BULLETINS

OF THE

Aerial Experiment Association

Bulletin No. XIII Issued Monday, Oct. 5, 1908

MR. McCURDY'S COPY.

BEINN BHREAGH, NEAR BADDECK, NOVA SCOTIA

Bulletins of the Aerial Experiment Association.

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BULLETIN NO.XIII ISSUED MONDAY OCT. 5, 1908.

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Beinn Bhreagh, Near Baddeck, Nova Scotia.

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Editorial Notes and Comments.

The work of the Aerial Experiment Association was suddenly interrupted on the 17th of September, 1908, by the lamentable death of Lieut. Selfridge in the accident to the Wright Brothers flying machine at Washington, D.C.

On Friday, Sept. 18, the Chairman accompanied by Mr. F. W. Baldwin, left Baddeck for Washington where they arrived Sunday, Sept. 20, and were joined by Mr. G. H. Curtiss and Mr. J. A. D. McCurdy from Hammondsport, N.Y.

On Monday, Sept. 21, a meeting of the Aerial Experiment Association was held at 1331 Connecticut Avenue, Washington, D.C.

Mr. McCurdy was elected Secretary of the Association, and resolutions were passed relating to the death of Lieut. Selfridge, and a resolution of sympathy for Mr. Orville Wright.

On Friday, Sept. 25, Lieut. Selfridge was laid at rest in the National Cemetery at Arlington, Virginia; He was given an impressive military funeral. Three volleys were fired over his grave by his comrades in arms, and the ceremonies terminated with the bugle call "taps" or "put out the lights".

The Honorary pall-bearers represented the Army and Navy the Aerial Experiment Association, and the Aero Club of America.

For the Army appeared Major Squier, Acting Chief Signal Officer, and Lieut. Winter of the aeronautical Dept. of the Army. For the Navy appeared Lieut. Creecy of the U S Marine Corps representing the aeronautical Dept. of the Navy.

The Aerial Experiment Association was represented by Alexander Graham Bell, Chairman, Mr. F. W. Baldwin and Mr. J.A. D. McCurdy (Mr. Curtiss was unable to attend).

The Aero Club of America was represented by a Committee consisting of Mr. Octave Chanute of Chicago, Chairman, Prof. A. F. Zahm of Washington, D.C., and Mr. George Oakley Totten, Jr. of Washington, D.C., and Mr. Hammer of New York.

On Saturday morning Sept. 26, 1908, a meeting of the Association was held at 1331 Connecticut Avenue, Washington, D.C. Advantage was taken of the presence of Mr. Edward A. Selfridge, father of Lieut. Selfridge, and the legal representative of his heirs to pass certain important resolutions which required the unanimous consent of all the interests involved in the Association.

It was decided to continue the Association under its present organization for another period of six months ending March 31, 1909; and Mr. Charles J. Bell was appointed Trustee for the Association.

Messrs. Curtiss, Baldwin and McCurdy accompanied by Mr. Gardiner H. Bell left Washington for Hammondsport, N.Y., Sunday evening Sept. 27.

Mr. A. G. Bell left Washington, Thursday morning Oct. 1, 1908, and was joined in Boston, Friday Oct. 2 by Mr. Baldwin and Mr. Gardiner Bell who accompanied him to Baddeck where they arrived Saturday October 3.

The members of the Association are now distributed as follows:- Mr. A. G. Bell and Mr. F. W. Baldwin at Beinn Bhreagh, C.B.; Mr. G. H. Curtiss and Mr. J.A.D. McCurdy at Hammondsport, N.Y., It is understood that Messrs. Curtiss and McCurdy will come to Beinn Bhreagh as soon as possible after testing out the new aerodrome No. 4 - McCurdy's "Silver-Dart".

Mr. Gardiner Bell has been appointed assistant editor of the Bulletins of the A.E.A.

The Chairman on behalf of the Association, has addressed a note to the President of the United States a copy of which is appended suggesting that an officer of the U S Army be detailed by the War Department to take the place of the late Lieut. Thomas E. Selfridge, as observer of the work of the A.E.A. in the interests of the U S Army. A.G.B.

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WASHINGTON MEETING SEPT. 21, 1908.

The following resolutions were adopted at a meeting of the A.E.A., held at 1331 Connecticut Avenue, Washington, D.C., Sept. 21, 1908.

Resolved: That Mr. J.A.D. McCurdy be elected as Secretary of the Aerial Experiment Association, as successor of the late Thomas E. Selfridge.

SELFRIDGE.

Resolved: That we place upon record our high appreciation of our late Secretary, Lieutenant Thomas E. Selfridge, who met death in his efforts to advance the art of Aviation. The Association laments the loss of a dear friend and valued associate. The United States Army loses a valuable and promising officer: And the world an ardent student of Aviation who made himself familiar with the whole progress of the art in the interests of his native country.

Resolved: That a Committee be appointed by the Chairman to prepare a biography of the late Thomas E. Selfridge for incorporation in the records of the Association.

Resolved: That a copy of these resolutions be transmitted to the parents of Lieut. Selfridge.

ORVILLE WRIGHT.

Resolved:-That the members of the Aerial Experiment Association herewith extend to Mr. Orville Wright their deepest sympathy for his grief at the death of their associate, Lieut.

Selfridge. We realize that in this pioneering of the air the unforeseen must occasionally be disastrous. We hope sincerely that Mr. Wright will soon recover from the serious injuries he has sustained, and continue, in conjunction with his brother, Mr. Wilbur Wright, his splendid demonstration to the world of the great possibilities of aerial flight.

