

Observations during a Soaring Flight along a Squall Line

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Short description of my flight on August 12, 1955, from Oerlinghausen to Dortmund during the "National Gliding Contest 1955" at Oerlinghausen.

Starting time: 1444. — Landing time: 1536.

Weather conditions: East wind, about 40 km/h; cumulus base 600—700 m; weak, narrow, incoherent thermal convection making it difficult to keep fast, high-efficiency gliders flying.

Type of Glider: Zugvogel.

Task set: Goal race Oerlinghausen—Dortmund (92 km).

After my first start at 1230 the weak thermal upcurrent did not permit keeping my Zugvogel flying and the wind drove me off very fast. Since I had reached only little height I could not fly back to the starting field against the wind. Thus I was forced to land outside and came back to the flying field at 14 hours. In the meantime the sun had become partially screened off by high clouds and a bank of clouds — not yet like a front — seemed to be approaching from the east. From the competitor's point of view, this day seemed lost to me.

When I started a second time at 1444 hours, the dark clouds almost reached Oerlinghausen. Launched by winch I reached 400 m, and after cutting loose I was climbing at a rate of 0.25 m/sec. While trying to keep myself circling in the upcurrent, I was driven off by the wind. After circling for about 10 minutes I had gained another 150 m of height. Then I saw at the east an agglomeration of still darker clouds with lightning and I could hear the rumbling of thunder. Therefore I left the weak thermal upcurrent I was in and turned toward the dark clouds in the east which were gaining more definite shape. I had scarcely reached them when I started climbing at a rate of 2—3 m/sec. Since this rate increased rapidly to 6—7 m/sec, I reached the base of the clouds at 1000 m after a very short time. I had to avoid being

taken into the clouds because I had no blind-flying equipment with me, blind flying being prohibited by the contest regulations. Therefore I operated the very powerful brakes and by pushing the stick forward gained a speed of 120 to 130 km/h. When I reached zero sink — neither climbing or falling — I took my course to Dortmund.

In the meantime a well defined front had formed with a pronounced leading edge and a heavy bank of rain clouds 3—5 km behind its head. Strokes of lightning and thunder now followed in quick succession and were of increasing intensity. From now on I did not circle but, like an engine driven plane, I was flying at speeds varying from 120—160 km/h, at constant height, immediately below the base of the clouds, to the destination where I arrived only 52 minutes after the start.

The front was moving from east to west; the general direction of the front, and the frontal squall cloud, was lying SSW-NNE. The direction of my flight was southwest. This constituted a great advantage because Dortmund, my destination, was reached by the front considerably later and I was not forced to penetrate it, a hopeless attempt for lack of visibility. In order to keep on my course to Dortmund I had to let the leading edge move ahead of me on its way to the west. I then approached the very sharply edged bank of rain. In front of this bank I found myself flying in a zone of

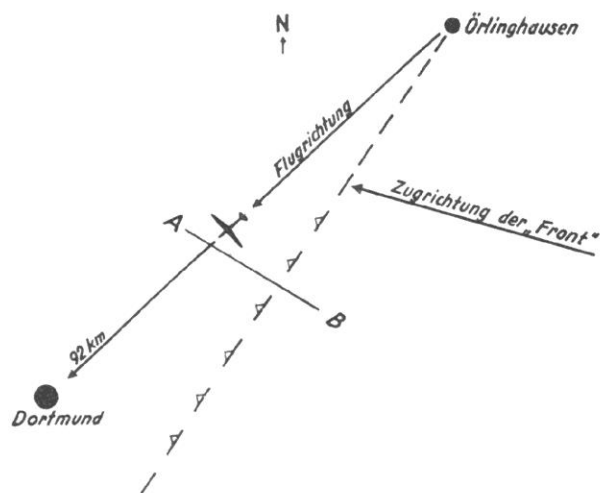


Fig. 1. The track of the sailplane with respect to the "front"

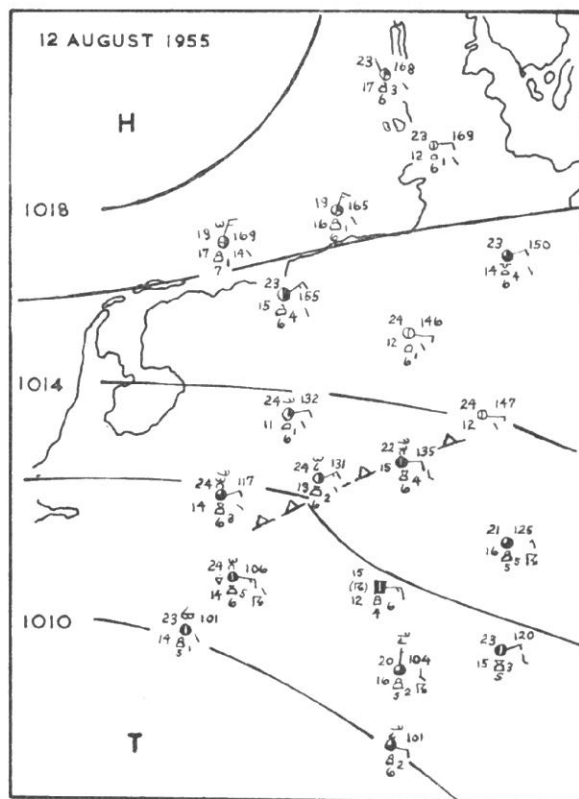


Fig. 2. Surface weather map 12 August 1955, 16 h.

