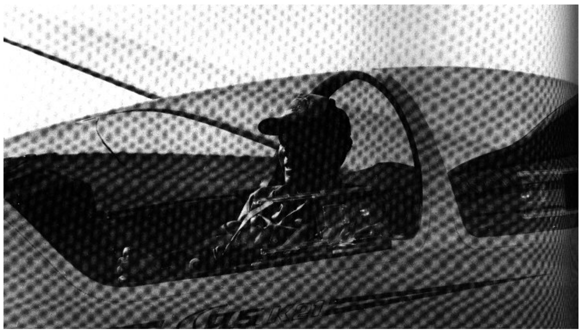
A FLIGHT TEST EVALUATION OF THE AS-K 21

By Richard H. Johnson, Published in *Soaring* Magazine, July 1985

The letters 'AS" stand for Alexander Schleicher Segelflugzeugbau, a well-known and long-established sailplane manufacturer of Poppenhausen, West Germany. The letter "K" stands for Rudolph Kaiser, a prolific and talented designer; he and Gerhard Waibel are credited with all of the more recent sailplane designs from the Schleicher firm. Rudy's designs reach back more than 30 years and include many well-known types such as the Ka-6. K-8 and AS-K 18 single-seaters and Ka-7 and AS-K 13 two seat models. These older designs were well crafted and were built mostly of wood in the old and reliable traditions. Hundreds if not thousands of these well-liked sailplanes are still flying around the world today.

With the AS-K 21 Rudy Kaiser broke his traditional loyalty to wood and joined the fiberglass designers in the use of this now-common structural material. The transition appears to have been easily accomplished, as this relatively high-performance tandem-seated 17-meter sailplane is obviously of outstandingly good design. As Figure 1 shows, the AS-K 21 is a thoroughly modern mid-wing configuration right down to the tee tail.



The author tries front office of the Schleicher trainer and judges it "an excellent configuration" with good visibility.

The fuselage rests easily on three non-retracting wheels, as does the popular Grob *Twin Astir* (Ref. A). Most of the load is supported by a five-inch by five-inch main wheel equipped with a hydraulic disk brake and located slightly aft of the loaded center-of-gravity. A well sized four-inch by four-inch nose wheel is located beneath the forward cockpit instrument panel, and this wheel is used during takeoffs and landings to support the relatively light nose loads. As long as this nose wheel is in firm contact with the ground the sailplane rolls in a relatively straight line, and this makes crosswind takeoffs and landings easy to accomplish if the stick is held forward. A standard 210 X 65-mm tail wheel is included as an option over a plain tail skid. This is well worth while as it makes ground handling very easy without the bother and expense of a tail dolly.

When Fred and Carol Taylor of Grand Prairie, Texas, took delivery of their new AS-K 21, they kindly offered its use for our flight test measurements. Fred also used his Maule towplane to helpfully provide some of the needed high tows to measure sink rates and perform airspeed system calibrations. The first four test flights were made to measure the AS-K 21 performance polar in its as-delivered factory condition, and those test data are shown in Figure 2. A minimum sink rate of about 148 feet per minute (.75 m/sec) at 41 knots, and an L/DMAx of roughly 31.7 at 53 knots were indicated at the flight test gross weight of 1230 pounds (558 kg).

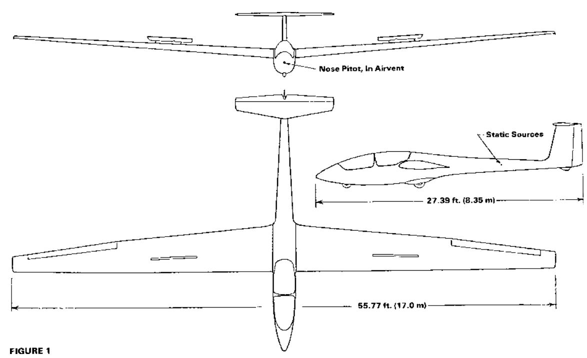
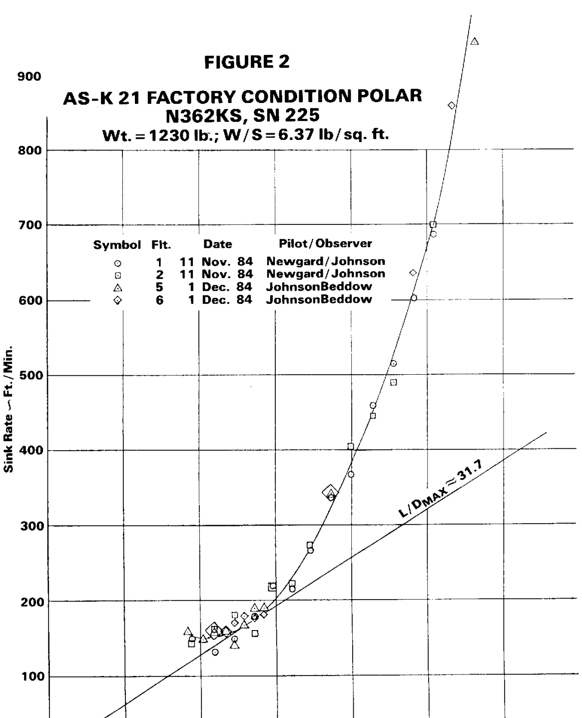


