BULLETINS

OF THE

Aerial Experiment Association

Bulletin No. ~~IX~~ Issued ~~MONDAY, Sept. 7,~~ 1908

~~LIEUT. SELFRIDGE'S~~ COPY.

Mr. McCurdy's Copy

BEINN BHREAGH, NEAR BADDECK, NOVA SCOTIA

Bulletins of the Aerial Experiment Association.

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BULLETIN NO.IX   ISSUED MONDAY   SEPTEMBER 7, 1908.

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Beinn Bhreagh, Near Baddeck, Nova Scotia.

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(For illustrations see over).

Illustrations.

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THE REMOVAL OF HEADQUARTERS TO BEINN BHREAGH.

Letters and telegrams from Hammondsport indicate that aeredrome No.4, McCurdy's Silver-Dart is now practically completed, and that the machine may take the air any day.

It is understood by all the members that the Associations headquarters will be removed to Beinn Bhreagh, Near Baddeck, Nova Scotia, after sufficient time has elapsed to afford Mr. McCurdy full opportunity of testing out his machine at Hammondsport.

A meeting of the Association must be held at Beinn Bhreagh on the 30th of September to decide upon the future of the Association, as this is the day when the Association, in accordance with out agreement of organization, expires by time limitation, unless some other arrangement is unanimously agreed upon by the members. It is therefore urged that the Hammondsport members should come to Beinn Bhreagh as soon as practicable.

Lieut. Selfridge, our Secretary, has for some time past been in Washington, D.C., having been ordered there by the War Department. It is hoped that he too may be able to visit Beinn Bhreagh before the 30th of September for the continuance of the Association after that date, in its present, or in any modified form, requires the unanimous approval of the members. Should Lieut. Selfridge find that his presence at Beinn Bhreagh upon that date would be inconsistent with his military duties in Washington, D.C., he is specially requested to communicate his views concerning the future of the Association by letter to the Chairman, so that his vote may be recorded. In such an event he is also requested to turn over the records of the

Secretary's Office to Mr. Curtiss, Director of Experiments, to be brought to Beinn Bhreagh in time for the meeting September 30.

The Treasurer, Mr. McCurdy, is requested to prepare a full report of the expenses of the Association since its formation, and all debts and liabilities of the Association should be paid off before September 30.

Mr. Curtiss, as Director of Experiments, should report at the meeting on September 30 upon the experimental work of the Association from its organization for preservation in our records.

The following business will come before the Association at its meeting on September 30, and it may be well therefore for all the members to be prepared with a definite answer to the queries proposed.

1. The first business will be the appointment of a Trustee to hold the property of the Association under an agreement to distribute the same in accordance with our article of organization.

2. Shall the Association be continued beyond the 30th of September, 1908.

3. Shall the present organization be continued, and if so for how long a period.

4. Shall the Association be continued in a modified form, and if so what modifications shall be adopted.

Reports.

1. Report of the Chairman.
2. Report of the Secretary.
3. Report of the Treasurer.
4. Report of the Director of Experiments.
5. Report of the Auditor.

A.G.B.

WORK OF THE AERIAL EXPERIMENT ASSOCIATION AS RECORDED IN TELEGRAMS FROM MEMBERS.

To Dr. A. G. Bell,
Baddeck, N.S.

Hammondsport, N.Y., Aug. 28, 1908:-Made two flights last evening; one with top surface off tail, another with both surfaces off. No noticeable difference with one surface off, but with both off machine was speedy and tremendously sensitive. Will need practice to attain skill. Used new propeller push 212 lbs. Silver-Dart about ready. Will prepare full details before trial

J.A.D. McCurdy.

To Dr. A. G. Bell,
Baddeck, N.S.

Hammondsport, N.Y., Aug. 28, 1908:- John and I both flew to-night with nothing behind but rudder. No tail.

G. H. Curtiss.

To J.A.D. McCurdy,
Hammondsport, N.Y.

Baddeck, N.S., Aug. 29, 1908:- Baldwin's "Little Devil" made twenty-four kilometers per hour this morning without any hydroplanes, an unprecedented feat for a motor boat driven by an aerial propeller.

Graham Bell.

To Dr. A. G. Bell,
Baddeck, N.S.

Hammondsport, N.Y., Aug. 30, 1908:- John came back last night with June Bug. Drawing wanted mailed to-morrow.

G. H. Curtiss.

To Dr. A. G. Bell,
Baddeck, N.S.

Hammondsport, N.Y., Aug. 31, 1908:-Glenn made circle to-night. Time 2 minutes and 28 seconds.

J.A.D. McCurdy.

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

Baddeck, N.S., Sept. 3, 1908:-Not advisable I think to enter for Scientific American Trophy, Sept. seven under new conditions without some reasonable prospect of success and without competitors, but do as you think best.

Graham Bell.

WORK OF THE AERIAL EXPERIMENT ASSOCIATION AS RECORDED IN LETTERS AND TELEGRAMS FROM MEMBERS.

(Letters).

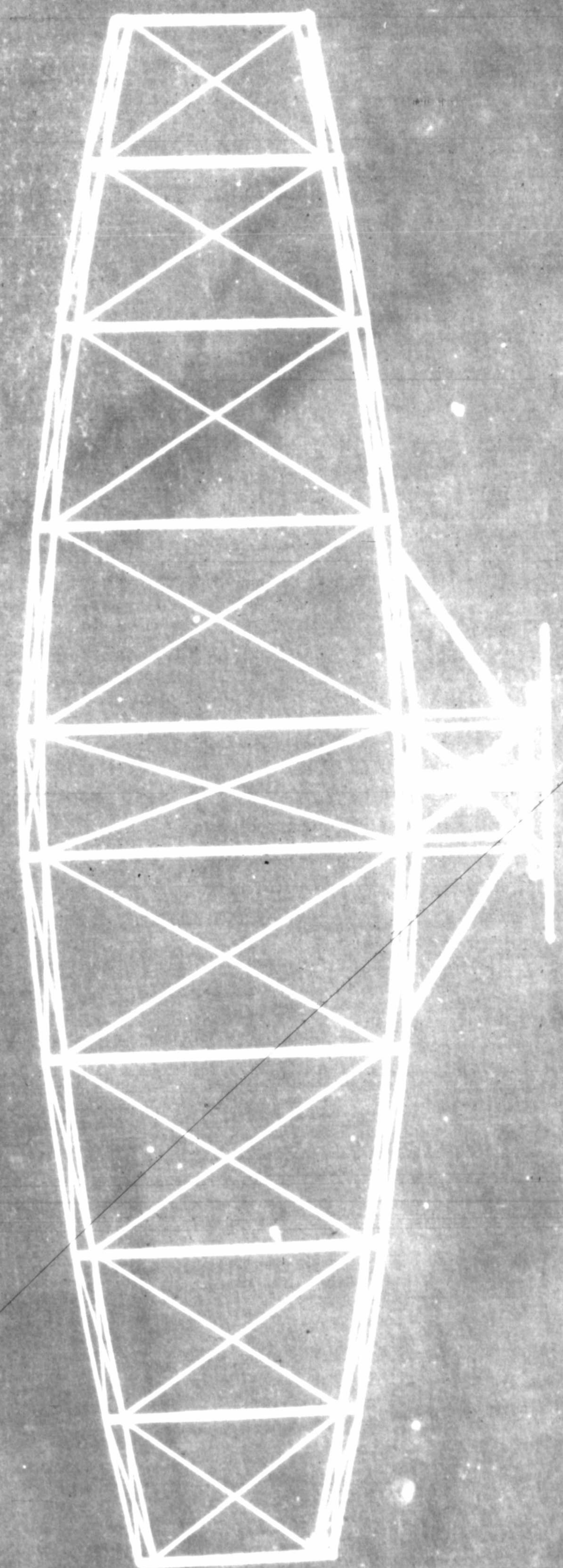
To The Aerial
Experiment Association,
Baddeck, Nova Scotia.

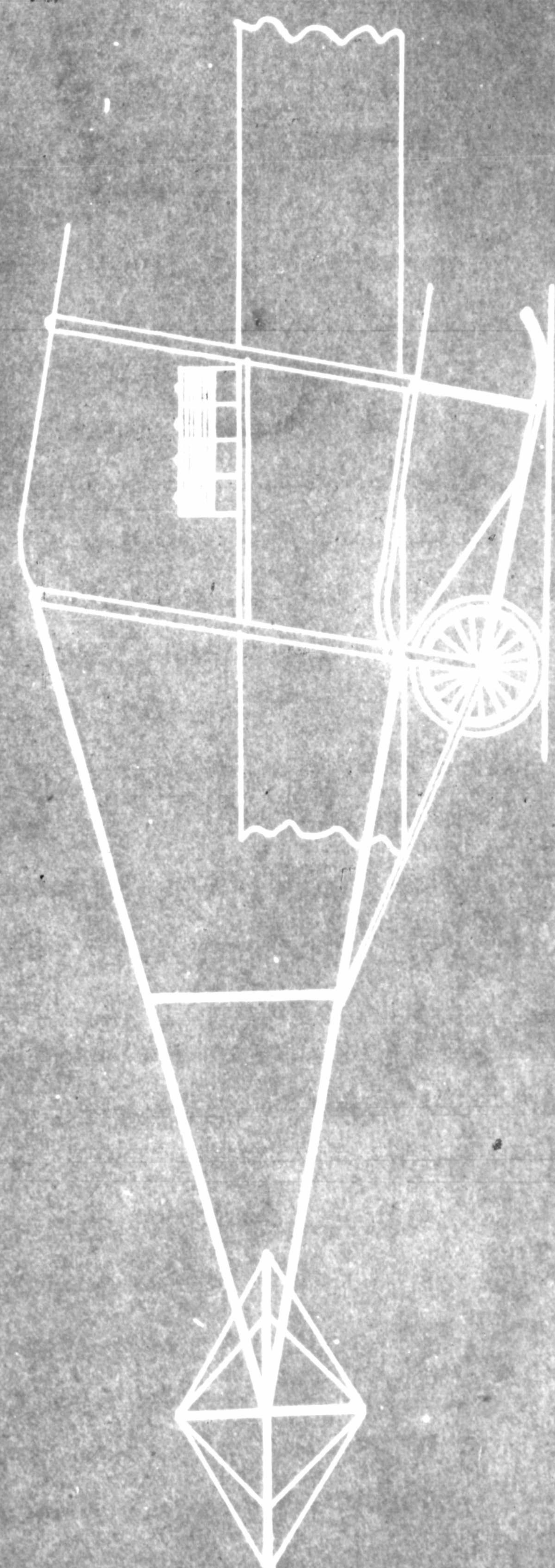
Hammondsport, N.Y., Aug. 19, 1908:- I have read the last two Bulletins with great interest. The scheme of starting a flying machine from and landing on the water has been in my mind for some time. It has many advantages, and I believe can be worked out. Even if a most suitable device for launching and landing on land is secured, a water craft will still be indispensable for war purposes and if the exhibition field is to be considered, would, I believe, present greater possibilities in this line than a machine which works on land.

