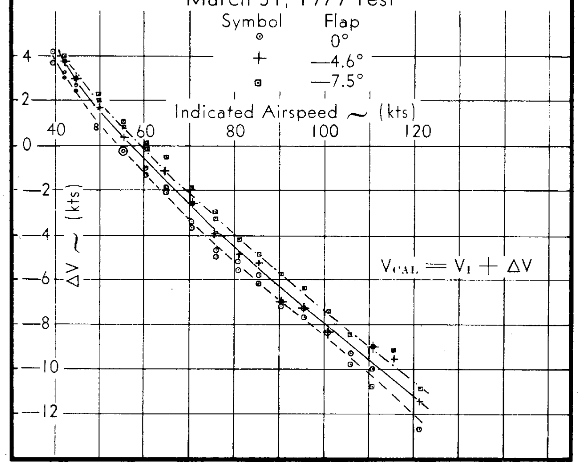
A FLIGHT TEST EVALUATION OF THE MOSQUITO

by Richard H. Johnson, published in *Soaring* Magazine, August, 1979

The Mosquito is Glasflügel's entry into the 15-meter flapped sailplane racing category, and it is a sleek, modern, fiberglass sailplane that is both meticulously engineered and pleasing to the eye. Its well-known cousins are the AS-W 20, LS-3, and Mini-Nimbus. All four made their competition debuts during the 1977 summer season. Our Dallas Gliding Association testing has already been completed with the AS-W 20 and LS-3, both of which showed superb performance, and the Mini-Nimbus, which displayed a good but slightly less outstanding polar curve. Naturally, we were anxious to add the Mosquito's polar to our data records; so when Jim Crisp of Lubbock, Texas, graciously offered to bring his unusually clean and well-sealed Mosquito for testing, we immediately accepted.

The Mosquito uses the same wing as the Mini-Nimbus, or more correctly, the Mini uses the Glasflügel-designed Mosquito wing. The basic bottom-hinged wing flaps work conventionally through a -7.5° to +12° normal flight range. The ailerons droop and raise in unison with the flaps to provide maximum wing efficiency over a wide airspeed range.

Figure 1
MOSQUITO AIRSPEED SYSTEM CALIBRATION
N46898, SN 75
Fuselage Nose Pitot, Aft Cockpit Side Static
March 31, 1979 Test



The airbrake control lever is located beside the flap control handle on the left side of the cockpit. It is several inches taller than the flap handle and is easily reached by the pilot. The airbrake actuation raises a forward-opening flap on the wing's aft top surface. As this upper flap opens past roughly 20 degrees, it begins to force the lower conventional flap to larger deflections. The upper flap then functions to both balance the lower flap airloads and to increase drag. Full airbraking rotates both the upper and lower flaps through roughly 60-degree angles. The system works beautifully, and impressively steep landing approaches can be made with little practice. These same airbrakes are used with the Mini-Nimbus, and further details are included in Reference A.

Beyond 20° the upper surface airbrake begins to work in concert with the flaps, thus balancing the lower flap airloads and increasing the drag. "The system works beautifully; impressively steep landing approaches can be made with little practice," says the author.

The Mosquito's cockpit is very comfortable and the visibility provided by the one-piece, forward-hinged canopy is quite good. Its canopy hinging system uses four links in a semi-parallelogram configuration. It is probably stronger than those of the AS-W 19, AS-W 20, and LS-3 cantilevered, spring-balanced, gas systems, but not quite as easy to operate. The control stick is mounted on an excellent link' parallelogram system that allows the pilot's hand-grip to be comfortably aft, yet prevents vertical accelerations from inducing unwanted elevator control motions prevalent with many aft-joggled, conventional, control-stick installations.

The only cockpit control problem is the wheel-brake control lever that is mounted on the cockpit floor just aft of the pilot's control stick. Here the pilot must abandon the airbrake and flap handles to operate the wheel brake, which I do not like to do. Also, when wearing a modern Security parachute that extends well forward on the cockpit floor, it was impossible to pull the brake handle sufficiently far aft to achieve any significant wheel braking.

The airspeed system was calibrated by towing to a high altitude in smooth conditions, and then comparing the Mosquito's readings with those of the calibrated Kollsman ASI connected to the Keil tube pitot and trailing static bomb. Three flap settings were tested from 40 to 120 knots indicated.