WASHINGTON MEETING SEPT. 26, 1908.

A meeting of the A.E.A. was held at 1331 Connecticut Avenue, Washington, D.C., Sept. 26, 1908. Present: Dr. A. G. Bell, Mr. F. W. Baldwin, Mr. G. H. Curtiss, Mr. J.A.D. McCurdy, members of the Association; also present by invitation: Mr. E. A. Selfridge, Mr. S. W. Selfridge, Mr. J. S. Selfridge, Mr. Octave Chanute, Mr. Gilbert H. Grosvenor, and Mr. Gardiner H. Bell.

The special object of the meeting was to consider the future of the Association as affected by the death of Lieut. Thomas E. Selfridge.

For the information of Mr. E. A. Selfridge, father of the late Lieut. Thomas E. Selfridge, an address was made by the Chairman giving the history of the Aerial Experiment Association, and explaining what interest the late Thomas E. Selfridge had in the work of the Association. The address was taken down by a stenographer and will appear in a forthcoming Bulleti

Opportunity was taken of the presence of Mr. E. A. Sel ridge, legal representative of the heirs of the late Thomas

E. Selfridge to pass resolutions requiring unanimous action on the part of the Association, Mr. E. A. Selfridge voting in the name and stead of his son, the late Thomas E. Selfridge, so as to obtain the unanimous consent of all the interests involved. The following resolutions were adopted:-

(1) Resolved: That the legal representative of the heirs of our deceased member, Lieut. Thomas E. Selfridge shall have the right to attend any of the meetings of the Association and vote at such meetings in the name and stead of the late Thomas E. Selfridge; and that, in all matters requiring the unanimous consent of the members, the consent of the said representative of the late Thomas E. Selfridge shall be required.

(2) Resolved: That the Association recognise Mr. Edward A. Selfridge of 3615 California Street, San Francisco, California, as the legal representative of the late Thomas E. Selfridge.

The above resolutions (1 and 2) were adopted by the unanimous votes of the surviving members, Messrs. Bell, Curtiss, Baldwin and McCurdy.

The following resolutions (3 and 4) requiring the unanimous consent of all the interests involved were then adopted.

(3) Resolved: That the Aerial Experiment Association be continued under its present organization for another period of six months, ending March 31, 1909.

Unanimously adopted, the vote of Mr. Edward A. Selfridge being accepted as the vote of the late Thomas E. Selfridge

(4) Resolved: That Mr. Charles J. Bell, President of the American Security & Trust Company, be appointed Trustee of the Aerial Experiment Association to receive and distribute the proceeds of the work of the Association in accordance with the article of agreement of organization, and of resolutions of the Association.

Unanimously adopted, the vote of Mr. Edward A. Selfridge being received as the vote of Thomas E. Selfridge deceased

Mr. Edward A. Selfridge gave his consent to the publication, outside of the Association, of an article written by the late Lieut. Thomas E. Selfridge entitled, "A Brief Sketch of the Progress of the Art of Aviation", which appeared in Bulletin No.II issued Monday July 20, 1908; and Mr. Octave Chanute kindly consented to revise the article before publication as to data and references but not as to the sense of the article.

The following resolution was then moved by Mr. Curtiss seconded by Mr. Baldwin:-

(5). Resolved: That the official headquarters of the Association be removed from Hammondsport, N.Y., to Beinn Bhreagh, Near Baddeck, Nova Scotia, on the first of October, 1908. Unanimously adopted.

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Letter from Maure, Cameron, Lewis & Massie.

To Dr. A. G. Bell,
Washington, D.C.

Washington, D.C., Sept. 24, 1908:- Will you please forward to us a copy of the dictation from which you read last night, differentiating the A.E.A. structure from the Wright machine, as Mr. Cameron feels that the same will be of great value to him in preparing the specification of the case which he has in hand.

(Signed) Maure, Cameron, Lewis & Massie.

Reply by Dr. Bell.

To Maure, Cameron, Lewis & Massie,
620 F Street, Washington, D.C.

Washington, D.C., Sept. 29, 1908:- I have been looking over the patent of the Wright Brothers, No. 821,393, May 22, 1906 to see how our method of lateral control differs from theirs. I give you a few thoughts upon the subject which may perhaps be of assistance to Mr. Cameron in preparing our specification of the case. At the same time this note will answer your note of September 24th as it contains the substance of the dictation you refer to besides other points.

Difference between the Wright Brothers Machine and our Hammondsport Machines.

1. The framework of the Wright Brothers machine is flexible, ours is rigid.

2. It is a necessary feature of their machine that the framework should be flexible in order to permit of distortion, so that the aeroplanes may be twisted in accordance with their method of lateral control.

In our machine the framework is a stiff and rigid truss, specially designed to resist distortion and twisting strains; and we do not, and cannot, twist our aeroplanes, or distort the framework upon which they are stretched.

3. In the Wright Brothers machine, in operating the lateral controls, each aeroplane is given a twist along its entire length, so that each aeroplane surface is given a helicoidal warp or twist; and this kind of action is preferred by them for the reason that it gives a continuous surface on each side of the machine which has a gradually increasing or decreasing angle of incidence from the center of the machine to either side.

