Flight Test Evaluation of the Schweizer 1-36

by RICHARD H. JOHNSON

The 1-36 *Sprite* is Schweizer's newest production model single-seated sailplane design, and it is surprisingly good in many aspects. Ruggedly constructed almost entirely of aluminum alloy, it features modern Wortmann laminar flow airfoil sections on its 46-ft. (14.0 meter) span wing. It is an intermediate performance sailplane designed to be easy and safe to fly by a wide range of sport-loving pilots. Our DGA flight tests confirm that its performance is about *45 percent higher* than that of the 1-26 models that it is replacing. This is a significant performance improvement, which will permit easier and better soaring flight achievements than were possible with the older and smaller 1-26 models. It will likely provide the basis for a new one-design competition class in the U.S.A.

The aluminum wing leading edge skins appear to be carefully formed of adequately thick material, so that no buckling of these surfaces occurs during normal soaring flight. Because of this, the wing apparently achieves a fair degree of low-drag laminar airflow. Measured t/c values were about .165 at the wing root, .164 at the aileron root station, and .131 at the wingtips. The wing spar is located at about .40c aft of the leading edge, and there, along the rivet line, an unfilled skin wave existed that no doubt terminated the laminar flow at that chordwise location. There had been no filling of any of the wing-skin rivet-line waves on our test 1-36 sailplane, but had that been done, it is probable that even higher performance could be achieved. A mixture of epoxy resin and microballoons is excellent for that purpose.

The 1-36 is offered with two landing gear options, neither of which is retractable. One option is a forward-of-*cg* mainwheel with a spring-supported tailwheel. Our test sailplane had the second option which is a *cg* located mainwheel with a conventional fuselage nose skid. I prefer the latter option because the more aft wheel location provides better directional control, especially during crosswind takeoff and landing. There is likely little or no aerodynamic drag difference between the two option configurations.

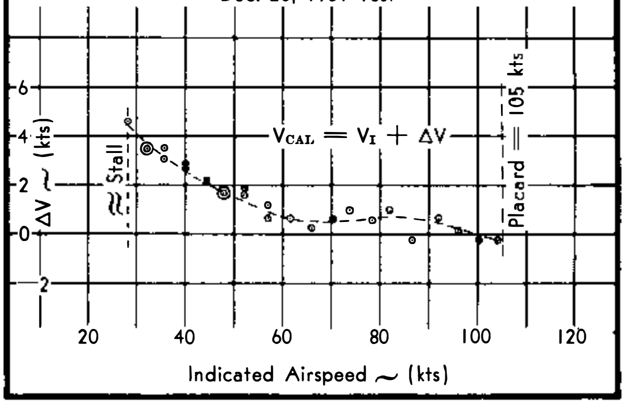
The mainwheel is a generous 13-inch O.D. by 5-inch wide size that is normally used with Open Class sailplanes. The wheel is equipped with a standard hydraulic disc brake that reportedly functions well. The wheel brake is actuated by the airbrake handle final aft movement, which is an excellent arrangement. I did not test the wheel brake with a hard application because our test 1-36 was to be displayed soon at the 1982 SSA Convention in Houston, and we did not want to place any scratches on the forward skid.

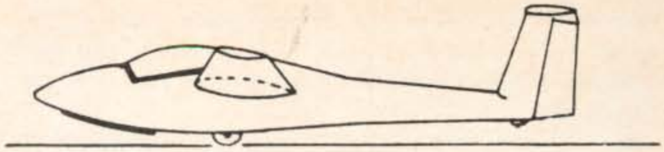
The airbrakes are beautifully balanced plates that extend from both the upper and lower wing surfaces, similar to those of the 1-26E. Though not as powerful as those of some of the recent European designs, they are easy to use, and cause minimal pitching. They are so well-balanced airloadwise that only very low actuating handle forces are needed to operate them in flight.

