

BULLETINS

OF THE

Aerial Experiment Association

Bulletin No. XXXVII Issued MONDAY, MAR. 22, 1909

MR. McCURDY'S COPY.

BEINN BHREAGH, NEAR BADDECK, NOVA SCOTIA

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Bulletins of the Aerial Experiment Association.

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BULLETIN NO. XXVII ISSUED MONDAY MARCH 22, 1909.

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Beinn Bhreagh, Near Baddeck, Nova Scotia.

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Changing of Rules for the award of the Scientific American Trophy. Outlook on Aviation in Canada. A mathematical comparison of the Wright Brothers' Machine and that of the Voisin Brothers (translated from L'Acrophile by Miss Mabel H. McCurdy).

ILLUSTRATIONS.

1. Drome No. 5, Bell's Cygnet II:- The upper picture, taken Mar. 15, shows recent changes in the apparatus. Bent runners strengthened with wood; vertical rudder below front control; and aviator's seat raised. Compare with photograph in Bulletin XXXIV p. 55. The lower picture, taken Mar. 15 shows an unsuccessful attempt at a flight in the Cygnet II with McCurdy as aviator. The machine is moving along the ice at the rate of about 15 miles an hour.....27

2. Drome No. 4, McCurdy's Silver-Dart:- The upper picture, taken Mar. 12, shows the start of a flight. Two men on either side in front hold the machine stationary while another man starts the engine by turning the propeller behind. Bedwin and this man then take their places on either hand behind the whirling propeller. Bedwin is on the left (starboard side of the aerodrome). All await a signal from Bedwin to let go. Bedwin raises his hand: The men in front let go and duck down allowing the machine to pass over them. The photographer also caught the signal and exposed his plate with the result here shown. The lower photograph, taken Mar. 16, shows McCurdy and the Silver-Dart in the air....28

EDITORIAL NOTES AND COMMENTS.

Patent Specifications.

March 19, 1909:- Two applications for U.S. Patents on the Hammondsport work of the Association have been completed and are now ready to be filed in the Patent Office as soon as the inventors have signed them. One of these is in the name of Frederick W. Baldwin alone; and the other is a joint application in the names of all the members of the Association (including Selfridge).

Last night (March 18) Mr. Baldwin signed his application, and swore to it before Mr. H. Percy Blanchard, Notary Public; and the joint application was signed and sworn to, before Mr. Blanchard, by DR. Bell, Mr. Baldwin, and Mr. McCurdy.

The joint application will have to be forwarded to Mr. Curtiss for his signature, and then sent to Mr. H.A. Selfridge in California.

Both applications will be mailed to-day (March 19) to Messrs. Mauro, Cameron, Lewis & Massie who will attend to the matter of getting the signatures of Mr. Curtiss and Mr. Selfridge. A.G.B.

CONFERENCE WITH THE CANADIAN GOVERNMENT.

March 19, 1909:- I have received an invitation to lunch with the Canadian Club of Ottawa on Saturday March 27 at one o'clock and address the Club on the subject of our experiments.

I have accepted the invitation, as I think it to the interests of the members of the Association that I should do so even at the expense of interfering with our closing experiments.

I will not only have the opportunity of addressing a distinguished and representative audience constituting indeed a National gathering of Canadians, but will also be able to secure a private conference with the Gov. General of Canada (Earl Grey), and with the Premier, Sir Wilfred Laurier and the members of his Cabinet on the subject of our work. I believe that important developments of the greatest consequence to the members of the A.E.A., will result from this conference. I would ask the members of the Association to consider this communication as confidential for the present.

A.G.B.

SCIENTIFIC AMERICAN TROPHY.

March 19, 1909:- Until recently I had been under the impression that the Scientific American Trophy would be awarded for the second time on much the same lines as on the first occasion excepting that the condition of distance flown would be more severe.

We had reason to believe, from verbal communications that have passed between some of our members and the President and other officials of the Aero Club of America that the Trophy would be awarded to the first flying machine in America to make a public flight of 25 kilometers under test conditions to be prescribed by the Aero Club; and that the award would be made immediately upon the fulfillment of the

conditions.

Believing that the Silver-Dart could fulfill the requirements we made application for the award; and agreed to pay the traveling expenses of representatives of the Aero Club from New York to Baddeck and back.

After receipt of our application, and in consequence of it, the Directors of the Aero Club held a meeting in New York to decide upon the test conditions. Upon this occasion however they took the opportunity to make a radical change in the understanding at which we had informally arrived; and this has led me to withdraw our application.

The Club now proposes to award the Trophy to the machine that shall make the longest flight over 25 kilometers during the year 1909. This means:-

(1) The award will not be made until after the close of the year 1909.

(2) Although we should actually succeed in making the prescribed flight of 25 kilometers this would not secure to us the award; for, should a longer flight be subsequently made by the Wright Brothers, or others during the year 1909 the award would go to them.

(3) I did not feel justified in incurring the expense of paying the traveling expenses of the representatives of the Aero Club on the almost absolute certainty that the award would be made to others.

(4) The status of the Association in the matter would be lowered by accepting under the present conditions. Instead of receiving the award as an honor commemorating our success in flying a distance of 25 kilometers we would be entering into a racing match in competition with others. This would place us in a position that would be derogatory to the best interests of a scientific Experiment Association.

(5) It would not be sufficient for us to fly the required distance of 25 kilometers, which is only the minimum but we would be expected to go as far further as possible so as to demonstrate the full capabilities of the machine.

We certainly had no intention of exhausting either the machine or the aviator or running any risks whatever. While we could easily fly 25 kilometers without any strain on the machine or the aviator especially if we had Curtiss with us to tune up the engine, it would not be advisable for us to run into extremes and bring out the full powers of endurance either of aeroplane or man. The man of course is more important than the machine and the indisposition produced in Douglas McCurdy by a flight of only a few miles by being subjected to a cold wind of 40 miles an hour produced by the advance of the machine warns us that an endurance test of the kind suggested might be fraught with serious consequences to the aviator.

These are in brief the reasons that have led me to withdraw our application for the award. A.G.B.

Drome No. 5, Bell's Gyronet II.

March 19, 1909:- Drome No. 5, Bell's Gyronet II has not yet demonstrated its ability to fly by leaving the ice.

There are various conditions however that show that we have not yet fully utilized the means of propulsion at our disposal. First, the engine has not been working well so that we did not have the benefit of its full power; and secondly, the calculation of Mr. Baldwin given elsewhere in this Bulletin shows that we are only utilizing in the propulsion of the machine a small portion of the power we possess, and that it would be possible to increase very materially the efficiency of propulsion by a different

propeller.

Taking the available power of our nominally 50 H.P. engine at only 21 H.P. which seems to be justified by our experiments, Mr. Baldwin's calculation shows that we are only utilizing about 7 H.P. in the propulsion of the Cygnet, 14 H.P. being employed in churning up the air behind into aerial foam. This shows that we may hope to produce a great improvement by constructing a new propeller as suggested by Mr. Baldwin having a larger surface in the propeller blades and a smaller pitch.

The present propeller is 9 ft. in diameter and has a pitch of 10 feet. We are now having a new propeller made with a diameter of 10 feet and a pitch of 5 feet. A.G.B.

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EXPERIMENTS: Reported by the Editor.Oionos Kite with Aero-curves.

March 13, 1909:- The horizontal surfaces or aeroplanes of the White Oionos Kite have been converted into aero-curves by the insertion of curved aluminum tubes under the surfaces.

This kite, in its original form was tried Feb. 13 and yielded an efficiency of 2.4, the lift being 2.4 times the drift (Bulletin XXXIV p.18).

To-day (March 13) the same kite was tried with its aeroplanes converted into aero-curves with the object of testing whether curved surfaces would be preferable to flat surfaces in Drome No.6, which is to be of the Oionos type.

The Kite weighed 44.2 lbs; and was flown by a Manila rope 100 meters long, weighing 10.7 lbs, attached at a point 50 cm in advance of the center of the kite.

Exp. I		Exp. 2		Exp. 3	
Wind 12.20 mph		Wind 10.05 mph		Wind 9.50 mph	
Pull	Alt	Pull	Alt	Pull	Alt
60	44	30	46	30	45
50	43	20	44	30	40
35	45	40	40	30	39
30	47	30	45	15	32
25	38	10	46	20	24
45	32	15	46	25	41
50	28	10	38	30	48
55	31	15	33	55	49
45	40	40	32	40	46
<u>25</u>	<u>43</u>	<u>15</u>	<u>28</u>	<u>45</u>	<u>45</u>
420	391	225	400	320	411

SUMMARY.

	Pull		Alt		Wind	
	Obs	Lbs	Obs	Angle	Obs	mph
Exp. 1	10	420	10	391	1	12.20
Exp. 2	10	225	10	400	1	10.05
Exp. 3	10	320	10	411	1	9.50
Summation	30	965	30	1202	3	31.75
Average		32.2 lbs		40°.1		10.58 mph

EFFICIENCY.

Alt 40° 00° Sin .643 Cos .766
 Pull 32.2 lbs Vert 20.7 lbs horiz. 24.7 lbs

Lift.

Weight of Kite 44.2 lbs
 Weight of line 10.7 lbs
Vertical Pull 20.7 lbs
 Total 75.6 lbs

$$\text{Efficiency} = \frac{\text{Lift}}{\text{Drift}} = \frac{75.6}{24.7} = 3.1$$

Comparison.

Oionos Kite Efficiency

with aeroplanes 2.4
 with aere-curves 3.1

Result: Curved surfaces are more efficient than flat surfaces. In the above experiments 30 observations of altitude and pull were made; and in the following tables the observations are arranged according to altitude.

