Notes by Thomas E. Selfridge, From September 24, 1907, to July 24, 1908

2

1907 Sep 24 Tuesday at house

At a second trial a pull of 110 lbs, which at times jumped to 120 lbs was obtained, while the torque at same point was 16 lbs, sometimes jumping to 18 lbs The above is a proposed glider of 2580 cellsdesigned from the Frost King, which is represented by dotted lines, to carry a man of 170 lbs and to have a flying weight of .5 of a lb per sq ft or 2500 gms per sq m. Dr. Bell foresaw difficulties in flying this and suggested the following modifications tonight This latter is an improvement. To-day Sep 24 we measured the wind made by the propeller and found it to be 47.1 miles per hour.

Four floats mounted on two boards placed at right anfles to each other

Fig 1

Fig 2

All floats same size. 3 When arranged as Fig 1 they all floated in the trough of the sea, that is, across the wind; when arranged as in Fig 2 they neutralised each other and the whole floated catacorners to thr wind.

It was then known that the water had something to do with turning the kite across the wind.

The floats were then put on the “Selfridge” as in Fig 2. The kite was taken out and flew beautifully. The wind velocities were :— 10 1327 1232=average=28 miles per hour 1136 It was under perfect control, being flown with a bow line far out to the front as below It was then brought down on the “U.D.” without the slightest difficulty.

The pull when flown on the bow line was 40 lbs, when on the flying line 90 lbs. The kite was then lowered by the bow line and released. The lines were then cut near the kite. It soon turned with its end in the wind, showing the water had not been entirely to blame for this tendency.

It would appear that the kite resembled a weather vane, the water being its support. It turned its end, which offered less resistance than its long front, into the wind.

As there was a heavy sea running, assisting its tendency to overturn, the kite resisted well. The turning into the wind could probably be overcome by placing all the floats 4 across the kite and adding a very long tail of cells or a large one, consisting of a single verticle plane. The front is made to offer a great resistance to the wind by the necessity of elevating the rear so as to prevent it turning over backwards; this, of course, necessitates a longer tail than otherwise to keep its head in the wind.

As it couldn't overturn under the very unfavorable conditions existing to-day, even though floating across the wind it would appear to be unnecessary to try to correct this as it does no harm; especially as it would be less apt to turn over when weighted with a man.

1907 Sep 27 Friday at at house

Afternoons of 25 and 26 spent on small gliders. Position of framwwork makes great difference. They can be made to glide with framework down by shifting weight in some cases to rear of center of surface. The more framework, the farther back weight goes. The end of glide, with framework down, very erratic from point of loss of headway. Glider first tips back, then turns completely over point first, landing as at start with framework on floor. It would seem that there is, as seems natural, greater skin friction on under than upper surface, hence when rough surface is down has greater effect than when above.

Some new gliders are being made with still further variation of framework and silk.

The 182 Frost King was taken out on the afternoon 5 of 25th, and flown with three lines, a bow and two flying lines. It was not as steady as with a single flying line though it could be steered off the wind at will. When tension was on both the kite oscillated very much as if flown with a bridle running from side to side. Its steadiness improved as the lines were separated. When the holders of the lines were far apart the kite could be held steady within a very few fe feet of the ground. In this position the control was excellent though the stress on the lines was very great.

Later the bow line was shifted to the flying position and the other lines shifted to the center and rear of the kite, along the keel stick, respectively. The stress was then taken on the middle line to see at how high an angle the kite could be made to fly. The strain developed was so great that the entire center of the structure was torn out, leaving the keel stick fastened only in front. The strain was transferred to the regular flying line and although considerably damaged, the kite flew as steadily as before, the efficient surfaces being symmetrically arranged on each side of the center. The forward end of the keel stick finally pulled out and the kite settled down gently.

1907 Oct 2 Tuesday at house.

On Sep 26 Ingraham made me a model illustrating an 6 idea for the improvement of the joining together of winged tetrahedral cells. This consisted of a hollow square of brass without top or bottom, 4 × 4 mm, 3 mm in depth, with a slit cut in each side large enough to admit the insertion of the projection found at each corner of the present kite cells.

His idea was to bend up the projection against the walls of the square after insertion. This would have proved a difficult and tedious task considering the dimensions of the square, and would have involved four operations

It was then proposed to put a top and bottom on the square and punch through the whole after the tins had been inserted. This also was rejected as impracticable. It was then

suggested that a barb be put on the tin projection which would spring open after being forced past the slit. This last promises well. The brass square, though weighing more than the wire now used, would give the long desired strong abutment for the sticks of the cells; It would be a very simple matter to force the four barbs into the square and thus join the cells, it would be possible to remove and replace any cell without deranging any of the other three by merely cutting off the tin close to the side of the square.

On showing the idea to McCurdy he suggested that a square steel spiral spring, such as was formerly suggested by McNeil be used instead of the square of brass, also that it would be easier to barb the tin projections on one side only. These appear to simplify the idea.

7

On the 2 of October, a new propeller, which had originally been a 15° two-meter one, had been cut down to 1.7 meters and finished very carefully, being finally covered with silk and shellac. When tried 1000 revolutions were obtained and 70 lbs pull The propeller, however, threatened to break and engine was stopped before completing experiment When examined the propeller was found to be cracked at the hub, the construction being too light. It also overloaded the engine, as it should have given 1600 revolutions per minute. The same day a fan shaped wheel of multiple blades (eight) was tried and proved totally inefficient, for when going at but 50 revolutions per minute it began to fail at the hub and would have been demolished, had not the engine been stopped. While the members of the Association were at Halifax a force had been left at work re-assembling a number of 20 cell tetrahedrons and half octrahedrons, the intention being to bead these sections and assemble them into a large man carrying kite. On trial, Oct 2 we found this method to be impractical and decided to discard it in favor of the homogenous structure built up solidly. On the 3d of October the double propellers were tried — the big homogenous structure mentioned above was started Oct 2. The orders given were to build a kite exactly similar to the old Frost King The double propellers consisted of two 15° 1-5/10 meter propelle pellers, mounted on a single shaft and driven direct. The gears used were of macadamite.