FIGURE 1



This is quite adequate performance for this type of general-use sailplane, but it is seven per cent below that claimed in the factory brochures. Installation of wing root and other air seals is likely to result in improved performance, as it has in other reported tests (Ref. B). Therefore, Fred plans to install air seals along with better wheel well sealing in the near future. We intend to remeasure the AS-K 21's performance when those improvements have been made and will report performance changes then (but probably not before the late fall months of 1985).

One moderately high tow was made to calibrate the airspeed system, and those data are shown in Figure 3 as error magnitude vs. indicated airspeed. The AS-K 21 handbook specifies that the sailplane's airspeed indicator be connected to the flush fuselage nose pitot and the aft fuselage side static sources. Such an arrangement is called an airspeed *system.* The errors measured there are a combination of pitot system and static system pressure discrepancies. Note that the overall airspeed system errors measured slightly less than one knot at airspeeds below 75 knots (140 kph), but that they increase steadily in a positive error direction at higher speeds. In other words, the ASI indicates less airspeed than it should above 75 knots.

This increasing error with airspeed may not be a problem to the operation of this sailplane, because placard speeds

FIGURE 3

AS-K 21 AIRSPEED SYSTEM CALIBRATION
Std. Fus. Nose Pitot, Aft Fus. Side Static

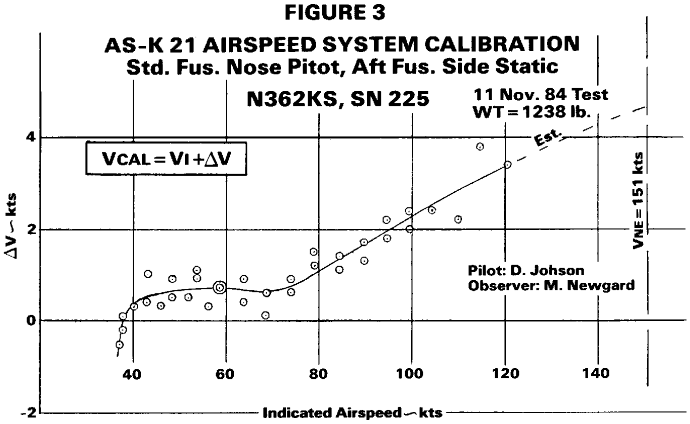


FIGURE 4

AS-W 19 AIRSPEED SYSTEMS CALIBRATION
Nose Pitot, Aft Fuselage Sides Static

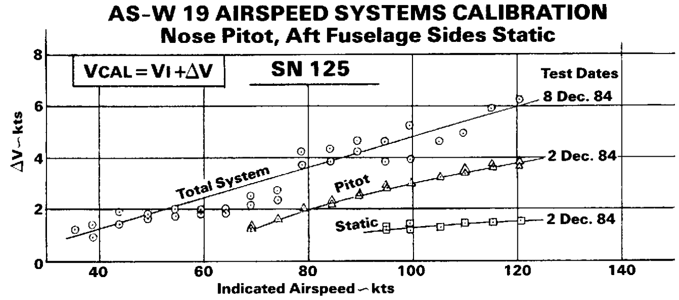
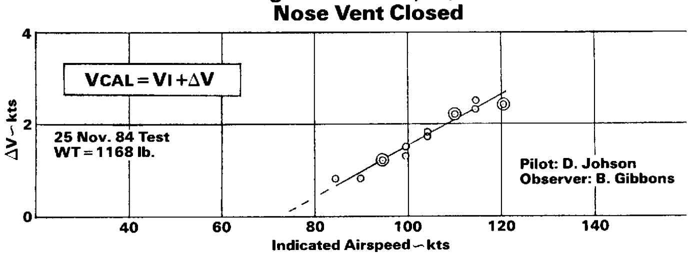


FIGURE 5

AS-K 21 NOSE PITOT ALONE CALIBRATION
Std. Fuselage Nose Pitot, w/o Extension
Nose Vent Closed



likely take these errors into account. However, if modern flight instruments such as air data computers, total energy systems or a wing drag probe are to use pressures supplied by either or both of the ASI pitot or static systems, their indications will be in error in proportion to the basic ASI system errors. For these reasons it was deemed necessary to determine just how much of the measured pitot-plus-static error shown in Fig. 3 was due to pitot system errors alone. The remaining error can be assumed to be due to static system error, as our recent AS-W 19 test data shows in Figure 4.