An arrangement of floats to support the flyer when at rest would be necessary. Then small hydroplanes to carry it up out of the water and to catch the shock of landing. I do not think the problem is difficult.

For work on land, I would submit the enclosed sketch of a new launching device. The one fixed wheel is used entirely for starting and alighting, the skids only acting as supports while standing. Balancing on the one wheel can be easily secured with the moveable wing tips and the front horizontal rudder as when flying in the air. If we have the opportunity would you advise trying this on the June Bug?

G. H. Curtiss.





To Dr. A. G. Bell,
Baddeck, N.S.

Hammondsport, N.Y., Aug. 26, 1908:- McCurdy's No. 4 is being assembled and is a beauty. Ingraham, who by the way is doing finely of late, thinks that a couple of days more will see it assembled.

Before taking the June Bug out of the tent to make room for the No. 4 we decided to replace the ribs which had straightened out by getting wet, and which accounts for Selfridge's failure to fly. This has been done and we will fly it to-day with the new surfaces which have no reverse curve. We have also added better lubrication for the engine which will enable us to make longer flights.

The new propeller is a grand success. It pulls ten to fifteen pounds more at 1000 than the old one at 1200 (roughly). I mailed yesterday a print of the folding tail on the June Bug which is Ingraham's idea. We can now make quick work of getting the machine out for flight.

Some stories have been going the rounds of the newspapers referring to a New York man, whose name is not mentioned, having ordered a flying machine for the Curtiss Manufacturing Company. For the most part there is no truth in it. It originated from a conversation with Mr. Baldwin in which he jokingly said he wanted one. As you know, most newspaper articles are unreliable.

Mr. Dienstbach of New York is with us. He is spending a couple of weeks in Hammondsport writing up aeronautical stories.

G.H. Curtiss.

To Mrs. A. G. Bell,
Baddeck, N.S.

Hammondsport, N.Y., Aug. 26, 1908:- You must be anxious to know what we are doing here. We are busy enough but things go rather slowly. We have one consolation, however, and that is that the No. 4 machine is being built, as you might say, "like a watch" and looks like business throughout. The parts are well finished, the result of knowing what we want and not having to change as in the previous machines.

We learned that Selfridge's lack of success in flying the June Bug was due principally to the surfaces straightening out and losing their curve which gives them the lifting effect. We have made new ribs and are putting them in so that further experiments can be made with the machine before it is taken out to make room for the No. 4.

G. H. Curtiss.

To Dr. A. G. Bell,
Baddeck, N.S.

Hammondsport, N.Y., Aug. 29, 1908:- We enclose prints of the old June Bug as it now appears. As we wired you last night, John and I both flew it with the tail entirely removed. The print shows the way we fastened the rudder.

The object of this experiment was to gain knowledge for the No. 4. We now believe that with larger front surface placed further forward the tail is entirely unnecessary; more speed is obtained and the turn seems to be easier although we cannot quite account for this. Per haps the vertical surface of the struts on the tail were enough to retard the turning action.

You have probably seen the photos and description of the Wrights'. They do not seem to have anything startling, but I cannot say as much about Mr. Herring; I believe he employs gyroscope, and I think there are great possibilities in this line. I see no other solution of automatic stability.

G. H. Curtiss.

To Mrs. A. G. Bell,
Baddeck, N.S.

Hammondsport, N.Y., Aug. 30, 1908:- You ask me in your letter why we thought of the "Silver-Dart" as a name for aerodrome No.4. Well the surfaces are silvered on one side, that suggested the "Silver", and the word "Dart" will explain itself. Also the combination of the two words sounded rather attractive to me. You didn't criticise but we understood Mr. Bell's telegram to mean that the name was quite agreeable to you all.

She certainly is a beauty. At present the four wings are assembled and all the wiring done. The truck with three wheels attached is all ready to secure in place to-morrow. We think that we ought to use a double-decked front control. It gives greater scope for rigidity, and also has double the surface for probably the same head resistance.

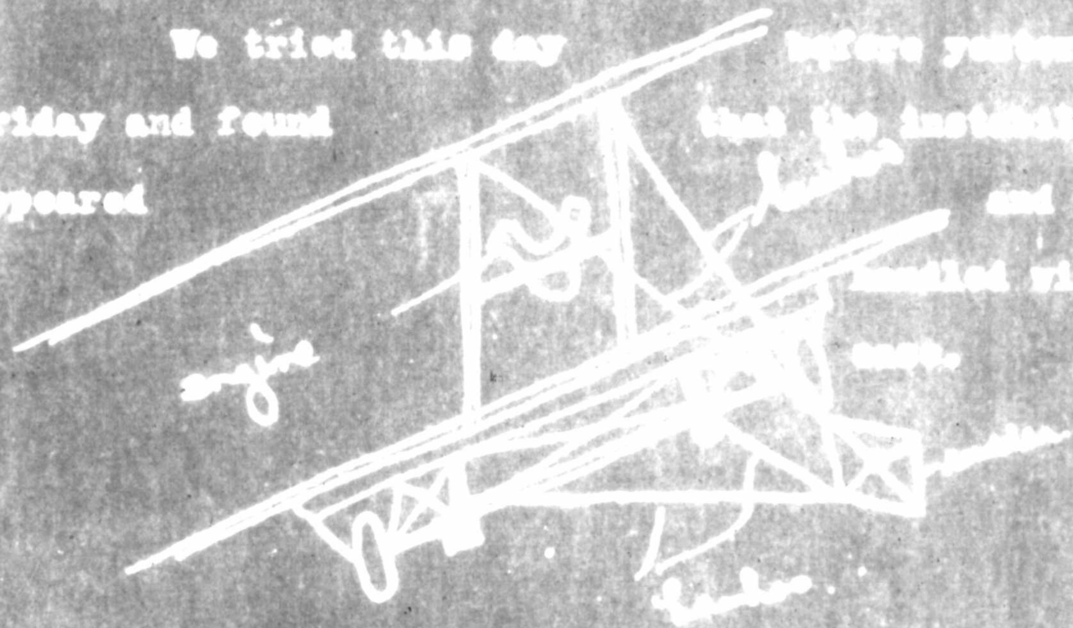
Another point is, that the front control ought to be powerful enough to CONTROL the machine under any condition whether simply gliding at a reduced speed, or under full power from the motor. When we get flying in heavier winds, we may want to force the machine to depress or elevate, and that might require quite a turning force.

We have been having quite interesting flights with the old June Bug the last few days. We were anxious to try her without a tail so first we removed the top surface of the double decked tail and upon trying a flight no change in stability manifested itself.

We then removed the bottom surface (both removed now) and tried a flight under "bare poles" as it were. The difference in stability was very marked. The machine would answer the control so much more readily and quickly that the least possible movement in changing the angle of incidence of the control was necessary to preserve a flight in one horizontal plane.

Day before yesterday we removed the tail structure altogether, and simply built out a support for the rudder as follows:- (diagram). The center of the rudder comes just opposite, or in continuation of the propeller shaft.

We tried this day before yesterday afternoon Friday and found that the instability had disappeared and she could be handled with perfect ease.



This may have been due to several causes, more skill in management, or lack of drag of the tail structure.

The old ribs have all been removed, and ribs such as we are to use on the Silver-Dart substituted. These ribs have just the single curve  and are made of four plies instead of three to obtain greater strength. Now upon trying the machine night before last (Friday) under these conditions new ribs of single curvature, and without a tail, (the seat moving back seven inches to make up for load removed from rear by removing the tail) I found that the machine would glide!

Approaching the place I wanted to land on I shut off the motor as in former cases and expected to land just as I had planned but the machine kept on gliding for a distance of

200 feet and I was about 15 feet in the air when I ...

Of course I manipulated the control to keep her ... fore and aft. Mr. Curtiss tried a short flight ... went through the same thing although ... from the flight he shut the motor off and ... of about 200 feet. She lands beautifully ... whatsoever.

Last evening (Saturday) we went ... five o'clock and I attempted a flight. ... ifully and much to the pleasure of ... describe the figure eight after ... miles.

... gliding down the ... but the engine ... were standing to ... another turn. I ... I ...

and yet produce more push.

Here is a comparison of the two propellers. A is the one we have always used in the June Bug, and B is the new one.

A diameter 5 1/2 feet; pitch 4.2 feet.
B diameter 6 feet; pitch 4 feet.

	Pull	revolutions per minute	Miles per hour	(theoretical)
A	200	1266	65	
	200	1266	65	
B	215	1104	50.2	
	216	1062	49.0	

These tests were made with the engine in a sling in a large closed room. Readings taken one right after another. It seems to show that what we want is greater diameter and smaller pitch.

