military School, Brooklands). May 11th, 1915.
1228 John Gordon McEwan (Maurice Farman Biplane, Military School, Brooklands). May 11th, 1915.
1229 Harold Jackson (Caudron Biplane, Ruffy-Baumann School, Hendon). May 11th, 1915.
1230 2nd Lieut. Ralph Imray Kirton (King's Own Scottish Borderers) (Maurice Farman Biplane, Military School, Farnborough). May 11th, 1915.
1231 2nd Lieut. Herbert Thomas Kemp (Cheshire Regiment) (Maurice Farman Biplane, Military School, Farnborough). May 11th, 1915.
1232 Flight Sub-Lieut. Frank Hartley Aspdon, R.N.A.S. (Bristol Biplane, Royal Naval Air Station, Eastbourne). May 11th, 1915.
1233 Flight Sub-Lieut. John Patrick Coleman, R.N.A.S. (Graham-White Biplane, Graham-White School, Hendon). May 12th, 1915.

1234 Flight Sub-Lieut. John Francis Roche, R.N.A.S. (Beatty Wright Biplane, Beatty School, Hendon). May 12th, 1915.

1235 Esca Houghton Colman (Maurice Farman Biplane, Military School, Brooklands). May 14th, 1915.

The following Aviators' Certificates were granted:—

- 1236 Lieut. Ewen Cameron Bruce (Maurice Farman Biplane, Military School, Farnborough). March 25th, 1915.
1237 Capt. Robert Anstruther Bradley (1st Batt. North Stafford Regt.) (Maurice Farman Biplane, Military School, Shoreham). May 12th, 1915.
1238 Flight Sub-Lieut. Edward James Poynter Burling, R.N.A.S. (Graham-White Biplane, Graham-White School, Hendon). May 14th, 1915.
1239 Percival Victor Fraser (Wright Biplane, Beatty School, Hendon). May 14th, 1915.
1240 2nd Lieut. Oswald Stanley Mosley Leigh (Maurice Farman Biplane, Military School, Farnborough). May 15th, 1915.
1241 William Thomas Lloyd Alcock (Beatty-Wright Biplane, Beatty School, Hendon). May 16th, 1915.

Presentation to the Club.

Mr. Jacques Schneider has presented to the Club a Plaque to commemorate the British Victory in the International Hydro-Aeroplane Race at Monaco in April, 1914, when the Jacques Schneider Trophy and Prize of £1,000 were won by Mr. C. Howard Pixton on a Sopwith Hydro-biplane.

THE FLYING SERVICES FUND administered by THE ROYAL AERO CLUB.

The Flying Services Fund has been instituted by the Royal Aero Club for the benefit of officers and men of the Royal Naval Air Service and the Royal Flying Corps who are incapacitated on active service, and for the widows and dependants of those who are killed.

The Fund is intended for the benefit of all ranks, but especially for petty officers, non-commissioned officers and men.

Forms of application for assistance can be obtained from the Royal Aero Club, 166, Piccadilly, London, W.

Subscriptions.

	£	s.	d.
Total subscriptions received by May 12th, 1915...	8,871	14	1
Employees of the Blackburn Aeroplane and Motor Co., Ltd. (Third subscription)...		0	15 0
M. N. Paine Ramming		1	0 0
Miss Lees		3	3 0
Mrs. A. E. Nicholson		1	0 0
Miss Woolward		0	10 0
Miss Bostock		0	10 0
G. B. Cockburn		10	0 0
A. V. Roe and Co., Ltd. — Proceeds from "Avro" Concert held March 27th, 1915	21	1	3
Collected from Visitors	7	7	11
Employees (Third subscription)	29	15	5
William Pryor		58	4 7
Mrs. Warden Chilcott		5	0 0
E. Dukinfield Jones (Second subscription)		1	1 0
K.		10	10 0
		36	15 4
Total, May 19th, 1915	9,000	0	0

B. STEVENSON, Assistant Secretary.

166, Piccadilly, W.

FROM THE BRITISH FLYING GROUNDS.

London Aerodrome, Collindale Avenue, Hendon.

Grahame-White School.—Instructors during last week: Messrs. Russell and Winter. On Monday, straights with instructor: Probationary Flight Sub-Lieut. De



Flight Sub-Lieut. R. G. Mack, R.N.A.S., who has secured his brevet at the G.-W. School.

Roeper. Landing practice: Probationary Flight Sub-Lieuts. Coleman, Greer, Hood, and Burling.

Tuesday, straights with instructor: Probationary Flight Sub-Lieuts. De Roeper, De Ville, Pennington,



Mr. H. Jackson, who recently took his certificate at the Ruffy-Baumann School at Hendon.

Simpson, Smylie and Wain. Circuits with instructor: Probationary Flight Sub-Lieut. Hood. Circuits: Probationary Flight Sub-Lieut. Coleman.

Wednesday, straights with instructor: Probationary Flight Sub-Lieuts. De Ville and Smylie.

Friday, straights with instructor: Probationary Flight Sub-Lieuts. De Roeper, De Ville, Leigh, Simpson and Smylie. Probationary Flight Sub-Lieut. Wain, solo straights. Probationary Flight Sub-Lieut. Greer circuits.

Saturday, straights with instructor: Probationary Flight Sub-Lieuts. De Roeper, De Ville, Leigh, Simpson and Smylie. Probationary Flight Sub-Lieuts. Greer and Hood circuits.

Sunday last, straights with instructor: Probationary Flight Sub-Lieuts. De Roeper, De Ville, Leigh, Simpson, and Smylie. Probationary Flight Sub-Lieuts. Greer and Wain circuits. *Brevets* during week: Probationary Flight Sub-Lieut. Coleman, May 12th; Probationary Flight Sub-Lieut. Burling, May 12th and 14th.

Beatty School.—The following pupils were out during last week, accompanied by the instructors:—Messrs. Allcock (55 mins.), Bright (25), Chalmers (30), Chapelle (22), Crossman (5), Crowe (27), de Meza (5), Fanning (10), Fitzherbert (20), Fraser (90), Hay (63), Johnston



Copyright, F. N. Birkett, from the F.N.B. series of aviators.
Flight Sub-Lieut. J. P. B. Ferrand, R.N.A.S., who recently obtained his 'ticket' at the Grahame-White School, Hendon.

(5), Roche (75), Summers (63), Tomlinson (10), Vickers (5), Whincup (8), Wiles (5), Wainwright (10), Hodgson (10), King (5), Jones (5), Davison (7), Eaton (7). The instructors were Messrs. G. W. Beatty, W. Roche-Kelly, C. B. Prodder and Bransby Williams, the machines in use being Beatty-Wright dual-controls and single-seater and Caudron tractors.

Certificates were taken by Messrs. Allcock, Bright, Fraser and Roche. Two passenger flights were taken, and exhibition flights were given on Saturday and Sunday by Messrs. Beatty and Roche-Kelly.

Hall School.—Last week the following work was got through:—Tuesday morning, Mr. Snook (14 mins.) and Mr. Hatchman (15). During the afternoon the following pupils received instruction: Messrs. Hamer (14), Booker (15), Millbourn (7), Mason (5), Cook (3), Bayley (4), Hatchman (4), Mitchell (6) and Lieut. Jowett (3).

