A REPORT ON THE SISU I AND SISU IA SAILPLANES

by LEONARD A. NIEMI

The purpose of this article is to first outline briefly the history of the Sisu I sailplane since the last report was published in *Soaring* in 1956, to present the results of flight tests performed in 1960 and to introduce the characteristics of the production version.

Specifications of the Sisu I

A complete report on the specifications and general construction of the Sisu I sailplane was published in the March-April, 1956, issue of *Soaring*. A revised set of specifications and 3-view has been prepared and submitted for publication in the OSTIV section of the Swiss *Aero Review* and the proposed second edition of "The World's Sailplanes." The revised specifications should be referred to for data on the ship as it was actually flown. The difference between the old and the new data, however, is minor.

Historical Record

The first test flights of the Sisu I, after about 5½ years of spare time engineering and construction time, took place on Dec. 20, 1958. The following spring and summer were used to fly away the FAA restriction to a 25 mile radius from the Grand Prairie, Texas, airport, and to build a trailer and clean up many small details.

During the 1959 Labor Day weekend, the first unrestricted cross-country flight ended in a very violent ground loop resulting from trying to mentally avoid a mesquite bush and stalling at the same moment. The ship virtually landed side wise. The mid-section of the fuselage and one wing was buckled and the landing gear was all but uprooted.

Due to the pressure of other jobs, repairs were not begun until three weeks before the 1960 Nationals. The repairs were completed in time for George Coder to compete with the ship. The decision to enter the 1960 Nationals was sparked by the desire to see the ship do something more than try for Silver C distance and to repay George for the many hours he spent behind a bucking bar during it's construction.

Performance Tests

Late in the summer of 1960, a flight test program was initiated under the direction of Dick Johnson who ran a similar program on the Adastra at the same time.

These tests were performed by the classical methods already described in detail in previous issues of *Soaring*. Briefly, the tests were conducted by towing to 9000 feet at dawn, when the air is stable, and after release, timing a 500 foot loss of altitude at various airspeeds. The airspeed position error was determined by connecting a special pitot tube taped to the nose of the ship and a trailing static bomb to a separate calibrated airspeed and comparing with the airspeed used during the performance tests.

All data was corrected for instrument errors and for standard atmospheric conditions. The temperature data used for corrections to a standard atmosphere was obtained from the weather bureau since they made observations only a few miles away at the same time the test flights were made.

Three performance test flights were flown and points obtained for three runs at a neutral flap setting and one run each at flap settings of $-5°$, $+5°$, $+10°$ and $+15°$. Three instrument calibration runs were also made, however, due to leakage in the pitot system, the results of the first run had to be discarded.

The test results are presented in figure 1. For comparison, the calculated sinking speed curve is also shown. The curves show that the measured sink is slightly lower than the computed values at speeds above 60 mph and slightly higher below 60 mph.

The higher values of sink at speeds below 60 are probably due to some separation of flow over the wing-fuselage juncture at high angles of attack. Further evidence of this is provided by buffeting as the speed approaches 50 mph. Since this buffeting provides a margin of safety as a stall warning indicator it may be unwise to take steps to improve flow at the expense of this stall indication.

The sinking speed curve for the $+15°$ and $-5°$ flap setting only are shown in figure 1 for clarity. The performance for intermediate flap settings can be interpolated between the $0°$ and $15°$ curves.

The special camber changing flap on the Sisu I was only a partial success. Up to a flap deflection of $15°$ the test results show a behavior substantially as expected originally. However, atmospheric turbulence has apparently a very large effect on moving transition forward and causing actual separation of flow over the deflected flap. The result is a much greater sink than is indicated by the curve, enough to cancel the gain obtained from a smaller circling radius except in the case of small but fairly strong thermals. This behavior provides a strong

The Sisu I as it appeared on the line for initial test flights, minus tail cone and before sanded filler on leading edges was painted.

Photo: Terry White