In our machine we have no kind of action at all analogous to this. We do not twist our aeroplanes, or any portion of them, for any purpose whatsoever: Indeed we look upon this kind of action as distinctly detrimental from a structural point of view; and our form of truss is specially designed to prevent it.

4. In the Wright Brothers machine the twisting of the supporting surfaces does not fully accomplish the result at which

they aim. They require to combine, with the twisting action of the aeroplanes, a steering movement of the vertical rudder at the rear.

Our lateral rudders by themselves accomplish the desired result without any co-operation with the vertical rudder.

This seems to be an important point of difference worthy of elaboration. The Wrights say (page 4, line 16 to 35).

> ***When the lateral margins of the aeroplanes are so turned in the manner herein before described as to present different angles of incidence to the atmosphere that side presenting the largest angle of incidence, although being lifted or moved upward in the manner already described, at the same time meets with an increased resistance to its forward motion, and is therefore retarded in its forward motion, while at the same time the other side of the machine, presenting a smaller angle of incidence, meets with less resistance to its forward motion and tends to move forward more rapidly than the retarded side. This gives the machine a tendency to turn around its vertical axis, and this tendency if not properly met will not only change the direction of the front of the machine, but will ultimately permit one side thereof to drop into a position vertically below the other side with the aeroplanes in vertical position, thus causing the machine to fall.

This is a confession by the Wrights themselves that the twisted aeroplanes do not accomplish the object they had in view. They require to include another element (the vertical rudder) in their combination in order to obtain our result. They say (p. 4, line 54 to 64).

> ***We do not limit ourselves to the particular description of rudder set forth, the essential being that the rudder shall be vertical and shall be so moved as to present its resisting-surface on that side of the machine which offers the least resistance to the atmosphere, so as to counteract the tendency of the machine to turn around a vertical axis when the two sides thereof offer different resistances to the air.

5. The expression "when the two sides thereof offer different resistances to the air" suggests the idea that perhaps under some circumstances the two sides might <u>not</u> offer different resistances to the air in which case the assistance of the vertical rudder would not be required: It is only "when" they do so that it is needed.

The language of the specification is thus somewhat misleading; for a little consideration will show that the twisting of the aeroplanes to any practicable extent is incapable of producing the righting effect desired, without at the same time causing the two sides of the machine to offer different resistances to advance through the air:- The vertical rudder is an essential element in their combination. A little further discussion of the point will demonstrate this proposition.

6. The word "aeroplane", as used in the Wright specification, is defined to mean "the supporting-surface or supporting-surfaces by means of which the machine is sustained in the air"

Now it is obvious that the machine will not be sustained in the air unless the air pressure is greater below the supporting-surfaces than above. The necessary condition of support is that the upward pressure from below must exceed the downward pressure from above, by the weight of the machine; otherwise the machine will fall.

This means that the aeroplanes that sustain the machine in the air must be tilted up in front, at a positive angle to the line of advance, so as to permit of an excess of air pressure from below. Even though it might be structurally possible to depress the front edge below the line of advance,

at a negative angle, it would not be practicable so to do; for the aeroplane, robbed of its support below would fall, and the excess of pressure acting upon the upper surface of the aeroplane would still further hasten its fall. The aviator who should twist his aeroplane to the extent of making a negative angle with the line of advance would speedily find himself in the position of Pat when he sawed off from the tree the branch upon which he sat.

So long as the instrumentalities involved in the twisting process are the "supporting-surfaces that sustain the machine in the air", it is obviously impracticable to turn the surfaces at either end so as to make a negative angle with the line of advance; at both sides the angle must be positive: That is, the surfaces must be tilted up in front at both ends. It is only practicable therefore to twist the aeroplanes sufficiently to present a different angle of incidence to the air at the two ends, both angles being positive. The side having the greater angle of incidence will experience more resistance to advance than the other; and thus produce a tendency to rotate about the vertical axis of the machine, necessitating a contrary steering action of the vertical rudder to prevent disaster. The vertical rudder is therefore an essential element in the combination of instrumentalities employed by the Wrights.

In our machine it is not so and for the following reason:-

The surfaces employed in our lateral rudders do not form any part of "the supporting-surfaces that sustain the machine in the air", and hence can be turned at a negative

angle to the line of advance without robbing the whole of one side of the machine of support, which would be the result of twisting one side of the Wright's aeroplane to a negative angle.

When our machine advances through the air, say upon a horizental path, the lateral rudders themselves are horizental. Their surfaces are parallel to the line of advance, not tilted up in front as in the case of supporting-surfaces. They are not, normally, supporting-surfaces at all; being merely appendages driven edgeways through the air.

In operating the lateral rudders the rear portion of one rudder is depressed, and the rear portion of the other elevated, and to an equal extent. The angles of incidence, one positive and the other negative, are equal; and the resulting resistance to onward advance is the same at either side of the machine, so the operation of the rudders does not tend to turn the machine about a vertical axis, but permits it to continue its rectilineal path without disturbance while the rudders perform their proper function of righting the machine after a tip.

Even though it should be held that the twisted aeroplanes of the Wright Brothers machine act as lateral rudders, or are lateral rudders themselves in effect, still it is obvious that they are not the equivalents of <u>our</u> lateral rudders, for an additional element is required in the Wright combination (the vertical rudder), to produce our result.

While the twisting of the aeroplanes is the method preferred by the Wright Brothers, and the only method shown

by them, their specification declares that their invention is not limited to this particular construction, but includes (p. 3, lines 41 to 45)

> "Any construction whereby the angular relations of the lateral margins of the aeroplanes may be varied in opposite directions with respect to the normal planes of said aeroplanes".