Wednesday, Mr. Hill made a number of good straights (20 mins.), Messrs. Furlong (8), Snook (19), Bayley (20), Millbourn (25).

Friday, Mr. Hill out on No. 1 machine making a number of good straights and Lieut. Blythe 6 good straights. Messrs. Cook (6 mins.), Snook (6), Furlong (4), Hamer (9), Snowdon (7), Bayley (6), Hatchman (10), Booker (8) and Snook (7).

Saturday, Lieut. Blythe 6 straight flights and 2 half circuits, and Mr. Hill 4 straight flights and 3 half circuits. Furlong 6 straight flights, and Messrs. Mitchell (5 mins.) and Hamer (8) rolling.

Sunday, Lieut. Blythe 6 straight flights and 2 half circuits, Hill 3 straight flights and 3 half circuits, and Minot 4 straight flights. Lieut. Jowett rolling (16 mins.).

London and Provincial Aviation Co.—Tuesday last week Monsieur Deschamps circuits and eights; then took good ticket. Messrs. Irwing, Redgrave Gummer and Bell rolling. Messrs. Hubbard, McCauley, and Turner straights. Mr. Allen half circuits.

Wednesday, Messrs. Irwing, Redgrave Gummer and Bell rolling. Messrs. Turner and Tranchomme straights. Mr. Allen half circuits.

Friday, Mr. Allen circuits, Messrs. Turner and Tranchomme straights. Messrs. Bell, Irwing and Redgrave Gummer rolling.

Saturday, Messrs. Turner and Tranchomme straights. Messrs. Bell, Irwing and Redgrave Gummer rolling.

Ruffy-Baumann School.—An excellent amount of work was accomplished last week at this school, all the machines from the 60 h.p. down to the 45 h.p. being in fine flying trim.

Tuesday Mr. Roobaert passed for a fine ticket, and being a Belgian subject has returned to Belgium for war service. He was a splendid flyer, and should make good. Sykes, Jackson, England, Blandy, and Cole were out on this day, and were all showing up well. Later, Jackson passed for *brevet* in very good style, landing well on the mark and doing good *vol plané*.

Wednesday, pupils were all satisfied with amount of

practice received, and besides Mr. Hudson another gentleman enrolled for extra practice.

Friday, also saw much work on the 60 h.p. Gnome Caudron, and the 45 h.p. Anzani Caudron was well used, Sykes, Cole and Blandy being in good form.

Saturday and Sunday, many passengers were carried during the day, and a great deal of school work was got through. Messrs. May progressing well.

One of the new 60 h.p. Caudrons is nearing completion, and should be out very shortly. Three pupils ready for tickets at time of writing (May 17th).

School instructors: Baumann, Ruffy, James, Virgilio, and Winchester.

Northern Aircraft Co., Ltd.

The Seaplane School, Windermere.—Flying on Monday, Tuesday, Friday, Saturday and Sunday last week. Instructors: Messrs. W. R. Ding, C. L. Pashley, and J. Lankester Parker. Practice with instructors: Flight Lieut. L. L. Atherton (20 mins), Probationary Flight Sub-Lieut. R. M. Clifford (23), W. L. Graham (28), L. W. Hodges (31), J. D. Hume (18), C. Perrett (16), F. R. Laver (18), Messrs. C. A. Barber (16), W. Laidler (15), N. K. Lawton (59), D. S. C. Macaskie (54), F. H. M. Macintyre (9), G. M. Part (9), H. P. Reid (9), H. Robinson (38), G. L. Railton (77), J. F. Ridgway (12), S. J. Sibley (27), H. Slingsby (15), E. R. Yates (57), Flight Lieut. L. L. Atherton, Messrs. H. Slingsby, G. L. Railton and H. P. Reid doing straights. Figures of eight: R. Buck out for ticket, but rising wind prevented continuance. N.A.C. Avro dual control, 50 Gnome, and N.A.C. Propeller, 80 Gnome, were the machines in use.

Messrs. Ding, Pashley and Parker out testing or giving demonstration flights. Mr. C. Fleming Williams delivered an illustrated technical lecture on "Internal Combustion Engines," after which students were conducted round the works and shown the various applications of theoretical findings.

EDDIES.

AMONG the many well-known aviators who have signified their intention of taking part in the proposed American National Aeroplane Competition that is down to start on July 4th, I find one name that is familiar to all readers of FLIGHT, to wit, W. L. Brock. At the time of writing nothing definitely is decided as to what machine he will pilot, but I should not be in the least surprised to hear that he will be at the wheel of one of his own design. I well remember one day last summer discussing the possibilities and future of aviation in America with Brock. He had already then designed a promising little biplane, the drawings of which I got a look at. At the time he had not been able to make satisfactory arrangements with any American firm, but as across the pond things aviate are seemingly looking up at last, it may well be that any lack of news concerning Brock's doings since he left this "cute little toy country," as he himself once called it, may be accounted for by the fact that he has been working away quietly, as was always his habit, on the construction of a "bus of his own. At any rate, given a decent machine to fly, we may safely expect to hear a good account of him in the race, for it is doubtful whether there exists in America a finer pilot, for cross-country flying anyway, than he. One need only call to mind the Aerial Derby, London-Manchester-London, and London-Paris-London, all three of which races Brock managed to gather in. So may he, in his own country, as on this side, "chew" his way to victory as usual, is the hearty good wish of us all.

"Have the Germans at last succeeded in producing a non-inflammable gas for their Zeppelins?" This was the question asked the other day by a friend as he threw open the door of my *sacrum sanctorum*, somewhat out of breath after a record climb that would have compared favourably with that of a machine going for its official tests at Farnborough. "Otherwise," he continued as soon as he had reduced the "periodicity" of pulsation of his heart to somewhere near normal, "how do you explain this?" "This" proved on examination to be an official account of how a Zeppelin had been seen, after supposedly having been hit by a bomb, to rise to 11,000 ft. with her tail down, while smoke issued from one of her compartments, and how she then succeeded in eluding her pursuers. I will pass the query on to my readers, as the only explanation that suggested itself to my feeble understanding, namely, that the smoke might possibly have come from the exhaust pipes of four Maybach engines "going all out," and the *cabre* position be the natural one for a Zeppelin in a hurry to get away from a lot of seaplanes that were, from her point of view, becoming a bit of a nuisance, did not seem to have any very convincing effect on my knowledge-seeking friend. That the gas with which this particular specimen of German "frightfulness" was filled could hardly have been hydrogen seems obvious, since, once a compartment had caught fire the whole airship would, so it appears to me, stand as much chance as the proverbial cat in Hades. So now who will venture on a solution of the problem?