900 revolutions were obtained indicating the engine was greatly overloaded. They were then cut down by reducing their edges; 1000 revolutions were 8 then obtained and eighty pounds pull — pull being same as that obtained on the previous trial. The engine being still overloaded, material was removed from the ends of the propellers. They now give 1088 revolutions per minute without increasing the pull beyond 80 lbs. On the evening of this same day the two kites with the horizontal surfaces, one arranged in checker-board fashion, and the other in one piece the amount of surface being the same in each case, were brought up to the kite house and weighed. The one with the surface in one piece, which we will designate by “A” had a surface of 125 × 125 cms and a weight of 1045 gms, and a flying weight of 691 gms per sq meter horizontal. The other, which we will designate by “B” had the same surface, weighed 1130 gms with a flying weight of 747 gms per sq meter. They were both lifted to the ceiling of the kite house and dropped; “A” took 1-8/10 seconds to reach the floor, and “B” 1 second. “A” oscillated as it fell, and was not nearly so steady as “B” which fell remarkably well, indicating that a broken surface is more stable than a solid one of the same area. The experiment is useless as far as indicating the supporting power of the two combinations, as one weighed 95 gms more than the other.

On the 3rd. October Mr. Curtiss left for Hammonds-port, to return about the first week in November. He is going to look up the automobile launching device and make arrangements so that it may be assembled without delay when needed.

The force here was still at work on the big structure plans of which were definitely decided upon yesterday in the 9 afternoon. Without the man carrying device it would consist of 3484 cells. The hole for the man will necessitate taking out 110 cells, leaving the structure with 3374 cells. The flying weight is to be kept, if possible, within 400 gms per meter sq of actual surface. The dimensions are to be 53 cells on top by 12 cells high by 12 cells deep by 41 cells on the bottom; beading is to be in meter sections on the four layers at the top, so as to prevent any chance of the structure breaking its back. The beading through these four layers will be in complete tetrahedrons with through members going from fore to aft at the bottom of the fourth layer. The ends are to be beaded in meter sections,

and the remainder of the structure exteriorly by two meter pieces. The hole will then be strengthened as circumstances require. The entire length of beading necessary is 204 meters. 51 of these will be required to outline the figure. The entire weight of beading allowable is 25 kilograms. The outline being necessarily heavier than the remainder will consist of beading of cross section of 2-5/10 centimeters, using stuff of half this dimonsion for the remainder of the beading, we will have 76 meters left for the beading of the hole and construction of bow, which now appears to be ample.

A complete set of formulae has been worked out by which the number of cells in any of the usual forms of kite may be directly computed. The following is a resume of principal features of tetrahedral construction as now used in kite building:— TETRAHEDRAL FORMULAE

10

TETRAHEDRAL FORMULAE

Oblique surface of 1 cell = 541.25 cms 2

Weight of 1 cell = 13.8 gms. (roughly 14 gms)

Dimensions, 1 cell = 25 cms

Flying weight 1 cell = 258.6 gms per m 2

Flying weight of light kite = 400 gms m 2

Average weight of 1 cell in beaded structure = 21.6 gms

weight of beading = 7.7 gms

Or allowable weight = 7 gms per cell

A good rule for beading is that it may weigh one-half the unbeaded structure.

If number of cells in solid tetrahedron be designated by N then:— When n is equal to the number of cells in height or depth of the figure

If number of cells in octrahedral centre of any tetrahedron be = to N then Where n again represents the number of cells in height of the tetrahedron A tetrahedron (whose height consists of n cells) may therefore be considered as made up od four tetrahedrons, the height of each of which is = more tetrahedrons whose height is = , the last four representing the number of cells in the central oct?ahedron. That is, if we have a tetrahedron of 8 cells on a side we may consider it as being made up of 4 tetrahedrons of 4 cells on a side + 11 4 more of 3 cells on a side. Theoretically, 32 cells correspond to 1 meter sq of horizontal surface, but 45 is probably the number which would be required to support the same load as a sq meter of horizontal surface.

Resume of Formulae

Arithmetical progression is expressed by the formula

number of cells in a triangular section = where n represents the number of cells in one of the sides. A truncated section would be represented by the formula In which x is the number of layers and n the number of cells in the longest side.

N = total number of cells

n = the height of the structure in cells

12

(Note: In the MSS the “y” in the last formula might be read for a “7”) JS

The following information and data concerning flight were given us by T. S. Baldwin, the aeronaut. air

His silk bag weighed 48 lbs there were 300 sq yards contained in it. This would indicate that his silk when fully prepared weighed only 80 gms per sq meter, which is remarkably light in view of the fact that he claims to have used elevan coats of varnish on it. If there had been only 200 sq yards of silk in the balloon it would still have weighed only 121 gms per sq meter. His silk was what he called 8“Mummy” Wild Japanese Silk, bought of Golcher of San Francisco. His varnish consisted of pure boiled linseed oil only. According to different climates is it necessary 13 to add more or less of a dryer. It is put on in very thin layers by diluting the linseed oil with gasoline.

If using a dryer, coach Japan in the proportions of one part of dryer to 5 of oil will answer the purpose ordinarily. It is advisable, however, to consult the carriage makers in the locality in order to ascertain the amount of dryer generally used. He stated that in some climates, as in Mexico and Denver, he was able to use merely the raw linseed oil diluted with gasolene in the proportions of 5 parts of gasoline to 1 part of oil. He recommended boiling your own oil and introducing the dryer during the process of boiling by the addition of 2 oz of litharge to one gallon of raw oil. In boiling, continue heating until the mixture ceases to bubble and will char a pine stick introduced into it. Never apply the varnish when it is colder than 56° Fahrt. A single coat of boiled oil diluted with gasoline is sufficient for water-proofing. Talcum powder is very useful to assist in drying Another good dryer is to use from half an ounce to an ounce of white lead to a gallon of raw oil plus half an ounce of beeswax to a gallon. The best method of drying is to draw the cloth over the edges of pine sticks. Baloon fabric should receive about 11 coats of varnish. The thinner each coat is applied the better. First coat each side of the material before assembling, then fill with air and apply coats to each side of the distended bag, putting an equal number on each side. A balloon thus prepared should have a maximum leakage of hydrogen of about ¼

of 1% in 24 hours. He states hydrogen is much easier to hold than coal gas, strange as it may seem. This he claims to have actually demonstrated.

14

When using the square mesh net about the gas bag for the suspension of the accessory parts, car &c, he claims an interior balloon is entirely unnecessary. In using hot air for an ascensive power, it is absolutely necessary to have a smoke producing flame. The smoke, though heavier than air forms a layer on the inside of the bag and keeps in the heat. If no smoke is used it is impossible to obtain a flame hot enough to inflate and raise the gas-bag without scorching it.

His propeller had a radius of 163 cms, was skeleton in form, with the blades inclined toward the engine. The pitch was equal to diameter. It was covered with canvas from a point 71 cms from the center to the tips of the blades. The width of the blade at the tip was 41 cms

The diagram represents the actual measurements of the pitch.

