ALDO CERNEZZI says

Soaring Fun

is the

SILENT ELECTRO

The Silent Electro is the latest development in a line of Italian made ultralight gliders. First came the Dream in 1991, a very lightweight, 12 m span, pure glider designed and built by Walter Mauri. His encounter with an entrepreneur gave birth to the Alisport factory, which produced the Silent in many variants, available as a complete kit for home-builders, or as a finished aircraft. More than 80 gliders were made in the 12 m "Club", or in the 13.3 m wingspan "2" and "Targa" editions. A vast majority features self-launching capability. The most common is the 2-stroke, single cylinder, fuel injected engine on a retractable pylon, driving a counterbalanced single-blade propeller. A few Silents have been built with jet-turbine engines, as well as an electric retractable engine.

The Electro incorporates all the features of the Targa version. It has a retractable landing gear, the new vertical winglets, and a variable incidence tailplane which is controlled via the flap lever.

What distinguishes the Electro from the previous variants is in the nose cone, as there is an electric engine with folding propeller. It was developed in co-operation with Luka Znidarsic of Slovenia, who produces the retrofittable (usually to LAK sailplanes) FES self-sustainer system.

The propeller blades are hinged on their hub, which is a cut-off from the original nose cone. When rotation is stopped, the blades fold and lay very close to the airframe. When the engine starts spinning, the blades open due to centrifugal effect, and the propeller provides traction. Recent independent Idaflieg measurements, in the words of the designer of the propulsion system, have demonstrated that the folded blades produce negligible or no drag at all.

I found that the blades do not stick to the folded position. Alisport suggests the use of a simple fabric wrap-up device, that keeps the blades folded. This must be removed before flight and until then actually protects the propeller from accidental ground damage (such as

Photos: Mattia Rigamonti and Aldo Cernezzi

SPECIFICATIONS

Length	6.35 m
Wingspan	13.3 m
Height	1.25 m
Wing area	8.9 m²
Aspect ratio	20.0
Empty weight	205 kg
(With recovery system)	212 kg
Gross weight	315 kg
Max. cockpit load	105 kg
Maximum speed Vne	220 km/h
Cruising speed	150 km/h
Maximum glide ratio	40 at 90 km/h 30 at 120 km/h
Min. sink rate	20 at 150 km/h 0.60 m/s
Cockpit width	0.56 m
Cockpit height	0.91 m
Wing profile	IMD 050 (16%)
Wing loading	34 kg/m²
Stall speed	64 km/h
Roll rate +/-45°	2.8 s at 80 km/h
Stall speed (Vs)	< 65 km/h
Take-off distance (hard)	~ 140 m
Take-off distance (grass)	~ 160 m
Landing run	~ 100 m
Max. G-loads	+5,3 g / -2,65 g +4,0 g /
Wing loading at 300 kg	34 kg/m2
Engine (DC Power)	Brushless 23 kW
Average rate of climb	2.0 m/s
Engine weight	6.5 kg
Engine r.p.m.	4.500 rpm
Propeller diameter	1.00 m
Battery mass (2 packs)	31 kg
Battery capacity	4.3 kW/h
Recharge duration 150 min at 220 V	approx.

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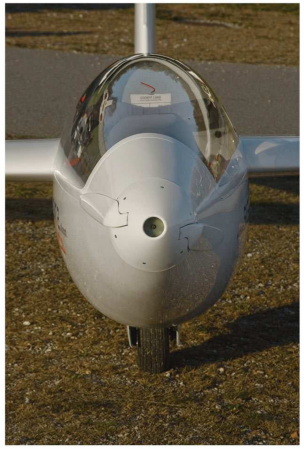


The folded blades lay close to the airframe without touching it.

by persons passing by).

AIRFRAME

The fuselage is carbon and glass fibre composite with epoxy resin. The wings have an elliptical planform, and new taller vertical winglets have been fitted instead of the older rounded "ears" of LS-style. Carbon is used both in the sandwich skins and in the tapered I-beam wing spar. Pultruded carbon rods make the spar caps lighter and stiffer. Flap extension ranges from landing L +8°, to +4° for thermalling, to 0°, -4°, and S -8° reflex positions for cruising. Schempp-Hirth-type spoilers extend on the upper wing surface only.