Grouped Altitudes	No of Obs	Summation		Average	
		Alt	Pull	Alt	Pull
20°-29°	3	80°	85 lbs	26°.7	28.3 lbs
30°-39°	8	275°	235 lbs	34°.4	29.4 lbs
40°-49°	19	847°	645 lbs	44°.6	33.9 lbs
Total	30	1202°	965 lbs	40°.1	32.2 lbs

Grouped Altitudes	No of Obs	Averages			
		Alt	Lift	Drift	Efficiency
20°-29°	3	26°45'	67.6 lbs	25.3 lbs	2.7
30°-39°	8	34°30'	71.5 lbs	24.2 lbs	3.0
40°-49°	19	44°30'	78.7 lbs	24.2 lbs	3.3
Total	30	40°00'	75.6 lbs	24.7 lbs	3.1

Result:- The efficiency seems to increase with the angular altitude of flight. A.G.B.

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EXPERIMENTS WITH CYGNET II.

March 19, 1909:- Experiments were made this morning to fly Drone No. 5, Ball's Cygnet II, with the Curtiss No. 3 motor, and with a 9 foot propeller, a perfect screw, pitch 10 feet.

The sledge-runners had been bent, the vertical rudder placed under the front control, and the seat for the aviator raised 50 cm. These changes were shown in photographs in Bulletin XXXVI p. 39. and also in this bulletin.

Baldwin reported that the push of the propeller had been tested upon the ice-beat, and found to be about 200 lbs.

The Cygnet II did not rise into the air, the speed attained not being sufficient for support.

Baldwin reported the following observations of speed over the ice on a measured course:-

Against wind $1/12$ of a mile in 23.4 sec.
With wind $1/12$ of a mile in 16.4 sec.

This was 12.8 miles per hour against the wind, and 18.3 mph with the wind. If x be the velocity of the wind in mph then:-

$$\begin{aligned} 12.8 + x &= 18.3 - x \\ x &= 2.75 \end{aligned}$$

This indicates that the velocity of the machine relatively to the air, or in other words the velocity of the Cygnet II in a calm under her own propelling power, was about 15.55 miles per hour. The engine did not, I think, develop

her full power, for most of the time I could hear the engine skipping, one cylinder missing fire occasionally and then exploding with a bang.

The calculated velocity of the wind, 2.75 mph, tallies very closely with an observed velocity of 3 miles per hour taken with an anemometer.

For further details concerning the experiments with Cygnet II see my press despatches in this Bulletin. I give below accounts by Mr. McCurdy, Mr. Baldwin, and Mr. Edw. Geoff. Stairs. A.G.B.

McCurdy's Account:- This morning (March 15) the Cygnet II was tried out having been fitted with the new 9 foot diameter 10 foot pitch propeller, geared 2-1. The engine did not work well in the start, but picked up well developing about 30 H.P. after a few seconds running.

We ran her up the Bay starting from Long Sand Point. The first few seconds run was over a measured course of $1/12$ of a mile. Over this she was run "flat", the time being taken by Baldwin. Upon elevating the control the machine responded and lifted back on the rear of her runners. We ran up the Bay for about $1/2$ mile, then stopping turned her round and returned under her full power. The time over the $1/2$ mile course was now also measured.

Mr. Bell suggested that as the day was good the engine be transferred to the Silver-Dart, and a few flights made. The transfer was made in one hour and 15 minutes.

J.A.D. McC.

Baldwin's Account:- Tried No. 5 this morning (March 15). Weather perfect, and ice fairly good though not quite as smooth as on some former trials.

On course of 1/12 mile took time with and against wind which was about 3 miles per hour. Speed was somewhere in neighborhood of 15 miles per hour, and machine would not lift.

Mr. Bell ordered engine to be shifted to Silver-Dart which was done before noon hour. F.W.B.

Stairs Account:- Monday (March 15), the Drome No. 5 Bell's Cygnet II was tested on ice of Baddeck Bay. Present:- Dr. Bell and Staff, Dr. McDonald, Mrs. McDonald, Mr. Stairs, and a number of Baddeck men. Machine was taken from shed to a position off Long Sand Point, and after adjustment, the aviator, J.A.D. McCurdy took his seat.

At 9.20 A.M. the engine was started but the effort produced no result in as far as causing Drome to advance. Sound of operation of engine seemed to a lay observer somewhat "jerky" or intermittent, with an exhausting and omitting sound, causing me to think that the engine was not giving off its best; which also seemed obvious. Engine was stopped and three minutes spent in adjustment, but on resuming, the blank exhaust sound continued with somewhat varied noises till propeller stopped. McCurdy left seat and examined engine, adjusting the connecting plug ends of the transmission wires. McCurdy and Baldwin took their position inside framework and connecting wires surrounding engine, and caused a "try out" of the engine, the Drome being kept

stationary, they remaining along side engine for observation and adjustment of the mechanical apparatus.

At 9.45 aviator resumed seat, and start of Drome was accomplished gliding to a point say 100 feet forward, heading slightly to the left. Drome was shoved back a short distance, and started off again. Drome glided forward in straight line about, say, one-quarter of a mile, coming to a finish off Dr. Bell's Observation Point on the small island.

Another trial resulted in Drome going forward say 300 yards, curving quite considerably to the right, towards shore, till it finished glide.

At 9.55 another start resulted in, say, 200 yard glide till concluded about, say, 60 feet from two small ice ridges on hummocks. Men pushed her over the ice and some adjustment of power batteries was about to be undertaken when Dr. Bell having come up, advised that no further time be spent in the test, as it was evident that engine was not powerful enough to produce needed speed to cause Drome to "get into the air"!!

Drome was reversed, and at 10.15 started back over and down the course towards original starting point, making a continuous glide of three-quarters of a mile.

Dr. Bell had driven down course in advance, and at a point about three-quarters of the distance covered, when off Dr. Bell's sleigh, Drome was seen to glide forward on rear runners, as result of the aviator causing front control to rise slightly which rear runner support continued towards

final concluding point, say, 300 yards beyond Dr. Bell's sleigh, when Drome had, as above stated, made a glide continuously for say, about (or slightly over) three-quarters of a mile.

Being at first starting point, operations were discontinued, and on Dr. Bell's advise Drome was taken to shed, to have engine transferred to Silver-Dart for tests of latter during afternoon.

Tests of speed observations, of length of glides, etc., etc. were made, photographs taken, and other data gathered for future reference.

Day seemed an ideal one, bright and practically calm, with very faint breaths of air coming down the Bay.

Above "observations", respectfully submitted by:
Hav. Geoff. Stairs.

EXPERIMENTS WITH SILVER-DART.

March 15, 1909:- After the experiments with the Cygnet II this morning the engine was transferred to the Silver-Dart, and her own propeller (7 1/2 feet diameter I think) was attached.

This afternoon the Silver-Dart was taken out on the ice and tried. The engine was skipping a good deal as in the morning experiments, and the Silver-Dart failed to rise.

Several unsuccessful trials were made suggesting to my mind the possibility that the failure of the Cygnet II to rise might also have been due to the engine as much as to the head resistance of the structure itself.

The engine was then given a thorough overhauling, and I left for the Point as I had been up all night and needed sleep.

The wind began to rise; and by the time all was ready for another test there was a breeze of from 10 to 14 miles per hour. Undeterred by this McCurdy attempted a flight and the machine rose from the ice.

He dromed the greater part of the way to Baddeck the machine pitching on the invisible billows of the air like a boat on the surface of the seas, giving him great experience in the handling of his controls. As I did not see this flight myself, I give below the accounts of McCurdy and Baldwin:- A.G.B.

McCurdy's Account:- About 2 o'clock (March 15) the Dart was taken out but difficulties with the meter prevented our trying a flight till about an hour had elapsed. By this time the wind had come up and the anemometer showed a velocity of 8-14 miles per hour. It was very puffy but it was thought that the experience in flying in such weather would be of good advantage, so finally after a few failures to rise, the engine was tuned so as to turn over 1000 rpm. This time the machine flew well and after arriving at Baddeck, I slowed down the engine landing on the ice and effected the turn. Advancing the spark resulted in the machine taking the air and away we flew, down the Bay with the wind till just off Carruth's when we stopped the engine. By this time the puffs were stronger and after a short flight of about 1/4 of a mile against the wind the machine was safely landed

and wheeled back to her shed. It was thought advisable not to try again.

I may say that the controls all showed their ability to maintain the machine on an even keel, and the flight down from Town with the wind was the most exciting one I ever negotiated. J.A.D. McC.

Baldwin's Account:- After lunch took out Dart and after an hour's engine trouble John made short flight 1/2 mile or so. Radiator boiled from previous running. Wind was blowing very puffily at average of 10.5 miles per hour. Took several observations, 7 second ones. 8, 8.5, 10 and 13.5 miles per hour being some of the readings.

The aerodrome was very uneasy in wind making quick little dives and recoveries which made her look like small boat bobbing up and down in choppy sea.

Wind got worse . Experiments given up for day. F.W.B.

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Bulletin No. XXXVII

ON THE PUSH OF AN ADVANCING PROPELLER.

March 17, 1909:- It was reported at one of our conferences that Maxim had declared as the result of numerous experiments with his large machine, that the thrust of a rapidly rotating propeller was the same whether the machine was advancing or whether it was at rest. Our experiments seem to indicate that the thrust of the propeller was less when the machine was in rapid motion than when it was still.

As our ice-boat, fitted with McCurdy's coiled spring indicator, advancing over the ice at 30 or 40 miles an hour, seemed to be admirably fitted to settle this question I directed Mr. Bedwin to make observations upon the point when he could do so conveniently without interrupting other experiments. I wrote to him upon the subject Feb. 12 but he has been unable to make the experiment until to-day. I give below the correspondence on the matter.