What happens to the aeroplanes captured during the war? This is a question that has often been asked, and one which is not readily answered, since it is not easy to obtain authentic information on the point. Just now and again a little daylight is let in upon the mystery. For instance, a Taube and an Aviatik have been and probably are still on view in Paris, and I would not be surprised if anyone told me there are a couple of captured German aeroplanes down at Farnborough—an L.V.G. biplane and a Fokker monoplane. It has not, so far, emerged that the Allies employ captured enemy machines even if these happen to fall into our hands in a serviceable condition. In the majority of cases the



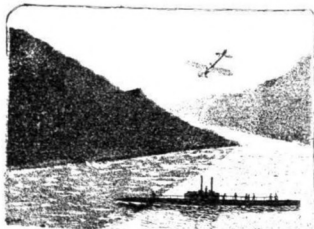
A Maurice Farman biplane captured by the Germans.

probabilities are that a machine brought down is either badly damaged in landing or else is deliberately set on fire by the pilot. Besides, the utility of a captured enemy aeroplane is a questionable asset, as—to point a moral—a great number of the German planes are readily distinguished from those of the Allies, and the substitution of a Union Jack for the black cross would hardly prevent such a machine from being fired on by our own troops, if flying at any height, even granting for the moment its usefulness for raids over German territory. On the other hand, the accompanying illustration, taken from *Flugsport*, seems to indicate that the Germans do employ captured French machines. It will be seen that the rosette of the French colours has been obliterated from the wings of this captured Maurice Farman biplane and the black cross substituted. The nose of the *macille* has been “decorated” (or the reverse, according to taste) with the German eagle. Whether this machine is employed for actual war service or not it is impossible to say, but the crosses and eagle seem to point to such an object being in view. This supposition is further strengthened when one knows that the Germans are actually building imitations of French machines, two firms for instance—the Fokker and the Hanuschke—having constructed monoplanes which could not possibly be distinguished from Morane-Saulnier monoplanes when flying at anything above a few hundred feet.

From the very commencement of the war the word “Taube” has had a peculiar fascination for the average war correspondent, who either could not or did not take the trouble to distinguish between monoplanes of the true Taube type and biplanes, but used the name to indicate any German military machine, much in the same way as the word *avion* is used to denote a French military aeroplane. This usage of the name Taube is hailed with satisfaction by the German aeronautical press, and it is pointed out

that it serves as an excellent mantle over the activity of the various German types. Attention is drawn to the fact, that great stress has always been laid on the development of the heavier and stronger biplane type of machine, which is, as a fact, employed almost to the exclusion of the Tauben. *Flugsport* has now adopted the word in its broader sense in many of its reports until such time when it shall be possible to give the biplanes the credit which is their due without fear of disclosing any military secrets.

It would be difficult to imagine anything approaching more closely to the dreams of Jules Verne than the game of hide-and-seek played by submarines and Lieut. Tryggve Gran, in and out of the *fjeldkrante fiords* on the western coast of Norway. From a small stretch of sandy beach, probably practically the only one on the Norwegian coast where it is possible for a machine to land and start with any degree of safety, Lieut. Gran sets out in all sorts of weather on his scouting expeditions for submarines and other smaller war-craft. That his is not exactly a Sunday-school picnic will be realised when it is stated that since the beginning of the war close on fifty submarines have from time to time paid visits to the various Norwegian fiords, the beautifully bracing air of which seems to possess great attraction for the men who do most of their work below the surface of the sea. It does not require a very vivid imagination to form a mental picture of the situation. A submarine is resting on the surface in some sheltered nook, with her hatches open and the men stretching their legs and enjoying a smoke whilst admiring the beautiful scenery spread out before them. On every side steep mountains, covered with fir and spruce trees, among which are visible the red-painted wooden houses scattered up the slopes. Suddenly the hum of a Gnome is heard, and like a great bird a Blériot two-seater comes into view, sailing closely over the top of the mountains. It swoops down until its wheels nearly touch the sea, and as it whirrs past, Lieut. Gran and his observer are seen to make signs which can only be interpreted as a polite but firm request to “get out.” Within a few minutes all the men have disappeared below deck, the hatches are closed, and the submarine slowly sinks



below the surface until it is only visible as a dark shadowy form proceeding slowly out towards the mouth of the fiord. Since the beginning of the war Lieut. Gran has in this manner flown more than 3,000 kilometers over the sea. On one of his trips from the coast and out to sea he covered a distance of nearly 400 kilometers, which is, to put it mildly, some stunt, considering that his mount is a Blériot land machine.

“ÆOLUS”

THE SCREW PROPELLER.

By F. W. LANCHESTER, M.Inst.C.E.

(Continued from page 345).

18. It is a fact which has immediate bearing, and otherwise one of considerable interest, that whereas in the case of the fixed propeller the investigation for least power involves the quantity representing energy lost in the rotational wake, in the case of the propeller of greatest efficiency this quantity is entirely ignored. We know that in the latter case there is power expended in the

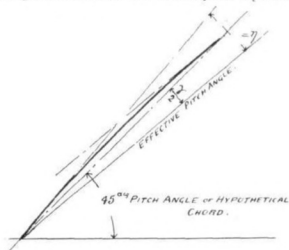


Fig. 14.

rotational wake, and under the conditions of highest efficiency, in the region of 45° , there is an approximately equal partition of energy between the sternward wake and the rotation; the question arises as to why and under what circumstances we are justified in

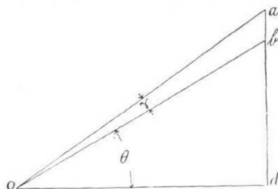


Fig. 15.

adopting the method employed where the conditions are varied. When the author originally gave the result of his earlier investigation ("Aerial Flight," Vol. I, ch. ix), though fully alive to the fact that the condition of best efficiency constitutes a special case, and that the method was not generally applicable, he was not in a position to give any more complete solution. It was quite apparent that the blade, considered as an aerofoil, could not glide at anything less than its least gliding angle, and the conditions governing this had been fully defined by the author in the preceding portion of his work, in which the angle itself was shown to be independent of the velocity. Thus, in Figs. 8 to 13, for any particular value of γ , we have already seen that the curve gives the maximum possible efficiency for every point along the blade, that is to say, for its each radial element. There is evidently no going behind the reasoning, once granted the hypothesis of radial elements of blade. Moreover, there does not appear to be anything in the hypothesis itself which could render the results open to suspicion. On the other hand, in the extreme case of the value of γ being vanishingly small, the angle θ becomes 45° , and it would appear superficially that something must be wrong, since, of the energy demonstrably lost, half only is expended in giving sternward motion to the fluid, and the other half is thrown away in giving useless rotary motion.

The truth is, that this result, although paradoxical from some points of view, is perfectly sound in fact. Thus, in the extreme case, where γ is vanishingly small, the propeller diameter for best efficiency is virtually infinite. More generally, whatever the value of γ may be, *i.e.*, however small, the condition of least gliding requires that the energy lost dynamically—in generating the slip

stream—shall be equal to that lost in direct resistance—in the augmented skin friction of the blades; hence a low γ value is only compatible with a low value of ϵ , and corresponds to a correspondingly low pressure constant C , and the area of propeller disc required to fill the conditions becomes *greater* in like ratio. Thus, however small γ may be, even if we consider it a vanishing quantity, we cannot ignore the direct loss of energy, for the propeller diameter is increased—in the limit to infinity—if the condition of best efficiency is maintained, and the angle approximates more and more closely to 45° . The extreme case only appears as a paradox so long as we imagine the finite diameter with an infinitely small γ , then the whole energy expenditure is distributed between the direct (rearward) wake and the rotational component; evidently if this were the condition, a clear gain would result if the angle θ were diminished, so that for a given rearward stream a less loss in the rotational component would result; once the falsity of this conception is realised, all difficulty vanishes.