Assembly of the 1-36 is relatively easy, though a bit more involved than with a typical fiberglass sailplane. The wing root spars insert into mating fuselage slots, and must be pinned along with the forward and aft drag fittings in addition to the main spar pins. The aileron controls must be pinned manually, but the airbrakes connect automatically. The tee-tail horizontal surface has a 7.93 ft. (2.42 meter) overall span and uses a conventional fixed stabilizer with a small-chord movable elevator at the rear. It is divided into removable left and right panels that plug into mating sockets of a short-span section of the stabilizer that is permanently fixed to the top of the vertical fin. A small pin must be inserted to retain the left and right removable portions, but the elevators connect to the control system automatically, *as all control systems should.*

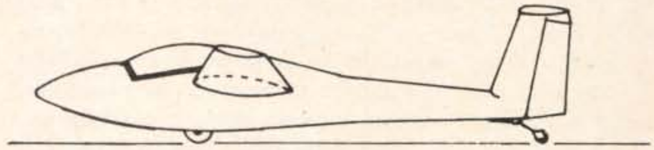
The airspeed system pitot is located inside the fuselage nose cockpit air vent opening, which is an excellent location. The static orifices are located on the lower sides of the fuselage, 14 inches (356 mm) aft of the nose. The overall system was calibrated during Flight #5, and the measured errors are shown in Figure 1. Less than 1-knot error is shown above 56 knots indicated airspeed. Below 56 knots the error steadily increases to about +4.5 knots at stall speed. This +4.5-knot error at stall means that when one *indicates* 28 knots, they are actually going about 32.5 knots. This is a fairly good airspeed system, but the static sources may have too much error to achieve satisfactory total energy compensation with most variometers. Therefore, either a venturi variometer

Figure 1
SCHWEIZER 1-36
AIRSPEED SYSTEM CALIBRATION
N3621T, SN 40
Nose Pitot, Lower Nose Side Statics
Dec. 26, 1981 Test