Bell to Bedwin.

Feb. 12, 1909:- The experiments with the motor-driven ice-boat have not yet given us a satisfactory and definite answer to the important question:- Is the push of a rotating propeller the same when the machine is stationary as when it is in rapid motion?

I would be much obliged if you would make a series of experiments to test this single point. Don't complicate matters by attempting to note the velocity of the machine or the velocity of the wind. We want the push alone with the direction in which the machine is heading. I enclose a blank form for noting the results of the experiments.

(1) With the machine heading down the harbor but held still start up your engine and note the push.

(2) Then let her go and note the push while going full speed down the harbor.

(3) Then turn her round heading up the harbor and note the push when the machine is held still.

(4) Then let her go and note the push when she is going full speed up the harbor.

This will constitute experiment I. Repeat the experiment a number of times. I want at least five repetitions but will be still better satisfied with ten.

(Signed) Alexander Graham Bell.

Bedwin to Bell.

March 17, 1909:- I beg to submit the following observations of propeller thrust on ice-boat, in answer to your letter of Feb. 12. The observations under heading "Still" are continuous steady push readings for one minute.

Then the engine was stopped and allowed to cool and started up again and the readings under "Moving" were taken during the time boat was getting under way and running over a course of about a half of a mile. The signs + and - indicate the direction in which the machine was heading. The wind was about 5 miles per hour.

Exp. 1		Exp. 2	
+ Still	Moving	- Still	Moving
115	100	125	105
	75		100
	75		50
	75		75
	65		75
	70		75
	65		70
	60		70
	70		75
	70		75

Exp. 3		Exp. 4	
+ Still	Moving	- Still	Moving
125	100	125	100
	90		95
	75		75
	75		75
	75		75
	75		75
	75		75
	75		80
	70		75
	70		70

(Signed) Wm. F. Bedwin.

The answer seems to be conclusive. The push of a propeller is different when the machine is advancing than when it is at rest. The push decreases with the speed. A.G.B.

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EXPERIMENTS WITH THE SILVER-DART CONTINUED.

March 17, 1909:- Douglas McCurdy started out this morning with the intention of making a sixteen mile flight to show that he could do the distance required as a minimum to win the Scientific American Trophy. The morning seemed to be ideal but the engine was not. He never had a more aggravating day. He put in several good flights but every time, after flying a few miles, the engine lost power and we have come to the conclusion that it is rather a fortunate thing that we had decided not to try for the Trophy under the new conditions imposed by the Aero Club. While we believe that the machine itself is capable of flying an indefinite distance for an indefinite time or so long as the engine and fuel will hold out it is very problematical what the result would be with the present engine we have. If Curtiss could only be here I have no doubt that he could easily arrange the engine so that it should run for the required time to make the required distance but in our hands, unassisted by Curtiss, it is a mere toss-up whether we could get the engine to do it.

I was not present on the ice to-day to witness the experiments but I watched the machine from the Point through a pair of field glasses, rounding the four mile mark about a mile beyond Stony Island in St. Patrick's Channel and kept her in sight until she disappeared behind Kidston's Island. On this occasion she did not reappear at the other end of the island and I could no longer hear the whirl of the propeller

from which it became obvious to my mind that something had happened. I then saw through my glasses spectators coming down on to the ice and proceeding in the direction of Baddeck evidently going towards the machine. I imagined a crowd collecting and examined the actions of the people on the ice to see whether I could obtain any indications of excitement to show whether an accident had occurred. All the people seemed to be walking leisurely along without any trace of excitement so I presumed that there had been no accident but that the power had given out and that McCurdy had landed in Baddeck Harbor. To make sure I telephoned to McKay's to find out what had happened and they simply reported that McCurdy had made a fine landing near one of the wharves. They evidently did not know that he was obliged to land. Later he proceeded down Baddeck Bay on the ice but I did not see him.

I hear afterwards that he had been in the Doctor's hands and that the Doctor had taken him to his office as he had been quite overcome by the cold. McCurdy himself was quite reticent as to what had happened and I could find out nothing from the Laboratory staff excepting that when McCurdy returned to a point near the Laboratory he got out of the machine and went at once to Dr. McDonald's sleigh, got in and immediately dropped asleep. This McCurdy indignantly denied, but I could not get any information out of him as to what had really happened and so I asked Mr. Stairs to give me an account.

The whole day, both morning and afternoon, was spent in experiments with the Silver-Dart. Numerous short flights were

made and at least three flights of four miles or more. The engine seems to have acted capriciously throughout. I give below the account submitted by McCurdy and Baldwin and the note from Mr. Stairs describing McCurdy's half frozen condition. A.G.B.

McCurdy's Account:- This morning (March 17) we anticipated that a flight of 16 miles (measured) would be made with the Dart. A beautiful day with no wind to speak of.

Started at usual place and flew well till off Baddeck when the power died dropping the machine to the ice. I however kept on and after a few seconds run on the ice she picked up and brought me to the end of the four mile course. Here she landed again while the turn was negotiated. Soon however she flew again and brought me to Baddeck, and from there home it was a series of jumps. Examination showed that one carbureter had become frozen and it was replaced by another one.

This time practically the same thing happened, but the engine stopped entirely stranding me at Baddeck on the return flight. It was found that the buss was weak and upon testing the batteries only 9 amperes were registered. We intend trying a new set of batteries this afternoon and have them packed in cotton waste to keep off the intense cold. J.A.D. McC.

This afternoon (March 17) with the new set of batteries packed in cotton waste we felt almost sure that the long flight so much desired would be accomplished.

The engine worked well in the shed but upon attempting a start on the ice the usual unsatisfactory working of the engine took place. After about an hour had been lost in tuning the engine she was released, but quite a strong puffy wind from the NW had sprung up which made the management of the Dart rather difficult.

Just off the old church the engine stopped. I looked things over but could find no cause for this, and so, with Mr. Benner's single help, got the machine started again. However, when off Dr. McDonald's, one side of engine refused to run and so Dart landed. By this time the crew on the power ice-boat arrived on the scene, and we decided that the carbureters had better be looked over carefully in case some dirt had become lodged in the valves. This was done and some dirt removed.

After a little tuning the machine was for the third time started and flew up the shore for about two miles, when after making the turn, overheating brought the machine to the ice again. Help soon came and after waiting sufficient time for cooling to take place the home stretch was negotiated in a very rotten way touching the ice at close intervals.

It was decided to suspend experiments for the afternoon and wait for the engine to get well. J.A.D. McC.

Baldwin's Account:- John made two flights this morning (March 17). Engine started off well in each case but faded away before John could cover Stony Island course.

The second of these attempts looked very promising. The start was the best I have seen. However John could not keep up and stopped off Baddeck on return. Batteries were

weak. P.W.B.

John tried several times this afternoon (March 17) to make a long flight. After finding batteries weak this morning, it was thought that a new set would keep engine working O.K. However, on each occasion engine faded after short flights had been accomplished, and experiments were given up about 4.30 P.M.

The wind was decidedly strong and puffy during one of these flights, and the Silver-Dart did a good deal of jumping about. P.W.B.

Stairs Report on McCurdy's Condition:- After Silver-Dart finished flight of approximately 20 minutes from the time of starting (March 17) the writer, on going up to the machine stationary on the ice, noticed McCurdy in Doctor McDonald's sleigh, and on going to the sleigh, observed that Douglas was apparently quite fatigued, he leaning back in a loose, limp manner, his hands hanging somewhat loosely at his side, and altogether to a casual observer gave the appearance of his either being faint, or exceedingly weary.

On speaking to him he made no response, which indicated that he was either partially (if I may use the expression) unconscious, or if not in that condition, was too far fatigued to reply or even to nod an assent or dissent to a question. At the time the Doctor was testing his right hand pulse and chafing his wrists.

A moment later Baldwin spoke to him, and Douglas again did not seem to either hear, or if hearing, in any way acknowledge the remark, finally however, just barely speaking in an under tone in a brief and jerky manner.

In the course of another moment or two another observer made a remark to him which he answered more vigorously by casually remarking that "he did not care". Then the Doctor suggested that they go in the sleigh to the Doctor's office and they started off.

As they went, the writer and Mr. Baldwin and others just didn't know what to think of Douglas' condition, though none of us were worried very much, feeling that if it was simply faintness he would pull through, or if it were cold it would pass over.

Possibly 20 or 25 minutes later when the Doctor and Douglas returned, he was in better shape, and on enquiry told me that his sensations, on coming from the machine, were those of an extremely cold man. He had not realized how cold he was while in the air, or running along on the ice towards the final stop; but on leaving the seat the coldness seemed to be emphasized in him.

He went forward to the Doctor's sleigh, and on having taken his seat, said, that for awhile he was bitterly cold which caused the appearance and desire of extreme fatigue or exhaustion. He said that after being in the sleigh for a moment or two, covered with a buffalo rug along side Dr. McDonald that he broke into a violent perspiration, which later he remarked the Dr. had said was caused by the action of the blood which had been more or less congealed forcing itself forward and outward through the pores.

As a result of "a little something" that Douglas and the Dr. had while in Baddeck (a prohibition town!), he seemed

to resume his former state, and on arriving back where the machine was, said he felt all right, which was evident in a few moments by his activity.

Dr. Bell has suggested to me that I, as an observer, should put it in this way for his information. E.C. Stairs.

There is no doubt in my mind that Douglas McCurdy's temporary indisposition was due to the extreme cold to which he had been subject, and to his great disappointment over the unsatisfactory condition of the engine which had prevented him from making his desired flight of 16 miles.

He finished off the afternoon by taking part in a vigorous game of hockey on the ice (Beinn Bhreagh Laboratory vs. Baddeck) and helping to win the game. This certainly helped to restore his circulation and his spirits.

