

Comparison flight tests of Orao II and Weihe

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At the World Soaring Championship contest at Örebro, Sweden in July 1950 there appeared a number of very interesting sailplanes as well as a good number of the classical design Weihe. The Scientific Section of the Organisation Scientifique et Technique Internationale du Vol a Voile appreciating the contributions to soaring which a careful flight analysis could make, suggested a comparison flight testing of all of these designs. In Appendix A will be found the program suggested by the Scientific Section. The program was presented to the contest committee and through the good offices of Mr Berthold Florman of the Swedish Aero Club the first test was arranged between the Orao II and Weihe. The Swedish Air Force kindly furnished the tow planes and the Jugoslavian team the Orao II and pilot Milan Borisek and the American team, a Weihe and its pilot, Paul B. MacCready, Jr.

The Orao II is fully described in Schweizer Aero Revue May 1950. At the flight test the sailplane had a gross weight of 400 kilograms. Its computed minimum sinking speed is 60 cm per second and its best glide ratio 31.7. The finish on the sailplane was not a glossy finish such as usually found on high performance sailplanes. In addition there were numerous large openings and slots which no doubt acted as spoilers to the smooth air flow. Upon completion of the flight test the pilot Milan Borisek reported that the left dive brake protruded five mm from the upper wing surface. The drag of this brake was sufficient for the pilot to hold rudder to maintain straight flight. In addition the Orao II carried a pitot-static tube on the fuselage nose which the Weihe did not.

The Weihe which Paul Mac Cready, Jr. flew, in comparison with the Orao II, was a typical example of how a sailplane can be improved by attention to small details. The American team used the nose pitot (Soaring May-June 1947, p. 6.) for the airspeed indicator. This permits an uninterrupted flow over the nose of the sailplane. The lower laminar drag over the fuselage nose is then obtained. In addition the American team closed the aileron gap on the wing by screwing flexible aluminum strips to the wing. All other openings and gaps were sealed with adhesive tape. Even the canopy was sealed after the pilot was ready to go. Such attention to detail raised the maximum glide ratio of this Weihe from 29 to over 31. But the gain in high speed cruising flight is even more important than the maximum glide ratio since a sailplane is usually flown at speeds above best gliding speed during competition. The finish on the Weihe was almost a glossy mirror finish.

The comparison flight was conducted in the evening when it was felt all turbulence should have dissipated.

The two sailplanes were towed to 2000 meters altitude by two towplanes of the Swedish Air Force. At this altitude the sailplane pilots released and joined flight so that they were side-by-side. Mac Cready then flew at constant airspeed while Borisek flew on Mac Cready. After two minutes the pilots noted the altitude of the other craft above or below the horizon. This is equivalent to determining the difference in altitude of the two comparison sailplanes which resulted after two minutes of flight at the particular airspeed which was flown. From an average of the readings of altitude differences taken by the two pilots and the time one can compute the difference in sinking speeds of the two craft. A series of such runs starting at the stalling speed of one sailplane and extending up to 150 km.hr. made it possible to obtain the speed polar of the Oraq II from that of the Weihe. The comparison method has the advantage that slight vertical motions of the atmosphere do not influence the results. Unfortunately for reasons beyond the control of the OSTIV it became impossible to conduct the comparison tests on the other sailplanes listed in the program, (Appendix A). However it is felt that the results which are shown in the curve (Appendix B) should warrant an effort by the individual nations possessing the particular sailplanes to complete the comparison tests. For example Switzerland could conduct the tests AIR-100 vs. Weihe, Moswey VI vs. Weihe and Moswey IV vs. Weihe; France could conduct Breguet vs. Weihe or AIR 100.

In the speed polar curve (Appendix B) the Weihe curve is the result of absolute sinking speed tests made by MacCready using an altimeter vs. time method. Unfortunately the airspeed was not calibrated although an attempt was made to do so. For this reason the glide ratio cannot be computed very accurately. The Oraq II curve was obtained by the comparison test which is the subject of this report.

It will be noted that the minimum sinking speeds of the Weihe and Oraq II are nearly identical, 58 cm per second. At 42 meters per second the Oraq II has a sinking speed of 30 cm per second less than the Weihe. However since the wing loading of the Weihe was 19 kg/square meter and the Oraq II was 22.5 some of the high speed performance of Oraq II may be ascribed to its higher wing loading. On reducing the performance of both ships to a loading of 19 kg per sq. meter the Oraq II still shows up better by 10 cm per second at a forward speed of 42 meters per second.

Conclusion by August Raspel, Chairman of the Ostiv scientific Section.

When a revolutionary design such as the Oraq II of Obad and Cyan appears in competition there also appear wild guesses and opinions as to its performance. Some designers are occasionally too proud to permit their craft to be evaluated. It is fortunate for the international soaring movement that Boris Cijan not only did not object to the foregoing comparison test but indeed cooperated in its execution. His contribution to sailplane design thus becomes immediately available to other designers the world over. In turn Cijan as a result of these tests appreciates the fact that Oraq II can be improved by the same techniques Mac Cready used on the Weihe.

In this program it is hoped the reader sees the function of OSTIV, the world dissemination of information on soaring flight.

(see Appendix A and B on page 44)

Appendix A

Program for Sailplane Comparison Tests

It is a recommendation of the Scientific Section of OSTIV that while so many progressive sailplane designs are assembled in one place as at this International Contest at Orebro the following program of comparison flights be carried out. In these flights, comparisons should be made between the new designs and the well known standard sailplane Weihe. These tests should include:

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|--------------|--------------|-------------------|-----|
| a. Orao II | versus Weihe | e. Breguet 900 | " " |
| b. Air 100 | " " | f. Fi-I | " " |
| c. Moswey VI | " " | g. Fokker-Olympia | " " |
| d. Moswey IV | " " | | |

The Weihe will then be calibrated for airspeed and for performance. From the systematic comparison tests, the absolute performance of all of the above sailplanes will then have been determined.

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Appendix B