Please ask Mr. Bell if we are to enter for the Scientific American Trophy game on Septem ber 7. We may not have the new engine ready, but yet there is a chance.

J.A.D. McCurdy.

WORK OF BEINN BHREAGH LABORATORY
by Wm. F. Bedwin, Superintendent.

Have received from Montreal 150 yards of nainsook which is available for work at any time. We have also received from Hammondsport s upply of sprocket wheels and chains to be used with the double propellers on Aerodromes 5 and 6.

Tetrahedral Aerodromes NO. 5.

We have made two models of the No. 5 aerodrome for study purposes, one a half sized, and the other a quarter sized model. These are of hollow type constructed like Kite D. We have also made another model of full construction as in the Cygnet (or Kite A) for comparison purposes. The half sized models have 32 cells on the ridge-pole, and are 8 cells high. We are now at work making some changes in the beading.

We have finished the assembling of sectional,2 and 3 of aerodrome No. 5, and they have been lashed together. Each section is lightly beaded on the outer edges alone, and the heavy beading will not be put on until the whole structure has been assembled. We are now at work putting together sections 7,8,9 etc. (See illustration showing the plan of sectional construction used in aerodrome No.5).

Tetrahedral Aerodrome No. 6.

A new outrigger-truss and new floats have been made for the Dhonnas Beag. Photographs are appended showing the old and new in comparison. Four sets of iron hydroplanes have been made for attachment to the Dhonnas Beag which are shown in appended photograph.

We are getting a set of double propellers, rotating in opposite directions, ready to put on the Dhonnas Beag.

The globular connection devices to be used in the tetrahedral framework to be placed on the Dhonnas Beag are progressing rapidly now. We have ordered fish-shaped sticks for the cells, and expect them here shortly.

Dates of Experiments.

Aug. 19, 1908:- Experiments with Kites A and D and the Pilot Kite; also experiments with the Dhonnas Beag towed in the harbor to ascertain the strain of the towing-line at various speeds.

Aug. 20, 1908:- Experiments with Kites A and D, the Victor Kite, and the White 50 centimeter celled kite; also experiments with the Dhonnas Beag with weight of engine high up trying stability.

Aug. 21, 1908:- Experiments with the Frost-King Kite; 84 observations, 4 of wind, 40 of altitude, and 40 of pull. Experiments in the afternoon with Kites A and D with a bag of sand attached to Kite D to make it of the same weight as the other.

Aug. 22, 1908:- Kite flying all day with Kites A,C, and D. 1176 observations. Wind, 56, altitude, 560, pull 560 observations

Aug. 25, 1908:- Experiments with the Dhonnas Beag with engine on and propelled by her own propeller.

Aug. 26, 1908:-Experiments with the Dhonnas Beag with engine on and propelled by her own propeller.

Aug. 29, 1908:- Experiments with the Dhonnas Beag with engine on and propelled with her own propeller. Attained speed of 15 miles an hour. W F B.

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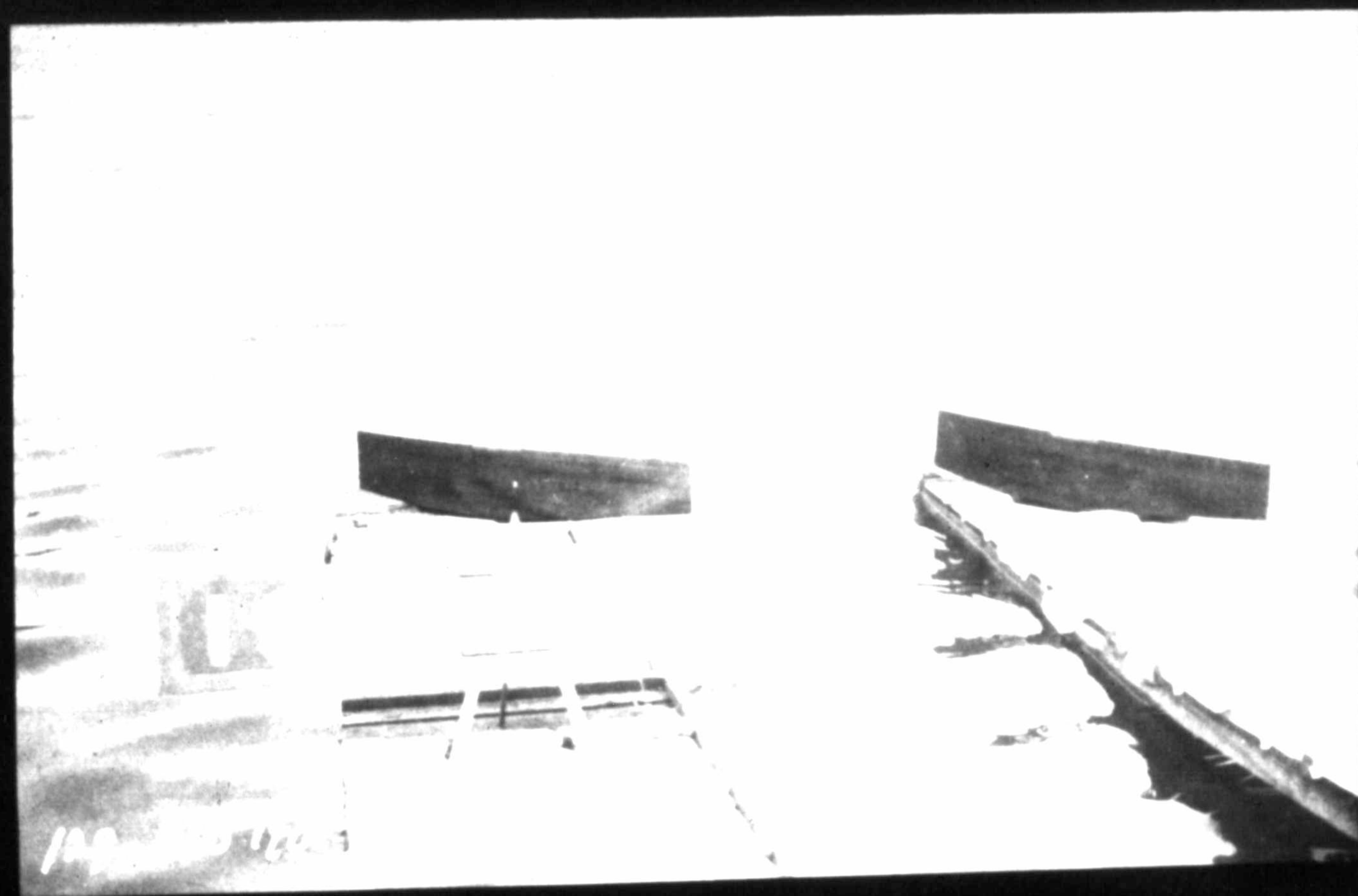