In the evening he gave a lantern slide exhibition to the men, and tumbled off to bed at eleven o'clock, and was asleep almost the moment his head touched the pillow.

A.G.B.

EFFECT OF COLD ON BATTERIES.

March 17, 1909:- After the forenoon experiments with the Silver-Dart Mr. Baldwin, having noticed that the Voltaic batteries employed to produce the ignition spark on the engine seemed to be weak decided to make a little experiment of his own to test the effect of cold upon the strength of the battery verifying or disproving the results of experiments reported by Baldwin in Bulletin XXXII pp. 14-19.

I find the following note by Baldwin concerning this experiment:-

*Took old set of 4 dry cells. Amperage 15, temperature 120° Fah. at 12.15 noon. Put them out in snow bank. At about one o'clock amperage was 13, temperature registered by thermometer 30° Fah. F.W.B.

The battery cells were left out in the snow bank all the afternoon and at 6 P.M. I found the amperage 11, temperature 23° F. The cells were then left out all night. At midnight amperage 11, temperature 21° F. A.G.B.

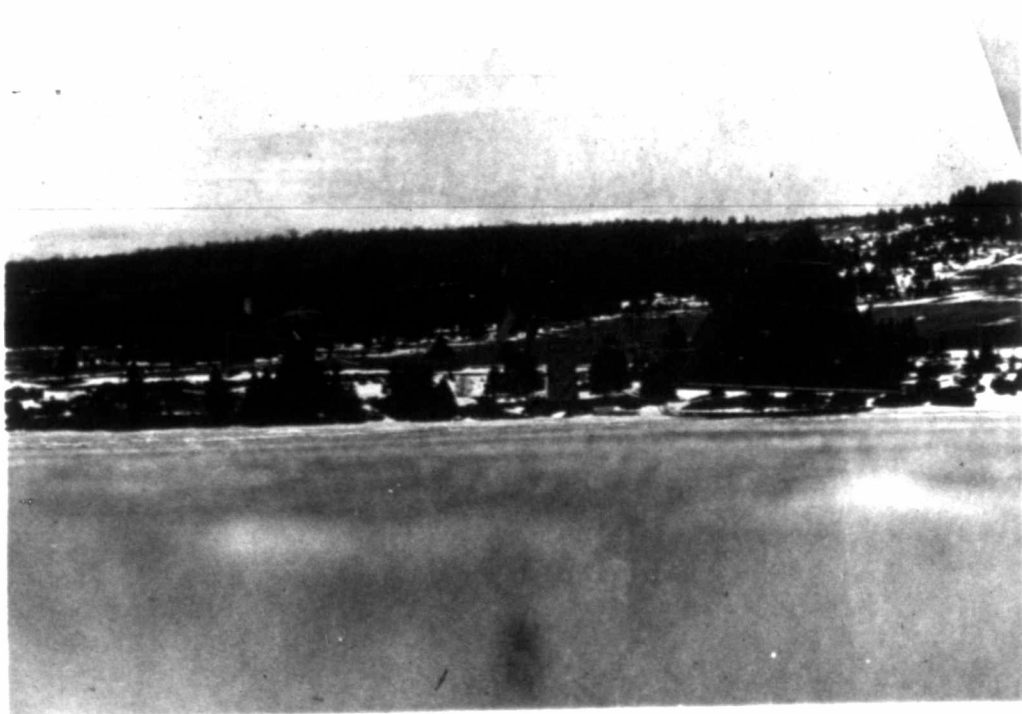
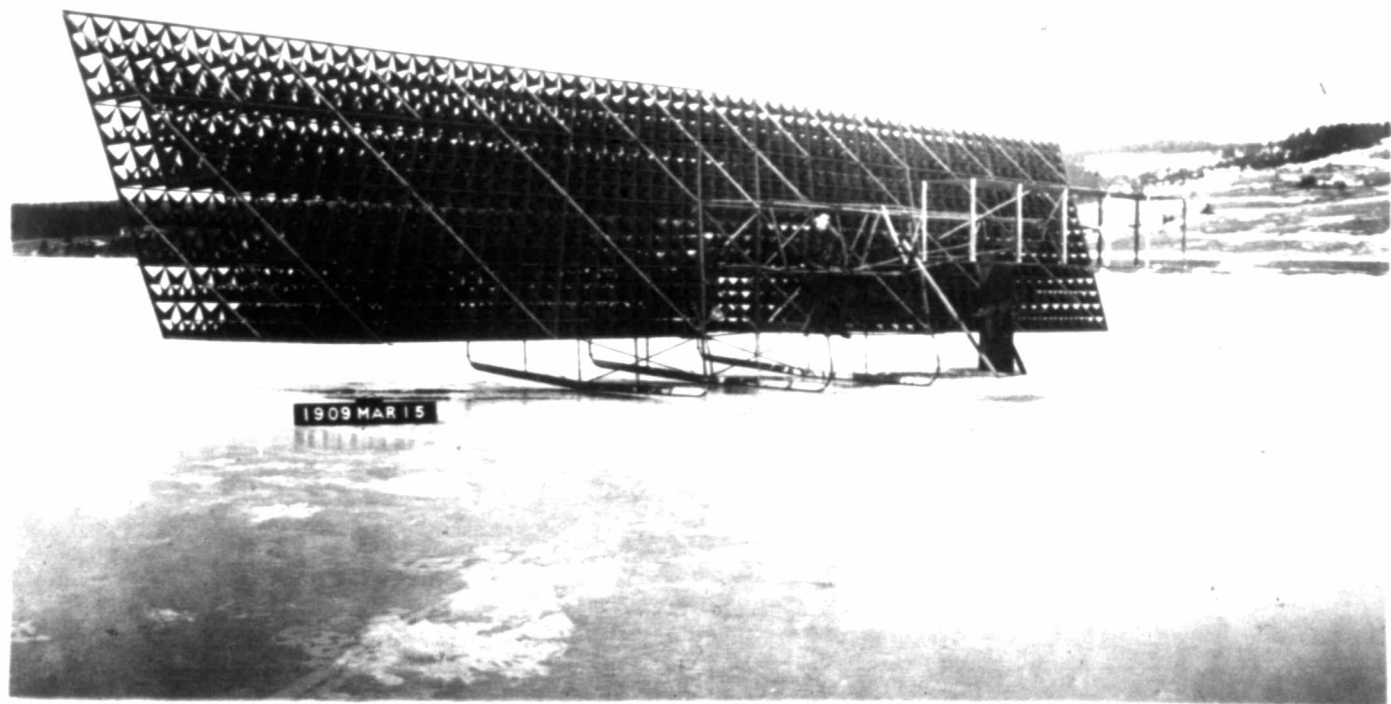
March 18, 1909:- We all of us forget to look at the batteries this morning, but this afternoon we found them covered with melting snow, and brought them into the house, and tested them. The amperage 11. The batteries were placed at two o'clock near the open fire in my Study and by 3.30 P.M. the amperage had risen to 16. The following table shows the