The measured errors were surprisingly large. They are shown in Figure 1 for each of the tested flap settings. At near stall the airspeed system indicates about 4 knots less than actual; whereas at 120 knots indicated the Mosquito is actually only flying at about 109 knots. This is the poorest accuracy airspeed system tested during our FTE series. Only the

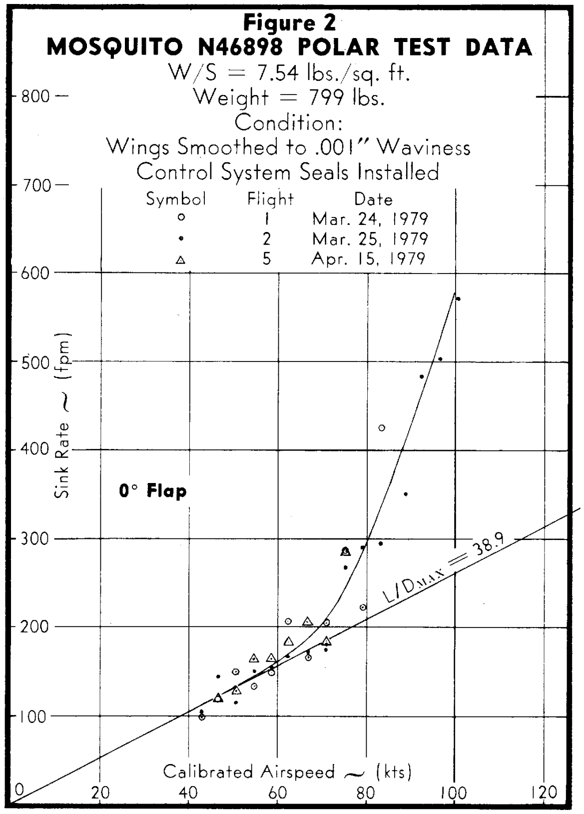


Figure 2
MOSQUITO N46898 POLAR TEST DATA

Standard Cirrus B ran a close second for this dubious honor (Reference B).

The principal fault with the Mosquito's airspeed system appears to be the location of its static ports. These are located on the sides of the fuselage at about nine inches below the wing leading edge. At low airspeeds the static ports apparently are in the wing's positive pressure region and this in turn causes the ASI to indicate lower-than-true speeds. Above roughly 55 knots the static ports apparently sense increasingly negative pressures which cause the higher-than-true airspeed indications.

The pitot is located inside the fuselage nose air-vent hole and it seems to function well in free flight. On aero tow this pitot performs poorly and erratically because the tow release is also located in this much-too-crowded nose vent hole. There is little problem when the nose air vent shutter is closed. However, when this vent is open, the indicated airspeeds during tow vary erratically with towrope angle, often reading about 15 or more knots slower than true. The pitot is obviously being blocked by the towrope wake.

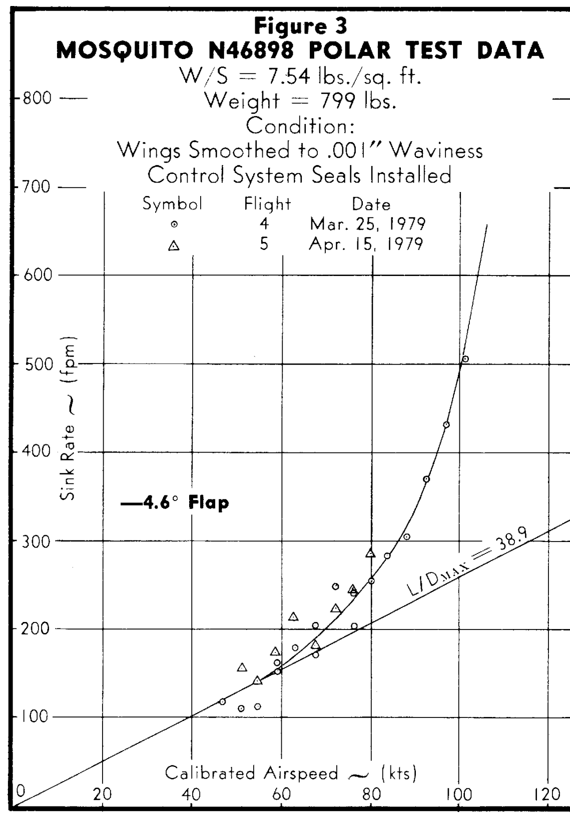


Figure 3
MOSQUITO N46898 POLAR TEST DATA

The wings on the test Mosquito had been filled and smoothed remarkably well by Alan Bikle about six months before our testing. My wave gage measurements could detect only about .001 inch peak-to-peak chordwise waviness, which is easily the smoothest wing that I have ever run my gage upon. Would this super smooth wing show superior performance? We were anxious to see.