The foregoing exposition, while clearing up any difficulty that may be felt as to the results given by the late Mr. W. Froude, and more fully in the author's "Aerodynamics," serves also to explain the essential difference in the conditions when the broader generalised problem is substituted for the particular case of maximum efficiency: it is quite evident that if we are dealing with a propeller of restricted diameter so that the direct resistance losses become comparatively small or negligible, the question of the rotational component loss becomes a dominant factor in the economics of propulsion; and, further, it is definitely only in the special case of the condition of highest efficiency that considerations relating to the rotational component cease to affect the solution and may be ignored.

19. To cut the matter short, in the expression for efficiency, $\tan \theta$, the quantity γ is not a constant in relation to θ as in the special case, but is a variable, and before we can give a solution we require to find a form in which γ may be expressed as a function of θ . Beyond this, the relation of γ to θ is clearly connected in some manner with the particular nature of the restriction, whether it be diameter, pitch, or other limiting factor; this limitation, therefore, must first be defined.

There is a possible alternative to the above procedure, namely, by a more complete and generalised analysis of the problem it should

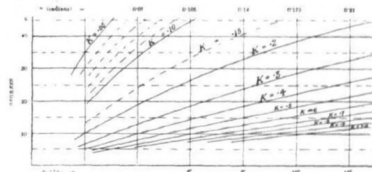


Fig. 16.

be possible to obtain a more comprehensive equation directly applicable to all reasonable variations in the conditions. There are several objections to this alternative, apart from which the mathematical difficulties seem to be far from light; the chief of these is

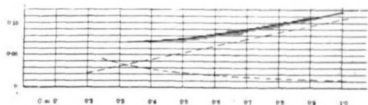


Fig. 17.

that it does not lend itself so readily to the incorporation of experimental data, and circumstances may sometimes occur to render this necessary, or at least desirable. The former plan of operation in the present paper has therefore been adopted.

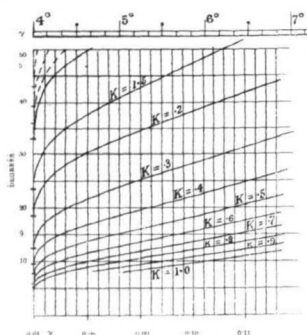


Fig. 18.

The first question that arises is in what manner it is desirable to initially specify the terms of restriction. The author has given preference to a form of expression involving the relative wake velocity, thus the limiting condition is taken as defined by a constant K representing the rearward wake velocity in terms of the velocity of flight: in the case of the marine propeller the velocity of

THE RIGID DYNAMICS

As was fitting, considering its *raison d'être*, the third Wilbur Wright Memorial lecture, delivered before the Aeronautical Society yesterday (Thursday), was of an extremely technical character. The lecturer was Prof. G. H. Bryan, F.R.S., and he dealt with some aspects of the stability problem, to which he has given so much thought.

The lecture was in fact a sequel to his book, "Stability in Aviation," and as the title—"The Rigid Dynamics of Circling Flight—Steady Motion in a Circle—Lateral Steering of Aeroplanes"—implies, it dealt with the steering of an aeroplane in a horizontal circle. The following are some notes in popular style of the lecture, drawn up officially by the Aeronautical Society. It is interesting to note that Mr. F. W. Lanchester, who presided at the lecture, has done notable work on aeroplane stability on different lines from those of Bryan.

Familiarity with the methods of the book is assumed in the lecture. For the benefit of those who are not familiar with those methods the basis of the book will be brought out in the following remarks:—

If any body or portion of matter moving steadily in a straight line is disturbed it will move in certain directions, according to its characteristics and the forces acting on it. By means of mathematics it has been found possible to predict in what way a moving body will behave in such cases, if we know certain things about it—for example, its weight, in what way the various masses that make up the body are arranged about its centre of gravity, &c. By using mathematical symbols for these properties of the body and certain others we are able to build up "equations of motion" that enable us to calculate the possible behaviour of the body when its steady motion is disturbed. This branch of science is known as "Rigid Dynamics," and it is of the first importance in the study of any bodies in motion.

The standardisation of "Rigid Dynamics" was largely due to Routh, who published a book with that title in 1860. Strangely enough, however, although over a hundred years ago aeroplanes having nearly all the important characteristics of present-day machines, except the motor, were invented, and the evolution of the aeroplane has thus been contemporaneous with the evolution of Rigid Dynamics, the application of Rigid Dynamics to the study of the motions of an aeroplane has only been accomplished within the last decade, and that mainly owing to the labours of Professor Bryan. This is all the more remarkable for the reason that an aeroplane is dependent for its sustentation on its rapid motion through the air, and it is essential for the pilot's safety that this motion should be stable and that disturbances should be overcome.

Bryan's "Stability in Aviation" was published in 1911, but he

the vessel. If the flight velocity be represented by the symbol v_1 and the rearward velocity imparted by the propeller by v_2 , we thus have $K = v_1/v_2$.

The value of K so defined does in fact determine the diametral restriction, at least this is so if we assume the whole of the fluid passing through the disc area as being operated upon; this is evidently the correct basis. The relation by which the constant K and the diameter are connected is to be sought in the Newtonian theory of propulsion in accordance with the teaching of Prof. Rankine and Mr. W. Froude, but it is also controlled by the stream contraction, allowance for which may be made on the lines suggested by the theorem of Dr. R. E. Froude, to which reference has already been made, i.e., that the velocity v at the point of passage through the propeller is equal to $v_1 + \frac{v_2}{2}$. Alternatively, the author's

extension of the Froude investigation might be made the basis of the allowance (see paper before I.N.A. on "Theory of Propulsion"). In the present paper this has not been thought desirable.

20. The mathematical work resolves itself into two very simple steps, supplemented by certain graphic transformations; thus the first step is to find an expression for K in terms of θ and η ; from this expression we make a plotting in which ordinates represent values of θ and abscissae η graphs being given representing $K = \text{constant}$, Fig. 16; we may call these graphs *iso-K* lines. Next, following the method of the author's previous paper (Appendix IV.), the constant relation between η and C is established, and η values are calculated or plotted, Fig. 17 (as in Fig. 18 of the paper aforesaid), with C as abscissae, the scale chosen for C being preferably such as to correspond with the η scale of Fig. 16. From Figs. 16 and 17 corresponding values of θ and η are read off, and these form the basis of a further plotting, Fig. 18, in which ordinates represent θ and abscissae η values; the graphs once again represent *iso-K* lines transformed now by the substitution of γ for η as abscissae.

(To be continued.)

OF CIRCLING FLIGHT.

had been working on the subject for some years previously. In 1903 he, in conjunction with Mr. Ellis Williams, read a paper before the Royal Society, and also before the Aeronautical Society, on the "Longitudinal Stability of Aeroplane Gliders," in which were given the germs of the methods expounded in his later book. As long ago as October, 1897, he had directed attention (in "Science Progress") to the necessity of applying mathematics to aeroplane stability and other problems.

"Stability in Aviation," then, is an application to aeroplanes of the equations of Rigid Dynamics. In this application great difficulties had to be overcome and snarls and pitfalls avoided, and one of the outstanding features of Bryan's work is the common sense way in which he has steered a true course through all these obstacles.

An aeroplane is sustained by air resistance, engendered by the rapid motion through the air of the wings of the machine. It will be clear, then, that if the motion of an aeroplane is disturbed, the air pressure on the wings will be disturbed, and we have certain very complex relations to disentangle, between the natural oscillations of the machine about its centre of gravity and of that centre of gravity in space, and the various accelerating or damping forces due to the varying air pressure on the wings and other portions of the machine.