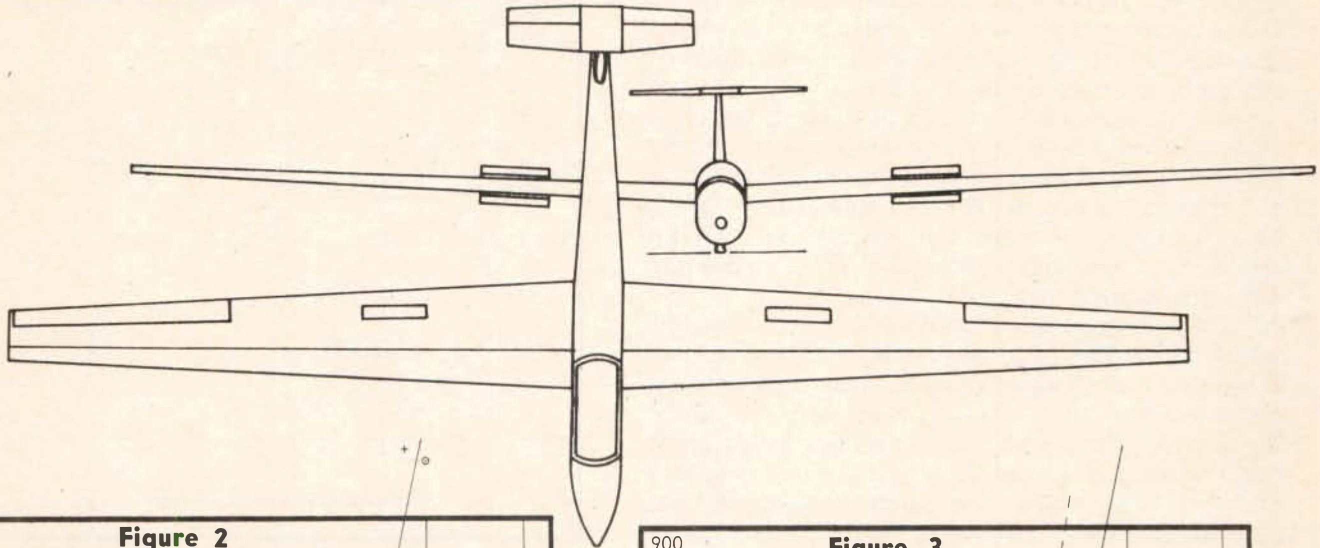




AFT WHEEL POSITION



FORWARD WHEEL POSITION



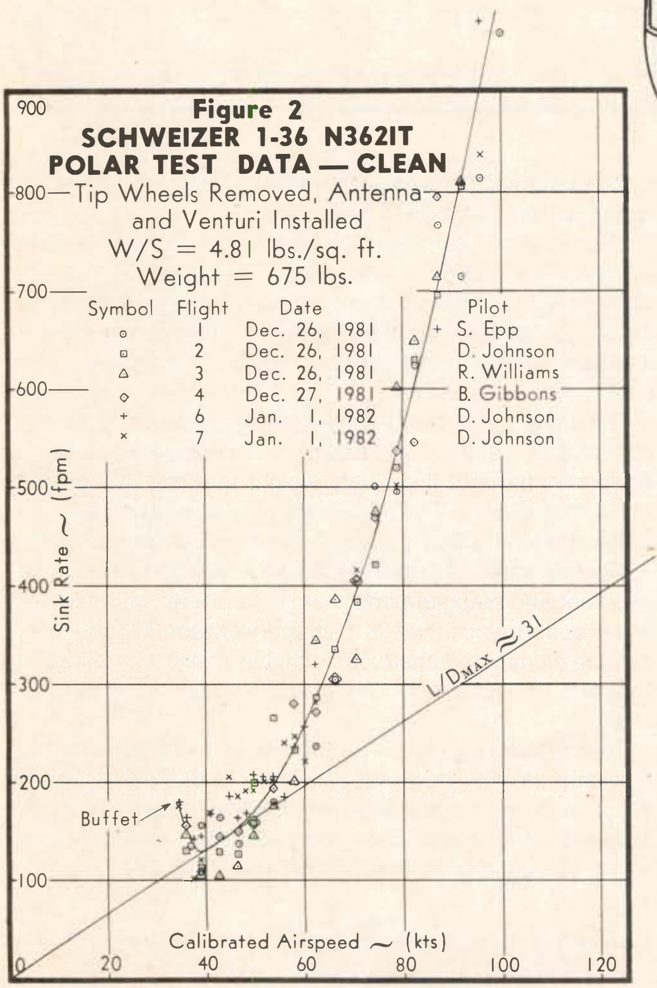


Figure 2
SCHWEIZER 1-36 N362IT
POLAR TEST DATA — CLEAN
Tip Wheels Removed, Antenna and Venturi Installed
W/S = 4.81 lbs./sq. ft.
Weight = 675 lbs.

Symbol	Flight	Date	Pilot
○	1	Dec. 26, 1981	S. Epp
□	2	Dec. 26, 1981	D. Johnson
△	3	Dec. 26, 1981	R. Williams
◇	4	Dec. 27, 1981	B. Gibbons
+	6	Jan. 1, 1982	D. Johnson
×	7	Jan. 1, 1982	D. Johnson