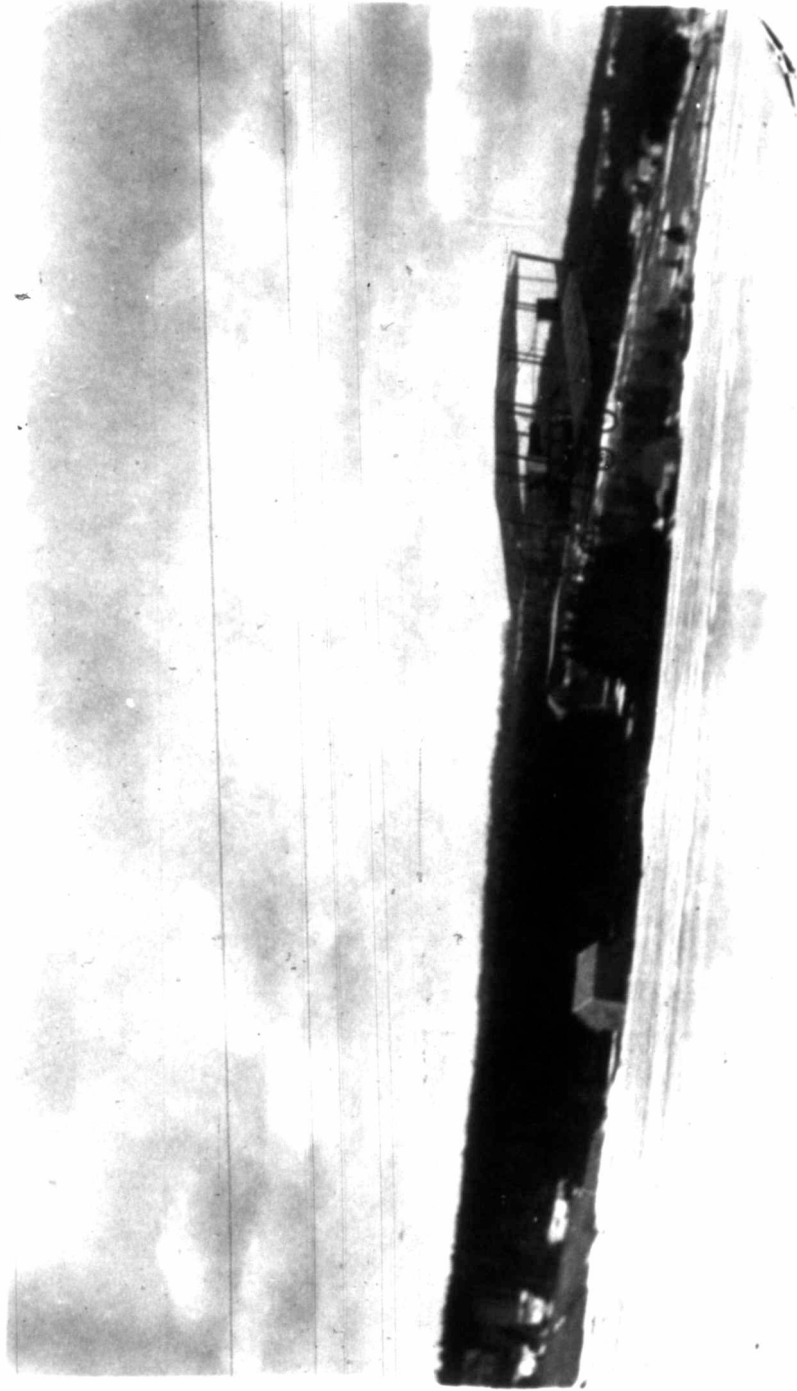
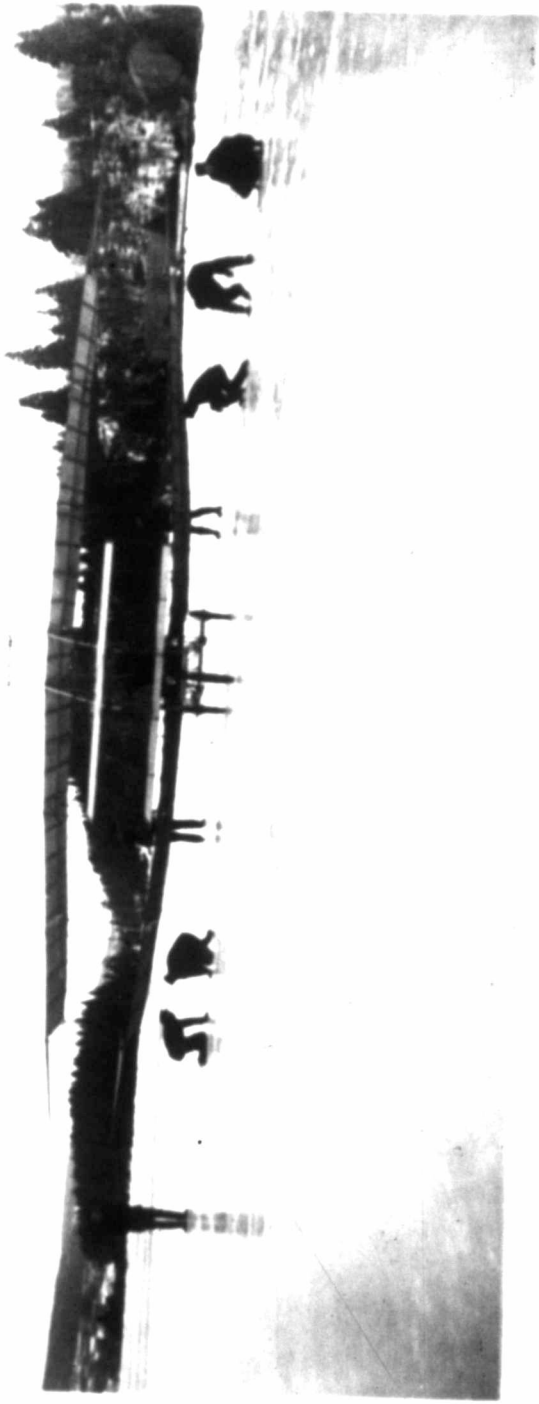
results:-

		Temp.	Amperage
March 17	12.15 noon	120° F	15
cooling	1.00 P.M.	30° F	13
cooling	6.00 P.M.	23° F	11
cooling	Midnight	21° F	11
March 18	2.00 P.M.	32° F	11
warming	3.30 P.M.	----	16

A.G.B.

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THOUGHTS CONCERNING MOTIVE POWER: By J.A.D. McCurdy.

March 12, 1909:- It seems to me that in obtaining a motor with which to propel a flying machine such as a tetrahedral structure, we should have these three points in view and their importance is in the order named. (1) Reliability, (2) Brake Horse-Power, (3) Weight.

It has been considered that the first requisite for such a motor is one of light weight and to naturally obtain greatest horse-power consistent with that weight. For instance if a motor should weigh, say, 400 lbs we might be liable to put that aside without more consideration because it is too heavy; we might not seriously consider that its great horse-power would more than compensate for its great weight.

A motor which will only produce a push of 200 lbs will as in the case of the Silver-Dart lift not only its own weight of 260 lbs but the aviator and machine making in all a total of 860 lbs. The landings made with this great weight are without jar or any shaking up to the machine.

Now in the case of the Cygnet what we must have above all other things is push, coupled with a certain definite pitch speed. This means horse-power. Now why should we try to install in this machine a motor which is of comparatively light construction and which produces not sufficient horse-power to drive the machine. The motor we have is a thirty horse-power motor and weighs itself 260 lbs. This is all right for a machine which only requires 20 H.P. to fly.

Now the larger you make a motor (within reasonable limits) the more it lessens per horse-power, or in other words a fifty horse-power motor of a certain design would weigh less per horse-power than a 20 or a 30 H.P. motor of the same design.

A motor having a certain cylinder capacity will develop a certain horse-power and the motor as a whole will weigh a definite amount. Now to increase the horse-power we must obtain greater cylinder capacity. As the area of a circle increases in proportion to the square of its diameter such a very little increase in the bore of a cylinder would greatly increase the capacity and horse-power. The weight of the material required for this increase in capacity would not increase proportionately to this increase in bore and hence the weight of the bigger motor as a whole would not increase in proportion to the horse-power. So we have a motor of less weight per horse-power than in the case of the smaller motor.

I would suggest therefore that if the Association contemplates the purchase of a new motor for the Cygnet let it be one of standard make and chosen according to the order of these requisites:- (1) Reliability, (2) Power, (3) Weight. J.A.D. McC.

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Bulletin No. XXXVII

THE HORSE-POWER WE ARE UTILIZING: By F.W. Baldwin.

March 19, 1909:- A comparison of the useful horse-power employed in the propulsion of Drones No. 4 & NO. 5.

The efficiency of a propeller is measured or rather should be measured by comparing the horse-power put into the propeller with the horse-power usefully expended in driving the machine.

When a machine is under way with uniform velocity the thrust of the propeller must necessarily equal the resistance of the machine otherwise there would be a plus or minus acceleration. Therefore the thrust in pounds multiplied by the distance through which the machine travels equals the work done by the propeller in ft. pds.

Now comparing the propeller efficiency of the Silver-Dart with the propeller of Cygnet II. The thrust in each case we judge to be in the neighborhood of 200 pds., but with this thrust the Silver-Dart travels at 40 miles an hour, while the Cygnet only travels at 15 miles an hour.

Silver-Dart.

Propeller thrust = 200 pds.
Speed of machine = 40 miles per hr. = 3520 ft. per minute.

Useful work done by propeller = 200 x 3520 ft. per minute.

$$= \frac{200 \times 3520}{33000} = 21.33 \text{ H.P.}$$

CYGNET II.

Propeller Thrust - 200 lbs.
 Speed of Machine - 15 miles per hr. = 1320 ft
 per minute.

Useful work done by propellers = 200 x 1320 ft.

$$\text{lbs. per minute} = \frac{200 \times 1320}{33000} = 7.10 \text{ H.P.}$$

Allowing for transmission losses the H.P. delivered to propeller by engine is about 28 H.P.

$$\text{Efficiency of Silver-Dart propeller} = \frac{21.33 \times 100}{28.00} = 72.62\%$$

$$\text{Efficiency of Cygnet II propeller} = \frac{7.10 \times 100}{28} = 25.36\%$$

Thus it is evident that the propeller used on Cygnet II is not well adapted for its work and while a pitch speed of 50 miles an hour may be necessary to fly Cygnet II it would seem that greater speed could be obtained by reducing the pitch speed either by increasing the area of the propeller blades and so cutting down their speed of rotation or by reducing the pitch.

The foregoing calculations assure that the thrust keeps up when under way. In case of Silver-Dart thrust may drop and so efficiency of propeller may not be quite as high as calculated but in any case it is clear that we are not getting more than 25.36% efficiency of propulsion with Cygnet II

P.V.B.

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TELEGRAMS.Bell to Post.

Baddeck, N.S., March 5, 1909:- Cortland Bishop's letter to McCurdy just received. Would be glad to have you visit me here and officially observe experiments.

(Signed) Graham Bell.

Bell to M.C.L. & Massie.

Baddeck, N.S., March 6, 1909:- Please forward patent applications for signatures at once if possible. Aerial Experiment Association ends March 31.

(Signed) Graham Bell.

Bell to Curtiss.

Baddeck, N.S., March 6, 1909:- Please write fully concerning your arrangement with Herring and how it affects your relations with Aerial Experiment Association.

(Signed) Graham Bell.

Bell to Charles J. Bell.

Baddeck, N.S., March 6, 1909:- Would like your views concerning commercial propositions in Bulletin XXXIV. Please write fully.

(Signed) Graham Bell.

Bell to Means.

Baddeck, N.S., March 6, 1909:- I would cordially welcome you to be my guest here and observe trial for Scientific American Trophy. Can you come? Telegraph reply.

(Signed) Graham Bell.

The above telegram was also sent to Major George O. Squier and to Lieut. Lahm.

Aero Club to McCurdy.

New York, March 6, 1909:- Can arrange to send representative later in month. Answer.

(Signed) Aero Club of America.

Means to Bell.

Boston, March 6, 1909:- Many thanks. Very sorry to say it is impossible for me to leave Boston now.

(Signed) James Means.

Curtiss to Bell.