His rudder was 197 cms by 292 cms. The length of frame was 40 ft and weighed 40 lbs. His mesh net weighed 12 lbs. His engine was a 15 HP Curtiss. The drive was indirect, gearing being about 1 to 10. His propeller made about 150 revolutions per minute. His only reason for pulling instead of pushing was that it cooled his engine better. He stated that on a calm day he could make about 18 MPH. The propeller gave a little higher efficiency when there was a cross wind blowing on it. He could not successfully make headway against a 12 mile wind. He stated that it was very difficult to hold the balloon head on in a strong wind; it invariably tended to swing off to one side or the other. 15 The capacity of his gas bag was 9000 cubic feet and his rule for lift was 60 lbs for 1000 cubic feet of hydrogen. The ordinary temperature of the gas inside a hot-air balloon was us usually from 80° to 100° Fahrt higher than that of the surrounding atmosphere. He recommended for waterproofing the use of paraffine diluted with gasoline, 1 quart (2 lbs) of paraffine to 1

gallon of gasoline. Put the paraffine on a slow fire in a hot sun out in the open air, then pour the melted paraffine into the gasoline, dip the silk in the mixture and dry it by drawing it over the edges of pine sticks. One coat is ample for waterproofing. It gives a remarkably smooth and glossy finish to the silk. The coat does not melt when again subjected to heat. It has been suggested that propellers might be covered with this paraffined silk to reduce the skin friction. He stated that there was a firm in Poughkeepsie, N.Y. who used an excellent waterproofing substance which added but very little weight.

An advertising concern had some codine kites flying over the exhibition grounds. They were very steady and of an unusual shape. They were completely collapsible. See diagram

1907 October 11 Friday at House

The big man-carrying kite, which will be known as Glider #1 should be completely assembled tomorrow, this morning but 410 cells were still needed.

I omitted to mention the fact that the “checkers” structure and the equivalent horizontal surface were tried 16 as gliders. The former needed less weight than the latter to keep it steady and seemed to glide better. Its center of gravity did not have to be moved as far forward as that of the other.

The experiments since last writing have mostly been for the object of obtaining a lighter and stronger beading. It was found that light sticks separated by blocks and fastened together gave the desired result in a most satisfactory manner. It seems now as though the beading could be reduced to half the calculated weight without impairing the strength of the structure.

On Oct 8 Dr. Bell was able to raise his paper balloon by inserting into it a hot water radiator through which he forced steam. The differences between the temperatures inside and outside the balloon were smaller than expected. No barometric readings were taken,

however, and this may account for the difference being less than indicated Boyle's & Marriott's laws

For temperature on outside = 10.6° C = x

“ “ “ inside = 21.1° C = y

Weight lifted =

Cubical contents = 12.6 cm 3

Weight, 1 cubic m at 0° = 1293 gms

The actual weight lifted was 840 gms or a gain of 188 gms or 14.9 gms per cu m.

On Monday Oct 7 the “Selfridge” was altered by the addition of a long tail, and taken out to try the effect of the change when riding on the water.

17

A Mr. W.R.Turnbull, M.E. of Rothesay, N.B. was here at the time and went out in the “Gauldrie”. The tail was long and insecurely fastened, and when rounding the point of the harbour was broken by the strong wind then blowing. This was not noticed from the “Gauldrie” and when the order to ‘let go’ was given the dangling tail caught on the “Ugly Duckling” and tipped the kite over. The wind catching it from the side at the same time, it was blowing so hard the U.G. could not be kept in the wind and at this instant was at considerable angle with it, and turned it completely over in the water. This ended the experiment for the day.

The following data was obtained from the kite:—

Main wing piece 296 cells

Bow 54

Tail 202

552 Cells

Weight 19068 gms

Ab. Surf 29.877 m 2 (30 m 2) ratio 636 gms per m 2

Wind readings were

Mr. Turnbull who has investigated the subject considerably believes in double curvature surfaces and propellers of increasing pitch.

18

A small model of Glider #1 has been completed. Its dimensions are just ¼ base of #1. Unfortunately it only represents #1 as it would be if made of meter cells. It will show somewhat how the large one will act when loaded as a weight is to be placed in its center, so that the flying weight will be equal to that of the large kite or 1200 gms per m 2 oblique.

The man hole of the big kite will be beaded as below

Length of beading for hole

20 m Sides & Faces

5½ m Uprights

5 m Side Ladder

1 m Front & Back Edge

5½m Slats

37 m for hole & length of nose

2 m Cross braces

39 m

4 m of regular beading

35 m for hole

19

1907 Oct 12 Saturday at house

20

Dr. Bell has been experimenting with octrahedral cells. He can, by these do away with the difficulty of joining cells at their corners, as these go together stick along side of stick. Complete blocks are thus obtained which can easily be built up with the help of clips, thus facilitating the study of tetrahedral structures. These, of course, in no wise change the form of structure, the spaces between the cells now being tetrahedral. The cells going together along their edges, will, if the cells are large enough admit of the use of open beading at these points, and thus provide a means of still further lightening the structures without impairing their strength.

1907 Oct 14

The total weight was 102.5 kilograms and not 66 kgms

Unfortunately it is impossible to tell just how strong the wind was at the kite or the exact direction, since we are uncertain as to the efficient area at the time.

If there was no pull on line and kite would just support 66 gms then MPH would be the necessary wind velocity. Drift would be 41 kgms

If flying at 5° with wind in order to support 102.5 kgms wind would have to be 32 MPH

The “Selfridge” weighed 15740 gms. surface = 13 m 2 horiz 13 × 32 = 416 cells

flying wt = 2 kgs per m 2 horiz or 1143 gms per m 2

21

Pull on bow line =

Lift = 26 kgs # ratio = or approx ¾ # # is probably a good rule for working conditions.

The kite flew in a 28 mile wind.

Wt; 105 gms per m These are cross sections of the beading to be used on Glider #1

There will be 31 m of #2 and 20/51 m of #1

Wt 125 gms per m

wt #1 = 2100 gms

“ #2 = 3853 gms

5953 gms

Weight of rest of beading 75 gms per m = 153 m × 76 = 11475 gms # total = 17428 gms. Allowable weight = 25000 gms # 7572 gms left for hole and bow.

1907 Oct 15 Tuesday at House

The modified egg shaped float had the following form and dimensions

Projected area = 3606.25 cm 2

Weight = 398 gms

Ratio = 1104 gms per m 2

The mean height is about 10 cms giving a displacement of 36062 36062.5 cm 2

22

It seems that Baldwin's double beading with blocks only weighs 50 gms per m, also it has been decided to put 23 m of beading on bottom of structure of 70° shift

35 m will be required for the hole

1907 Oct 27 Monday at house.

Since my last notes experiments have been made with gliders, the small model of glider #1 and connections for the small aluminium octahedral cells.