Again they say (p. 5 lines 74 to 76)

> "Our invention is not limited to this form of construction, since it is only necessary to move the lateral marginal portions etc".

Moving the "lateral marginal portions of the aeroplanes" is then the essence of the Wright method. The one essential ingredient of their combination. If we do this we infringe their patent according to their own declaration. But if we do not, do we infringe? Here we have the utmost scope of their invention defined in their own words; and yet it seems to me they do not cover our case.

In our machine we do not move "the lateral margins of the aeroplanes" at all; and could not move them, even if we so desired, on account of the rigid nature of the trussing employed.

Of course we must anticipate an attempt to show that our lateral rudders <u>are</u> the lateral margins of the aeroplane.

I think we may hopefully assume the position that our lateral rudders, so far from being the lateral margins of the aeroplanes, are not even "aeroplanes" at all in the sense that term is employed in the Wright specification. Of course they are substantially flat surfaces: But they are not "the supporting-surfaces by means of which the machine is sustained

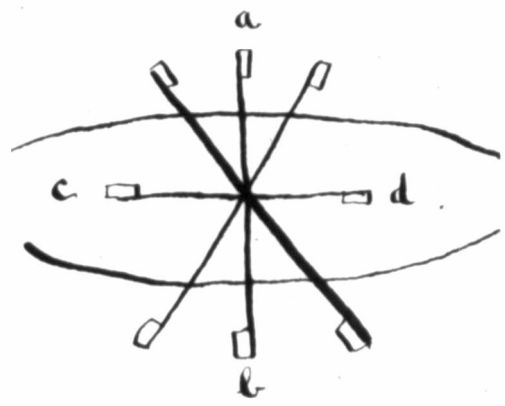
in the air": They are not "portions" of those surfaces whether "marginal" or not: They are not "supporting-surfaces" at all, for their surfaces are normally parallel to the line of advance, and are normally driven edgeways through the air without being inclined at an angle (or rather their angle of incidence is zero), whereas a positive angle of incidence, however small, is necessary to bring about "support". I think we can show clearly that our lateral rudders are quite distinct from "the lateral margins of the aeroplanes", by exhibiting the scope of our invention and dwelling upon cases which could not by any possible reasonable construction be declared to be covered by the expression, "the lateral marginal portions of the aeroplanes".

Our lateral rudders are mere appendages which may be placed in any convenient location in the machine so long as they are oppositely or symmetrically arranged on either side of the longitudinal axis of the machine.

We prefer to place them beyond the lateral end of the aeroplanes so as to obtain as great a leverage as possible: But they may be placed between the aeroplanes, in front of them or behind them, above them or below them, in fact their exact location is immaterial to their mode of operation.

We might even have a series of such rudders arranged radially, like the vanes of a wind mill, around the longitudinal axis of the machine. (see diagram). This is a most interesting case, suggesting the advisability of avoiding the use of the word "lateral".

Some of these rudders could hardly be considered as lateral rudders. Take the vertical pair for example (ab).



The function of our rudders ("balancing rudders"?) is to turn the machine around a longitudinal axis as desired, without turning it around a vertical axis.

Any two of these opposed vanes would do the work. Take for example the vertical pair (ab) in which the surfaces, as in all the other cases, are normally parallel to the line of advance being driven edgeways through the air. Here, however, the surfaces are normally vertical instead of horizontal.

Now when we move these vertical rudders (ab) to one side, are we moving "the lateral margins of the aeroplanes"? Assuredly not.

Here it is obvious to the blindest eye that we are dealing with a different thing altogether. But the operation of the vertical pair (ab) does not differ in principle from that of the horizontal pair (cd) which constitute, substantially, the rudders we use.

I am decidedly of the opinion that our invention is not covered by the Wright Brothers patent. If we can only grasp, and express, the essential features, I am inclined to think we may obtain an independent patent of value which will not be subordinated to the Wright Brothers patent in any respect.

(Signed) Alexander Graham Bell.

A Note by Mr. Edmund Lyon.

Washington, D.C., Sept. 29, 1908:- The Wright Brothers in their lateral control rely wholly upon varying the support of different portions of their aeroplane by means of a twisting feature. All parts of the plane necessarily retaining more or less of their lifting power. The total amount of lift in their plane being variable when the medial axis maintains a constant angle to its vertical axis.

In the Hammondsport idea, however, the amount of lift is unchanged by any action whatever of the lateral rudders. When in normal position the lifts of these rudders are both zero and when in operation the resultant effect of the two rudders will be zero, the positive effect of one being exactly counterbalanced by the effect of the other. The lift of the entire plane will not for one instant be increased or decreased by any action whatever of these lateral rudders.

The Wrights idea changes constantly the lifting power of their machine, whereas the Hammondsport idea leaves the lifting power invariable.

(Signed) Edmund Lyon.

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WORK OF BEINN BHREAGH LABORATORY:
by William F. Bedwin, Superintendent.

Aerodrome No. 5.

Aerodrome No. 5 has now begun to look like a real flying machine. The beading of the machine is practically completed and its weight, as it is suspended from the ceiling of the Aerodrome shed is 160 lbs. It contains 3690 winged cells assembled in the manner shown in photograph (Bulletin No. IX, pp 31-32). The center section is not in the machine. Appended is a photograph of the best view we could get of the machine in the Aerodrome shed, it being very inconvenient to remove it to the outside in its present condition.