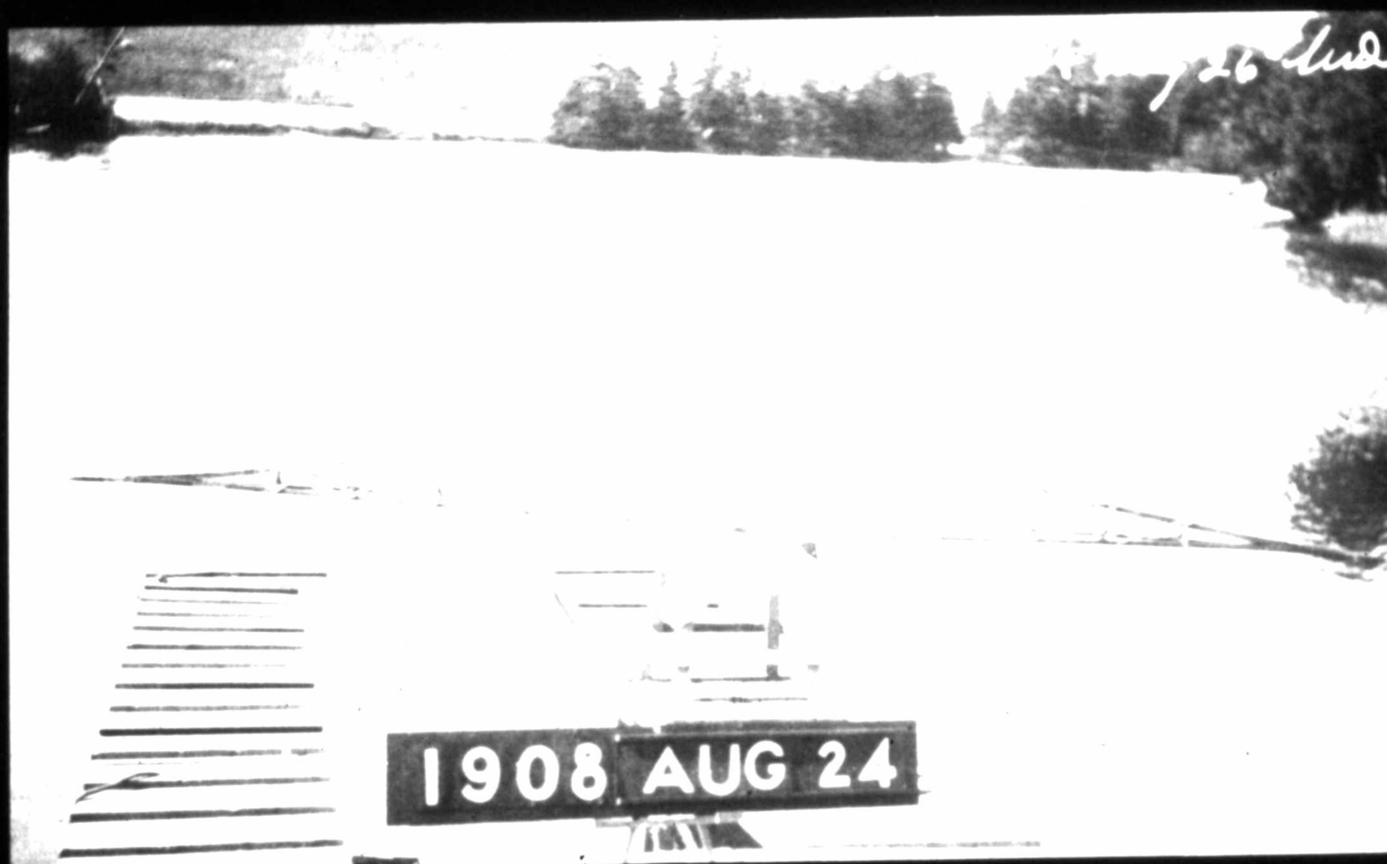
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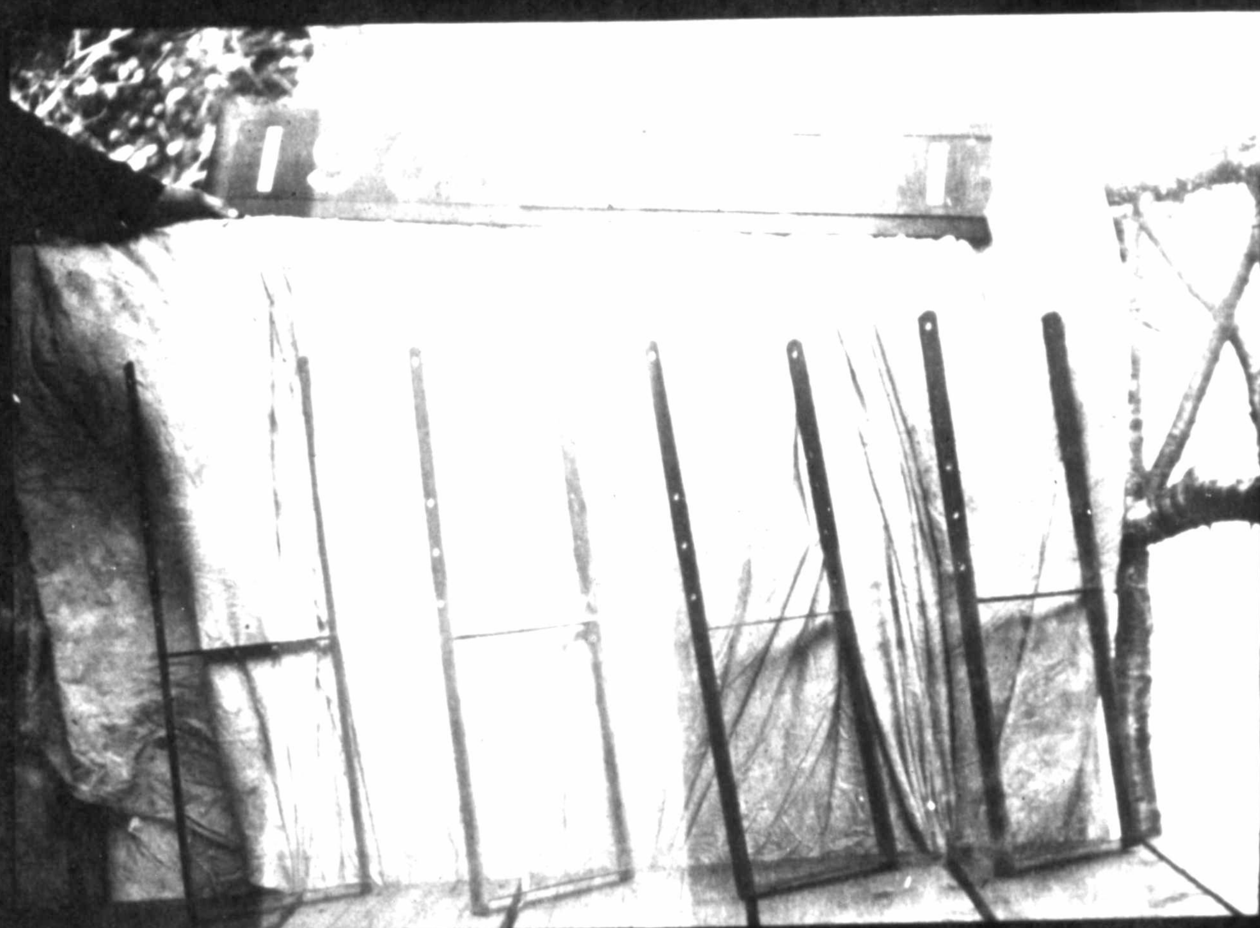


PLANS FOR AERODROME NO. 5
by A. G. Bell.

In considering the whole subject of tetrahedral construction there are two points that constantly recur as unique and advantageous.

1. That we possess the ability to build large structures of indefinite size without increasing the ratio of weight to surface.

2. That large aggregations of winged cells, without any horizontal surfaces at all, exhibit marked stability in the air; the structures containing the largest numbers of cells seeming to be the most stable.

No one, I think, who has seen a large tetrahedral structure flown as a kite in a fully supporting breeze can help feeling what a great thing it would be if such a stable structure could be made the basis for an aerodrome, and propelled through the air by its own motive power.

The moment we begin to prepare for practical experiments looking towards this end certain disadvantageous conditions present themselves.

The winged cells are markedly inferior in supporting power to the same surfaces arranged horizontally, so that a structure designed to support a man and an engine in the air would have to be built of much larger size than in aerodromes of the June Bug class. This difficulty however is easily overcome on account of the ability to increase the dimensions of the structure without increasing the ratio of weight to surface. There is not therefore the same objection to a large structure as in the case of one in which the weight would increase as the cube of the dimensions, while the surfaces increase only as the squares.

If it is desirable to support a man and an engine in the air in a tetrahedral structure to be flown as a kite, it can certainly be done by increasing the size of the structure to a sufficient extent. But here fresh difficulties appear from the aerodrome point of view in the form of increased head resistance due to the increase of size, demanding apparently an engine of greater power than in the June Bug class of aerodrome. But greater power involves greater weight in the engine; and greater weight in the engine involves a still larger structure to support it etc. etc. etc., so that we really do not know how far it may be practicable to propel such a structure by the engines we possess. Of course the proper way to ascertain this is by experiment.

What we do know from our former experiments is this, that we can certainly build a tetrahedral structure that will support a man and an engine in the air when flown as a kite. We have already supported a man; and are entitled to conclude that without any change in the arrangement of the cells, a still larger structure than the Cygnet would also support an engine. It is not necessary for support that the engine should be in operation at all: We can certainly sustain it through the action of wind.

We have then the opportunity of ascertaining just what an engine and propeller will do with such a structure without any danger of the structure coming down through the failure of the engine to give sufficient power for self support.

Should the engine happily prove sufficient for this purpose the tow-line will become slack. It can then be dropped and the machine proceed on its way as a free flying machine.

If, on the other hand, the engine power should prove insufficient the machine will not come down but will continue flying as a kite. The engine and propeller will certainly produce some effect which we can study and measure. The strain on the flying line for example will certainly be reduced; we can observe this reduction of pull instrumentally, and thus be able to accumulate data from which to calculate the amount of power required for self support; and the general practicability of a tetrahedral aerodrome of this kind which makes no use of horizontal surfaces. Through the presence of a man in the structure, we can also obtain data concerning the angle of incidence of the supporting surfaces to the wind, a matter of which we are ignorant at the present time.

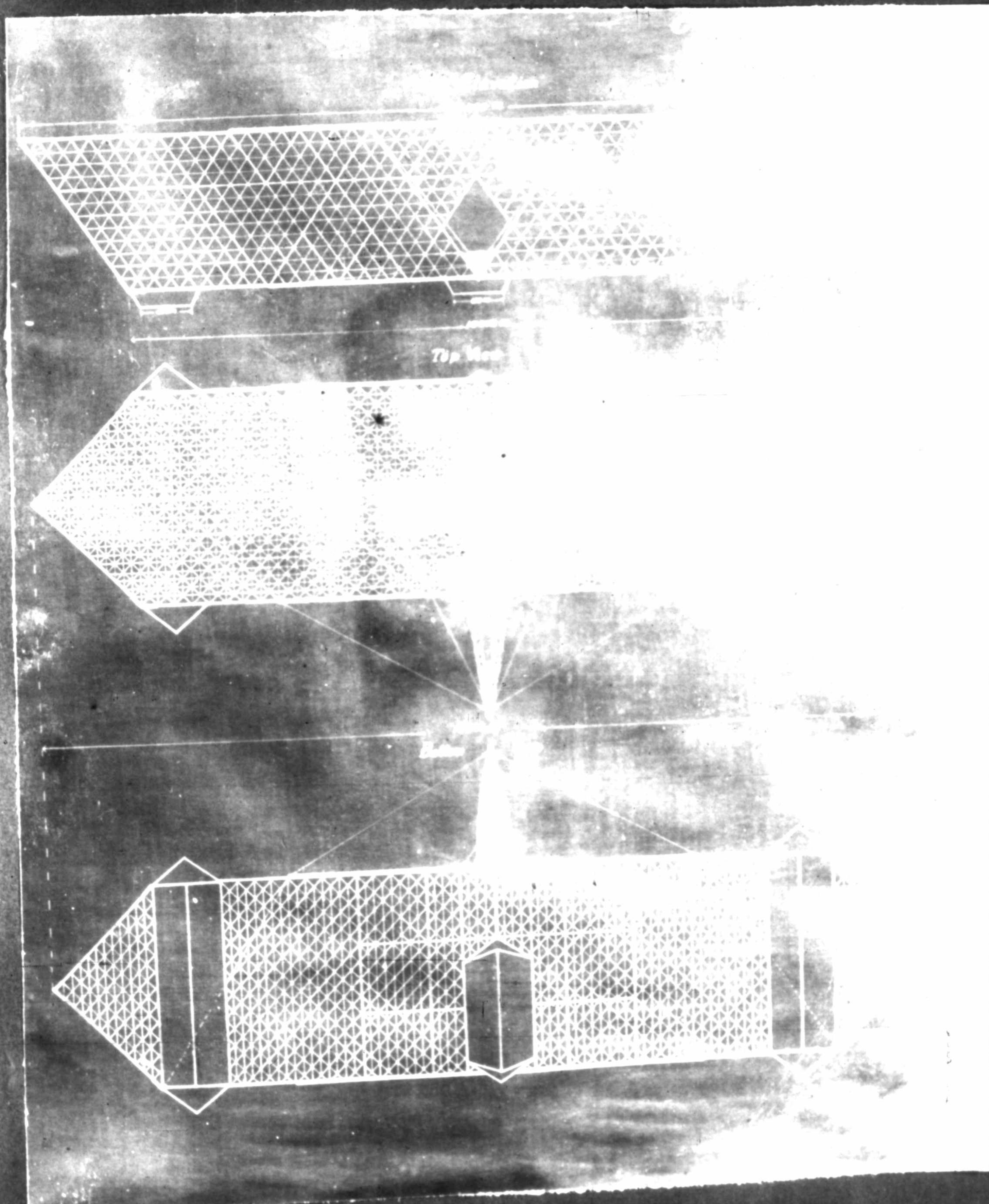
In aerodromes of the June Bug class, if the engine power is insufficient, the aerodrome will not fly at all; and it is only when sufficient power has been obtained for support that experiments can be made in the air. There is no half way between these conditions, but in a kite aerodrome we have intermediate conditions all the way from the kite without self propulsive power at all up to the free flying machine without a restraining rope. I look upon the kite as a flying machine at anchor; and the flying machine as a free kite; and between these two conditions we have a vast field for exploration with engines and propellers operating under the actual conditions of flight, the whole being supported in the air by the wind whether the engine should prove self supporting or not.

