

Sept. 27th. '91

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Dear Sir.

I have the plans of your proposed apparatus, and have had the strains calculated. You will probably find them somewhat grater than you anticipated. In the drawing enclosed the straith on each portion of the spines, and also the weight of the spines is indicated by figures. The whole is them tabulated below, so that the total weights may be seen.

You will notice that the frame is calculated for the use of brass tubing. Steel tubing would undoubtedly be somewhat lighter, but the brass is as strong as wrought iron. You will however probably have to use brass in the construction of the machine, for the thin iron or steel would rust quickly by exposure to the weather. I have not been able to find any desirable steel tubing yet.

In the calculations of the stresses on the wings, the tail has been omitted from consideration, as I assumed that the wings would carry all of the weight, and that the tail would support itself, but that it would not be used to support any other portion of the machine being merely used to guide it.

I have recently had some tests made on the strength of bamboo and find that, if it were substituted for the brass or steel in the machine you propose, that there would be a saving of about 70 lbs. in the weight, for the material is stronger in proportion to its weight than iron or steel.

[Seite 2]

One of the causes of weight in your present design, which might be modified, is the double central spine B, and the reason that this has to made so heavy is because the wire running out to it is so little inclined. This produces considerable compression in the brass tube shown, and the latter has to be made heavy to resist the strain. If the wire were inclined more, as is shown by the lower dotted line, then both it and the brass tube could be made much lighter.

From the appearance of the design, I should think that when the wings were not subject to the pressure of the air on their lower sides, that is, when the machine is not in use, that the wings would drop down and break by their own weight. I think that some arrangement should be made to prevent this. The trouble could be remedied by extending a wire over the top of the machine, as is shown by the upper dotted line, the ends being

attached to mast and to the central points of the wings.

I think that one radical defect will be found on the small surface which you propose to use in carrying weight. There are 350 lbs. to be carried on 225 sq. ft. of wings. With the brass tubing there will only be 0.644 sq. ft. per lb. of weight, while even if the bamboo should be used there would only be 0,803 sq. ft. per lb. Very few soaring birds in this country use less than one sq. ft. per lb. weight.

I should be inclined to recommend a surface of not less than two sq. ft. per lb. of weight. Even that will give a far greater shock on alighting, than is experienced in the use of the ordinary parachute, in which the surface is about three sq. ft. per lb.

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After I have your answer to this I will take the design up again, with a view to putting it into the best shape that it admits of. As I told you in our last conversation, if the planes are superposed, that is to say, if the apparatus be made like two birds, one on top of the other, there is then a chance to brace them rigidly together like the top and bottom members of a bridge, and to obtain stiffness and strength without so much weight.

Thibault, a French experimenter, found that if two planes were placed one above the other, at a distance equal to their width, and exposed to a current of air at right angles to their surfaces, that the total pressure was 1.7 times that on the front plane alone, so that the loss was 15 % of what the pressure would be with the two planes isolated.

Prof. Langley in his recent experiments found still more favorable results, and says that if the planes were properly spaced, there is no loss of sustaining power whatever.

You did not seem to favor the idea when I spoke to you about it, but I wish that you would think it over again, and let me know your conclusions.

Very Respectfully,

*O. Chanute*

[Seite 4: detaillierte technische Zeichnung eines Gleiters]