The full-sized model of the center section of aerodrome No. 5 has been completed with its metal fastenings etc., and is suspended in a frame at the Kite House for study purposes. The weight of this center section, photograph of which is shown in Bulletin No.XI p. 25 is 54.5 lbs.

Material for guy wires, turn buckles etc. etc., has been ordered from Hammondsport and is expected here daily.

Aerodrome No. 6.

CORRECTION:- I would like to correct two errors that appeared in Bulletin No. XII in relation to the eight foot pitch, double propellers used on the Dhonnas Beag. These propellers are 7 ft. diameter instead of 6 as stated, and the new double propellers which have a pitch of 30 degrees at tip

are 2.28 meters diameter instead of 2.08 as stated.

On Sept. 29, 1908, an experiment was made with these new double propellers, which are now mounted on the Dhonnas Beag geared 8-40. The following results were observed:- Maximum pull 107 lbs., steady pull 90 lbs; rotation of engine 695 in 30 seconds, giving a rotation of propeller of 1390 rpm. In this experiment the engine turned up very nicely. No run was tried over course as I thought this part of experiments should be deferred until Mr. Baldwin returned. A description of the construction of these propellers is given in my report, Bulletin No. XII p. 15. Photographs of the propellers separately, and on reverse gears, and mounted on the Dhonnas Beag are appended.

The model for aerodrome No. 6, Oienos type, is complete so far as the oblique surfaces are concerned. It is composed of one meter tetrahedral cells covered with nainsook, these cells are made up of the 50 cm triangles referred to in Bulletin No. I, p. 31, and interlace one another in single Oienos form as shown in appended photograph. On account of the unfinished condition of structure, it was necessary to photograph upside down. At the points of inter-section of these cells there are thirteen horizontal surfaces inserted each 50 cm by 50 cm. On the top of the structure will be placed a horizontal surface 7 meters long by 1 meter wide, making a total horizontal surface of 10.25 square meters. No attention has been paid as yet to putting on body part of machine. I thought it better to go ahead and build the whole wing structure, and then cut out a portion of the center to insert body. My reason for doing

it in this way was, that I could get the whole material lined up more truly and at the most, all I will have to cut out will be one 50 cm inverted cell, and a square surface 50 cm by 50 cm.

The wooden members of this construction are made very light only 8 millimeters by 4 millimeters in cross-section. It is proposed to strengthen these members by a system of wiring suggested by Mr. Baldwin.

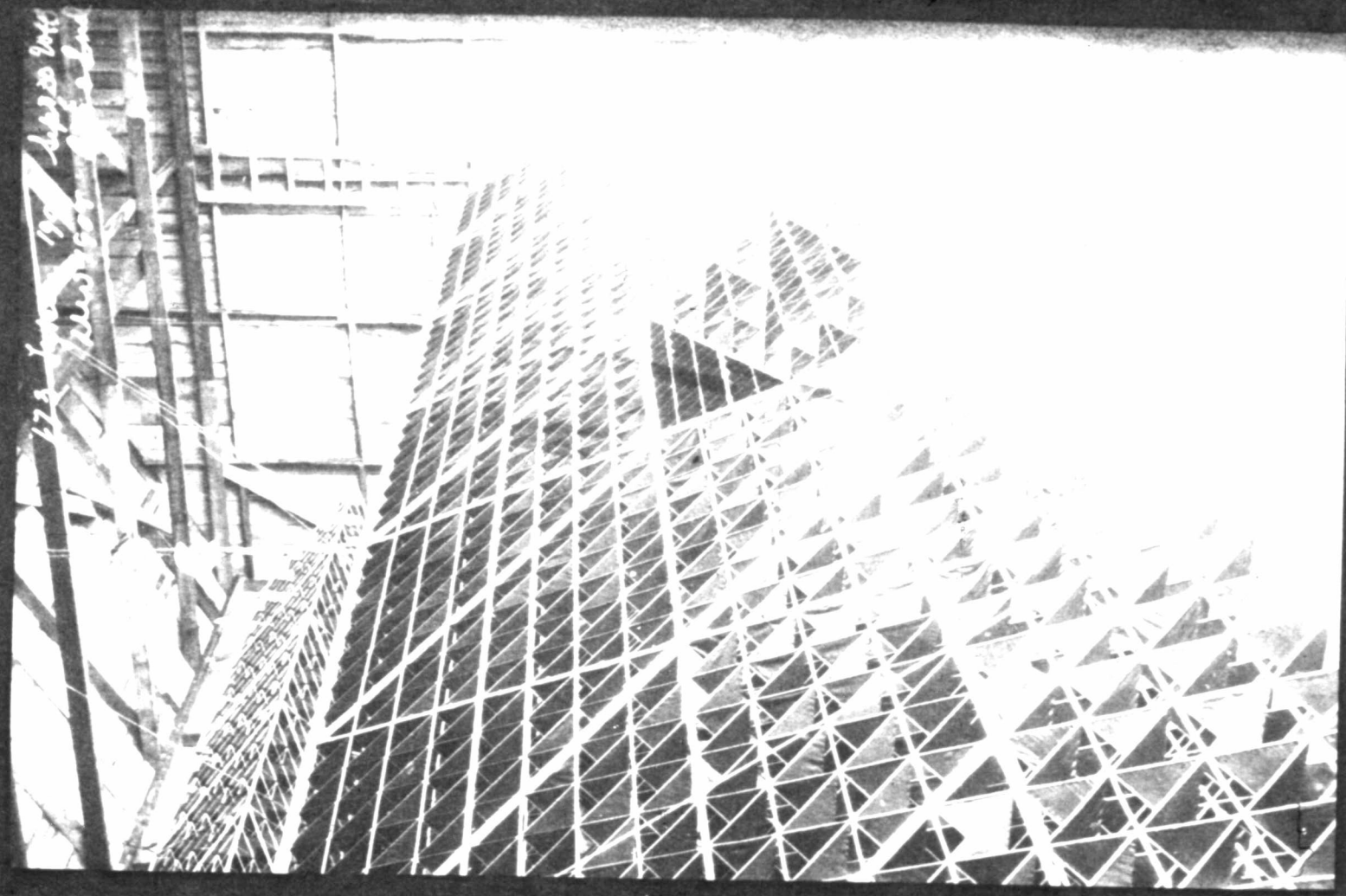
I have found considerable difficulty in keeping the Dhonnas Beag perfectly water-tight, and discovered that in carrying it in and out of the building, we have started cracks in the planking due to the strains of lifting it in and out of the water. Considering this I have thought it better to make a cradle to set the boat in, and have placed a set of rollers on the platform and floor so that it can be run in and out without any undue strains to the hull. I think this will be more satisfactory than the old way of launching.