The structure has been stress-tested to 8g and was the object of aerolastic investigations by the University of Aachen as part of the German design approval procedure. The tailplane has been redesigned, also with elliptical planform to minimize drag.

Pitch-trim is unusual and advanced. The stabiliser angle of incidence is governed by the flap setting. The five settings of the flap control produce corresponding changes to the stabiliser incidence, thus defining the trim airspeed in relation to flap inputs.

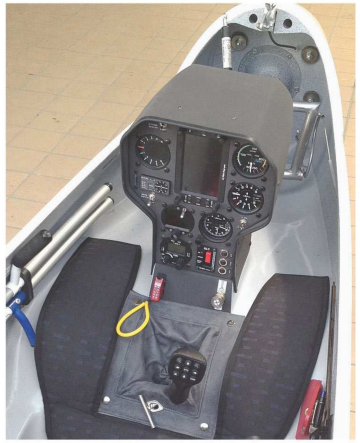
The retractable main wheel behind the pilot has a shock absorber and drum brake activated by the aft part of the airbrake extension lever travel.

Rigging the glider is easy and effortless when compared to any traditional, heavier sailplane.

Finish quality is very good, but in the low sunset light I noticed some small imperfections of the wing surface, chordwise. These are barely visible and will most probably have no implications on aerodynamic performance.

COCKPIT

The whole idea of an ultralight glider involves weight savings by definition. Pilots up to 180-185 cm tall will fit comfortably. The headrest consists of simple straps with padded foam. The tubes that connect the left and right main wing-fuselage pins converge behind the pilot's shoulders, saving several inches of available cockpit length. The front-hinged canopy, made of high quality materials, is supported by a gas-spring and produces no optical distortions.



The tall (optional) instrument panel. The yellow ring is the tow cable release

Rudder pedals can be adjusted in flight. The owner may choose between a small instrument panel, and the larger version as installed on this example. There we find more room for modern equipment and graphic displays, but forward visibility is significantly reduced during ground operations, at least until the tail can be raised from the ground.

ENGINE AND SYSTEMS

The engine is derived from the system called Front Electric Sustainer, designed by Luka Znidarsic for installation or retro-fitting on pure gliders by simply changing the nose cone and the subsequent recertification as a motorglider. The FES as installed on big gliders like the 18m LAK-17 allows slow climbs and should be used only as an aid to self-retrieve before committing to an outlanding.

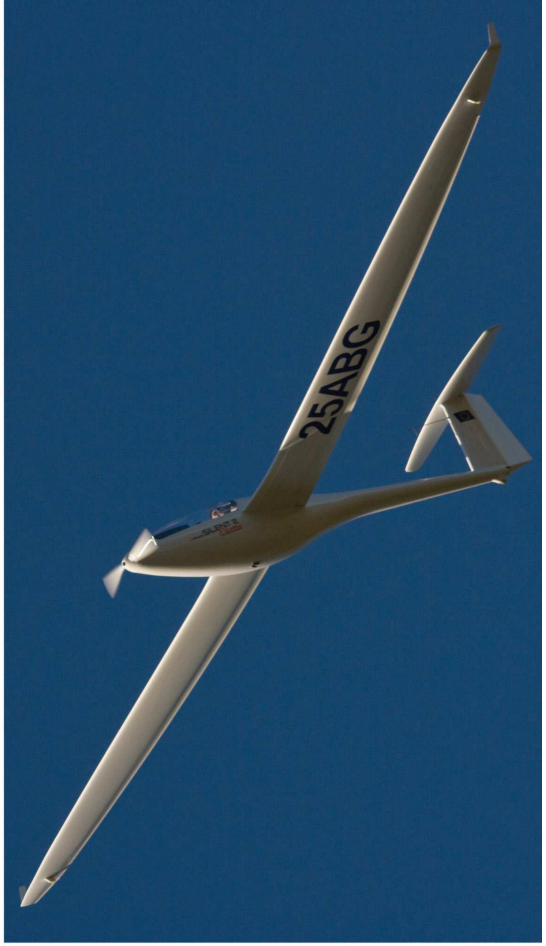
With a more powerful engine, and appropriate electronics, the Silent Electro is able to self-launch safely and with reasonable range. Lithium-polymer batteries are grouped into two packs weighing 15 kg each, which are fitted into a fuselage compartment behind the wing, accessible from the outside. For charging the batteries can be removed with a simple operation. You can buy more packs, and a quick exchange allows repeated take-offs in rapid succession.