One more moderately high tow was made to isolate and measure the AS-K 21 pitot system error, and those test data are shown in Figure 5. Note that these pitot system errors were approximately zero below 75 knots (140 kph) indicated airspeed, but above that speed the errors increased steadily. This error A pressures were not steady at a given airspeed. They fluctuated abnormally, apparently due to unsteady vortex airflows within the fuselage nose cavity which houses both the air vent and pitot inlets. The air vent was closed during our tests, and possibly different results would have been measured had it been fully opened. I neglected to think of this until after the test flight.

The + direction error means that the pitot system senses less than full dynamic pressure, and therefore the sailplane is really flying faster than the ASI indicates. This less-than-full dynamic pressure indication is likely due to the cross-flow effect in the fuselage nose flush pitot, caused by an increasingly negative fuselage angle-of-attack with airspeed. The handbook shows that the error can be as great as + 22 knots when flying inverted, but the factory does provide a pitot tube extension which the handbook recommends for use with inverted flight to reduce the pitot system errors caused by flying at those large negative angles of attack. We did not test the ASI system with the pitot extension installed, but there is little doubt that such an extension would reduce the pitot system errors.

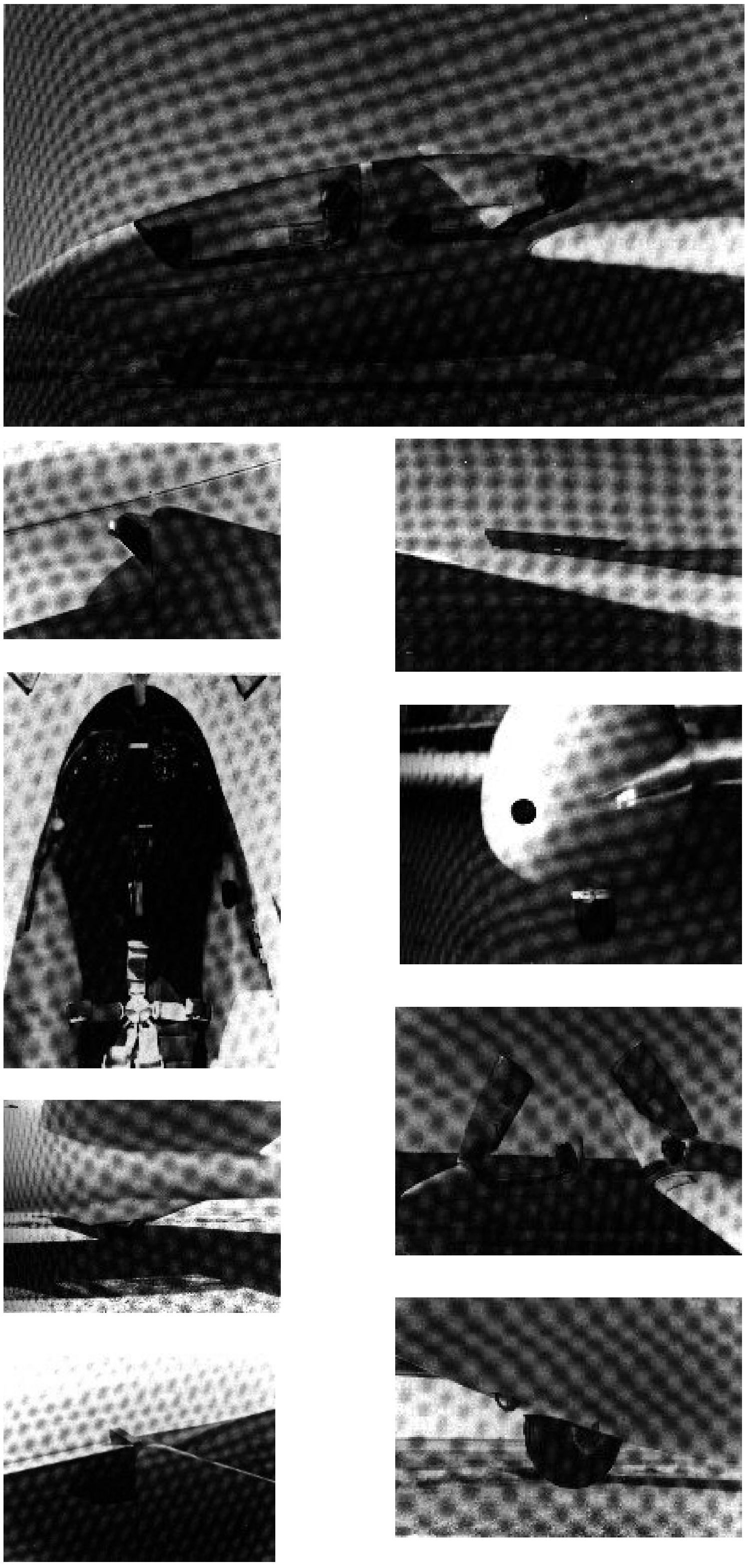
The AS-K 21's wing panels appear to be well made and expertly finished. Their thickness-to-chord ratios measured .1991 at the wing roots, .1975 at the aileron roots and .1470 at the aileron tips. Each wing panel weighs about 215 pounds (97.6 kg), so three or more robust people usually are needed for assembly.