I have written to a Boston firm asking quotations on cedar planking 3/16 of an inch thick to be used for the boat part of aerodrome No. 6. I think this material will be much lighter and better for the purpose than the cyprus used in the Dhonnas Beag.

The double propellers on the Dhonnas Beag weigh only about 8 lbs each, and are remarkably stiff and strong.

Appended is a photograph of a propeller being made at the Laboratory by Mr. C. McLean. It will be noticed that one blade is expanded and one contracted. It is proposed to have this fitted so that the blades can be expanded during rotation.

W. F. B.



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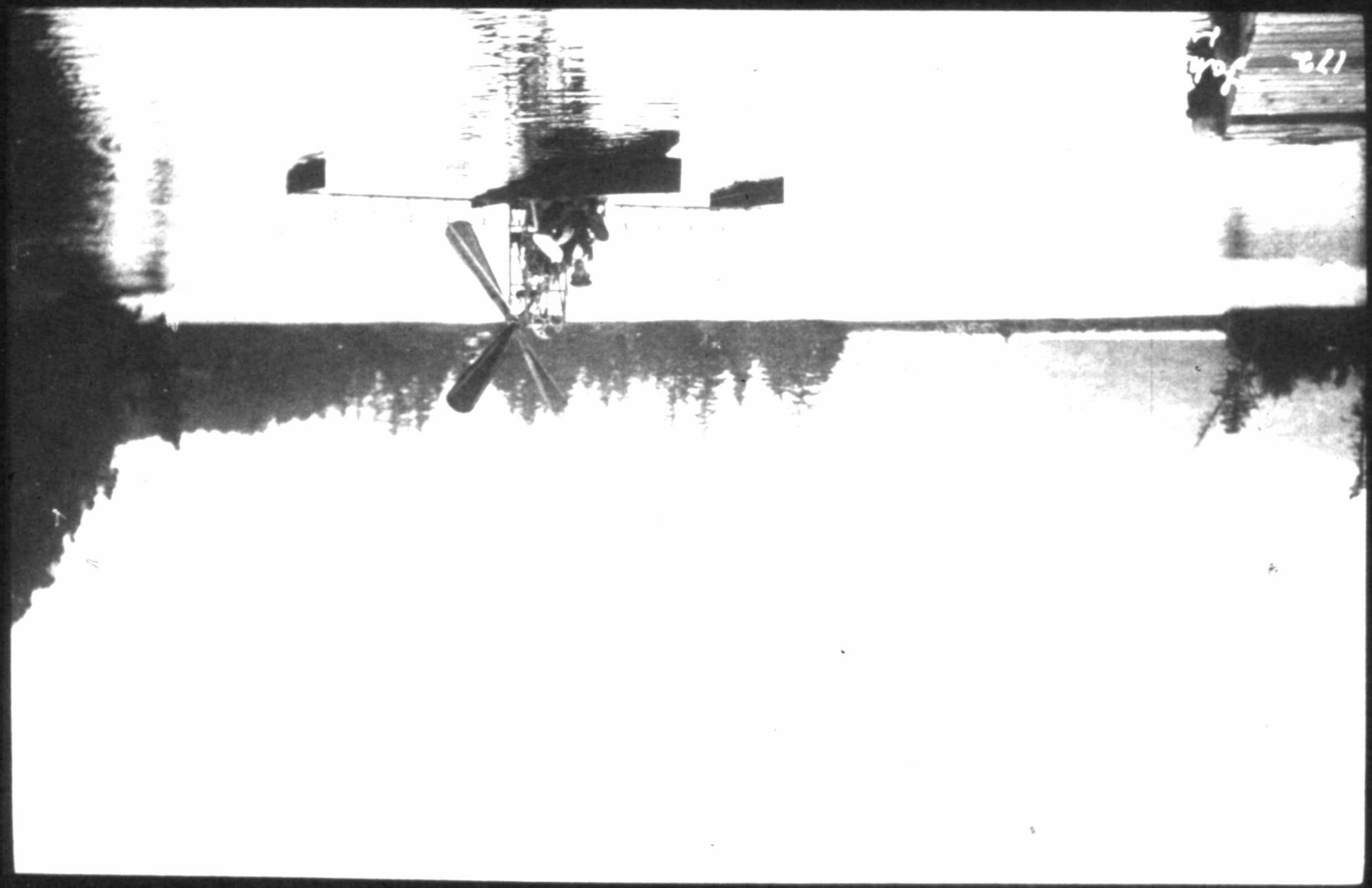

ON THE DEATH OF SELFRIDGE.