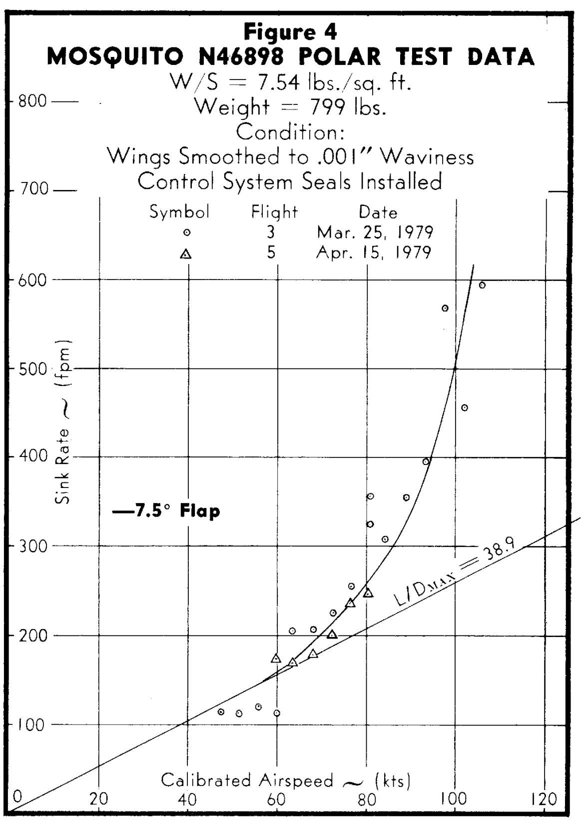


Figure 4
MOSQUITO N46898 POLAR TEST DATA

High tows were made in smooth air to measure the Mosquito's sink rates at various airspeeds and flap settings. These data are shown in Figures 2 through 4 for flap settings of 0˚, -4.6˚, and -7.5˚, respectively. There was more scatter in the test data points than I would like, but this spring's test weather refused to cooperate. A high-altitude jet stream persistently blew over our Texas skies, causing gentle wave motions, and scatter in the test data. Also, rain and low ceilings prevented testing on many days.

The 0˚ flap data appears to be fairly good. An averaged curve through these data indicates an L/D_{max} of about 38.9 was achieved at near 50 knots. This is very close to that measured with the Mini-Nimbus and not surprisingly so since they share the same Glasflugel wing design.

The -4.6˚ flap test data shown in Figure 3 can also be rated fair scatterwise. It shows about the same 38.9 L/D_{max} at near

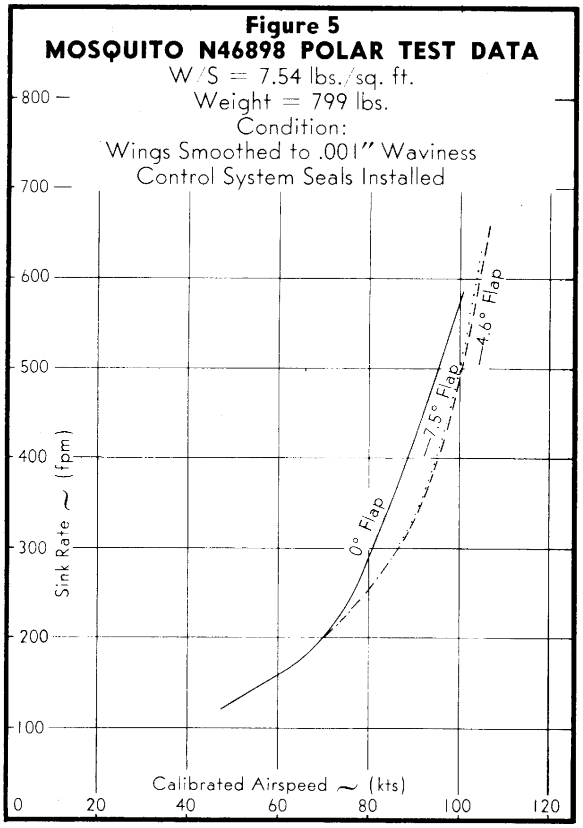
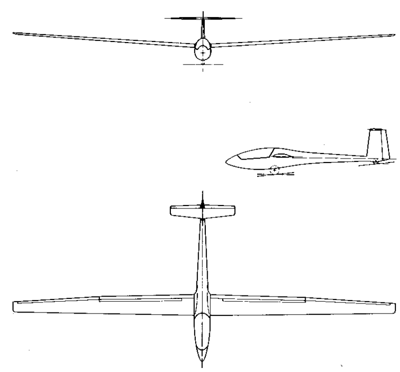


Figure 5
MOSQUITO N46898 POLAR TEST DATA
W/S = 7.54 lbs./sq. ft.
Weight = 799 lbs.
Condition:
Wings Smoothed to .001″ Waviness
Control System Seals Installed

55 knots. The -7.5° flap data in Figure 4 is less good scatter-wise, but with a little imagination it shows approximately the same polar as measured with the -4.6° flap setting.