The stall characteristics are excellent, with little tendency to wing drop during stalls from either straight or turning flight. However, little if any prestall buffeting occurs; therefore one needs to pay attention to the ASI, especially when flying at low altitudes. The AS-K 21's thermal circling characteristics were very good when tested in our weak winter conditions, and the 15-meter single-seat sailplanes flying with us appeared to have only a slight advantage. Rolls from + 45 degrees to -45 degrees required about 4.5 seconds to perform when flying at 50 knots thermaling airspeed. Control coordination is perhaps a bit better than that experienced with the Twin Grob.

The aerotow hook is sensibly located about 3.5 inches forward of the nose wheel, and that made aerotowing easy. A second ground launching (auto or winch) towhook is provided further aft, about 36 inches forward of the main landing wheel. This aft towhook location is not recommended for aerotowing, and therefore was not included in our testing. The main wheel is mounted on a shock-absorbing strut that helps smooth out rough airfield surfaces and hard landings.

The airbrakes are top wing surface Schempp-Hirth parallelogram-type plates that are each about 54 inches (1.38 M) long. They operate well and provide very good glidepath control. The rear cockpit is somewhat small and cramped for a six-foot two-inch (1.88 M) person, and not as comfortable as the Twin Grob. On the other hand, the fuselage buffeting observed with the Twin Grob above 50 knots was not found with the AS-K 21, probably due to the better main wheel fairing on the Schleicher ship.

The rear cockpit of the AS-K 21 uses an aft-hinged canopy that is unforgiving if left unlatched on takeoff, or inadvertently unlatched during flight. Suction (negative pressure) airloads exist over that canopy most of the time such that it will lift open immediately during most flight conditions if not properly latched. We did not test



A pot pourri of bits and pieces of the AS-K 21 with cockpit and canopy details, the wheel and fairing arrangements, a look at the nose pitot/ air vent intake and the automatic elevator hookup on assembly starting with S/N 205. Note two tow hooks, ahead of nose wheel for aerotow and ahead of the main for ground launches. The ship rests on the nose wheel when occupied, making crosswind takeoffs and rollouts easier to manage. Autor counsels care in latching rear canopy, and recommends installation of new interlock system on ships that weren't built with it.

this item ourselves, but I understand that the rear canopy will tear itself free if opened in flight. An unlucky impact with the tail surfaces could possibly cause sufficient damage to render the sailplane marginal or worse in terms of controllability. Recently a new rear canopy interlock system connected to the front canopy has been introduced, and that should greatly improve that situation. These interlock systems are offered as a backfit kit so that AS-K 21's already in service may be thus modified.

The forward canopy is front-hinged like the AS-W 20, and it is an excellent configuration providing easy access to the entire cockpit and instrument panel. Visibility from both cockpits is quite good, and the cockpit controls are simple and easily operated. In summary, the AS-K 21 is a fine sailplane overall, but in my opinion the improved rear seat canopy latching system is needed.

Thanks to Fred and Carol Taylor for the generous use of their fine new sailplane for flight-testing and to DGA for providing the towing funds. Also to Fred and the other tow pilots who generously gave of their time.

References

A. Johnson, R. H., "A Flight Test Evaluation of the Grob 103 Twin II," *Soaring,* Feb. 1983.

B. Johnson, R. H., "A Flight Test Evaluation of the Grob 102 Club IIIb" *Soaring, Jan.* 1984.

The reader of flight test evaluations should recognize the data are subject to uncertainties regardless of the method used. The data presented are those measured and experienced, but they do not purport to be absolute or always repeatable and comparable to other data. Hence they should be used with appropriate consideration of the implications and uncertainties involved. ED.