Now in practical flying we want a machine that will maintain or recover its equilibrium so long as we require it to do so, but which we can turn and twist about when required. To design such a machine three courses are open to us—we may proceed by pure experiment, by pure theory, or by a combination of both experiment and theory. The latter course commends itself to the majority, and the more one considers the question of what particular theoretical methods are likely to come into general use in the future, when the design of aeroplanes is as much a matter of routine as that of, say, electric motors is now, the more is one driven to admire the foresight of Professor Bryan in adapting the equations of Rigid Dynamics to aeroplanes, and to endorse the honour that he has received from the Aeronautical Society by the award of its Gold Medal, which will be presented before the lecture. It must not be supposed, however, that this adaptation has been completed. Very far from it, as is shown by the present lecture.

It was said that certain characteristics of the moving body under investigation were denoted by symbols and that the manipulation of these symbols foretells the behaviour of the body in certain circumstances. It will be clear at once that everything depends on our choosing the essential characteristics at the outset and on giving correct numerical values to our symbols when we want quantitative results, as we must do when actually designing machines of definite

weights and powers. In order to simplify the equations and minimise the possibility of error, it is necessary to make simple assumptions and work up to the more complex relations. Despite the fact that the assumptions made by Bryan reduce the problem to as simple a form as is compatible with usefulness, it may at once be seen, by a study of the mathematical work, that it is beyond the scope of the layman and, indeed, of many engineers. Not only this, but the experimental work required to make practical use of the equations has entailed very heavy work and involved the expenditure of thousands of pounds at the National Physical Laboratory and elsewhere. Nevertheless, the importance of the results obtained, when realised, makes us wonder, not that so much time and money should be used up on filling paper with symbols, but that much more time and much more money has not hitherto been available for work which has, it is to be hoped, been brought home to all, by the aerial happenings in the present war, as of national importance. It can be safely said that the future of England depends very largely on the efficiency of her aerial fleet.

One of the main objects of the paper now being considered is to ascertain the conditions which render it easiest to steer an aeroplane in a horizontal circle of any radius that is not too small, and Professor Bryan has introduced the idea of "inherent controllability" to denote the property which an aeroplane may possess of freely describing a circular path without any pressure on the controlling rudders, *i.e.*, an aeroplane in which when turning on a chosen path, the rudders are not in action except as guides to prevent the machine from leaving that path. He finds that aeroplanes approaching this ideal can be obtained by several designs, but he makes quite clear that he has not investigated the question as to how far it is desirable on other grounds to follow these designs in actual practice. These investigations he must, owing to lack of time, at which restraint he rightly feels, perform leave to others. He appeals for mathematicians to sharpen their wits on aeroplane problems in preference to the more esoteric exercises in which they so often delight.

He says:—"I cannot help thinking that a study of the present work, followed by a few experiments, will either lead to improvements in the steering of aeroplanes, or if the present arrangements are the best, it will now be easier to understand the reason why." For the benefit of the reader, it may be said at once that the National Aeronautical Services are fully aware of the value of Bryan's methods and are making use of them. At the same time private enterprise could find a rich field for accomplishment in study and experiment on the lines advocated by Bryan.

The detailed summary of conclusions are given below, but it is of very great interest to note that one form of "inherently controllable" aeroplane would have wings shaped somewhat like a gull's when circling, *i.e.*, bent down at the tips, which are pointed. Another form would have bent-up wings, which were wider at the tips than at the base. This latter form is of much interest owing to the fact that a bird which performs the most alarming twists and turns with the utmost nonchalance is the pewee, which has wings which are distinctly "spatulate" in plan form. This aerial gymnast may be watched at his feats at the present time in our fields.

An interesting point to note is that the Germans have not failed to recognise the importance of studying aeroplane stability on the lines that Bryan has evolved, and this fact has in reality acted to their disadvantage in the present war. Owing to their national characteristics of methodical thoroughness they have given most of their aeroplanes great stability at a sacrifice of speed, while ours have been, generally speaking, less stable but more speedy. Now, in the evolution of the perfect aeroplane for which we are all striving, it has been found that too great stability is undesirable, not only because it slows the machine, but because it opposes "controlability"—the ideal dealt with in the present lecture. The perfect aeroplane will contain the best compromise between absolute stability and controllability, and we may hope that our national characteristic of common sense will lead us nearest to that goal. In the quest, work such as that of Bryan in the Wilbur Wright Lecture, 1915, is of the highest importance.

Summary and Conclusions.

1. In steady motion in a horizontal circle, both the longitudinal and the lateral equations of equilibrium are affected.
2. The turning point may be in front of or behind the centre of gravity, its distance when in front being denoted here by b .

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Gramophones Wanted for the R.F.C.

In connection with the excellent work which is being done by the Royal Flying Corps Aid Committee, Lady Henderson, the president of the Fund, would be very grateful for one or two gramophones and some records for the men of the Royal Flying Corps at the Front. They should be sent to Lady Henderson at the Headquarters of the Fund, Surrey House, Marble Arch, W.

The axis o , the aeroplane then envelopes a circle of a certain radius a , the real radius of the circle described being $\sqrt{(a^2 + b^2)}$.

The system usually cants over sideways through a certain angle ϕ .

3. Given the velocity and radius of the circle it is not usually possible to satisfy the three equations of lateral equilibrium by assigning suitable values to δ and ϕ , but when this is possible the system is said to be inherently controllable.

In an inherently controllable system the rudder planes merely act as guides, and it is necessary that they should be so placed as to render the motion laterally stable.

In other cases steady motion can only be maintained by pressure exerted by the rudders or a couple applied by means of *ailerons* or some such action representing the third unknown variable required for the solution of the three simultaneous equations of lateral equilibrium.

4. In a system of straight planes $\sin \phi$ is proportional to the radius a of the envelope, but it also appears that the other conditions of lateral equilibrium are only possible when pressure is applied by means of a rudder and when a and ϕ have certain definite values. The only way of varying the radius of the circle actually described is by varying the position of the turning point which may be in front of or behind the centre of gravity.

The addition of boxes in ends or vertical partitions improves the steering, but it still leaves $\sin \phi$ proportional to a . The inference one would naturally derive from the formulae is that all such systems would be liable to sway from side to side of the straight path in curved arcs of finite radius. In no case can the radius of the circular envelope exceed the limit corresponding to $\phi = 90^\circ$.

5. With bent up wings, as in the "Antoinette type," it is possible to satisfy the conditions of equilibrium so that a is no longer limited and ϕ no longer large. Such a system can be steered in a circle of large radius without being inclined at a large angle.

In general circular motion can only be maintained when pressure is applied by means of a rudder or a couple applied by means of *ailerons*, but if the two principal moments of inertia about axes perpendicular to the line of flight are equal, the rudder exerts no pressure and the system is inherently controllable, the inclination satisfying the relation $\tan \phi = \frac{b}{a} \tan \phi$.

6. Another kind of "inherent controllability" in which the system always remains level, the inclination ϕ being zero, is possible in certain systems. A necessary condition is that the wings should be bent downwards and not upwards at the tips, and it will be usually advantageous that they should be most bent down at their extremities. The condition representing this fact is that the space between the wings and a chord joining their tips should be as large as possible.