(Extract from letter from Mrs. Bell).

Baddeck, Nova Scotia, Sept. 20, 1908:- I can't get over Tom's being taken. I can't realize it, it doesn't seem possible. Isn't it heart breaking? Yet and yet it is better for him than to die as poor Langley did. He was so happy to the very end. I know he would have said he was having the time of his life, and though he must have realized his danger in these last seconds, he would still hope to escape, and he had no time for unavailing regrets. It was the happiest way death could come to him now, but why need it have come now when he was ready to put to his country's use all the results of his long patient preparation.

I feel I never realized how dear and good he was. I find all the old women here heart broken for his dear sake, he was so good to them, and what higher testimonial could a young fellow have. How few will turn aside in their gay happy lives and full interests to be kind to the broken old women with nothing attractive about them, but that they were women and he a knightly boy.

I miss the thought of him so. Nobody ever did so many little things for me as he. Others have loved me more of course, but he just saw the little things, pushing up my chair at table, or bringing a screen to shut off a draught, all so quietly and unobtrusively no one noticed.

I am so sorry for you in this breaking of your beautiful Association. But it was beautiful and the memory of it will endure:- "Bell, Curtiss, Baldwin, Selfridge, and McCurdy".

It was indeed a "brilliant coterie" as one paper said. Do anything you think best, but let the A.E.A. be only these to the end, and then take some other name.

Give my love to them all, and let's hold tight together all the tighter for the one that's gone. Casey called me the "little mother of us all", and so I want to be; I love all our boys, and there can't be any others just the same, etc.

(Signed) Mabel G. Bell.

Bell to Curtiss.

Mr. G. H. Curtiss,
Hammondsport, N.Y.

Washington, D.C., Sept. 29, 1908:- I notice in the newspapers this morning that the Wright Brothers have applied through their sister, Miss Wright, for an extension of time on their contract amounting to about nine months.

While the War Department is inclined to favor this extension it is disappointed that the Officers of the Signal Corps should be deprived for so long a time of the opportunity of experimenting with heavier-than-air flying machines. Through Wilbur Wright, the Officers of foreign armies will be able to gain experience in the use of such machines; whereas in our own army we must await the recovery of Orville Wright, or the return of Wilbur Wright to this country.

Now why cannot the Aerial Experiment Association offer its services at this juncture? We are not in any sense competitors of the Wright Brothers in the matter of their contract with the Government. We are an experiment association, pure and simple, carrying on experiments to promote the art of aviation in America. One of the reasons for associating Lieut. Selfridge with us was that the United States Army should have the benefit of our experiments through an Officer specially detailed to observe them. We now have two aerodromes (No.3 and 4) ready to fly, and why should we not offer the War Department the use of these aerodromes for experimental purposes while they are waiting for Orville Wright to recover. If you and the other members of the A.E.A. think well of this idea telegraph to me upon receipt of this at once, and I will invite Major

Squire to go to Hammondsport and look over our machines, or detail an officer to report upon them, and express to him our desire to be of assistance to the War Department in this matter without in any way interfering with their dealings with the Wright Brothers. I can say that we are their friends, and not their competitors, and will not do anything that would interfere with their contract with the Government.

I suppose you are now starting on some flights with the June Bug to show Casey the advance you have made in gaining skill in the manner of its operation. There is only one thing I am afraid of in regard to these experiments, and I had quite a serious conversation with Douglas McCurdy about it. The temptation is strong to attempt to carry two men in the June Bug, or in the Silver-Dart, because Orville Wright, Wilbur Wright and Farnam or Delagrange have done it. I do not want you, or any of you to attempt it. It has already been done by others and of course we know that we can do it too, but I do not think that we have any right to run unnecessary risks and am not at all in sympathy with the idea, as it cannot advance our experiments, and it might be possible that we might regret it. Orville Wright, the most experienced aviater of the world, and probably the best, has lost poor Selfridge. Do not let us, with less experience, run any risks of this kind. Nothing can be gained by it, and the weight of another man - a mere mass of lead, and not a living human being, would serve just as well to demonstrate the capabilities of our machine. We would justly lay ourselves open to severe

criticism were we to make such an experiment without adequate reason for so doing. I cannot speak too strongly on the matter. Remember Selfridge.

Yours sincerely,

(Signed) Alexander Graham Bell.

TELEGRAPHIC REPLY TO ABOVE.

(Curtiss to Bell)

To Dr. A.G. Bell,
Parker House, Boston, Mass.

Hammondsport, N.Y., Oct. 1, 1908:- Casey and Gardiner arrive Boston Friday morning. Think well of your idea. All here with you in any action you take.

(Signed) G. H. Curtiss.

Bell to President Roosevelt.

To The President
of the United States,
White House, Washington, D.C.

Baddeck, N.S., Oct. 5, 1908:- The death of Lieut. Thomas E. Selfridge, in the recent accident to the Wright Brothers flying machine, has deprived the United States Army of the services of the only officer acquainted with the work of the Aerial Experiment Association of which I am Chairman.