Hammondsport, March 6, 1909:- Proposed Herring arrangement will not affect Association's plans. Letter to you to-day.

(Signed) G.H. Curtiss.

McCurdy to Aero Club.

Baddeck, N.S., March 6, 1909:- Send representative as soon as possible. Ice our only chance. Will probably last through this month.

(Signed) J.A.D. McCurdy.

Post to Bell.

New York, March 6, 1909:- Telegram received. Am considering possibilities of going. Will advise later.

(Signed) Augustus Post.

Lahn to Bell.

Washington, D.C., March 7, 1909:- Sincerely regret official duties prevent accepting your kind invitation.

(Signed) Frank Lahn.

Baldwin to Mrs. Baldwin.

Baddeck, March 8, 1909:- John made grand flight, eight miles in eleven minutes, fifteen seconds.

(Signed) Casey.

McCurdy to Post.

Baddeck, N.S., March 8, 1909:- Silver-Dart flew eight miles in eleven minutes and fifteen seconds this morning. Made four other flights.

(Signed) J.A.D. McCurdy.

Bell to Mrs. Bell.

Baddeck, N.S., March 8, 1909:- Douglas flew eight miles today in eleven minutes and fifteen seconds. He dived to Stony Island and back, passing over Baddeck Harbor both ways.

(Signed) Alce.

Press Despatch.

Sent to Chas. S. Thompson, Associated Press, New York, Fred Cooks Correspondent of London Times Ottawa, Ont., W.R. McCurdy Halifax Herald, Halifax Chronicle, Milton Browne, Sydney Post.

Baddeck, N.S., March 8, 1909:- The Aerial Experiment Association resumed experiments here this morning with Drone No. 4 McCurdy's Silver-Dart. Mr. Douglas McCurdy made five flights with the special object of practicing landing on the ice. After four short flights he attempted a longer excursion, and flew a distance of eight miles in eleven minutes and fifteen seconds. Starting from Dr. Graham Bell's Laboratory he dived to Stony Island and back passing over Baddeck harbor both going and coming. The flight was witnessed by practically all of

the people of Baddeck, who were brought to their windows by the buzzing of the engine.

(Signed) Graham Bell.

Pfitzner to McCurdy.

Hammondsport, N.Y., March 8, 1909:- Best congratulations.

(Signed) A.L. Pfitzner.

Morning Chronicle to Bell.

Halifax, N.S., March 8, 1909:- Permit us to congratulate you on success of to-day's achievement and to thank you for Bulletin.

(Signed) Morning Chronicle.

Times Correspondent to Bell.

Ottawa, March 8, 1909:- Thanks for to-day's message. Your experiments arousing great interest in England.

(Signed) Fred Cooke.

Squier to Bell.

Washington, D.C., March 8, 1909:- Regret exceedingly official duties do not make it possible to accept your invitation. Very many thanks.

(Signed) George O. Squier.

Halifax Herald to Bell.

Halifax, N.S., March 8, 1909:- Thanks for despatch. We will be glad of more than what you sent on a great flight like that of yesterday.

(Signed) W.R. McCurdy.

Davidson to Halifax Chronicle.

Baddeck, N.S., March 8, 1909:- J.A.D. McCurdy, in his aerodrome Silver-Dart, made five successful flights over the ice on the Bras d'Or Lake remaining in the air, in one flight, eleven minutes fifteen seconds starting about a quarter of a mile below Dr. Bell's Laboratories. After running for a distance of seventy-five yards on the ice, the Dart ascended in the air to an elevation of about twenty feet keeping along the shore and went partly over the town of Baddeck for a distance of two and a half miles beyond, making a circular turn back over the same course and made a beautiful landing within twenty yards of the aerodrome shed flying over, in its course, people, horses, and ice-boats, in all covering a distance of over twelve miles in the flight. Mr. McCurdy said, in landing, the Wright Brothers had his greatest respect in remaining in the air for two hours twenty-three minutes. The Dart was in full control throughout the flights.

(Signed) J.C. Davidson.

Bell to Chas. J. Thompson (Associated Press, N.Y).

March 9, 1909:- The Aerial Experiment Association decided today that the wind was too strong and puffy to render a long flight with the Silver-Dart safe or advisable. Mr. McCurdy therefore simply practiced upon the ice making a series of short flights at a low elevation none of which exceeded a mile in length. In every case the landing was effected safely and gently and without jar to the machine or aviator.

(Signed) Graham Bell.

Mrs. Bell, Mr. and Mrs. Fairchild to Bell.

Washington, D.C., March 9, 1909:- Can men be really flying. That which the world considered impossible has really been accomplished. Hurrah for Douglas and the Silver-Dart.

(Signed) M.D.D.

Stairs to Bell.

Mulgrave, E.S., March 9, 1909:- Canadian Courier desires authentic article. Kindly have Douglas telephone me to-night Sydney Hotel, if convenient see me to-morrow.

(Signed) E. Geof. Stairs.

Curtiss to Bell.

Hammondsport, N.Y., March 10, 1909:- Congratulations McCurdy's flight. Anxious for details. Preliminary Herring agreement signed.

(Signed) G.H. Curtiss.

Associated Press to Bell.

New York, March 10, 1909:- Many thanks for despatches concerning aerodrome experiments. Please continue them and expand freely in case notable flights occur always sending collect.

(Signed) Chas. S. Thompson.

Bell to Associated Press.

Baddeck, N.S., March 10, 1909:- Mr. Douglas McCurdy made two flights this morning in the aerodrome Silver-Dart aggregating about 19 miles in all. The flights took place over the ice on Bras d'Or Lake along a measured course in a

straight line of four miles. This route is marked at half-mile intervals by spruce trees planted in the ice and passes through the harbor of Baddeck. The engine was removed this afternoon from McCurdy's Silver-Dart and experiments will now be resumed with Dr. Bell's tetrahedral aerodrome, Cygnet the second, the fifth aerodrome built by the A.E.A.

(Signed) Graham Bell.

London Times to Bell.

Ottawa, March 10, 1909:- Private. (The private part is here cut out). File early Thursday two hundred word description Cygnet in untechnical language far as possible to use with story of experiment. Shall be glad if you will file story of flight earliest possible moment. To-day's message too late for Thursday's Times owing to difference in time.

(Signed) Fred Cook,
Correspondent of London Times.

Bell to Fred Cook.

Baddeck, N.S., March 11, 1909:- Thanks for telegram. The Aerial Experiment Association will be dissolved March thirty-one as we feel that our researches have now gone beyond the experimental stage, and we are now discussing what to do commercially. This is private, not for publication. Cygnet description will follow later. No experiments to-day.

(Signed) Graham Bell.

Telegrams.

- March 11 Post to McCurdy:- Heartiest congratulations from Club and myself. Rules formulated. Director's meeting to-morrow. (Signed) Augustus Post.
- March 11 Bell to Curtiss:- Unless we can obtain 30 brake horse power from this motor we must order automobile engine at once. We are unable to get more than eight absolute horse power. What do you say? (Signed) Graham Bell.
- March 11 Curtiss to Bell:- Is engine entirely wrecked or just out of order? Engine developed 35 H.P. when I left and must have been doing over 30 to make flights reported. Wire further information. (Signed) G.H. Curtiss.
- March 11 Bell to Curtiss:- Nothing has happened. Simply can't get the power. Sometimes Dart flies, sometimes not. Margin too close at best. (Signed) Graham Bell.
- March 12 Curtiss to Bell:- Conditions evidently require present engine man. I agree to be in New York for proposed organization next week. Can however send Pfitzner who tested engine and can be absolutely depended on to correct. Is this O.K. and if anything wanted. (Signed) G.H. Curtiss.
- March 12 Bell to Curtiss:- Twenty-five horse-power this morning. Am telegraphing you before experiments are concluded in order to relieve your mind. (Signed) Graham Bell.
- March 12 Bell to Curtiss:- Discovered trouble. Getting 31 H.P. to-day. Keep Pfitzner at home. (Signed) Graham Bell.
- March 13 Brown (Sydney Post) to Bell:- Received following cable this morning:- London, England, Brown, Post, Sydney, N.S. Interview Graham Bell for thoroughly accurate scientific description aeroplane. Also ascertain if it infringes Wright's patents as regards flexible wings. Cable up to 300 words. (Signed) London News. Would you be kind enough to wire me something to cable them. (Signed) Milton Brown.
- March 13 Bell to Brown (Sydney post):- Glad to see you here. Too busy to prepare article. (Signed) Graham Bell

March 13 Bell to Brown (Sydney Post):- You may use the following upon the clear understanding that it is cabled strictly verbatim:- The Silver-Dart is a double surface machine of unique construction distinguished by the spar-like form of its frame which is deep in cross-section at the middle and tapers towards the ends.

This form of construction permits of bow-string wiring which converts the whole machine into a rigid truss extremely light and with little head resistance.

It also leads to a novel and very advantageous arrangement of supporting surfaces, which are curved laterally, as well as in the fore and aft direction.

The lateral stability is controlled by balancing rudders which operate upon an entirely different principle from that adopted by the Wright Brothers securing lateral stability without any cooperation of the vertical steering rudder and without sacrificing rigidity in the main structure. (Signed) Graham Bell.

March 13 Brown (Sydney Post to Bell):- Thanks for telegram. Will cable as directed. (Signed) Milton Brown.

March 13 Aero Club of America to Bell:- Rules Scientific American Trophy adopted. Club will send representative if all expense paid. Answer quick. (Signed) Aero Club of America.

March 13, Bell to Aero Club of America:- Will pay expenses as suggested. Send representative as soon as possible. (Signed) Graham Bell.