This arrangement of the wings somewhat reproduces the action of gulls' wings in circling flight, and it will be found that differences in the form and curvature of the wings may have a considerable influence in the problems of this class.

7. A third kind of "inherent controllability" is only possible when portions of the wing surface are in front of or behind the rest; and a possible solution exists in the form of a system suggested by me in the *Aeronautical Journal* with front and rear planes, one set being turned upwards and the other downwards.

It appears, however, from the analysis that the necessary conditions cannot be satisfied in the case of surfaces of uniform breadth bent up into a plane dihedral angle at the centre or bent into a trihedral angle at some points intermediate between the centre and tips. They can, however, be readily satisfied by suitably curving the wings or by varying their shape so as to make them as a rule broader towards the tips than near the base. The present arrangement has the further advantage that the system would not tend to turn round sideways if struck by a side gust of wind, and I should consider it worth trying experimentally.

8. Although no attempt has been made to discuss the analytical conditions of inherent stability further than has been done in "Stability in Aviation," it appears from general considerations that the rudder plane at least in an inherently controllable system should be placed on the opposite side of the centre of gravity to the turning point, and that difficulties, probably instability, must necessarily occur if the rudder is between the centre of gravity and the turning point. It seems almost certain that the best position for the rudder is when it and the turning point are in the relative positions of the centres of suspension and oscillations of the system when treated as a compound pendulum.

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Presentation of Aeronautical Society's Medals.

PREVIOUS to the reading of the third Wilbur Wright Memorial Lecture by Professor G. H. Bryan at the meeting of the Aeronautical Society yesterday (Thursday), the Gold Medals of the Society, awarded to Professor Bryan and the late Mr. E. T. Busk, were presented by Major-General R. M. Ruck, C.B. (Chairman of Council), to Prof. Bryan and to Mrs. Busk (on behalf of her son).

AIRCRAFT AND THE WAR.

In the despatch dated May 8th from Mr. E. Ashmead Bartlett describing the fighting on the Gallipoli Peninsula, there was the following :—

"At 1.30 p.m. (on May 8th) these final movements were completed, and there came a complete lull over the battlefield, the only incident being the appearance of one of the enemy's aeroplanes, which attempted to drop some bombs on the beaches and ships, without, however, doing any damage."

Reporting an interview with an observer who had just returned from the Dardanelles, Reuter's correspondent in Cairo said :—

"The greatest difficulty was experienced in locating the enemy's artillery, as directly the Allied aeroplanes appeared to reconnoitre, firing ceased."

According to the Constantinople newspapers, Turkish aviators dropped bombs on the British troops at Sedd el Bahr on May 13th, and it is claimed that the results achieved were very considerable.

In a despatch from Athens on the 14th inst. a *Daily Telegraph* correspondent stated :—

"Yesterday the Allied aviators attacked some Turkish aeroplanes above the Island of Mourais. After an aerial battle the Turkish aeroplanes were destroyed."

In a *communiqué* issued in Berlin on the 14th it was stated :—

"The occupants of a French biplane which was compelled to land near Hagenau were taken prisoners."

A *Daily Mail* correspondent in the North of France on Saturday, reported :—

"A Taube flew over Calais at 8.30 this morning. It got such a hot reception from the fort guns that it beat a hasty retreat without dropping any bombs."

Mr. James Dunn, writing to the *Daily Mail* from Rotterdam on Sunday, said :—

"A report of a thrilling fight between a Zeppelin and a squadron of Allied aeroplanes has reached me from the frontier. The evidence is extremely strong, though absolute confirmation is difficult to get."

On Monday two Zeppelins passed over Brussels, going in a westerly direction towards the Yser, and aroused little comment on the countryside, as a German airship has frequently been seen in this neighbourhood recently. At about eight o'clock in the evening a Zeppelin, returning alone, was surrounded and attacked by a squadron of the Allies aeroplanes. Many people counted 27 machines. The Zeppelin put up a spirited fight with her machine guns, and tried to escape by soaring to a high altitude, but the aeroplanes manoeuvred skillfully and quickly and gave the bulky airship no chance. In less than 15 minutes they disabled the Zeppelin, which, amid several explosions, fell between Brussels and Ghent. All the crew of 60 were killed. Two aeroplanes were destroyed and the pilots killed by fire from the Zeppelin's machine guns. The relics of the airship are being treasured by hundreds of peasants who witnessed the battle in the air."

Writing from Boulogne on Sunday a *Daily Telegraph* correspondent stated :—

"According to another officer, the German land guns that are responsible for the bombardment of Dunkirk are situated at Clarken (2½ miles due south of Dixmude). Clarken has not seen any fighting for over three months, and the enemy has installed a captive balloon station there."

A Reuter's correspondent with the British Headquarters in France, in a despatch dated Sunday, said :—

"There seemed to be but little response from the German gunners, though a balloon was sent up over La Basse, doubtless in an attempt to discover the position of the British batteries, so well screened by the greenery."

A *Daily Telegraph* correspondent at Rotterdam, writing on Monday, said :—

"Another Zeppelin has come to grief in Belgium. On Thursday night it fell in Gierlesche woods, and was badly damaged. Two of the crew were thrown out when the Zeppelin reached the ground and were severely injured. Afterwards the airship was dismantled and taken away in sections to Germany."

"On Friday three Zeppelins, which have been housed in Belgium or some time, left for Germany and have not returned."

"Early this morning there was an aerial contest between Bruges and the coast. A Zeppelin, which came from somewhere inland, and was sailing towards the coast, was attacked by an Allies' aeroplane. So far as could be seen by distant spectators, the airship was not hit, but it returned instead of continuing its journey towards the coast."

The *Daily Mail* correspondent in the North of France on Monday sent the following account of the air raid on Calais :—

"The biggest Zeppelin raid attempted on Calais since the beginning of the war took place last night and early this morning. Three Zeppelins flew over the town on three separate occasions. On Calais itself few bombs were dropped. Most of them fell on the villages near by. Nevertheless the air Huns succeeded in killing a baby and an old lady."

The first raid took place at 11.30 p.m., when the whole town was suddenly awakened by the violent ringing of the tocsin on the Place d'Armes and the terrific reports of heavy gunfire. Almost simultaneously bomb explosions could be heard. The sky presented a wonderful spectacle. Half a dozen powerful searchlights were working and shells were continually bursting in mid-air with a dull roar. The airships hovered over the town until about ten minutes past twelve, when they were eventually driven off by the guns at the forts."

About half an hour later a second alarm was sounded. The three Zeppelins came this time from Grisnez, and followed the railway line between Boulogne and Calais. At the time a passenger train was going through a station. The airships dropped several incendiary bombs and flares round the train, but none reached their mark."

"The Zeppelins eventually dropped four incendiary bombs, two of which fell on a house, causing a fire and killing a tiny baby and an old lady. Before reaching Calais they were vigorously bombarded by the coast forts. The commander of one of the Zeppelins, apparently fearing that his airship would be hit, must have given orders for all the bombs to be thrown out, for twenty-one fell simultaneously on a little village about a mile and a half from Calais. Fortunately all fell into the fields, and the only damage was five cows killed. The Zeppelins continued their journey over Calais and while over the town a wonderful bombardment took place. All the searchlights found the airships, which stood out like large cigars. Shrapnel burst all round them. The Zeppelins answered with machine guns and bullets rained down on the town. Again, fortunately, there were no casualties, and the Zeppelins were driven off."