On behalf of the Association therefore, allow me to say, that we shall be very glad to give any information concerning our work to some other officer of the U S Army if desired.

We have, at Hammondsport, New York, an aerodrome available for experimental purposes, which won the Scientific American Trophy July 4, 1908, by flying one kilometer in a straight line.

We have another improved aerodrome upon the same model which is expected to take the air in about two weeks at Hammondsport, New York.

We have also at Beinn Bhreagh, Near Baddeck, Nova Scotia two other aerodromes partly completed, of entirely different construction which will probably be ready for trial in the early part of November.

We shall be glad to submit all these aerodromes, and the whole past work of the Association, to any officer properly detailed by the War Department, and afford him every opportunity for making experiments with our machines.

Signed) Alexander Graham Bell
Chairman of the A.E.A.

WHAT THE WORK OF THE AERIAL EXPERIMENT ASSOCIATION MEANS

by Carl Deinstbach.

When the first Hammondsport moter-aeroplane was built, the greatest achievement in power-flight before the public was the Voisin-Farman machine. It was therefore most natural to build the "Red Wing" on similar lines. There was indeed no true "rear cell" in the first construction, but the horizental-vertical "weather-vane" behind, very soon developed into a regulation "cell". While the "Red Wing" contained indeed virtually every part of the Farman machine, it still was superior. The "tail" in the rear cell was much smaller in proportion, and rectangular instead of forming a cube, and there was no dihedral angle - that <u>imperfect</u> method of maintaining side equilibrium.

The "Specialty" of all Hammondsport machines, vise-curving the wings toward each other at their tips, while originally only an archi-tectonic feature, that means, adapted only in the interest of a specially strong and light pattern, embodied at the same time two important aerodromical advantages.

Its natural consequence was a narrowing of the wings toward the tips. Lilienthal first explained scientifically how this increases the efficiency of the surface as a whole in

> "narrowing the supporting air wave at its lateral margins, and preventing it from breaking up into eddies at the sides".

It also tended to facilitate turning, as it became instructively evident to everyone who had seen Farman's machine fly after the "June Bug".

But it not only increased the efficiency of the surfaces but also the lateral stability. A little reasoning will show that it shielded the marginal portions of the wings from being lifted by the air current unless it came straight from the front. The effect of side gusts was thus minimized from the outset.

Moreover: The effect of shoving the machine sideways, which might be expected to some slight degree from a side gust striking the "spindle-shaped" body represented by the side elevation of the machine, tended further to decrease the excess of lift (on the side first struck) it would have produced in machines of the ordinary type.

The reason is very clear: The machine would thus yield to the impulse, and that means, that its lift, in this sideways sense, would be diminished in much the same way as that of a kite of which the flying line has been severed, and which is receding before the wind. Also this yielding of the machine might cause a certain compensating "pseudo-wind gust" from the opposite side at the moment of the first impact, as the machine might be itself pushed sideways against air, which, in the lateral sense, was yet "still" during the first instant.

In the "Red Wing" the upper wing-tips overlapped the lower, and there was therefore more down-bent tip-surface than compensating up-bent one. The effect was therefore like having a plane with down-bent tips, and it is known, that this shape is really the best for side equilibrium, for the simple reason that a side gust which naturally tends to lift the side it strikes is neutralized by the downward pressure it exerts at

at the same time on the down-bent side tip. This is no mere theory, but the outcome of practical experience with the Wright gliders. So even the "Red Wing" possessed evidently a high degree of automatic lateral equilibrium.

The excellence of the tip-control since introduced and its superiority in not producing any one-sided drift and not requiring any compensating action of the rear rudder, over the Wright Brothers tip-control is evident. It is also, in the last machine the "Silver-Dart", fully as powerful as the Wright's device. What the moveable tips may comparatively lack in surface, is made up by their greater leverage, being disposed at the ends of longer and narrower wings.

It is most significant for the keen judgment which has controlled the Hammondsport experiences, and which has so fully made the best of its experiences, that the Wright Brothers views about the fallacy of seeing in a rear cell a really beneficial stabilizer under any but exceptional conditions, were arrived at independently.

Similarly it was found, that the horizontal front rudder, as well as the vertical rear rudder had to be powerful and capable of exerting a very strong effect in emergencies.

The outcome of the development gone through in three tentative constructions seems, that aeroplane No. 4, the "Silver-Dart" has become a machine which reaches fully the level of the Wright flyer.

There might be unfinished points: The exact proportions of the leverage in the rudders to their surface and to the measurements and proportions of the whole machine might not yet have been hit. There might be avoidable dead resistance in

part of the framing (front control support). There may still be imperfections in the shaping of details (front ends of wings etc.) in which all the Wright Brothers had a larger experience to guide them; but there seems a superiority in the way the controlling devices are operated (the latter all act independently from each other and are put in action by seemingly more convenient and natural means, steering wheel, fork around body, etc) to fully make up for that all.

So it seems perfectly true, that a man, with sufficient skill to make record-breaking flights with the Wright machine, might do at least fully as well with the tailless, tip-controlled, powerfully steered, reliably-motored "Silver-Dart"; and a splendid future lies before the Hammondsport experimenters.

It must not be forgotten moreover, that they attain so far their achievements under rather adverse conditions of the testing grounds.

(Signed) Carl Dienstbach.