Figure 5 shows all three of the above polars plotted together without the test data points. This figure indicates that no measurable performance changes occurred when the flap positions were changed between -4.6° and - 7.5°. Admittedly, our weather plagued testing was not very precise above 80 knots with the -7.5° flap setting, and possibly that curve is somewhat in error. Pilots usually like large negative flap settings during fast cruising even if sink rates are not reduced. This is due to the sailplane's more nose-up flight attitude giving the illusion of a flatter glide angle.

Figure 6 compares the measured Mosquito polar with those of the previously measured Mini-Nimbus and AS-W 20, reported in References A and C, respectively. The test wing-loading curves were reduced by the square root of the weight-ratio method to a common 6.53 lbs./sq. ft. wing loading so that direct comparisons can be made. The Mosquito performance appears to be slightly better than the Mini below 75 knots but significantly below the AS-W 20's, especially in the 50 to 70 knot range. At 80 knots all three appear to perform about equally. Above 85 knots the AS-W 20 becomes increasingly superior and the Mosquito increasingly inferior, with the Mini about half way between the two.



The Mosquito has very good stability and control characteristics, and it is very pleasant to fly. A fixed horizontal stabilizer combined with the excellent linked control-stick configuration provide outstanding longitudinal characteristics. Stalls are gentle and well mannered.

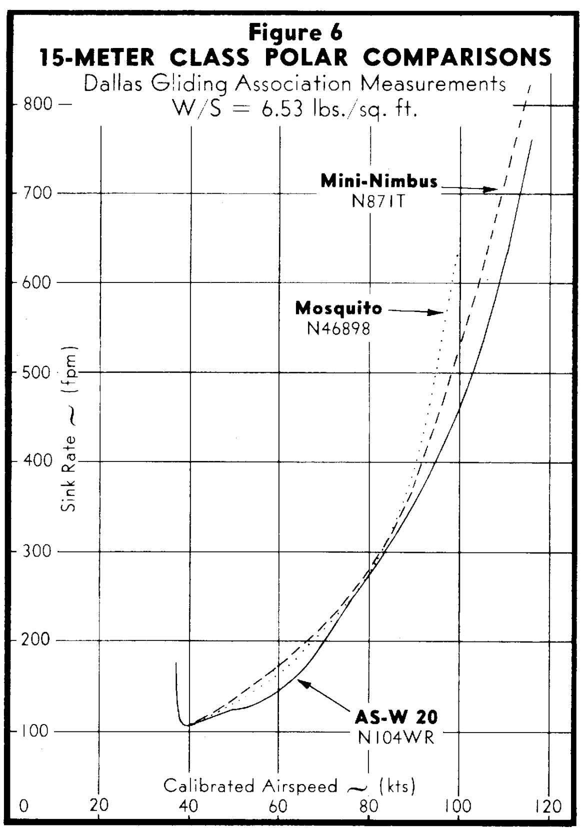


Figure 6
15-METER CLASS POLAR COMPARISONS
Dallas Gliding Association Measurements
W/S = 6.53 lbs./sq. ft.

The wing area was measured at 105.9 sq. ft., which compared well with the handbook's 106.1-sq. ft. value. The factory unequipped empty weight was 548 pounds. However, the subsequent wing filling and smoothing increased the wing panel weights by about 9 pounds each. Jim had installed extensive instrumentation and a large 38-cubic foot oxygen system, and these increased the Mosquito's empty equipped weight to about 620 pounds. Integral water ballast tanks are provided in the wing leading edges, and their combined capacity is listed as 115 liters, or about 250 pounds. The left wing panel weighed close to 165 pounds and the right roughly 160 pounds. The wing maximum thickness-to-chord measurements showed .165 at the root, .168 at the flap tip, and .155 at the aileron tip.

The thermaling climb performance at the 799-pound flight-test weight appeared to be fairly good, but not up to LS-3 standards. Stall speed with +11.7° thermaling flap setting was measured at near 39 knots calibrated. Roll rates were typical for a modern 15-meter sailplane, requiring about five seconds to perform a 45°-to-45° roll at 50 knots with ± 11.7° flap.

No bug polar sink-rate measurements were made because of the inclement weather. Likely the Mosquito's polar with 20 bugs/meter on the wing leading edges would be close to that measured with the Mini-Nimbus, and reported in Reference A.

In summary, the Mosquito was found to be generally well made and indeed pleasant to fly; however, it lacks the performance edge necessary to make it fully competitive in major contests, especially at high airspeeds.

Thanks are gratefully given to Jim Crisp for kindly bringing his exceptionally clean Mosquito to Dallas for testing, to those who towed and assisted, and to the Dallas Gliding Association for providing the towing funds.

R**EFERENCES**

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B. Johnson, R. H. “A Flight Test Evaluation of the Standard Cirrus B,” *Soaring*, March, 1976.

C. Johnson, R. H. “A Flight Test Evaluation of the A5-W 20,” *Soaring*, May, 1978.