At 3.30 a.m. a third alarm was raised, and the air dual recommenced. Bombs were dropped by a Zeppelin a couple of miles west of Calais on the coast."

The following account of the raid was sent by the *Morning Post* correspondent :—

"In the air the Germans have, however, renewed their activities. During last night three Zeppelins have been hovering over the Pas de Calais, followed by the two Taubes. When passing near Margate, however, the battery at Cape Gris Nez succeeded in hitting one Zeppelin with a shell. The invaders turned back at once and passed once more near Calais."

A report reaches me that the winged Zeppelin was unable to reach the German lines, and fell on the beach at Fort Mandieck, about two miles from Dunkirk, and was completely wrecked. Forty men on board the aircraft, it is stated, were taken prisoners, among them being seven officers. At present I have been unable to obtain definite confirmation of this statement."

Included in an account of the raid on Calais, from the *Daily Chronicle* correspondent was the following :—

"After the first attack the Zeppelins flew in the direction of Boulogne, followed by the two Taubes. When passing near Margate, however, the battery at Cape Gris Nez succeeded in hitting one Zeppelin with a shell. The invaders turned back at once and passed once more near Calais."

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"Calais people are positive that some of the gas compartments of the airship were pierced when it passed over the town, though not sufficient gas was lost to compel it to descend. A woman and three children are reported killed in a quarter of the town known as Fort Naculay, but relatively little material damage was done considering the scale of the attack."

Mr. James Dunn, writing to the *Daily Mail*, from Rotterdam on Monday, said:—

"Two Zeppelins were seen at Flushing last night following the course of the Scheldt towards the sea. Only one returned at half-past four this morning. Four Allied aeroplanes half-an-hour later were seen by people on the Dutch frontier being shelled by the forts."

In a later message he said:—

"A Zeppelin, said to be the one which dropped bombs on Ramsgate, was attacked by an Allied aeroplane near Bruges on its way from the North Sea."

"The Zeppelin rose to a great height, and the aeroplane was driven off by the anti-aircraft guns protecting the aerodrome near Bruges. The airship returned to the Berchem shed, near Brussels."

Mr. John Buchan, writing to the *Times* from the British Headquarters in France under date May 17th, said:—

"The Royal Flying Corps has been busy these last weeks. Since April 23rd there have been no less than 35 single combats in the air, in which we have invariably had the best of it. It is impossible to exaggerate the importance of our success in this arm. We know from air reconnaissance the exact position of every German trench, while the German machines are very chary of coming over our lines for that or any other purpose. Without aeroplanes to 'spot' for our guns it would be impossible to get at the enemy's concealed batteries. The modesty of this splendid service is not less than its gallantry. Exploits are credited not to individuals, but to the corps, and only an heroic death like that of Lieutenant Rhodes-Moorhouse lifts the veil and reveals the dangers which dozens brave every day. It was reported this morning that a German Zeppelin had come from Ghent in the direction of Dunkirk or Calais, and had been promptly attacked by five aeroplanes—the first conflict of the kind that the war has seen. Unfortunately it was not brought down, but its tail was blown off, and it went home rudderless on a very drunken course."

The *Daily Telegraph* correspondent at Havre reported on Monday:—

"An artillery park established by the Germans at Ghisteltes, to the north-east of Ostend, has been completely destroyed. Successive attacks by the Allied aviators have reduced it. Nothing remains beyond some hangar walls, half consumed, under which lie the debris of aeroplanes reduced to pieces by the bombs of the Allied aviators. The Germans, disconcerted at this result, are hunting for a favourable place to erect a new aerodrome behind their lines."

A Reuter correspondent at Athens reported on Monday:—

"On May 9th a German aeroplane which left Germany a week beforehand for Turkey was damaged in descending at Philippopolis. An old woman was killed. The German aviator was conducted to the military commander of the town, and his aerial journey doubtless came to a sudden close."

In an article by "A Neutral" in the *Times* of the 17th there was the following:—

"Germany is talking of the coming invasion of London by a fleet of Zeppelins, possibly accompanied by other forms of aircraft. Some people there have even gone so far as to predict a date for the destruction of London, so confident are they in the power of the latest creations of Count Zeppelin, aided by a highly-trained staff of scientists. Germany has shown herself, by the employment of the death-dealing gases in the battlefields of Flanders and Northern France, fully alive to the part which chemical research can play in 20th century warfare, and investigation is being pushed forward unceasingly to find new methods which can be employed against the enemy."

The writer then gives the following extract of a conversation which he heard in a famous restaurant in Munich:—

"But this work of the submarines is small compared with what the Zeppelins are going to do. You have observed that the Zeppelins have been more active and are going still farther and wider—and nearer London. Thus, you see, great things are in preparation. The British did not believe the power of our submarines. Now they have to. They have not believed in any real military power in our Zeppelins. That time will come."

"Well," said another of the party, "there has long been talk of that. It is no good to talk."

"But I know," replied the first. "Things have become different now. We will hit London. New machines, new bombs. I can

tell you a secret. One of our foremost chemical works has been making something quite new for the Zeppelins. You know the "Stink-bomb" (asphyxiating bombs). Our chemical resources are not yet exhausted. And I have seen the new Zeppelins."

Two days later, when travelling south from Munich, the writer was spoken to by a stranger in the train, who, after pointing out certain landmarks, said he had witnessed something quite remarkable there the other day.

Then he related how there had been a new big Zeppelin from Friedrichshafen flying over the plain in perfectly clear air. It made the journey to experiment with a new apparatus, the purpose of which was to enable the Zeppelins to make raids over enemy countries in the day time. This apparatus was a kind of "nebel-bomb" (fog-bomb), with a time fuse. When this bomb was dropped from the airship it exploded at a calculated distance from the ground and, with incredible rapidity, sent out a fog which absolutely shut out the Zeppelin from view. It was thus protected against attacks from guns and aeroplanes, and would be able to get away in comparative safety.

"I saw it myself," he exclaimed. "It was grand. The fog spread for many kilometres nearly instantaneously. With several bombs 20 kilometres square could be covered."

"My expressions of doubt and wonder were met by the assurance, 'I have carried the bomb myself; I am working in the factory.'"

It began to look as if there might, after all, be something in the predictions made in the Munich restaurant.

"I tried to get the young man to explain more clearly, but he only said, 'Well, you will soon hear more of it,' and turned on to the subject of the marvellous discoveries which had been made in chemistry to make such things possible."

Later I was told by a friend that five or six new Zeppelins had been constructed at Friedrichshafen, specially intended to be used in an air raid on London. It would not be a question of any isolated airship dropping one or two bombs, but of a fleet of dirigibles. The journeys already made to the neighbourhood of London had given evidence of the feasibility of such a plan, and the Hochst and Badensche chemical factories, the most proficient in the world, were hard at work for some purpose in connection with a plan of that kind."

The Geneva correspondent of the *Journal* reported:—
"The latest Zeppelin which has been completed at Friedrichshafen is the twelfth since the commencement of the war."

"Yesterday it made a trial trip with a full crew on board from Lake Constance. It can carry a ton of explosives, and is supposed to be much faster than all the Zeppelins previously constructed."

"It is designed with five of the same class to take part in the great raid on London."

