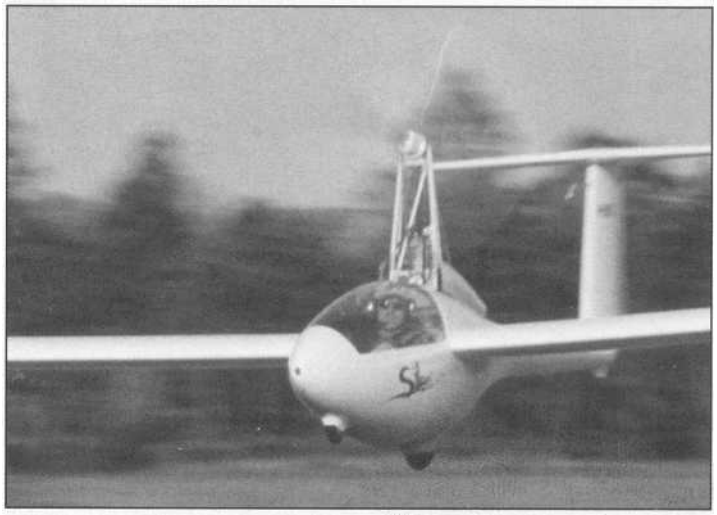
The Alisport Silent-IN

A report on an interesting small motorglider from Italy.

by Dean Carswell

Author Dean Carswell after a successful flight.



A powered flyby.

The Silent-IN self-launch sailplane is fully independent: from its hangar into the air and then back to the hangar, it needs no towing, wing walking or tip running at takeoff. It is a small 12-meter (39.4-ft) span simple sailplane of all-composite (carbon and glass-fiber) construction, control surfaces included. Maximum gross weight is just 640 lb, and it carries a nominal payload (including fuel) of 265 lb. The best glide ratio is around 31:1 at 43 kt. The Italian-designed glider is offered by manufacturer Alisport complete, or as a kit.

A unique feature of the IN is its patented one-blade fixed-pitch propeller driven by a 28-bhp Alisport A300efi single-cylinder fuel-injected two-cycle engine with electronic ignition and full authority digital engine control (FADEC). This was developed jointly with the engine company Zanzottera and is manufactured by Alisport. The counterbalanced single-blade propeller is attached to a teetering (as opposed to rigid) mount at its hub, intended to reduce vibration and weight.

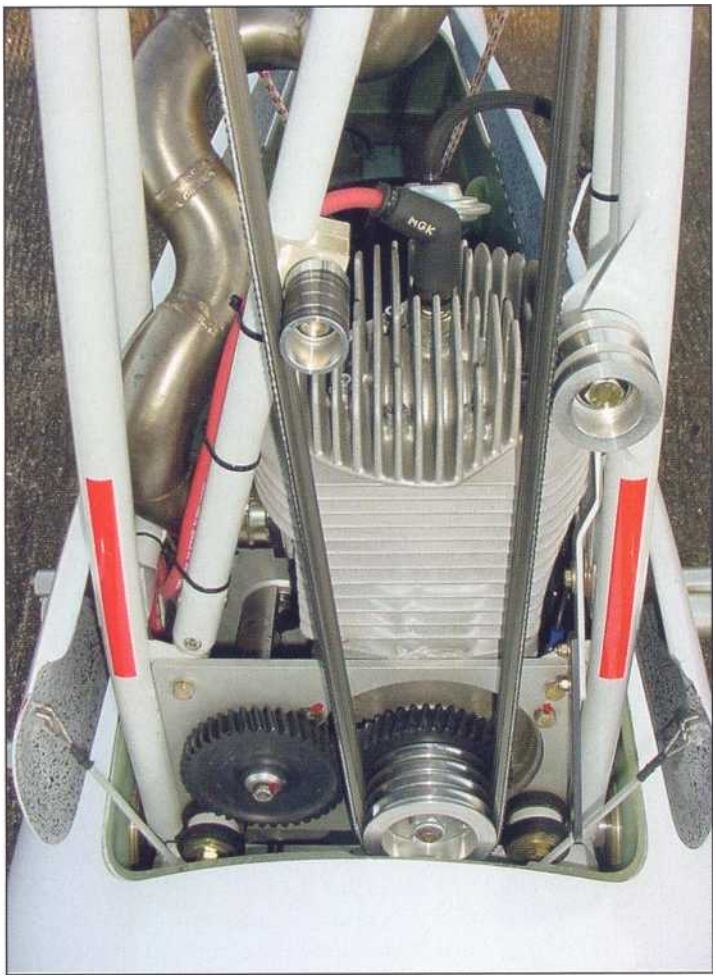
The glider is of conventional design with a T -tail, three wheels (nose, main and tailwheel, all non-retractable), and is designed to specifications which will likely conform to the FAA's expected requirements for light sport gliders under its sport aircraft and pilot initiative. Components are light - the wing panels weigh about 87 lb each making for easy rigging. All flight controls hook up automatically. The propeller is mast mounted and retracts electrically into the center fuselage behind the cockpit. When the mast is fully extended, the engine, mounted near the bottom of the mast, is exposed to the airflow for cooling. Fuel is premium unleaded gasoline (with oil mixed in) stored in a 5.3 gal tank located in the fuselage close to the mainwheel. The tank is translucent, so quantity can be checked visually on the ground. The steerable tailwheel and forward-hinged canopy are two valuable options. Basic price delivered to Baltimore, MD is $37,200 (kit $26,900); as tested with these options, the list price is approximately $39,150 including engine and basic flight instruments.