Aerodrome No. 5

The attempts to produce a tetrahedral aerodrome at Beinn Bhreagh were commenced last year, and were carried to the point of raising a man into the air in the kite Cygnet. (See photographs of plans of the Cygnet appended to this article).

The stability exhibited by the Cygnet when carrying Lieut. Selfridge was in every way satisfactory, but the experiment lasted for so short a time that the instrumental data secured were quite inadequate to afford a safe basis for calculation.

The mode of descent of the Cygnet too was in every way satisfactory. It came down so gently that Lieut. Selfridge was unaware of the fact that he was descending until the structure actually reached the water. This indeed, was the cause of the subsequent disaster. The initiative in the matter of letting go the towing-line had been left to Lieut. Selfridge. It had been arranged that when he was ready to come down, he should make a signal to the steamer Blue Hill . The steamer was then to reduce speed, and the men on the Blue Hill were to be prepared to let the towing-line gradually slip from the cleat as the kite neared the water, and at the moment of actual contact with the water the line was to be let go at both ends, Leut. Selfridge releasing it from the kite and the men at the other end releasing it from the Blue Hill.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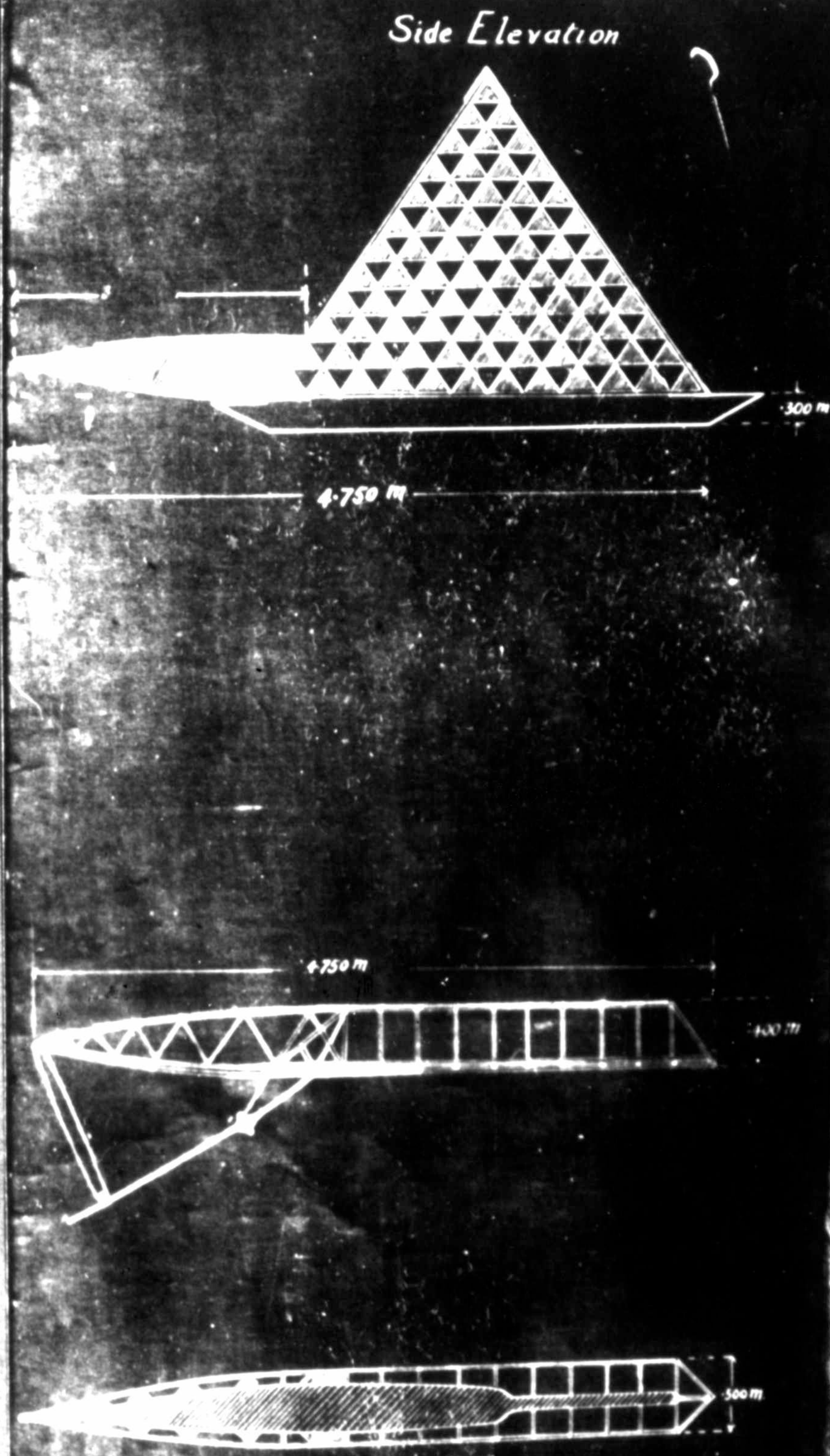
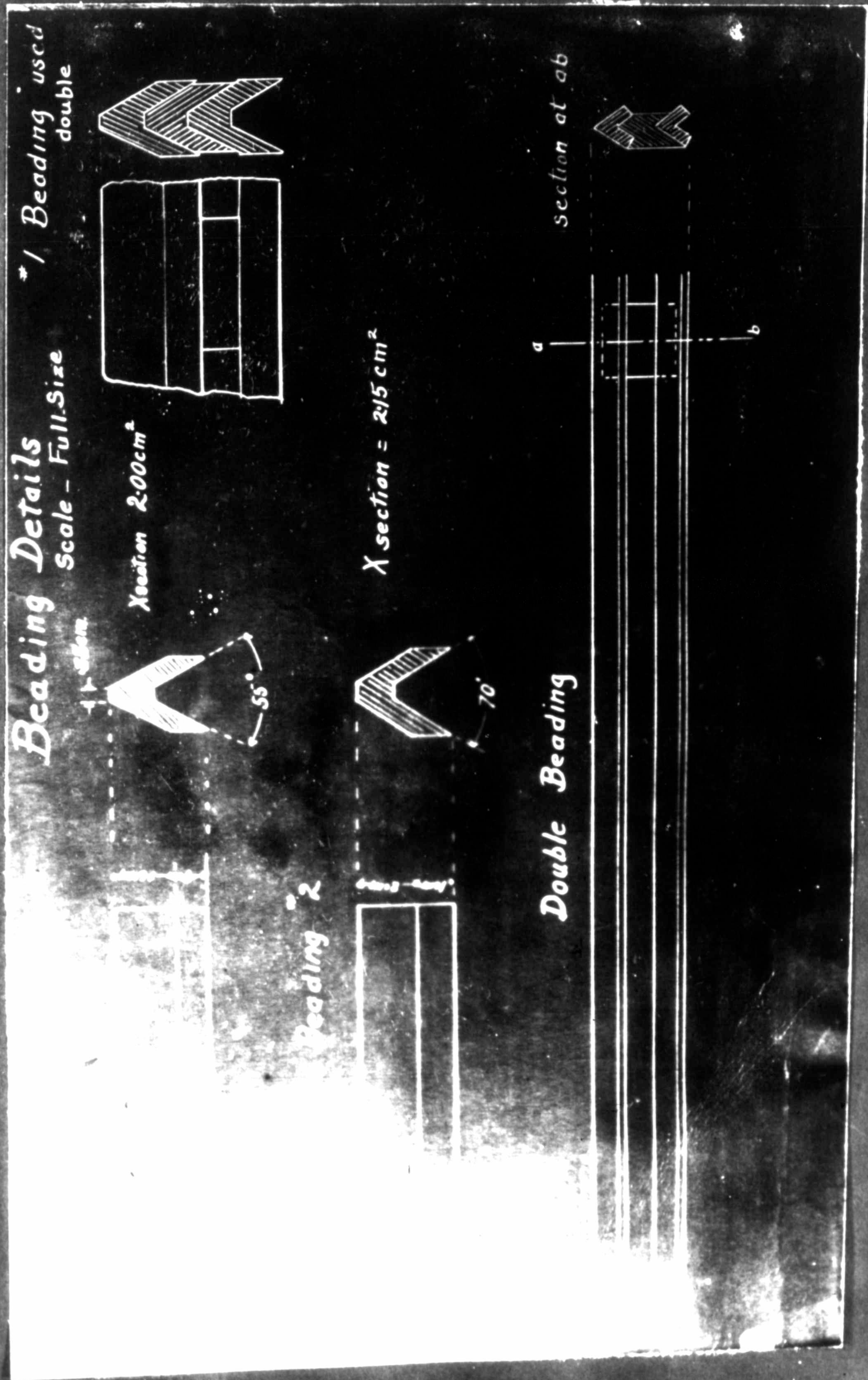


3393 cells

Surface (including bow) - 1840000 cms.²

Weight (including floats) - 100334 gms.