March 14 Aero Club of America to Bell:- Telegram received. Cup for 1909 goes to aeroplane making longest flight above 25 kilometers during this year. Shall we send representatives. (Signed) Aero Club of America.

March 15 Bell to Aero Club of America:- The Aerial Experiment Association has been under the impression that the Aero Club of America would honor the first to make a public flight of 25 kilometers duly authenticated by representatives of the Aero Club by awarding at once the Scientific American Trophy. Believing that Mr. Douglas McCurdy could fly this distance in our aerodrome Silver-Dart we applied for the Trophy. Finding however from your telegram received to-day that the Trophy is to go to the machine making the longest flight above 25 kilometers during the year 1909 we must under these conditions withdraw our application. We are purely an experimental Association and do not care to enter into competition or attempt to make the longest possible flight. (Signed) Graham Bell, Chairman of the A.E.A.

March 15 Bell to Cook (London Times):- Unable to get Drone No. 5 Bell's Cygnet II into the air this morning. Speed over ice only 15 miles an hour. Not sufficient for support. The engine will now be transferred to Drone No. 4, McCurdy's Silver-Dart with which experiments will be made this afternoon. (Signed) Graham Bell.

March 15 Cook (London Times) to Bell:- New York Despatch says representative Aero Club America left for Baddeck witness Silver-Dart's flight for Scientific American Cup. Is it intention contest for this cup, and if so with engine of Cygnet II. (Signed) Fred Cook. Cor. London Times.

March 15 Bell to Cook (London Times):- The engine was transferred to Silver-Dart this afternoon, and the Silver-Dart also failed to rise throwing doubt upon cause of non-success this morning with Cygnet II which may have been due to engine and not to head resistance of structure. After thorough overhauling of engine Mr. McCurdy made a fine flight in the Silver-Dart droming to Baddeck and back to Dr. Bell's Laboratory in spite of a puffy wind of from 8 to 14 miles per hour which tried the equilibrium of the machine and the ability of the aviator to control it. The Aerial Experiment Association understanding that Aero Club would honor first machine making 25 kilometers under test conditions by the award of the Scientific American Trophy, and believing that the Silver-Dart could fulfill the requirements made application for the award. The Aero Club however after receiving this application held a meeting and changed the rules deciding that the Trophy should go to the machine making the longest flight over 25 kilometers during the present year thus delaying the award and making it a matter of competition. Under these circumstances the Association has withdrawn its application. (Signed) Graham Bell.

March 15 Bell to Associated Press:- Experiments of Aerial Experiment Association were not very successful to-day. Drone No. 5, Bell's Cygnet II was tried this morning but speed attained not sufficient to support her in the air. Whether this was due to the great head resistance of the structure or to skipping of engine does not clearly appear for Drone No. 4, McCurdy's Silver-Dart also failed at first to rise this afternoon. After thorough overhauling of engine the Silver-Dart made a good flight. Mr. McCurdy droming to Baddeck and back to Dr. Bell's Laboratory in spite of a puffy wind of from 8 to 14 miles per hour, which tested the stability of the machine. (Signed) Graham Bell.

- March 15 New York Times to Bell:- Will you kindly state by wire your objections to the new rule for the Scientific American Cup in connection with your refusal to try for it. (Signed) New York Times.
- March 15 Bell to New York Times:- The Aerial Experiment Association understanding that the Aero Club of America would honor the first machine making 25 kilometers under test conditions by the award of the Scientific American Trophy and believing that Drome No.4, McCurdy's Silver-Dart could fulfill the requirements made application for the award. The Aero Club however after receiving the application held a meeting and changed the rules, deciding that the Trophy should go to the machine making the longest flight over 25 kilometers during the present year, thus delaying the award and making it a matter of competition. As the Association is an Experiment Association pure and simple it does not desire to enter into any competition and does not intend to try to make the longest possible flights with its aerodromes. It regrets the misunderstanding with the Aero Club in this matter and withdraws its application. (Signed) Graham Bell, Chairman, A.E.A.
- March 16 Gerald Brown (Canadian Club) to Bell:- Canadian Club Ottawa would very much like have honor your company at luncheon or dinner on date to be named by yourself and to receive address from you on recent development Science Aviation with which your name is associated. Canadian Club is non-political organization with membership one thousand including many members both Houses Dominion Parliament. Financial Minister Fielding, with whom I have discussed matter would attend well as other members of Cabinet and could promise you gathering thoroughly worthy of occasion. Club will bear all expenses of your trip and stay in Ottawa. (Signed) Gerald H. Brown. Hon. Secretary.
- March 16 Bell to Gerald Brown (Canadian Club):- It would give me much pleasure to address the Canadian Club but could not leave here before Monday, April 4. Any later date will be convenient for me. (Signed) Graham Bell.
- March 17 Fred Cook to Bell:- For reasons mentioned your private telegram last week would strongly urge acceptance of Ottawa Canadian Club invitation early in April. Gathering will be National one and might lead to important results. (Signed) Fred Cook.

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- March 17 Bell to Fred Cook:- Thanks for telegram. Will come any day March or April so long as I can be here Wednesday March thirty-one to preside at final meeting of Aerial Experiment Association. (Signed) Graham Bell.
- March 17 Bell to Gerald Brown (Canadian Club):- Since telegraphing I find I can address Canadian Club any day in March or April convenient to the Club consistently with my being here on Wednesday, March thirty-one to preside at final meeting of Aerial Experiment Association. (Signed) Graham Bell.
- March 17 Gerald Brown (Canadian Club) to Bell:- After consultation with Fielding and other Cabinet Ministers find Saturday 27th March best date to bring together kind of company you would yourself prefer. One o'clock luncheon meeting also preferred to evening dinner. Please confirm by wire if these arrangements satisfactory. (Signed) Gerald Brown.
- March 17 Bell to Gerald Brown (Canadian Club):- Telegram received and it will give me pleasure to lunch with Canadian Club one o'clock Saturday, March 27. (Signed) Graham Bell.
- March 17 Bell to Chas S. Thompson (Associated Press):- The aerodrome Silver-Dart was on the ice all day. Mr McCurdy made numerous short practice flights including three four mile flights. He suffered considerably from the cold experiencing practically blizzard weather by being rushed through the cold air at 40 miles an hour. The people of Baddeck are becoming so accustomed to the flights that comparatively few people were on the ice to-day. (Signed) Graham Bell.

March 17 Davidson to Halifax Chronicle & Sydney Record:-

The Aerial Experiment Association resumed experiments this week with Drome No. 5, Dr. Bell's tetrahedral Cygnet II with Douglas McCurdy as aviator. Whether due to the head resistance of the structure or the inability of the engine to develop the power required the Cygnet failed to rise. The engine was immediately transferred to the Silver-Dart for a flight and the Dart in turn failed to rise on the first attempt. After a thorough overhauling and speeding of the engine another flight was attempted which proved successful and one of the most sensational flights Mr. McCurdy the aviator has yet accomplished. As a puffy wind varying from 8-14 miles an hour was blowing at the time, it gave the aviator an experience to test the stability of the machine as well as his ability to control it, which were both accomplished without a hitch and a flight of three miles made against and with wind. Mr. McCurdy made several flights to-day over a measured course on the ice but in each flight the engine was working very unsatisfactorily, and Mr. McCurdy made a landing on the ice in each flight before he covered the eight mile straight course covering a distance of 16 miles in flight. The wind was again very unsteady. For recreation and to clear their minds off flying machines for the day a pleasant game of hockey was played between Dr. Bell's Laboratory Staff including the aviator and Baddeck Club. Result 3 to 1 in favor of Laboratory. (Signed) J.C. Davidson.

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March 18 Bell to Associated Press:- Mr. F.V. Baldwin, Chief Engineer of the A.E.A. made this evening at dusk a flight in Drome No. 4, McCurdy's Silver-Dart. This is the first time the Drome has been tried by anyone except Mr. McCurdy. (Signed) Graham Bell.

SELFRIDGE TO A.R.A.

San Francisco, Cal., Feb. 27, 1909:- I am pleased to acknowledge Bulletins Nos. XXX,XXXI,XXXII.

They indicate much work and patience in the great problem you are laboring to solve.

Will you express to Mrs. Bell my grateful appreciation of her loving and touching commemoration of Tom.

(Signed) E.A. Selfridge.

Curtiss to Bell.

Hammondsport, N.Y., March 5, 1909:- I wired John last night briefly about the trials for the Trophy and my affairs in New York. I looked Mr. Post up immediately on arrival and talked the thing over with him, but it seems that Mr. Bishop has assumed full management of the Club's affairs. I saw him Tuesday and was talking with him when he received John's letter, which he immediately answered. It seems that he is changing the rules for the Cup Trial, but he would not tell me what the new conditions would be. I asked him to write Mr. McCurdy in full. He assured me that he would be glad to have the trial made there, and that a representative of the Club would be sent as observer if his traveling expenses would be paid, which is one of the new rules for Cup Trials made at a distance of over 25 miles from Club headquarters.

This however, is not a serious item as I take it that only one observer would be necessary. If conditions are right and you will wire direct to Mr. Bishop, I think that a man

will be sent on at once. It will be necessary to name a date, and I would suggest that three dates in succession be named. This is the way the Wrights did in France in making the trials for prizes. This gives them three chances for good weather.

Our party made the trip to New York without mishap, although we had to make a quick change at the Junction outside Montreal on account of the train being late. Mrs. Bell stayed a few hours in New York to see some friends, Mrs. Curtiss came on to Hammondsport and I remained in the city until Wednesday.

I found Mr. Herring quite anxious to close up the deal with me, and I finally made him an offer, a little better than his original proposition, which he verbally accepted. He has promised to come on to Hammondsport at once and make final arrangements. The announcement was made at the Aero Club Wednesday evening of the consolidation. Mr. Bishop represented the moneyed interests, and I understand that Mr. Hawley and Mr. Cooper Hewitt are among the others.