Quick release harness: one piece shoulder strap loops under the wing brace tubes.

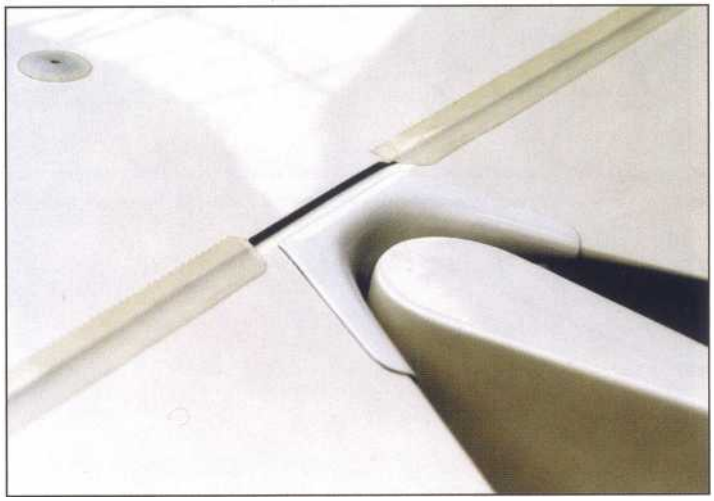
The cockpit is reasonably roomy, with a fixed seat position fitted with a 4-point harness and ground-adjustable rudder pedals. The seat pan is deep, a good safety feature. Alisport reports that a slender 6'3" pilot with parachute can just get in; at 5'9" and 150 lb, I found the cockpit roomy.

At rest, with the tail on the ground, visibility all around is good, with the rather small instrument panel never intruding into the view. The engine instruments and controls (other than the throttle, located by the pilot's left thigh) are set all together in a very compact console directly below the instrument panel. The controls come easily to hand, with all the secondary flight controls (flaps, airbrakes and elevator trim) mounted in that order, one below the other, on the left side of the cockpit. Each control has a distinctly shaped knob to pre-

Controls (top to bottom): flap, airbrake, trim, throttle, blade stop, and door lock.



Alisport A300efi fuel-injected engine: the external gear-driven counterbalance shaft is visible to the left of the drive pulleys.



Elevator connection.

Elevator automatic control connection.

Launching from a grass runway.

vent confusion.

Raising the mast is simplicity itself - master switch on, press the rocker switch to `up', and up it goes, the extension process completing automatically, confirmed by the illumination of a green light. Engine ignition is prevented until this happens. Once up, the engine can be started immediately, with throttle closed, by turning on the ignition switch (which activates the fuel pump and FADEC), then pressing the starter button. Engine start is immediate, and it idles at 1,800 - 2,000 rpm. There is no other engine gauge: the FADEC allows progressively higher power settings as the engine warms up, and reduces power if necessary to prevent overheating or over-revving.