The work on the big kite has been progressing steadily, and should be finished during the present week. The hole has been cut and beaded. The entire structure has also been beaded.

At the same time the three large floats have been in course of construction, and the “Ugly Duckling” has been completely rebuilt and the launching device re-modeled to suit the new conditions.

Small floats # the dimensions of the larger are also being made for the model of Glider #1. Experiments have also been made by coating the silk with Baldwin's, the aeronaut's, varnish of boiled oil and gasoline. Four coats re-inforced with a light coat of spar varnish have been found ample for waterproofing.

The large floats are one meter by three on top and 23 come to a pointed bow at each end as shown in the accompanying sketch.

(no sketch shown in MSS)

The “Ugly Duckling” has been widened to four meters instead of two and the new arrangement of the launching device is shown below.

(no sketch appears in MSS)

The gliders have been demanding a great deal of thought as many of their erratic actions still remain unexplained. It was discovered that the propelling fingers or points on the launching device materially affected the action of the gliders when placed at different angles. Their front edges which come into contact with the rear of the glider must slope slightly to the rear to obtain the best results The fingers must then be kept in this position during subsequent launchings else the gliders do not perform uniformly.

McNeil has devised a very simple and efficient method of binding the octrahedral cells together. It consists of steel wire bent in the following shape This is a strong clamp which is easily put on or taken off at will.

These octrahedral blocks which can now be built up quickly and easily should prove of great value in the study of tetrahedral construction.

On October.....the Selfridge, with its long tail of cells was again taken out. This time, as the “Ugly Duckling” was out of commission it was carried out on the stem of the 24 “Gauldrie”. There was a fairly strong wind blowing, possibly 15 MPH with a rather small sea on. As it was only intended to test the flotation and the action of the wind on the structure when floating on the water, the kite was lowered in the water and set free. It almost immediately turned over

It was righted twice more, but the same result obtained each time. The floats had the same position in all the other experiments. There was consequently nothing under the long tail The pressure of the wind on this tail depressed it, thus tilting up the front end of the kite

and allowing the wind pressure to be applied on the unde r surfaces with the obvious result. The kite twisted over so quickly each time that it was impossible to say how it would have floated with respect to the wind There was a long stream fastened to a long pole on the top of the structure to indicate the direction of the wind.

On Oct.....The Selfridge was again launched. This time a float had been placed under the tail. There was about a ten mile wind and practically no sea. The kite acted very erratically even swinging with its tail in the wind at one time The addition of the tail seemed in no way to correct its tendency to swing its head out of the wind.

Baldwin suggested a plan of reefing surfaces to reduce support and head resistance when travelling at high speeds. Have your surfaces, whether superposed or single so that they may be reduced by having the tubing telescope while the cloth rolls up on a roller in the middle/

.. oionos surfaces used to have the projecting triangles fold up against the upper plane by means of two levers.

25

1908 Jan 13 Monday at Hammondsport

I arrived here Saturday noon and found the Glider almost ready. We decided to try it Sunday, weather permitting.

We were unable to get out on account of a heavy snow storm.

The machine is a single Hargrave cell of curved surfaces, with two small vertical end pieces and a spring horizontal tail.

The surfaces are 25 × 6 with a flexible edge of 1 in the rear. They are entirely covered with cloth with the exception of the bottom of the middle panel.

Total surface 300 - 30 = 270 sq ft

The surfaces are 5 ft apart

The panels are 5 ft × 5 ft × 5 ft

The tail consists of a flat surface 3 × 4 = 12 sq ft, stretched between two bamboo rods and inclined about 15° with the main surfaces. This angle, owing to the flexibility of the bamboo rods becomes reduced as the speed increases, that is helping automatically to change the angle of incidences of the surfaces.

Its front edge was 5 ft in rear of the rear edge of the surfaces.

Two bamboo skids were placed at each end to afford protection in alighting. The structure then weighed 68 lbs

On testing the machine, the bamboo skids gave way and were replaced with stout pieces of spruce of triangular cross section. These brought the weight up to 72 lbs. They 26 were bowed like carriage springs and in the triangle at their after end cloth was placed to give the required vertical surface

The ribs were T shaped and part of them formed the upper and lower fore and aft chords of the panels.

The glider was taken out in the afternoon to the hillson the other side of the valley from Hammondsport. The air was very calm. Four glides were tried on a very gentle slope but it was impossible to get up enough speed here to obtain the necessary lift. We then went further up the hill until we came to quite a precipitous low knoll. After a couple of tries Baldwin and I both made a couple of good though short flights. We then took it up the hill to what looked a very promising place. Here we made in all about 25 glides, Baldwin and I alternating and Curtiss trying once We obtained a number of very good flights and two of

100 yds and 90 yds respectively. These were measured by pacing. Our instruments had not arrived yet, so we were unable to take any accurate measurements. Later the wind came up and caused the glider to swing to the right back up the hill. We couldn't seem to correct this, even by moving our weight.

The machine stood up remarkably well and developed surprising strength. At the end of the day the breakage amounted to both skids, one T rib and one arm support. These were fixed without any trouble.

27

1908 Jan 14 Tuesday at Hammondspoty, N.Y.

On Monday night we discussed the advisability of using a tail attached to the frame with a spiral spring and the putting on of front controls. We decided to try the tail but concluded we weren't ready for the controls yet.

This morning was spent in looking up material for the tail and putting on an extra pair of heavy skids in the center. These brought the weight up to 75 lbs. The new tail wasn't finished, so the old one was returned.

The wind was blowing quite strongly and in puffs.

A long distance telephone call prevented me from going out with the others. When I did reach the hill I found who wind had made it very difficult to make good flights. On one glide the machine had come down backwards and broken the tail all the skids and the back edges of the lower surface. I tried one glide with the tail off, but found the machine very unsteady. A new tail was rigged and new skids put on the ends. Curtiss then made a long glide of almost 70 yards, but had to do a great deal of moving about.

We decided it was too difficult to handle the machine in the wind and so stopped for the day.

1908 Jan 15 Wednesday at Hammondsport, N.Y.

On Monday Baldwin Bedwin went to Bath to see about some fish shaped stock. He obtained no results. Curtiss called up another firm about the matter, and to-day Bedwin went to see them with good results. This was the start of “Red Wing”

28

Resume of work at Baddeck

False start on Cygnet Sep 27 by building by sections. New orders Oct 2. Cells assembled by Oct 12 Kite beaded Nov 5 First model experiment and drill Nov 5: Nov 16 grand test by McC and S of safety of U.D. Continued model experiemnts after remodelling U.D. till Dec 2 when Cygnet was taken out for first time. Flew well, but one float leaked. Badly damaged before she reached her shed. Ready for man flight Friday Dec 6. I went up in her on that date and from data obtained ascertained that but 41% of the cells could have been acting. This is exactly the number of cells in the two bottom layers and the front face.