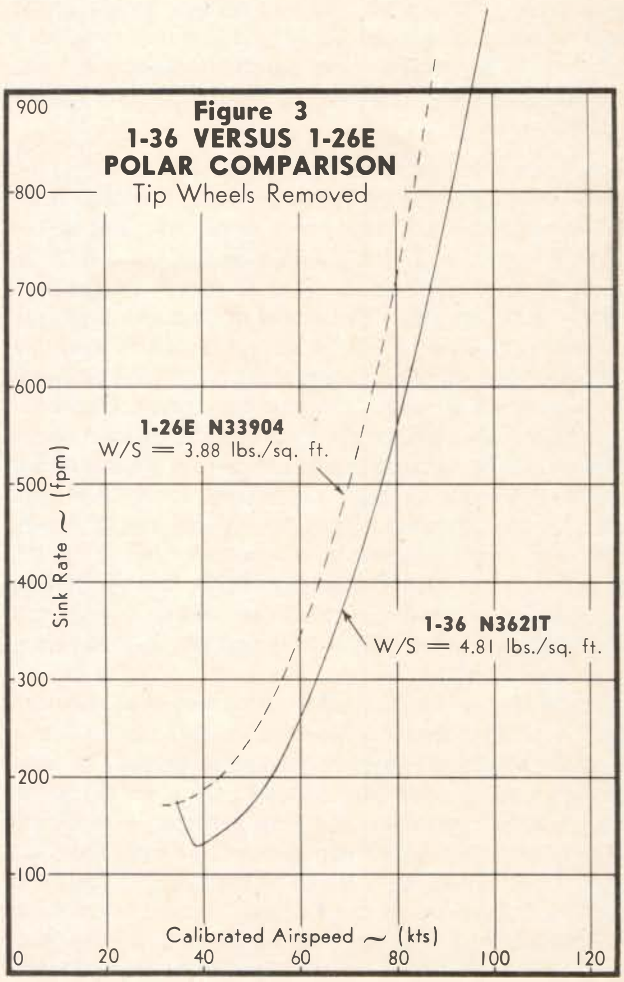


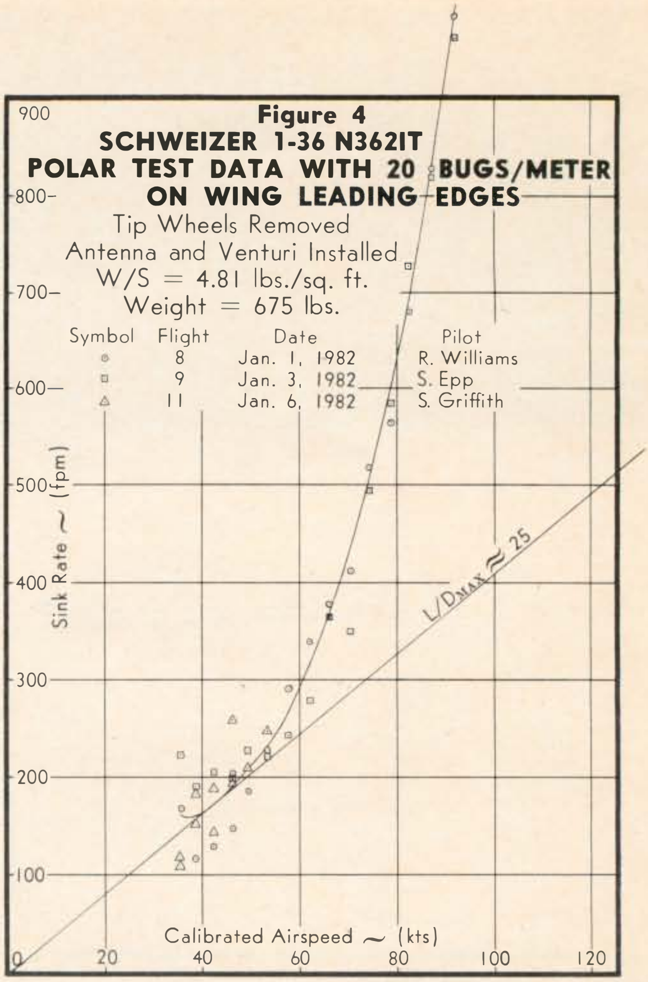
Figure 3
1-36 VERSUS 1-26E
POLAR COMPARISON
Tip Wheels Removed

static should be used, or an additional low-error static source should be installed on the aft fuselage sides. Our test 1-36 used a factory-installed, tail-fin-mounted venturi, which worked well.