After a couple of minutes the engine is warm enough to start the taxi to the takeoff point. Tailwheel steering is positive and instantaneous without any backlash. Prior to takeoff, the single-ignition motor is run up to full power (a little over 6,000 rpm)

The pylon/engine control switch panel is located at the base of instrument pod.

which is easily held by the wheel brake, activated by the airbrake lever. Other checks are standard glider procedure.

Lined up for takeoff, the throttle is advanced to full power, causing the nose to pitch down onto the nosewheel. Acceleration is swift with no tendency to swing. The full-span flaperons give immediate lateral control, and there is no sign of excessive pitch sensitivity. The glider is responsive, but not twitchy. Takeoff roll is short - the flight manual quotes 400 ft on asphalt and 600 ft for grass. Best climb seemed to be about 43 kts (yellow triangle speed) and the nose had to be raised fairly quickly to keep the airspeed down to this value. In the climb, the nose-high attitude caused a large blind spot, necessitating a gently weaving flight path to clear the area ahead.

A timed climb to 3,000 ft (the first 1,000 ft with full power at 6,200 rpm and the rest at 5,850 rpm) took almost exactly 10 minutes. Engine noise level is high (as might be expected with the engine a few inches behind the pilot's head) but use of ear defenders made it quite unobtrusive. At a safe altitude, I experimented and discovered that, at climb power, the Silent stalled around 35 kt at a ridiculously nose-high attitude after some gentle tailplane buffeting. Recovery was immediate upon lowering the nose. Stalling in the climb would take an almost blind, much distracted pilot. However, in the event of power loss the nose needs to be quickly lowered to a safe gliding attitude.

Maintaining 5,850 rpm, I lowered the nose to stabilize the glider in level flight; this gave a cruise speed of around 60 kt (engine-on operation is restricted to 73 kt). The brochure quotes fuel consumption at 75% power (5,750 rpm) of 1.3 gal per hour, or a potential absolute range of about 200 run. This would be increased by using a 'sawtooth' engine on/engine off flight profile. Engine shutdown and retraction needs careful sequencing, accomplished in my case with about 200 ft of height loss - with familiarity and practice this could likely be reduced by around half. Air restarting is as simple and quick as the initial start on the ground.

Control harmonization is pleasant and, as befits a 12-meter glider with full-span flaperons, roll rate is very good - the factory reports 45˚ to 45˚ (from start to stop) in 3.0 seconds. As in most gliders, adverse yaw is significant, but there is sufficient rudder authority to remain coordinated at maximum aileron deflection. The stall with the glider clean occurred with similar warning to the power-on condition at a slightly slower speed, and with a slight wing drop. Recovery is immediate when the nose is lowered. Spinning and aerobatics are prohibited. Cockpit visibility is good, and it is possible to see the tips of the horizontal stabilizer by leaning forward slightly. Ventilation is good from a nose vent and the usual scoop on the side window.

The glider thermals very pleasantly - in the conditions I encountered, best rate of climb was at *38-39* kt. Turning, it sat nicely in the groove, mostly hands off at 30 to 40 degrees of bank. The brochure quotes a minimum sink rate of 138 fpm. `Normal' operation seemed best with the flaps set at the 0° takeoff/climb setting, which has a permitted maximum speed of 86 kt. Redline with flaps at minus 7° is 108 kt.