According to the Ostend correspondent of the *Telegraaf* a British or French airman recently dropped a bomb on an electric tramcar, with the result that 24 soldiers were killed.

The following Central News message was received from Amsterdam on Tuesday:—

"A German airship passed along the Belgian frontier of the Dutch province of Zeeland this morning, pursued by a British aeroplane. The British airman was firing at the airship, which, however, was not replying."

The *Daily Telegraph* correspondent in the Eastern Mediterranean, writing on Tuesday regarding an attack by H.M.S. "Queen Elizabeth" on the "Goeben," said:—

"Owing to the extreme difficulty of indirect fire (from the Gulf of Saros) over the mountain range, and the invisibility of the enemy ship, the British Dreadnought was unable to fire many shells before the Goeben took flight. An observer in an aeroplane directed the 'Queen Elizabeth's' fire."

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Aerial Attacks on Neutral Vessels.

The *Daily Telegraph* correspondent at Rotterdam on the 14th inst. reported the following:—

"The Dutch steam trawler 'Gravenhage,' on arrival at Ymuiden this morning, reported having been attacked with bombs by a German aeroplane in the North Sea on Wednesday morning. The vessel was in longitude 53 mins. 30 deg. north, latitude 52° 20 deg. east, and was flying the Dutch flag, when three bombs were dropped from a Taube."

"They fell into the sea a considerable distance away, and caused tremendous explosions."

MODELS.

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

Speed of Pusher v. Tractor.

MR. W. E. EVANS, hon. sec. of the Paddington and Districts Aero Club, writes as follows:—

"My plan for carrying out this test is as follows: One model only is being used, namely, an ordinary tractor monoplane, driven by a single skin of rubber. It must be borne in mind that it is unnecessary for the model to rise off ground for the purposes of this test. Nevertheless a chassis has been fitted in order to keep the c.g. as far forward as possible. No tail skid is fitted because it would serve no useful purpose. The rubber being below the fuselage, the rear hook acts as a skid, and as a matter of fact the model has risen off and flown for 30 secs. or more. Before describing the change over, a few details of construction must be explained. The fuselage is a D section hollow spar of silver spruce 3 ft. 6 ins. long, $\frac{1}{2}$ in. by $\frac{1}{2}$ in. This, I find, is very rigid and fairly light. The tension of the rubber neither bends nor twists the spar. The tail is fixed entirely on the fuselage, and does not extend beyond it as is often the case. The propeller bearing and the rubber hook at other end are soldered on to brass caps which are a firm fit on the ends of the D spar. Now all that is necessary to convert the tractor into a pusher is to remove the propeller bearing to the rear end of fuselage and the rear hook to the front. The same propeller is used, but with the hook reversed. The only other adjustment necessary is to move the main plane a little farther back to counteract the altered distribution of weight caused by having the propeller at the rear instead of at the front. The head resistance of the model when gliding will be the same in both cases. I did not mean that the head resistances would be the same in flight, because I contend that the slipstream of the tractor increases the head resistance, and therefore the tractor model should be slower than the pusher, whereas in full-size practice the pusher machine is slower than the tractor. Why is this? I should have pointed out that the model is not designed to rise off as a pusher and the propeller is unprotected, but I do not think this will affect the results aimed at. The model will be timed (in calm weather) over a 100 ft. course, flights to be made both ways."

Model Research Work.

MR. O. Hamilton, jun., of the Stony Stratford and District Kite and Model Aeroplane Club, writes as follows:—

"With reference to your remarks on model research work and the speed-loading table, I regret to state unfortunately that we cannot altogether claim a result from actual experiment, but we have carefully checked some figures we have collected with our formula, and find that the table gives very close results."

"Regarding the source of information we obtained the table. Our contributor 'Thrust,' when he included the table in his notes, stated, 'I have discovered the following useful speed table, and I am including it in my notes for my readers' note books, the figures being taken from FLIGHT of January 15th, 1915, in answer to a query to Mr. J. Chapman.'"

"I enclose a table of speeds and loadings. Table for loadings ranging between 3 and 8 ozs., calculated in miles per hour and feet per sec., as suggested to me by Mr. Evans."

We hope to have some more interesting figures on the subject later.

Adits to Scientific Model Building.—The following table shows the relationship between the loading of a model and its speed:—

Loading.		Speed.		Loading.		Speed.	
ozs. per sq. ft.		m.p.h. ft. per sec.		ozs. per sq. ft.		m.p.h. ft. per sec.	
3	10.3	15.2	5.2	4.4	14.4	21.1	
3.5	10.8	15.9	6	14.7	21.6		
4	11.2	16.4	6.5	15.0	22.0		
4.5	11.6	17.0	7	15.3	22.4		
5	12	17.6	7.5	15.6	22.8		
5.5	12.4	18.1	8	15.9	23.3		
6	12.7	18.7	8.5	16.15	23.7		
6.5	13.1	19.2	9	16.45	24.1		
7	13.4	19.7	9.5	16.7	24.5		
7.5	13.75	20.2	10	17	24.5		
8	14.1	20.6					

AFFILIATED MODEL CLUBS DIARY.

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.

Paddington and Districts (77, SWINDERRY ROAD, WEMBLEY).

WHIT MONDAY: Two prizes are offered for the best and next best exhibition of flying, with any type of model, including compressed air. The usual flying ground will afterwards be closed until first Saturday in July.

The Aero Committee S.M.M.T.

At the last meeting of the Aero Committee of the Society of Motor Manufacturers and Traders, Mr. J. E. Hutton was unanimously re-elected chairman for the ensuing year, and Mr. Louis Coatalen, of the Sunbeam Motor Car Co., Ltd., was elected to the committee. At present the committee is not directly represented on the Council or Management Committee of the Society, and it was decided to endeavour to obtain such representation.

Acetylene Welded Fittings and Propellers.

CLAIMING to be the first firm to be established in this country for aviation work, Messrs. T. W. K. Clarke and Co. have, in the past few years, had an unique experience in all kinds of aeroplane and glider work. It is gratifying to hear that the excellence of their workmanship is now being appreciated in high quarters, as is shown by the fact that they now have on hand contracts from the Admiralty and War Office for Acetylene Welded Fittings and Propellers. These are specialties of the firm, who have put in special plant for the purpose, and they are open to do any kind of welded work and to manufacture propellers in any sizes or quantities at their works, High Street, Hampton Wick, Middlesex, near Kingston Bridge.

Oleo Plugs in Demand.

WE understand from Messrs. Leo Ripault and Co., of Poland Street, that in spite of the ever-increasing demand for Oleo plugs they are able to keep pace with it owing to the considerable additions which have been made to the machinery at their works. The plant has in fact been almost doubled, so there need be no hesitation in sending along orders for Oleo plugs either for aeroplane or motor car work, as prompt delivery can be given.

A War Time Catalogue.

THERE is a distinctly war time air about the latest catalogue issued by Gamage of Holborn. Not only has it a khaki cover, but it contains particulars of all sorts of things for those on active service abroad, or those who are doing their "bit" at home. Clothing equipment and useful articles for officers and men of the flying services or the anti-aircraft corps are all set forth, and among them may be noted some special caps and boots for aviators. Not only is the book full of good things, but it is an excellent example of well-balanced make-up, the illustrations and details of the various articles being most attractively arranged. A copy can be had on application to Gamage, Holborn, London, E.C.

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