

AT RHINOW.

[The following is a translation of an extract from an article by Lilienthal in *Zeitschrift für Luftschiffahrt*, March, 1895.]

LILIENTHAL writes thus of the extreme care needed in making changes in an air-sailing machine:

My neglect of this circumstance I once came near paying dearly for. The winter before last I constructed several machines, the sustaining surfaces of which had an exact parabolic profile which almost coincided with the arc of a circle. The holding point for the hands and arms I placed in such a manner that the centre of gravity of the body was, on the average, situated one-tenth of the width of the wing in front of the centre of the surface. In my experiments made before Easter from the still higher mountains near Rhinow, I perceived that I had to bear with the upper part of my body a good deal towards the back to prevent my shooting forward in the air with the apparatus. During a gliding flight taken from a great height this was the cause of my coming into a position with my arms outstretched, in which the centre of gravity lay too much to the back; at the same time I was unable — owing to fatigue — to draw the upper part of my body again towards the front. As I was then sailing at the height of about 65 feet with a velocity of about 35 miles per hour, the apparatus, overloaded in the rear, rose more and more, and finally shot, by means of its *vis viva*, vertically upwards. I gripped tight hold, seeing nothing but the blue sky and little white clouds above me, and so awaited the moment when the apparatus would capsize backwards, possibly ending my sailing attempts forever. Suddenly, however, the apparatus stopped in its ascent, and, going backward again in a downward direction, described a short circle and steered with the rear part again upwards, owing to the horizontal tail which had an upward slant; then the machine turned bottom upwards

and rushed with me vertically towards the earth from a height of about 65 feet. With my senses quite clear, my arms and my head forward, still holding the apparatus firmly with my hands, I fell towards a greensward; a shock, a crash, and I lay with the apparatus on the ground.

A flesh wound at the left side of the head, caused by my striking the frame of the apparatus, and a spraining of the left hand, were the only bad effects of this accident. The apparatus was, strange to say, quite uninjured. I myself, as well as my sailing implements, had been saved by means of the elastic recoil-bar, which, as good luck would have it, I had attached for the first time at the front part of the apparatus. This recoil-bar, made of willow wood, was broken to splinters; it had penetrated a foot deep into the earth, so that it could only be removed with difficulty. I describe this accident so minutely because it is probably the worst which could happen in sailing flight; I wish to say that this is not the accident which gained publicity through the press, and which was the cause of a correspondence from all countries. The only outside spectators of this fall were the little girls and boys of the Stöllner schools, who had had vacation, and were looking on with their teachers at my experiments from the ridge of the mountain.

My brother, who also took part in these experiments and had been able to get a perfect side-view of my unsuccessful flight, said it had looked as if a piece of paper had been sailing about in the air at random. In my thousands of experiments this is the only fall of that kind, and this I could have avoided if I had been more careful.

If one uses the necessary precautions when making the experiments, any great danger is, strictly speaking, excluded. The use of a recoil-bar is, of course, always advisable.

In the very slight accident which a reporter who happened to be present brought into the papers in a greatly exaggerated and incorrect way, the elastic impact of the recoil-bar proved to be excellent. In this experiment a change in the curve of the surfaces came into account. I was occupied in testing wings of the strongest possible curves to make compara-

tive experiments regarding the influence of the amount of concavity on the bearing capacity. I had already taken several successful flights with an apparatus the concavity of which was a little over $\frac{1}{2}$ of the breadth of the wing; then while sailing, the apparatus was pressed down in front by a wind from above, in the middle of the course of flight, by means of which it was run to the ground.

With these strongly curved profiles the danger is, that the surface being strongly inclined, the front receives some pressure of the air from above in consequence of sudden changes in the wind, and this would, of course, greatly diminish the stability of the flight. As has already been observed, it is not advisable to extend the height of the profile beyond $\frac{1}{2}$ of the breadth of the wings, in spite of the excellent sustaining qualities which may so be obtained.

One can produce very safe working qualities with strong power of sustentation with a height of profile between $\frac{1}{8}$ and $\frac{1}{16}$ of the breadth of the wing.

As a matter of course, the more one penetrates into the details of the technics of flight the more varied the points of view will become. This is the case even with simple sailing flights which demand only a simple sustaining surface. How much more this will be the case in dynamic flight! I have had already enough impressions as to that. But of this some other time.