Opening the single-element top-surface Schempp-Hirth type airbrakes with stick held resulted in a noticeable nose-down pitch movement. This, however, can easily be avoided by maintaining the nose attitude relative to the horizon; doing this seemed to cause little airspeed reduction. Closing the airbrakes had a similar pitch-up effect, again easily controlled. On

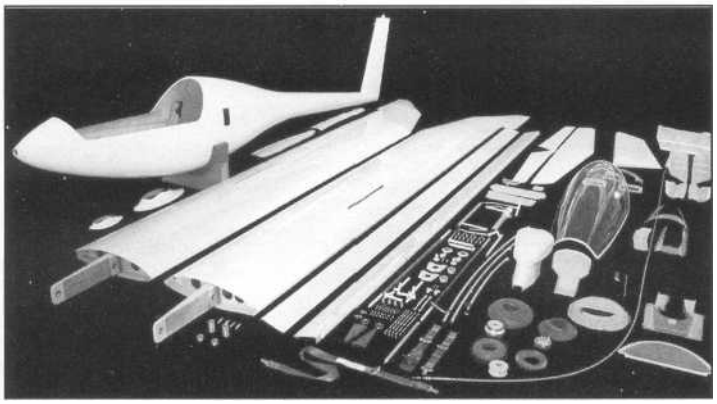
Engine Details
by John Good

Few pilots can look at the Silent-IN's propulsion unit without remarking on the unusual single-blade propeller. This is the most striking detail of this innovative engine installation, but not the only unusual one. Others include a "teetering" propeller hub, an external anti-vibration shaft and a sophisticated engine-control computer.

Why a single blade? The simple answer is that this permits the largest propeller disk area for a given size opening in the fuselage. It doesn't seem as if a single blade could be balanced, but with a tungsten counterweight of the proper size, it is. The counterweight is mounted aft of the axis of the blade, which allows it to balance the blade's thrust at all rpms. The blade and its counterweight are hinged at the hub, so they are free to "teeter" in operation, which greatly reduces stress at the hub. Precise design of the counterweight means that the teetering action extends through less than a degree from idle to full power - the path of the blade tip varies less than a centimeter.

A simple single-cylinder engine is inherently unbalanced and must produce significant vibration at essentially all rotational speeds. Alisport has included an external anti-vibration shaft to address this problem. The result doesn't match the balance of a V-6, but is a big improvement on the teeth-rattling action of many "one-bangers." A reasonably sophisticated engine mounting system also helps.

The engine-control computer goes by the acronym FADEC - full-authority digital engine control. The pilot moves a throttle lever which directly controls the position of the throttle-body butterfly valve. The computer measures the butterfly valve's position (along with other parameters such as temperature and altitude) and sets mixture and ignition timing for best results. The result is easy starting and simple, reliable power control.



The Silent-IN is also available as a quick-build kit.

approach, the airbrakes are moderately effective. Descent rate can be quickly increased by slipping. At approach speed with airbrakes out, there is a clear view ahead over the nose. On touchdown, the steerable tailwheel gives excellent directional control. Rolling out clear of the runway, raising the mast and starting the engine is accomplished in a very few seconds, enabling the pilot quickly to taxi away.

To summarize, the Silent-IN is a simple, pleasant-to-fly, sailplane which taxies out to the runway, self-launches, soars sweetly, and, after landing, taxies back to the hangar. In a word, delightful!

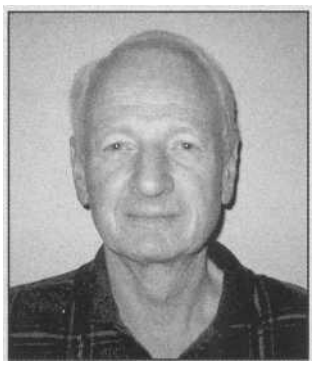
What is needed to fly a Silent-IN? As a self-launching glider, it requires a CFIG signoff following ground and flight training in self-launch procedures and operations (FAR 61.31(j)(iii)) - i.e. in a two-place self-launch glider (unless the grandfather provisions of the FAR apply). It can, of course, be aerotowed but that defeats a large part of the object. How much prior experience is needed before conversion can be safely accomplished? Apart from the complication of the engine, and even allowing for its wing flaps, this is essentially a simple glider - probably of the same order of difficulty as a World Class PW-5 or a LET L-33 Solo (the single-place 'Blanik'). The addition of an engine should be coped with by a careful study of the flight manual, a thorough ground briefing, a structured (read good checklist) approach to raising / starting / stopping / retracting the engine and practice in doing all this on the ground. As always, a careful and systematic approach to this process (Ref. 1) will pay dividends and avoid unpleasant surprises.