1908 March 2 Monday at Hammaondport, N.Y.

This morning an attempt was made to put up the big kite which persistently refused to fly on Saturday, as promised by Curtiss, owing to lack of wind. This morning the wind was stilltoo light and we again had to give up the attempt.

Between time Bedwin and his crew were working on the power-driven machine on which only the front control has yet to be completed.

This afternoon we decided that we should have to take the kites up on top of the hills and fly them there if we wish to obtain any definite results.

(Marginal note : “because wind so erratic down in the valley — puffy, not steady)

About four o8clock a strong wind came up (Marginal note:14.1mph) and we took the kites out for another try. This time we had no difficulty in putting up the two tetrahedral forms, one 29 with the full number of cells, and the other with some of the cells removed. The first weighed 8723 gms and contained 408 winged cells, the second 8394 gms and 253 cells (Marginal note: Cord attached 50 cms back from front edge)

Pull on flying line of No. 1 was 125 lbs (max) and averaged 85 lbs. The string was at an angle of 35° – 38°. Wind averaged 14.1 MPH (9readings) The weight of flying and bow lines have not yet been computed

Unfortunately the flying line of No. 2 kite broke before we got it well up and most of its flying was done on the bow line. It seemed, however, to be quite as steady as kite No. 1 and to fly in as light a breeze. In fact the kites might have been identical as far as flying qualities went. The devices for measuring the angle of incidence are not what they ought to be and will have to be changed. Tomorrow the three kites will be taken on top of one of the hills and flown simultaneously.

Dictated by T.E.S. to J.A.D.McC.

30

1908 March 7 Friday at Hammondsport.

Owing to lack of wind and heavy rain and snow storms it has been impossible to fly kites until to-day.

This afternoon we went up to the hill where we now have the kites and put up the full celled and the skeleton kite. The wind died down before we could finish our readings on the second and gave us no opportunity to fly the checkers.

The wind was blowing up the slope which was 9°

Full kite :— Angle of fly line Pull on flying line in lbs Pull on bow line Angle of incidence on fly line Angle of incidence on bow line 42° angle of bow line Pull. 17° 12° 43° 35° 50 20° 25 22½ 43° 100 40° 100 38° 110 45° 70 36° 90 34° 100 40° 70 44° 60 40° 50

Skeleton kite:— This kite was in the air at the same time as the former and presented no difference as regards flying qualities.

Angle of bow line Angle of slope of hill Pull Angle of Incidence 18° 6° 25 lbs 40°

TES

31

1908 April 3 Friday at Hammondsport

On march 9 the aerod No. 1 was ready for trial and was put on the ice to test the vertical rudder. Results satisfactory.

Driven by Curtiss, Selfridge and Baldwin.

On March 12 Baldwin made a flight of 318 ft 11 ins Flight terminated by tail buckling up on right side. Machine landed on right runner and broke one strut.

Repairs made and tail changed to a light box.

Attempt made on 13 but wind broke one wing and no trial made.

On 16th Herring came up and criticised the apparatus very favorably.

1908 May 22 Friday at Hammondsport

On 17th trial was made on ice near Bluff Point on West Branch. Day very favorable at start. Rain and wind at time of flight. Surfaces very wet. Probably 100 lbs of water on them.

Short flight made of 120 ft. Left ice 50 ft from start Baldwin in machine. Came down on left wing, badly damaging machine. A box tail had been substituted for single surface tail. 10 × 2¼ × 2¼. Smaller vertical rudder used 2¼ × 2¼ instead of 4 × 4.

Work started on new machine March 23, finished White wine May 6.

Weight No. 1 = 185 lbs. Engine & propeller &c 200 lbs Operator 185 lbs. Total 570 lbs. Surface 386 sq ft. Spread 43 ft, depth 6# 2#. Launched from ice on runners.

New machine No. 2

32

Weight 485 lbs. Surface 408 sq ft. Operator 165 lbs. Spread 42 ft Depth 6# 6#

Had side controls in addition to others possessed by No. 1. All parts covered in.

Finished in six weeks.

Taken out for trial Thursday May 14. Then had two front castor wheels mounted to bottom of .two. center parrels. These proved inadequate and broke down with operator in machine Third wheel under tail.

Three wheel truck next fitted on Friday May 15 Two wheels under rear of center 4# 8# apart and single castored wheel in front under nose, about 7 ft in front of rear wheels.

Again tried on Sunday, May 17 Run up and down track several times with both Selfridge and Baldwin. Very difficult to steer on ground and port wheel quite weak.

Replaced with wheels mounted with regular “Curtiss” front forks and connection to steering wheels. Proved very satisfactory.

Tried on Monday May 18 after several trials on track by Selfridge, Baldwin mounted and after travelling about 200ft on track flew 45 yards.

Rear flexible edges had been raised by pressure & had interfered with propeller, taking splinter m 1# wide out of rear edge. Front wheel also broke down, due to lack of support for head.

Frame changed from triangle to trapezoid and head firmly braced; part of rear surface of lower plane removed and propeller trimmed.

33

On Tuesday May 18 nose was re-covered and Selfridge made two flights, one of 100 ft and the other of 237 ft, the last at height of 30 ft. At end of first flight machine ran over rough ground for about 220 ft at speed with no damage to running gear, showing it to be at last satisfactory. A guy wire of rear center panel was loosened, however, and injured propeller slightly. Repairs made on spot and second flight made. The machine came down unexpectedly at end of this flight in plowed field, burying her nose and breaking front control and support of front wheel, also a guy wire and lower front members of first panel to right of center, also small right auxiliary wheel. Repairs completed. Wheel frame raised & covered by nose covering. Indicator placed on nose to show position of side tips. Trials expected late this afternoon.

1908 Mar 26 Tuesday at Hammondsport, N.Y.

Before I forget it, I wish to note that it demonstrates beyond a doubt that the tetrahedral kites would not fly in a wind less than 14 MPH. The anemometer registered 12 miles and the kites could only be put up by running, which added at least two miles more. Dr. Bell was present at the experiment which took place on the hill. These were what is known as light kites, that is their flying weight was under 400 gms per m 2 The gutted and full kites are almost identical in their flying qualities.