Ratio - 545 gms per m.² (oblique)


Beading Details
Scale - Full Size
#1 Beading used double
Xsection 2·00cm²
55°
Beading #2
X section = 2·15 cm²
70°
Double Beading
Section at ab
a
b

An unfortunate combination of circumstances prevented the release of the towing-line at either end, while the Steamer Blue Hill did not reduce its speed. The smoke of the Blue Hill so obscured the view of the observers on the steamer that they as well as Lieut. Selfridge were unaware that the kite was coming down until it was down. The towing-line at the Blue Hill end of the line was lashed to a dynamometer attached to the cleat in such a manner that the line could not be released at a moments notice. If I remember rightly a man had been stationed there with an axe to cut the line in the event of an emergency, but the observers were so little prepared for the descent of the kite that even this was not done until too late. As Robert Burns observes:-

> "The best laid plans of mice - and men -
> gang aft aglee".

No signal having been made, the Blue Hill did not stop or reduce speed; the attachment of the dynamometer to the cleat prevented the gradual release of the tow-line when it was realized that the kite was coming down; and the unpreparedness of the man with the axe prevented the sudden release of the line by cutting until too late.

At the other end of the line Lieut. Selfridge being so far in the interior of the kite that he could not see the water on account of the silk surfaces below him, and being quite unaware from sensation alone that the kite was dropping on account of the gentle descent, failed to make any signal to the Blue Hill, or to change his center of gravity to cause the kite to go up again (as he had done at the beginning of the experiment, when there was danger of the kite touching the water). He was so little prepared for the descent that he allowed the kite to come right down on the water without releasing his end of the tow-line.

All these circumstances combined contributed to the sudden destruction of the kite. It was towed at full speed through the water by the steamer Blue Hill; and as, of course, the structure was not designed to stand such a strain, it naturally broke in pieces.

So far as the experience in the air was concerned the behavior of the structure was most encouraging and satisfactory; and it is only to be regreted that we did not have sufficient time before the final disaster to accummulate instrumental data that would guide us in subsequent experiments.

We cannot therefore stop our experiments in this direction with the construction of the Cygnet; but must go on and build another machine on the same general model large enough to support both a man and an engine in the air when towed by a steamboat against a good wind, and then accumulate sufficient data concerning the conditions of flight to yield reasonably reliable averages which may be made the basis of calculation.

While the ratio of weight to surface is substantially the same in a large tetrahedral structure, as in a smaller one on the same model, it by no means necessarily follows that the surfaces are all equally efficient. In the large structure of full tetrahedral construction the interior cells are much more shielded by those in front of them, than in the case of the smaller model. Indeed it was a great surprise to find that the mass of closely packed cells known as the "Frost-King" would fly at all; and it was a still greater surprise to find that it would support a man hanging on to the flying line. The still larger aggregation of cells employed in the Cygnet flew with such increased lifting-power as to support a man easily in the air in the midst of the structure. In fact we have found that each increase in size has given us greater lifting-power; so that it is obvious that whatever shielding action is exerted upon the interior cells, the adavantages of the combination as a whole have outweighed the disadvantages, at least so far as lifting-power is concerned. It is also obvious that the limit of size, if there is a limit, has not yet been reached, and we can confidently increase the dimensions of a structure like the Cygnet with reasonable prospect of getting it to fly when towed by a steamer against the wind.

One of the reasons that led to the adoption of the full form of construction in the Cygnet arose from a feeling that the interior cells, even though they might not be as efficient for support as the exterior cells, gave greater strength to the structure as a whole. The hollow type of construction seemed to me to lack strength in the very place where it should be strongest - the middle.

I was therefore much surprised when Mr. F. W. Baldwin stated that, from an engineers point of view, the interior cells were of little consequence to the strength of the combination; and that the outer part of the structure was of so much more consequence that the whole of the interior could be scooped out without injuring the strength of the combination as a whole by taking the material from the inside, and placing it upon the outside in the form of stronger beading, or strengthening material. He pointed out the fact, very obvious when stated, that a pipe may be very strong indeed without any interior material at all.

In attempting to build a large structure of the Cygnet form, it has become obvious that the interior cells can , if desired, be omitted without danger of diminishing the strength of the structure. No necessity exists for the retention of these cells unless it can be shown that their presence materially assists in the support of the kite.

Before deciding upon the actual type of structure to be adopted in the new machine, it was thought advisable to test the efficiency of interior cells by constructing kites of both full and hollow construction of sufficient size to develop the point.

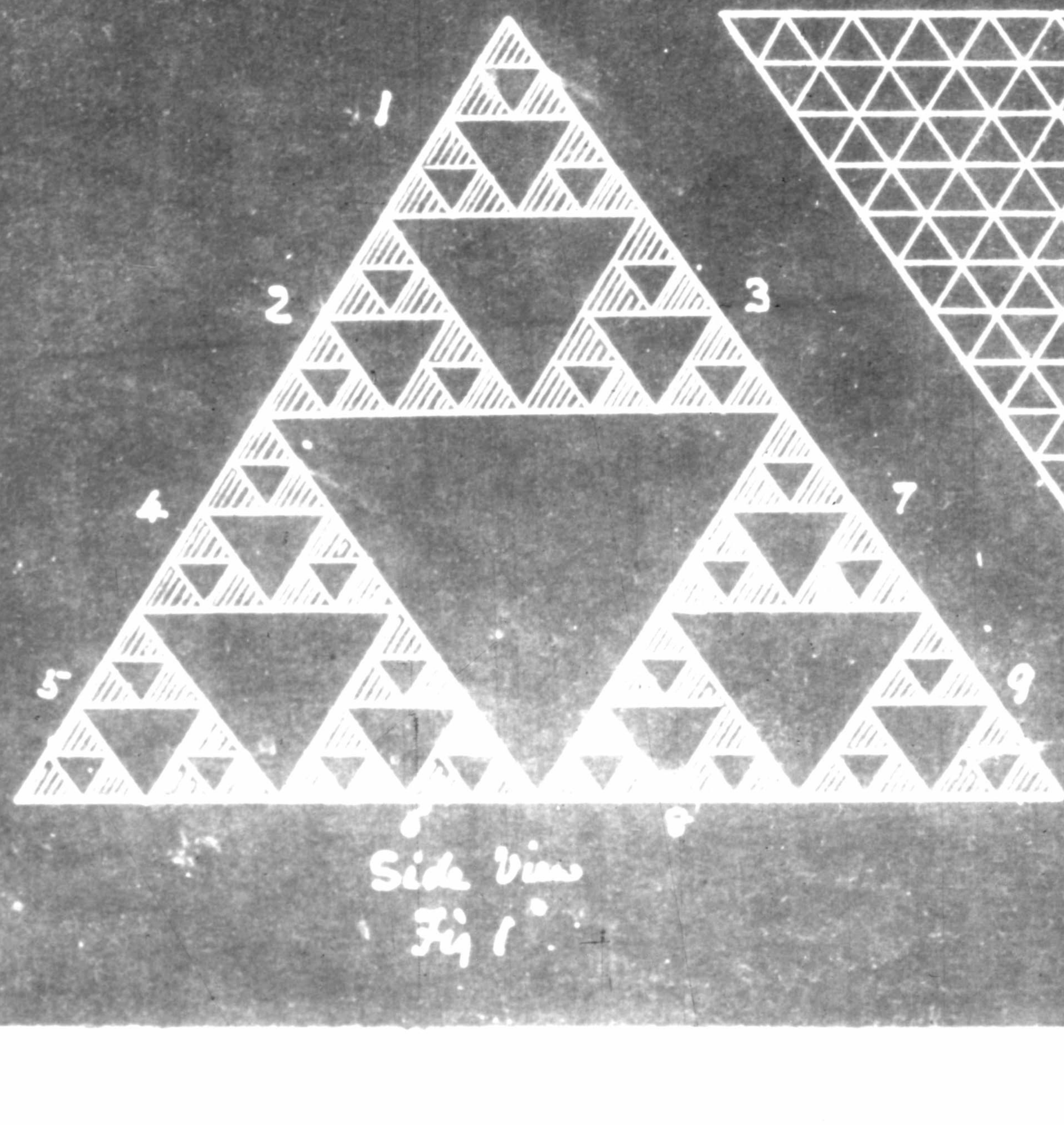
Such kites were made in Hammondsport, but there were very few occasions upon which they could be tried, and the observations made with them were inadequate in number and reliability, to yield positive results. Upon the principle therefore of adopting the known and proved form of construction in the large structure, it was decided that the full construction would be used in the new aerodrome unless reliable data could be obtained at Beinn Bhreagh indicating that the hollow type of construction would be equally efficient for support.