extraordinarily calm air, in which my Zugvogel was "bedded like a board". From time to time its left wing plunged into the rain zone out of which it sometimes snowed and hailed. To the west, in front of the head of the squall line, sunshine and small cumuli were still visible. The head, now 3—6 km distant from the bank of rain, showed a marked expansion and along its border zones of down current with rain were visible. I was, therefore, getting afraid of being enclosed by the front and tried to fly west, underneath the front head, in order to make sure I could escape if it became necessary. At this attempt I was seized by such heavy squalls that I thought my Zugvogel was being taken asunder. As fast as possible I therefore returned, accompanied by strokes of lightning and thunder, to the calm zone near the bank of rain, keeping my eyes on what was going on at the front head. If more rain zones had formed or combined at the front head it was my intention to dive almost vertically with brakes open and to land, or instead, to get ahead of the front at low speed in the upcurrent through the squally zone. However, this did not become necessary.

At a speed never before experienced in a glider over such a distance I saw villages and towns passing beneath. Being afraid that Dortmund might be reached by the rain front, my landing thus becoming impossible, I closed the brakes in order to be able to increase my speed to about 160—170 km/h. Flying at constant height I arrived at my place of destination before the rain started. With brakes open I went down steeply, crossed the target line at low height and landed 52 minutes after my start. The average speed was 102 km/h.

During my 24 years' flying practice I have never had an experience comparable to such a front. From the meteorological point of view the length of the front, the extremely

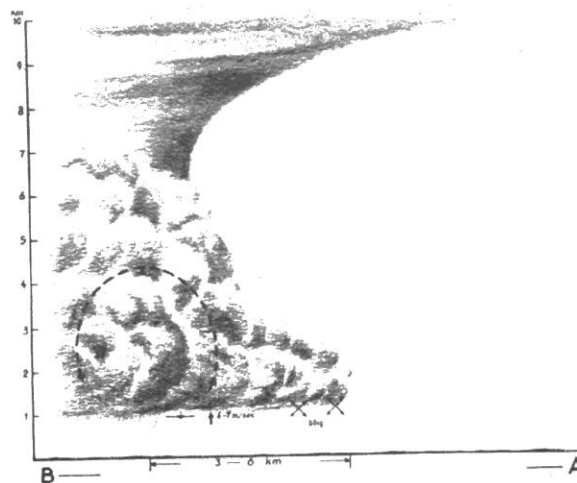


Fig. 4. Cross-section through the "front"

calm zone in front of the bank of rain and the enormous squalls under the front head were extraordinary. As a competitor, I had to thank Providence for the kindness of stationing the front exactly along my course and exactly at the right time.

Remarks by Prof. Flohn, Frankfurt

The 1500 GMT observations (1600 local time) show an easterly circulation with a quasi stationary upper low over northern France and the existence of a local, moderately strong line of convergence with several thunderstorms which extended from WSW to ENE and moved from the ESE. The line is indicated by the distribution of winds, the rapid fall to the north of it and the pressure jump observed at Salzuflen. The Hannover ascent at 1400 GMT shows instability with respect to the wet adiabat. There was no pronounced change of temperature at the convergence line so it cannot be defined as a real front. The upper winds at Hannover changed temporarily during its passage from E to ENE and then to SE. This explains the observed anvil which extended far to the north.

The observations made during the flight show a permanent circulation system, which was quasi-stationary with respect to the coordinate system fixed on the front, inside the convergence zone which was probably composed of single Cb cells. This may explain the strong steady upcurrents in the 3—6 km broad zone between the squall line and the precipitation area. The squall line extended approximately 100 km. Rainfall amounts differed considerably, as is usual during thunderstorm conditions. Lippstadt reported 18.1 mm in 24 hours.

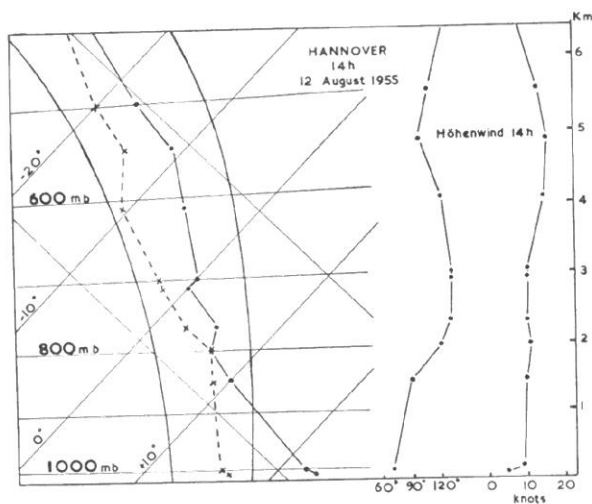


Fig. 3. Radiosonde data, Hannover