On Friday May 22 at 6.47 p.m. Curtiss made the record flight with aerod No. 2 He first tried her about 5 p.m. but she refused to rise, the front wheel only coming 34 off the ground for a short way. Lack of power was plainly indicated. After carefully overhauling the engine, it was found that a bolt had dropped into the crank case and cracked a hole in it, letting out the oil, so that the engine was dry on her first trial. The case was then filled with oil and the engine started immediately. This time she went beautifully and rose after travelling feet, then flew a total distance of 339 yards in two flights, one of 205 yards at which point she touched the ground so lightly that Curtiss was not aware of it, and the other 134 yards when he landed on the adge of a plowed field. The cause of alighting at that point is unknown, though probably due to inexperience of operator. But little damage was done. The shock of alighting loosened a couple of guys. A second flight was not attempted on account of the condition of the engine.

The greatest height did not exceed ten feet. The flight was a series of marked undulations. The machine answered all her controls well and was 19 sec in the air, giving her a speed of 37 MPH. It indicated that the problem, as felt all along, is to train a man to drive the machine, which itself is quite easy to build and presents no difficult problems.

On May 23 McCurdy had his try at the machine and miraculously escaped piling himself, coming out with a scratch on the inside of his left thigh, a slightly bruised shoulder and a pair of town knickerbockers. The flight was a good one as it reached 183 yards, and was at a height of 20 ft, and not so undulating as the one of the previous day. Owing to one of the hind wheels rubbing, the machine swerved to the left while on the track and almost ran into the bank and both hind 35 wheels came off and she ran on the front one alone for 20 ft or so. She then rose and followed the track for about 40 yds then swung slightly to the left, due to ruoder, and then to the right, due to wind, at the same time tipping slightly to right. It looked very much then as though a landing would be made in the vineyard which is a mass of poles and wires This was averted by the machine tipping and turning more and more to the right, until the right wing struck, breaking it and crumpling it somewhat as

the left wing of the Redwing did on March 17 last. The machine pivotting on the right wing, and tipping to the front then struck her nose and turned a somersault, resting finally on her top plane with wheels in air. This effectually smashed nose, front control front wheel bearing, propeller and part of engine bed. The crankshaft was sprung, and the case at the shaft bearing cracked. When the nose struck McCurdy was thrown out of his seat to the right, hit his left shoulder and turned a partial somersault, finishing just in time to see the engine pass over his head. Fortunately the bed was stronger even than we thought — the engine remained with the frame. A stick from the nose, probably, tore the inside of his left trouser leg and scratched him slightly twice on the inside of his left t thigh. To the spectators McCurdy appeared to come out of the back of the machine quite unhurt. He himself didn't discover his injuries until that evening. The flight atarted at 4.14 p.m. and lasted 10-# seconds, at the rate of 35 MPH The debris was carried to the tent, which Capt. Baldwin kindly lent us, and the crowd dispersed. Mr. Bell was telegraphed to immediately, and on the receipt of his answer it was decided 36 to rebuild. Plans were started on the 25th mor. and actual work on the 26th. The new machine will have a long central body, carry front control, wings (which will be bolted to it) propellers and tail and running gear. The wings will be practically the same as before, but two 8#0# propellers of 16° will be used instead of one of 6# 2# and 17 ½° They will be driven by same engine at 750 rpm. Mr. Bell and Mr. Post left on 20th and father on 21st. The last arrived Saturday 16th. The total distance flown by White Wing was 679 yards. Total for both machines is 826 yards.

1908 June 28 Sunday at Hammondsport, N.Y.

Aerodrome No. 3 was christened Curtiss's “June Bug” at Mr. Bell's suggestion. On June 19 machine was completed having been commenced on May 26.

The propeller used was 6# 2# × 9 ## at tip × 17° on June 15 this gave a pull of 165 lbs at 888 rpm.

Then cut down to 8# at tip and at 960 rpm gave 180 lbs pull. On 4 cylinder at 660 rpm gave 100 lbs and on the other four (port side) at 680 rpm gave 100 lbs. At 920 rpm it gave 170 lbs. The blade was curved about ¼#, 4# back from front edge of 10# tip. Maximum thickness of blade at same point 5/16# At last test propeller picked up wire and chipped itself. Ends were rounded.

On June 19 the center section was run around without wings and a speed of about 45 mph was obtained. The wings were attached and a flight attempted that evening. A chip about 1 ½# wide and 15# long flew off the cutting edge of one of the propeller blades just before starting. It seemed 37 to balance the propeller better than before and not to impair its efficiency in the least. A start was made, but before going very far the old red box tail collapsed, suspending experiments for that day.

On June 20 a new white spar shaped tail was made and completed in time to make a trial late in the evening. The tail was shaped like the main cell at Mr. Bell's suggestion Mr. & Mrs. Bell were with us at this time. Three trials were made but the machine refused to rise. This was most discouraging Curtiss, and we all agreed with him, seemed to think it due to the porosity of the cloth. This was very light and was quite easy to blow through. It was decided to coat it with paraffine dissolved with gasoline to close the pores. This was done on the 21st and a cloth stretched between the two skids, adding a surface of 18 sq ft. Also the propeller was cut down 1 ½# on each tip and the broken edge sharpened. This was now tuned up to 1170 rpm. The paraffine was melted and poured into five parts of gasoline and allowed to cool before applying to the surfaces.

On the evening of June 21 the machine made three successful flights:—

1st 456 ft 152 yds at 28 mph in 11 sec (elated to find it would fly so slowly)

2nd 139 yds or 417 ft at 31 ½ mph in 9 sec

3rd 422 yds and 38 yds at 34 ½ mph 25 # sec The weights of the machine are:—

38

The weights of the machine are:—

Engine 210

Rope 3

Coil 5

Bearing 3

Prop 9

34

Coil 5 lbs 473 lbs machine

Battery 14 lbs 142 lbs operator

Prop 9½ 25 about add (1

Eng & Fuel 176 lbs

Rear beraing 3

Total 207 lbs 640 Total

Eng & fuel 176 lbs

Tail 25 lbs

Mid-section124 lbs

Wings 106 lbs

Front c'trol WORKING SURFACE IS 370 sq ft

11 lbs

473 lbs

Tank 51.5 cms

Oil 23 cms

Gas 28.5 cms

Slant

height cone

9.7 cms

Circum 28.7 cms

37) 640 (1.73 lbs per sq ft

37

270

259

110

On June 22 the machine was again tried but failed to rise. It was found that the surfaces had again become porous. The paraffine and gasoline should be put on hot. A mixture was now made of gasoline, paraffine, turpentine and yellow ochre, the color being introduced to facilitate taking photos. This was put on on June 23 and the machine put in readiness. A trial was made on June 24 late in the evening. Two very short flights were made; one was unintentional and the second was of about 100 yards. A strong side wind was blowing which drifted the machine and it was not deemed advisable to try any long flights.