Kites A,B,C & D were therefore made at Beinn Bhreagh, and we were fortunately favored with a few days when the wind conditions were exceptionally good. A large number of comparative observations have been made of these kites in the air flown separately and together. The observations have been so numerous as to yield averages that may fairly be considered as reliable.

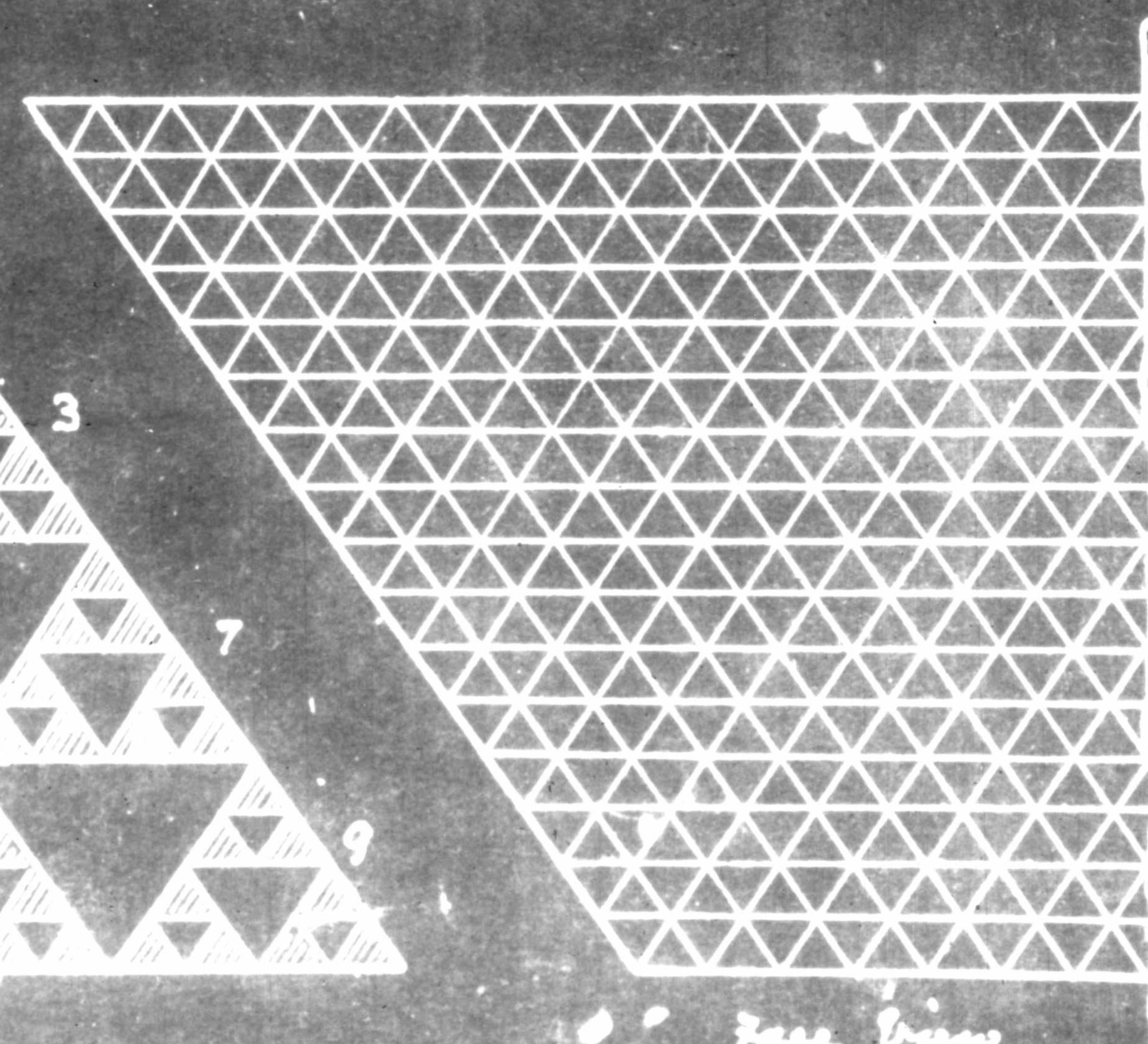
As the general result of these observations it was found that the full type of construction exemplified by kite A possessed no points of superiority over the hollow type exemplified by D, with the doubtful exception of a sort of "water-logged" stability due probably to the presence of inefficient cells. It was certainly demonstrated that Kite A was a heavier-flying kite than Kite D, and required a greater wind to support it. The smaller aggregate of cells employed in the hollow Kite D proved quite as efficient for support as the larger aggregate of cells massed in Kite A.

Kite D too possessed many points of advantage over A from a structural point of view, especially when it was proposed to adopt it in a structure of the size we are building. One great point lies in the ability to build the large structure in sections of small diameter so that every part of the structure can be easily reached both during the process of construction and the process of repair.

The materials for the new aerodrome are being rapidly assembled. Figs. 1 & 2 will give a general idea of the nature of the structure. It will contain 64 cells in the top layer, Plans for Aerodrome No. 5



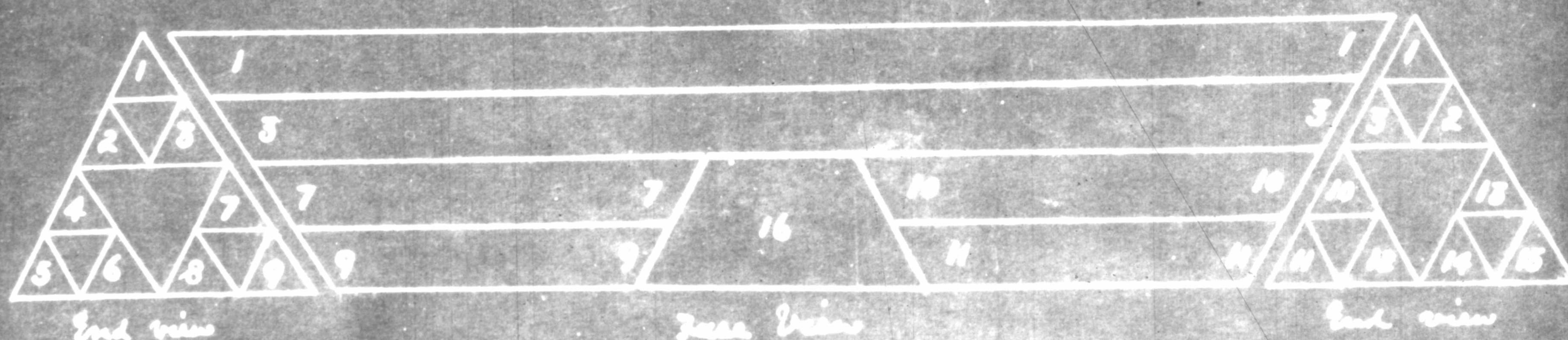
Side View
Fig 1



Face View
Fig. 2

AGB

Plans for Aerodrome No. 5



Arrangement of [illegible]

Fig. 3

49 cells at the bottom, and will be 16 cells high. Thus the aerodrome will be 16 meters from side to side on the top, 12 meters from side to side on the bottom, 4 meters high (measured obliquely), and four meters deep from fore to aft at the bottom. This of course gives the dimensions only of the main part of the structure and does not include the protruding beak for the support of the front control. It is not proposed to use any tail, as the rear cells of the structure are believed to act as a tail. The exact position and form of the vertical rudders, or adjustable wing tips, if such are considered necessary, have not yet been decided upon.

The cellular part of the structure is being built in 16 sections, which are illustrated in Fig.3. The 16th section will contain the body with its protruding beak, details of which will be furnished later. The other sections are all triangular in cross-section (1 meter on the side), and contain a hollow space in the center forming in cross-section an equilateral triangle having a side of 50 centimeters. Each section is being beaded with very light material on the outside edges only. These sections will then be lashed together; and when the whole cellular part of the structure has been assembled through-beading will be added of stouter material to give strength and solidity to the whole.

Sections, 1,2, and 3 have already been completed and have been lashed together. The other sections are being so rapidly assembled that it is probable that the whole cellular part of structure will be ready for the through-beading before this Bulletin is issued. A G B.

BALDWIN'S EXPERIMENTS WITH THE DHONNAS BEAG AUG. 25, 26, 29, 1908, WITH A FEW NOTES OF PROGRESS: by A.G. Bell.

Aug. 25, 1908:- The Dhonnas Beag was tried this afternoon with Mr. Baldwin on board. It was propelled by the Curtiss motor No. 2 with aerial propeller, 140 cm diameter. The propeller had originally been 150 cm diameter with 17° 1/2 at tip, but had been cut down to 140 cm diameter and the ends rounded and shod with brass. Dr. Cobb estimated that the boat traversed the 100 meter course with the wind in 24 seconds; and against wind in 30 seconds. The push of the propeller was found to be 45 lbs., instead of 85 lbs. as in former experiments.

Aug. 26, 1908:- Mr. F.W. Baldwin reports concerning his experiments with the Dhonnas Beag to-day as follows:-

Exp. 1. Tried Dhonnas Beag this afternoon (Aug.26) first taking thrust of propeller. New carbureter was fitted and engine ran nicely giving thrust of about 85 lbs. On first trial boat speeded up quickly, and just as she had attained about her full speed the starboard out-rigger float tore itself loose from the outrigger. This threw the boat around quickly to port. I shut off immediately, and by meeting her with the helm and leaning well out kept the boat from upsetting.

A quick turn has a strong tendency to depress the outside float due to the inertia of the engine.

Exp. 2. The floats were then more securely fastened and a second attempt made. This time at full speed the port float seemed to bury itself, and fearing the consequences I had to shut off again before the 100 meter course had been completed.