The Silent-IN is marketed in North America by Alisport's representative Leo Benetti-Longhini, who can be contacted at <info15@alisport.com> (or see the website: www.alisport.com).

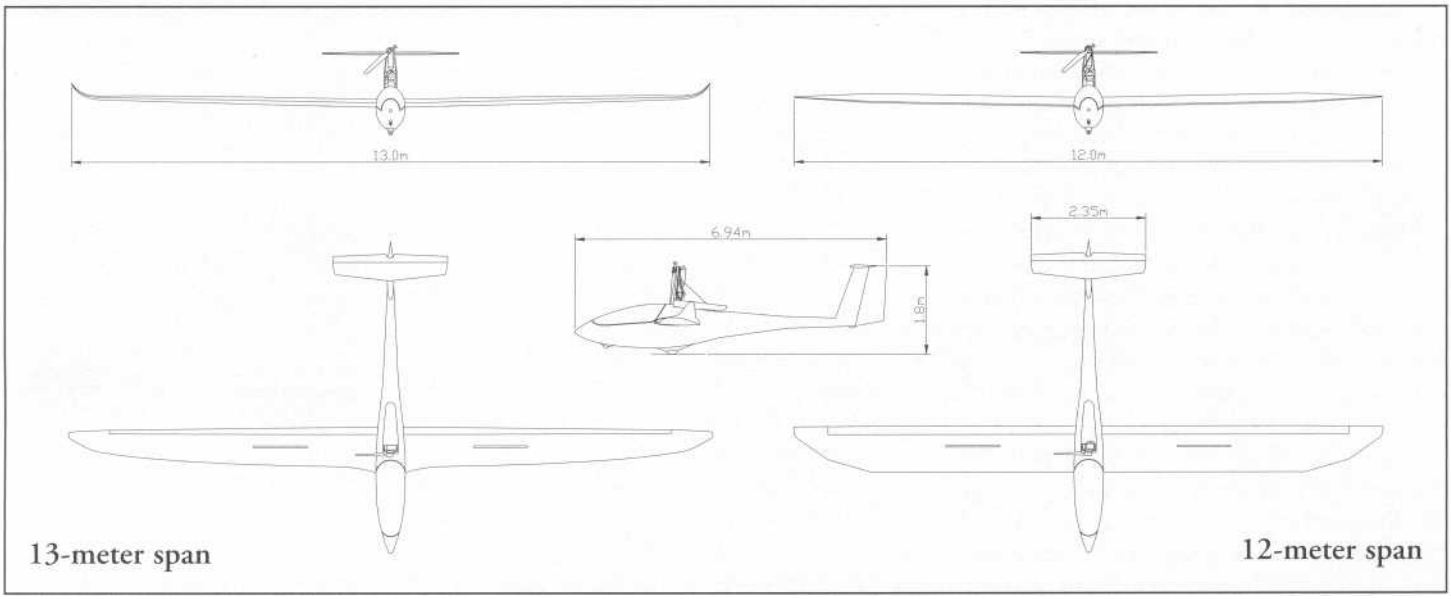
Reference:

1. Carswell, Dean: Sailplane Type Conversions, *Soaring*, September 1996, page 18.

About the Author:



Dean Carswell is a long time instructor, the SSA's Chief Master Instructor and, until very recently, the President of the Auxiliary-powered Sailplane Association. He has over 2,800 hours glider flight time, holds a Gold badge with 2 diamonds, and has flown over 130 different models of gliders.



New Wings

Alisport has recently announced the development of an additional model of the Silent-IN, (to be called the Silent 2 IN) with a new 13-meter (42.65-ft) span carbon-fiber elliptical wing. A glider with prototype wings was displayed at the SSA Convention at Dayton in January 2003. This is an exciting improvement: aspect ratio is increased from 14 to 19.2, wing area decreases from 110.9 to 94.7 sqft, and wing loading increases from 5.75 to 6.96 lb/sqft. The result is an increase in the calculated best glide ratio from 31 to 39. Production is scheduled to begin in the second half of 2003.