On the morning of June 25 at 6.15 a.m. the machine made a flight of 725 yards in 41 secs at 36.2 mph. The side controls were used extensively for the first time and worked well. The machine landed hard in a hollow and broke some guy wires. The front control was not nearly powerful enough and the machine showed such a marked tendency to climb that the operator had to climb forward, and finally terminated the flight by shutting off the power to bring her down. A height of 40 ft obtained.

A larger front control was made and also a larger rudder, as it was found that the machine was very hard to steer to the right. There were two vertical surfaces in the tail, and it was undoubtedly the action of the side wind on these that tended to force the machine around to the left. These were taken off and a larger rudder put on.

On the same evening, with the new control and rudder the machine made a flight of 1140 yards in 60 secs at 38.863 mph on the arc of a circle to avoid a vineyard. It was under 40 good control throughout the flight, but for the front control which was still lacking in power, it being full down throughout practically the whole flight. Height from 3 to 20 ft.

It was now decided to move both operator and control a foot further to the front in hope of obviating this difficulty; the 26th was spent in making these alterations. On the evening

of the 27th two flights of 400 yds in 24 secs at 34 mph. The covering of the running was taken off and a flight of 540 yds in 33 secs at 33 mph. The machine was more manageable than before, though the front control is still too weak; we shall now add to its surface.

1908 July 3 Hammondsport, N.Y.

Started for New York on the 28th. Went to Elmira in car and saw Jones fail to getup on account of leaky bag. Reached New York on Monday morning. Were met by Baldwin. Glenn was my guest at club. Met Post at Aero Club at 9.30 Called up Manley and & met Hawley. All were for us. Called up Munn. Rather discouraging; made appointment for 2.30. Had long talk during which Scientific American came to our way of thinking. Their position absolutely untenable Went out to Empire Hotel and saw end of first day's run. Dined with Post, went to Aero Club about 9.30. Met Manley & Hawley and completed arrangements for contests on July 4 at Hammondsport. Spent night at Fleishmann's. Met Mr. Arnold next day. Innovation people, Stetchert & Carn Meyer also Hewett. Like his scheme of distribution of weight and surface. Went to Tuckahoe and returned with Post & had him as guest for dinner. Later met Mr. Guy and Glenn. Gave form er 41 an interview. Looked up Mr. Bates at last on Monday. Invited him up. Returned via Elmira and reached here Wednesday about 1.30 p. m. Went out to track and inspected machine. No flights attempted as alterations and repairs not completed.

On July 2 made two short trials, longest of 150 yds at 22 MPH; both very unsatisfactory and machine hard to control. Swerved and rocked badly; also no speed; hard to account for.

This morning had waht threatened to be a very disastrous accident. Machine rose very fast and lost headway also control swung sharply to left; struck left wing and front control; crushed wing and smashed control and front wheel. Looked very bad at first. Curtiss alright. Repairs fortunately easily and quickly made and machine ready again at 5.30. Old and small control used, about five square feet less surface than the last. Were dubious of

result. Trial most successful Machine under better control than ever. Reached end of field then decided to try and return but too late and had to land near trees. Was confident of his ability to turn if he had thought of doing so soon enough. Flight most encouraging. All had been rather disheartened by last three flights which developed vagaries we couldn't account for. 1300 yds covered in 68 # secs, a little over 38 MPH Machine landed in fine shape. Both tips and rudder used in attempts to turn. Worked well. Machine practically all ready for tomorrow. A few finishing touches will be made for appearances. Mr. Nott first of A.C. to arrive, called tonight. Go to meet Fairchilds early in morning/.

Machine has made 13 flights to date

42

1 = 152 yds - 11 sec

2 = 139 yds - 9 sec

3 = 422 yds - 25 # sec

4 = 40 yds 3 sec

5 = 100 yds - 6 sec

6 = 725 yds - 41 sec

7 = 1140 yds - 60 sec

8 = 400 yds - 24 sec

9 = 540 yds - 33 sec

10 = 30 yds - 2 ½ sec

11 = 150 yds - 14 sec

12 = 30 yds - 2 ½ sec

13 = 1300 yds - 68 # sec

1760) 5168 yds.60) 29.9 #

2.94 miles 4.99 min.

Total by Glenn

5168 299 #

339 19

5507 318 #

3.24 miles 5.32 min

1908 July 11 Saturday at Hammondsport

On July 4 two flights were made with the small control one of 900 yds in 56 ½ secs and one of 2000 yds in 1 min 42 ½ secs. The contest Committee of the Aero Club were present, and both flights were trials for the Scientific American Trophy. In the second flight the machine passed directly over the finish stake, and then flew 600 yards further The official kilometer was made in 1 min 17 sec, and the total official distance in a straight line was taken as 5090 feet in 1:42½ and the official speed was 33.1 mph.

This flight entitles the Association to have its 43 name inscribed on the cup as the first successful competitor. Between the first and second flights the tail was given a slight positive angle.

On July 5, with machine just as it was the day before Curtiss succeeded in turning completely around, but in trying to avoid the vineyards after he had started back, he turned

too short and came down, crumpling one wing, and breaking the front wheel of the running gear. Flight 1 min 15 sec. Front control hard down.

The machine was not ready until the 8th when a flight of about 900 yards in 55 secs was made. The operator had again been shifted a foot further to the front, and the small control which had been smashed on the 5th replaced by a larger and heavier one. The machine now appears to be very well balanced, and is to be weighed and balanced to-day.

On the 8th. the machine rose much later than usual and came down by the head when she landed rather heavily, despite the efforts of the operator to keep the head up. The engine was partially shut off in the air, and the machine failed to pick up quickly enough, so that the flight ended against the aviator's wish. Mr. Cameron, the patent attorney witnessed the flight.

On July 10 another flight lasting 1:30 sec was made in another effort to return to the start. The machine was faced to the rear, but on the last part of the turn, lost headway and came down before really started on the way back The distance was very close to one mile. The machine seemed to be better balanced from fore to aft than ever, but otherwise was quite erratic and swayed a good deal. The front 44 control was neutral most of the way, and when at full speed was quite effective.

July 4 – 14 900 yds 56 ½ sec = 32 mph

July 4 – 15 2000 yds 102 ½ sec = 39 mph

July 5 – 16 circled 75 sec

July 8 – 17 900 yds 55 sec

July 10 – 18 circled 90 sec = 33 mph

July 11

Decided, on receipt of telegram from Mr. Bell on July 6 to build McCurdy's No. 4.