Exp. 3. Both floats were raised a little at the bow to secure them against diving, and on the third trial we got the time up and down over the 100 m course. On the way down the harbor the boat was not quite under full headway and took 20 3/5 seconds. Coming back she was well under way, and opened out full with spark advanced and covered the 100 meters in

18 seconds. There was practically no wind at the time, but what there was was against her going down the harbor and with her coming back. F.W.B.

Aug. 29, 1908:- Mr. Wm. F. Bedwin makes the following report concerning Baldwin's experiments with the Dhonnas Beag to-day:-

Exp. 1. This morning (Aug.29) in going down the harbor the Dhonnas Beag made 100 meters in 17.5 seconds engine worked fine.

Exp. 2. Going down harbor made 100 meters in 21 seconds. Coming back made 100 meters in 27 seconds; engine not working well.

Exp. 3. In flat calm the Dhonnas Beag made 100 meters in 15 seconds going down the harbor and made the same speed coming back (100 m in 15 seconds).

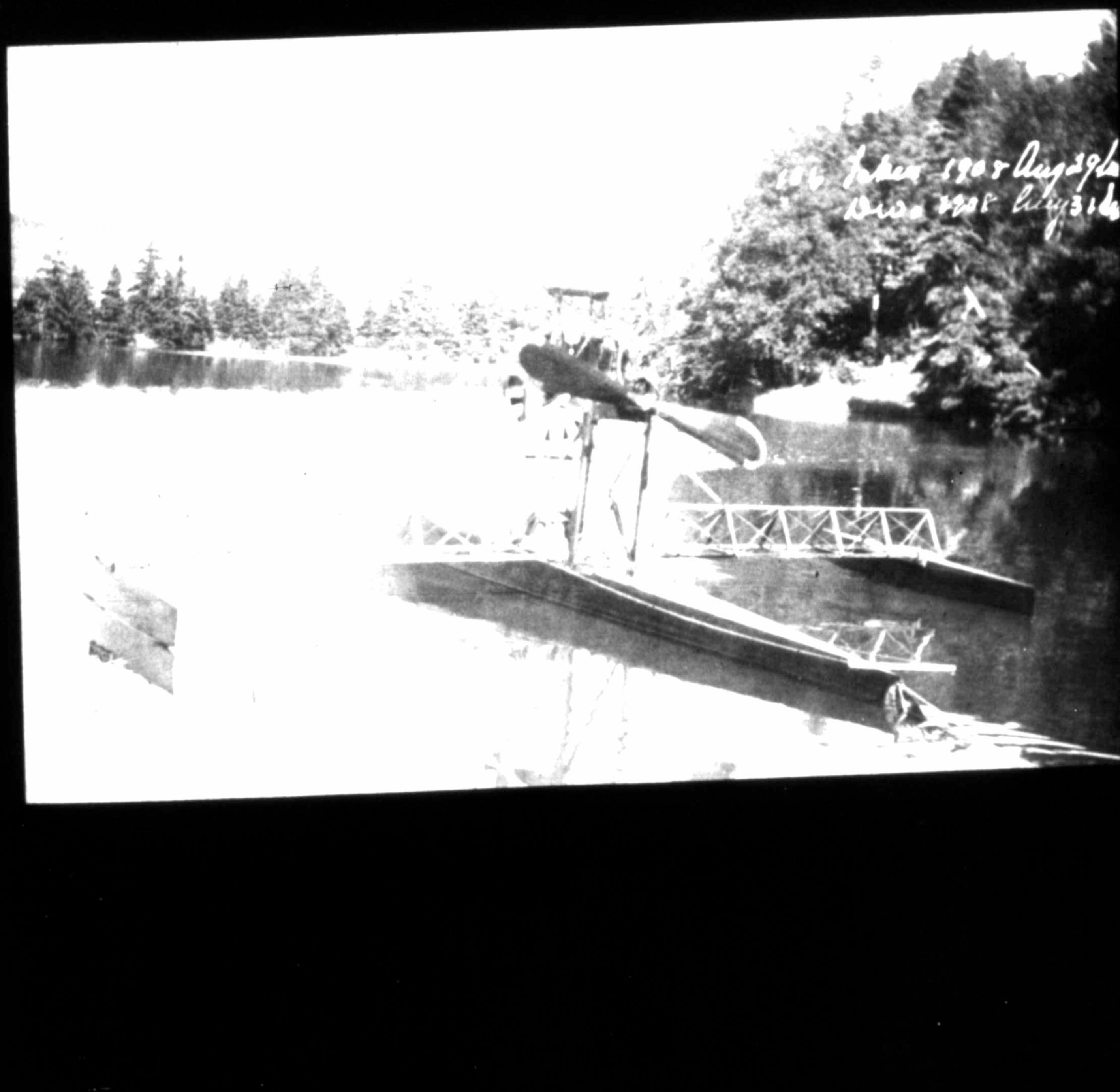
Exp. 4. This afternoon (Aug.29) the Dhonnas Beag going down harbor made 100 meters in 18 4/5 seconds, engine not working well.

Exp. 5. Down harbor 100 meters in 20 seconds engine not working well.

Exp. 6. Down harbor 100 meters in 15 seconds; up harbor 100 meters in 16 seconds; pretty good breeze.

Exp. 7. Down harbor 100 meters in 14 seconds up harbor 100 meters in 17 seconds, pretty good breeze. Wm. F.B.

Early in the afternoon before the 4th experiment was made the Gauldrie came into Beinn Bhreagh Harbor with a number of visitors to see what we were doing. On board were Dr. and Mrs. Thayer, of Baltimore, Md., Dr. Cobb of Washington, D.C., Mrs. A. G. Bell, Mrs. F. W. Baldwin, Miss Cadel, Miss Gertrude Grosvenor, Mr. Byrnes, and Capt. McIver. Other witnesses of the experiment not on board were Mr. Angus McInnis, Mr. John McDermid, and the Laboratory staff employed upon the experiment. The Gauldrie remained in the harbor while experiments 4 and 5 were being made, and then went away leaving as witnesses of


Taken 1908 Aug 29th
1908 Aug 31st

Experiment 6 and 7, Dr. Cobb, Mr. McInnis, Mr. John McDermid, and the Laboratory staff more immediately concerned in the experiments, including besides myself, Mr. F. W. Baldwin, Mr. Wm. F. Bedwin, Mr. MacDonald (our photographer), another Mr. MacDonald, Mr. MacFarlan and others.

General Remarks.

The speed of the Dhonnas Beag "in a flat calm" (Aug. 29, Exp.3) was about fifteen miles an hour. If any such speed can be obtained when hydroplanes and aeroplanes have been attached to the boat, there can be no doubt that the Dhonnas Beag will rise out of the water into the air, and become a true flying machine.

The very promising results so far attained indicate that the experiments will not only result in a safe means of getting into the air, but will also lead to radical improvements in the methods of propelling steamboats, and motor boats of every kind, over, not through, the water:- Both aviation and navigation will be benefitted.

It is important that, in this new kind of motor boat and this new species of flying machine, the different steps of development should be fully noted, and in consecutive order; but I doubt very much whether this is being done by Mr. Baldwin, who has aerodrome No.6 specially in charge. In order to supplement his notes therefore, I will here record a few of the changes that have been made in the apparatus, or are under contemplation.

Changes of Apparatus.

1. The outrigger-floats used in experiments Aug. 19, and in the earlier trials were 108 cm long, 10.5 wide, and 21 deep. Each weighed 2 1/2 lbs., and had an estimated maximum displacement of about 30 lbs. It was thought that the resistance to upsetting could be improved, without detriment to speed, by lengthening the floats without materially increasing their width or depth.

New floats were therefore made, which were 183 cm long, 13 wide, and 20 deep. Each weighs 6 lbs., and has a maximum displacement estimated at about 64 lbs. Both the new and the old pairs of floats are shown in a photograph in this Bulletin.

2. The upsetting tendency has been favored by the high position of the center of gravity, resulting from the necessity of placing the engine at a considerable elevation above the boat hull in order to allow the propeller to clear the hull, the propeller being driven directly from the engine-shaft.

It is hoped to diminish this tendency by lowering the position of the engine and using an indirect drive. The engine will be placed as near the hull as practicable and will work the propeller indirectly by a chain and sprocket wheel. The chain and sprocket wheels to be used arrived from Hammondsport Aug. 27.

3. In the earlier experiments with the Dhonnas Beag the outrigger-truss was placed in front of the engine-bed, and Mr. Baldwin used it as a seat.

Thinking, however, that the weak hull might be subjected to twisting strains by swinging motions of the elevated engine, he has recently placed the truss directly beneath the engine, and now uses the deck of the boat as a seat where it has been strengthened by a board placed across it, a little in front of the engine-bed. This is also advantageous by bringing his own center of gravity lower down than before.

4. In the experiments Aug. 26 and in the earlier trials the outrigger-truss used terminated at either end in a point, or narrow nose, which rested upon one of the floats at about its thickest part. The float had some liberty of rocking upon the end of the truss as an axis. The longer floats developed a tendency to dive (Aug.26), and one of them tore loose from its attachment. The truss also did not seem to possess sufficient rigidity against twisting motions, although it had been strengthened by a zig-zag beading of metallic tubing (aluminum)

To remedy these defects a new outrigger-truss has been made, not terminating in a narrow nose, but of equal dimensions from one end to the other. Like the old truss it is triangular in cross-section. It is much superior in rigidity to the old truss employed and permits of a more rigid connection with the outrigger-floats. It was used in the experiments (Aug.29).

5. The Dhonnas Beag, when traveling upon a straight course, exhibits a constant tendency to depress its right or starboard float, a result attributed to the torque produced by the left-handed rotation of the propeller.

Mr. Baldwin has hitherto neutralized this tendency by leaning over to the port side; but it is now proposed to do away with torque altogether by employing two propellers rotating in opposite directions upon the same axis. Double propellers are being arranged for a trial.