Mr. Herring showed me a great deal, and I would not be at all surprised if his patents, backed by a strong company, would pretty well control the use of the gyroscope in obtaining automatic equilibrium. This seems to be about the only road to success in securing automatic stability in an aeroplane.

If the deal goes through I will be manager of the Company and everything will go on just as it has, except that we will have Mr. Herring's devices on the machines which we

my build, which, by the way, recalls the fact that I accepted an order from the Aeronautical Society for an aeroplane to be delivered in the Spring at Morris Park, N.Y. I did this on my own responsibility with the idea that if the consolidation was made with Herring it would be turned over to the new company, or if a commercial organization succeeded the Experiment Association the order could be turned over to them. If neither of these materialized, the Curtiss Co. would endeavor to fill the order itself.

I am planning to go to Washington to see Mr. Charles Bell as soon as I am sure of the outcome with the Herring proposition. There is no reason why the Aerodrome Company should not be formed if the Herring deal goes through unless the members of the Association would care to come into the Herring combination. This would please Mr. Herring I am sure, and I don't know but that it would be just as well for the Association. Mr. Herring was intending to write to you about the matter. You will probably have a letter from him within a day or so. I received John's message about the radiator and am pleased to learn that the square one did the business. A fan can be easily attached to the engine balance wheel to help out on the cooling, if necessary.

I find stacks of correspondence and matters requiring my attention and I will be busy the next few days in clearing this away. I will advise you of any further developments.

(Signed) G.H. Curtiss.

AVIATION. EXPERIMENTS BY CANADIANS.

(Extract from Hansard, March 11, 1909).
Canadian Parliament.

Mr. Sam. Hughes (Victoria and Haliburton). I notice from the newspapers that very successful experiments have been made by certain Canadians in aerial navigation and especially at Baddeck, in N.S., in the case of the invention of Mr. Alexander Bell, the eminent Canadian. I wish to know whether the government has taken any steps to recognize the advance of this science in Canada, and if not, is it their intention to take measures to encourage the science as in the case of the Marconi wireless telegraph system?

Hon. W.S. Fielding (Minister of Finance). We have the highest appreciation of the work that has been accomplished by Mr. Douglas McCurdy and also Mr. Baldwin of Toronto, who is associated with him in the work with Dr. Graham Bell. We have not, shall I say fortunately or unfortunately, any branch of our public service in which we could conveniently utilize the discoveries of these scientific gentlemen. Nevertheless we felt that we should take some notice of their achievements and for the present we have taken steps to draw the attention of the imperial government to them in the hope that the officials of the War Office and the Admiralty, who are now directing their attention to aerial navigation, may be able to avail of the services of these young Canadians and thus retain them for the benefit of the empire.

Mr. Hughes. Hear, hear.

THE OUTLOOK ON AVIATION: BY J.A.D. McCurdy.

It is with regret that we note the action of the Aero Club of America in relation to the application for the award of the Scientific American Trophy filed by the A.E.A.

From the standpoint of true sporting principles they are to be severely criticized for making a change in the competitive rules after an application for trial has been filed and accepted.

If any such action on the part of the Aero Club was anticipated the change in the rules should have been made at an earlier date so that our application for the award could have been made with the full knowledge of the conditions under which the Trophy could have been won.

THE OUTLOOK ON AVIATION: By E.G. Stairs.

The Outlook on Aviation in Canada is indeed bright! History has been made in the last week, for Canada, as a nation; has in a more or less official manner taken note of the Science and art of aviation within the Dominion.

Col. Sam Hughes, M.P., Canada's keenest military critic and himself closely in touch with the Minister of Militia and military council, asked the Laurier administration on Thursday March 11, questions which were answered by Hon. W.S. Fielding Minister of Finance. The questions and answers are published elsewhere in this issue of the Bulletin.

We note an article on "Aviation in Canada" - "A National Organization proposed, and discussion invited" written for Motoring, of Toronto, by Dr. Mark G. McWhinney of Toronto

for March (09) issue. It contains an interesting proposal concerning National Organization and concludes - "A fuller public discussion might lead to an ultimate solution".

The present writer of this brief note will, if permitted present his views on the matter raised by Dr. McKhimmey in the next issue of the Bulletin. Possibly as one knowing the men of Canada from Coast to Coast and somewhat and somewhat closely in touch with general public opinion I may be so permitted.

(Signed) Mr. Geoff. Stairs,
"The Outlooker".

I have given below an interesting article translated from L'Aerophile (Mar. 09) which shows a comparison of a few points concerning the Wright Brothers machine, and those constructed by the Veisin Brothers of France. J.A.D. McC.

THE WRIGHT AEROPLANE AND THE FRENCH AEROPLANES.

Diverse replies to M. Lefort's article which appeared under this title in L'Aerophile.

In this that concerns the act of launching it is evident that the actual method of the derrick and rail ought to be abandoned before very long. The Wright Brothers having worked up till now for experiments alone, without trying immediately to solve the question of a commercial use for a machine, had found the employment of the derrick and rail, which much restricted the space necessary for the flight simpler.

The work demanded of the derrick being furnished by the falling of 700 kgs. through a vertical distance of 5 meters

fall of which takes place in $3\frac{2}{5}$ seconds (verified time) the power thus utilized corresponds to about 13 H.P. so M. Lefort states it thus:-

$$\frac{700 \times 5}{3\frac{2}{5} \times 4 \times 75} = 13.7 \text{ H.P.}$$

M. Lefort assumes to 1st, the equality of their speed. This equality does not exist, for if the average number of chronometer trials for each of the two types of machine is taken, a speed of 16 m per second is found for the Wright and 17 m 50 for the Voisin. This difference, which seems insignificant at the first sight, entails in fact an additional effort essentially demanded of the Voisin machine (about 20 0/0 more to pass 16 m than 17 m 50).

"....2nd. The equality of their resistances to penetration and on account of the propelling forces of their propellers".

We are still much less agreed on this point for the two very characteristic advantages of the Wright over the Voisin are precisely: not such a great resistance to penetration on account of: 1st not such a great incidence of the planes when the machine is at its normal speed; 2nd not such a large surface detrimental to starting, shrouds, cross-pieces, cart etc.

The estimate made of these differences (calculated and verified by experience) shows that, for the same speed of 16 m per second given the two machines, the necessary effort of propulsion is only 83 kilos. for the Wright, whilst it reaches 110 kilos for the Voisin (and 127 k 5 to 17 m 50).

"....3rd. The following values of the absolute efficiency of the propellers: Wright 70 0/0; Voisin 60 0/0.

"...4th. That the speeds are proportional to the number of revolutions and to the diameters (?)..."

(This last proposition is not comprehensible, we shall not occupy ourselves with it, besides it is not necessary for determining the efficiency.

In this which concerns the efficiency of the propellers, we shall estimate that of Wright at 75 0/0 and that of Voisin at 66 0/0; but we must not forget that the transmission by chain in the Wright entails a loss of power to the extent of 10 %. The total percentage of power transmitted by the shaft of the motor to the propellers can then be figured by : $0.90 \times 0.75 = 0.675$ in the Wright and 0.66 in the Voisin. Otherwise these results can be considered as equal.

The great difference between the two types of machine reside, in fact, not at all in the propulsion (let us say in passing that we much prefer slow propellers to rapid propellers) but in the resistance to penetration, this difference is due to this, that in the Wright the rear edges of the planes is very supple thus diminishing the incidence in proportion as the speed of the machine increases, and provokes less eddy because of the special curve which takes these planes under the push of the air.

If then we look for the effective work demanded on the shaft of the motor in the two machines, in utilizing these rectified calculations, we find:-

For the Wright: $Pt. = \frac{P \times V}{H} = \frac{83 \times 16}{0.675} = 1965$ kilograms or 26 H.P.

For the Veisin: $Pt. = \frac{127 \times 17.50}{0.66} = 3370$ kilograms or 45 H.P.

These two horse-powers are substantially those of the two motors of Wright and of Veisin. Finally it seems to us that it would be preferable to compare the usefulness between those of the aeroplanes of different types, that is to say, the coefficient of utilization of an aeroplane is the ratio of the utilized weights transferred to the total weights, multiplied by the speed of advance (which is proportional to the space traversed) and divided by the free effective power on the shaft of the motor and expressed in horse-power.

The formula would be then:-

$$U = \frac{Pu \times V}{Pt \times H}$$

Let us apply this formula to the Wright and Veisin machines, we shall find:

$$U = \frac{70 \text{ kgs.} \times 16 \text{ m.}}{450 \text{ kgs} \times 26 \text{ H.P.}} = 0.096 \text{ for the Wright}$$

and

$$U = \frac{140 \text{ kgs} \times 17 \text{ m. } 50}{640 \text{ kgs} \times 45 \text{ H.P.}} = 0.055 \text{ for the Veisin}$$

Remarks: We have taken 140 kgs as utilized weight in the Veisin, on account of the supporting chassis which it possesses (76 kilograms) and which would render inexact the comparison with the Wright if allowance for it is not made.

The coefficient can still be calculated by adding the weight of this chassis of Veisin and calculate the addition of power which it would necessitate on account of the resistance to the air (about 70 kilograms). Thus would be found respectively as new values of U: 0.070 for the Wright and 0.043 for the Veisin. But the first solution (counting the chassis as weight utilized) may seem more just.

Our conclusion is then found to be the same as that of Lefert, but for quite different reasons, it is not the propulsion which makes the great advantage of Wright, it is the principle of construction of the supporting surfaces.
G. Garnier.

J.A.D. McC.

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