Fairchilds present at flights of 4th and 5th

Mr. Cameron arrived July 8th, left on 9th

Baldwin left July 10 for Baddeck — to buy boat in New York en route.

July 23

A ten ft propeller, 15 ½° pitch, 19# at tip and curved about 1/20th of chord ¼ dist from cutting edge, gave the following results on July 21 :—

r. p. m.

1 1668

2 1794 210 lbs 240 max

3 1764

4 1350

5 1876 240 lbs steady

6

9 ft propeller

r. p. m. pull

1332 135 lbs 150 max 1908 July 24 Hammondsport

45

1908 July 24 Hammondsport

The following notes on gyroscopic action written to John by Mr. Bell July 18

Left hand rotation

1. Steering to right sends bow up

2. " " " " bow down rolls on resist

3. " down " bow right

4. " up " bow left

Right hand rotation (clockwise)

1. Rt bow down

2. Lt bow up rolls on resist

3. Down bow left

4. Up bow right

On June 25 Curtiss started machine but struck oats with tip right wing. Swung machine around and broke both hind wheels.

1908 Aug 3 Hammondsport, N. Y.

Curtiss made a short flight of 250 yds July 26 in an attempt to make a short turn, but struck his left wing broke one upper chord, bent front forks, and broke down hind wheels. Duration 23 sec.

Aug 5 Selfridge then made three short flights averaging 160 yds apiece, 11 sec duration. Curtiss's weight was 138 lbs and Selfridge's 168. As no changes were made in the machine 46 the addition of 30 lbs in front of the center of pressure (the machine was just balanced for Curtiss' weight) naturally made it head bearing, and the low altitude (10 to 15 ft) at which it was travelling, it was impossible to start up after the machine started on a downward swoop before the ground was reached. Otherwise the “Bug” behaved nicely.

On the 27th. McCurdy made a flight of 800 yds straight away in 43 sec, shutting off the power when about 15 ft in the air and gliding to the ground. This was followed by a flight of 2000 yds in 1 min 45 sec. after a short flight in which the machine seemed to lack power.

After the long flight two attempts were made by Selfridge to fly the machine back, in both of which a short jump of about 30 yds was made. The machine absolutely refused to make a longer flight. The surfaces were found to be leaking, and to this was attributed the reason for lack of sustaining power.

McCurdy then tried twice, and although his flights were longer than Selfridge's, about 50 yards, in one of which he rose about 12 ft, the machine refused to remain in the air. It was then pushed back over the fences, Mr. Bradford assisting, till the hay field north of the potato patch was reached McCurdy then mounted and drove the “Bug” back under her own power, flying a distance of about 50 yds after crossing potato patch. This ended experiments for the day. Selfridge left that evening for New York.

On the 28th McCurdy made eight flights, one of 2000 yds to end of Smith's field 1# 43# One complete turn, coming to middle of potato patch 1# 50# 47 two other turns of 1# 50# each one turn of 1# 30# and three other short flights all under one minute.

On 28th, McCurdy made flights above mentioned, after increasing size gasoline of feed pipes to carburettors.

On the 29th McCurdy made a turn lasting 1# 50# and a short flight to potato patch in attempt to turn before reaching vineyard. Left for New York that night.

On Friday 31st Mr. C Bradford, Professor Wood and I saw Farman fly. The 2nd and longest flight timed and measured by McCurdy was 140 yds in 11 sec, at the rate of 24.6 mph,

McCurdy, Professor Wood and I returned Saturday night McCurdy stated all his long flights terminated by motor stopping, due to overheating.

On Sunday, Aug 2 in a squally wind, variously estimated UPPER SURFACE TAIL REMOVED. at from 8 to 10 mph, but not measured, Selfridge made a flight lasting 1# 30#. The upper surface of tail had been removed just before. Machine flew very strongly, and answered front control instantly. MACHINE PITCHED & ROLLED BADLY, DUE PROBABLY TO SQUALLY WIND. Climbed to a height of about 75 ft. the greatest altitude yet attained. In last part of turn machine came down hard on front wheel and broke wooden support, then hind wheels broke by side sheer, as machine was drifting fast with side wind. Front spar of front control snapped after front wheel had given way, so as to let it touch.

48

Repairs made morning of Aug 3 and Selfridge made a VERY STEADY FLIGHT, SMALL TAIL DOING VERY WELL. flight of 800 yards in 50 sec. The machine landing due to lack of power. No damage. On returning to track for another flight, after driving machine back under its own power one of the SURFACES WERE RECOVERED WITH PARAFFINE AFTER McC'S LAST FLIGHT ON JULY 29th. bearings of the cam shaft was found out of place and blocking oil hole, due to lock bolt coming out. Experiments ended for the day; motor dismounted and taken to factory that evening. Thoroughly overhauled and remounted on Aug 4. Thunderstorm prevented flight and almost blew down tent.

NEW FOLDING TAIL USED IN LAST FLIGHT (42) GREAT LABOR SAVER. INGRAM'S IDEA John had laid great emphasis on motor overheating, and Prof. Wood had suggested water spray in New York. Gelnn liked idea. On night 4th suggested packing cylinders with cotton batting saturated with water. Experimented next day (Aug 5) on 1 cylinder motor cycle. Ran it for 20 minutes without overheating, but renewed water with rubber hose. Then tested it for one charge of water, starting motor cold and it ran for 7 minutes before starting to overheat. Then packed PACKED “BUG” ENGINE big engine in “Bug” on Aug 5 and prepared for flight, but did not succeed in tuning up motor sufficiently to attempt a flight. Much disappointed.

Took Cook out morning of 6 to tune up motor, could not get sufficient power to lift Selfridge on first try. On second try a short jump of 30 yds was made, but engine still running very badly, and machine had very little power. A third try made with same result, A strong wind blowing in direction of flight, seemed to have but little effect, however.

49

Afternoon, two more attempts were made, in each of which the machine left the ground, but with no power at all and refused to make a sustained flight. Motor still working badly and developing but little power. Altogether very discouraging as all other conditions apparently just right, and machine, aside from motor, in best condition to date.

A separate oil tank with 4 uninterrupted feeds to crank case installed on Aug 4. Answers purpose very well.

On July 20 Selfridge suggested rear as well as front control for raising and depressing machine, and on Aug 3 SUGGESTS DOUBLE HORIZ. CONTROL a castor wheel with circular bearing for wheel axle connected to vertical rod by basket. This gives a vertical bearing at all times and does away with the displacement of wheel and resultant side strain which arose in types of castor wheels previously tested and discarded/.