Six high tows were made to measure the *Sprite*'s clean configuration sink rates at various constant airspeeds. These were flown by four different pilots, ranging in height from my 5-ft. 10-in. (1.78 meter) to Robert Williams' 6-ft. 7-in. (2.00 meter) height. These sink rate test data are shown in Figure 2. Regrettably, the air was not as still as we would have liked during any of the three test days, and a fair amount of scatter exists in the data. However, a curve faired through the averaged data points should provide a fairly representative polar. This indicates that a 130-ft./min. minimum sink rate can be achieved at about 39 knots, and that an L/D max of about 31 is achieved at about 42 knots calibrated (≈39.5 knots indicated). This L/D max is excellent for this class of sailplane and fully up to the manufacturer's claim.

Figure 3 compares the measured 1-36 polar to that of the DGA-measured 1-26E polar reported in Reference A. As this figure shows, the 1-36 is markedly superior to the 1-26 at all except stall airspeeds. With the laminar airfoil and a .93 lb./ft^2 (4.54 kg/m^2) higher wing loading, the *Sprite* will naturally need to be flown at somewhat higher airspeeds to achieve optimum performance.

The final portion of our performance testing was done with our standard pattern of 20 tape "bugs" per meter span attached to the wing leading edges to obtain some estimate of how much the effect of insect impact roughening would have on the 1-36 sink-rate polar. Previous testing of the 1-26E showed that similar roughening had no measurable effect on that nonlaminar wing profile (Reference A). The 1-36 wing is different, however, as the test data in Figure 4 indicates.



Again, unwanted air movements introduced scatter in the sink rate data at airspeeds below 50 knots. However, averaging the available test data shows a minimum sink rate of about 160 ft./min. at 37 knots, and a best L/D of roughly 25 to 1 at 42 knots. This is about a 23 percent increase in minimum sink rate and a 24 percent decrease in maximum glide ratio. Obviously it will be advantageous to keep the 1-36's leading edges smooth and clean at all times possible.

The roll rate at 40 knots calibrated was quite good, measuring about 6 seconds for 45°-to-45° rolls. Stalls are gentle and preceded by buffeting starting about 2 or 3 knots above full stall. Directional stability and rudder control are quite good. A centering-spring trim system is provided for the elevator, with a reset release lever mounted close to the left side of the control stick. During most flying, this trim system is unnecessary; therefore I taped the release lever to the control stick during later flights to temporarily deactivate the trim spring system.

Although the elevator system provided very adequate pitch control at all airspeeds, it was noted by all five pilots of our test group that we all tended to have some difficulty in maintaining a steady aerotow pitch attitude, particularly during the initial portion of the tows. The 1-36 exhibited a moderate tendency to oscillate in pitch during towing, for some unknown reason. Possibly this was caused by the dynamics between the Super Cub towplane, the towrope, and the *Sprite*'s low towhook location. This is easily controlled, and after the practice of one or two takeoffs, I could quickly damp the oscillation by proper timing of elevator movements. Locking out the trim spring system seemed to help there.

The cockpit is comfortable and well laid out and visibility is good. The canopy is side-hinged, well-fitted, and sealed. The cockpit is relatively quiet during flight. Only one or two aft-of-spar wing-skin panels buckle slightly during flight in turbulent air, but these do not produce much noise to the pilot.

The unequipped empty weight of N362IT was 470 pounds. Instruments, battery, nose ballast (5 lbs.), and miscellaneous equipment brought the empty weight to about 492 pounds without tip wheels. The measured wing area was 140.4 ft.^{2}, which is almost exactly equal to the Handbook's 140.6 ft.^{2}.

All considered, the new 1-36 sailplane appears to be an excellent intermediate-performance sailplane with markedly better performance than its 1-26 predecessor. Its robust and durable aluminum construction should make it an attractive sailplane for clubs, sport fliers, and one-design-class advocates.

Special thanks go to the Schweizer Aircraft Corporation for providing the fine new test sailplane, to the Dallas Gliding Association, plus a few dedicated SSA members who kindly provided the test tow funds, the patient tow and test pilots, and to our good photographer/test pilot, Skip Epp.

REFERENCE

A. Johnson, R.H. "A Flight Test Evaluation of the Schweizer 1-26E," *Soaring*, Feb. 1977.