On the panel a small instrument displays information and controls delivered power. Starting procedure requires to first activate the master breaker contact, to then power up the instrument, a rapid check of essential data (some in very small fonts: state of charge of the battery, temperature, power), and finally turning on engine power by rotating the small knob clockwise. It can be "spinned" to obtain a very quick shift to maximum or no power, or can be fine-adjusted turning it in progressive steps, each corresponding to 1 kW of power out of a total of 23 kW. Nevertheless, I still would prefer a larger, more traditional "throttle" lever, and I'm told that the factory is working on it.

The engine responds immediately, making it easy to modulate the thrust for taxiing, takeoff, and the early stages of the climb. At low engine speeds the engine emits a low-pitched, almost grinding sound. At very high speeds it is higher-pitched and more "usual" in tone.

TAKE-OFF

Getting acquainted with the operational procedures is quite easy, certainly more than it is for retractable 2-stroke engines. The take-off run shall start with a progressive increase of the power, as I'd better minimize the risk of propeller damage. Still, the tail should lift off more than 80 cm (almost 3 ft) for the prop to hit the ground. Thrust generates very little pitch-down moment, but the tailplane is immediately effective and my weight (in front of the main gear) is very close to max cockpit load.



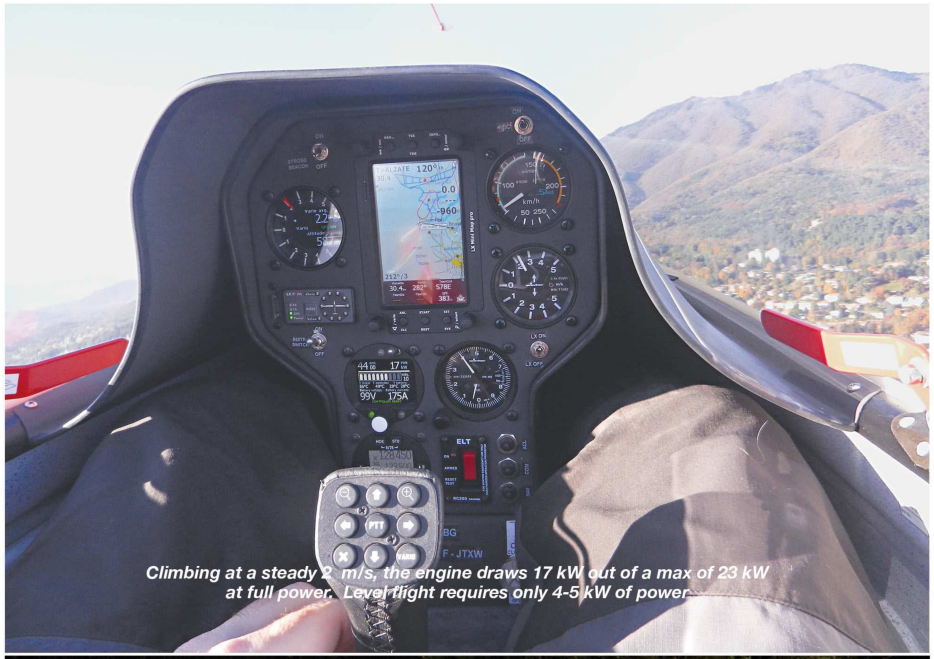
The Silent Electro export price is E60,210. To this add E4,100 for the optional sailplane ballistic recovery system.

I now understand how limited front visibility is, though only in an angle of about 15 degrees horizontally, due to the high instrument panel. Speed builds up surprisingly quickly, and I soon reach 80 km/h when the sailplane lifts off and climbs happily, at a bit less than 3 m/s (6 Kt.).

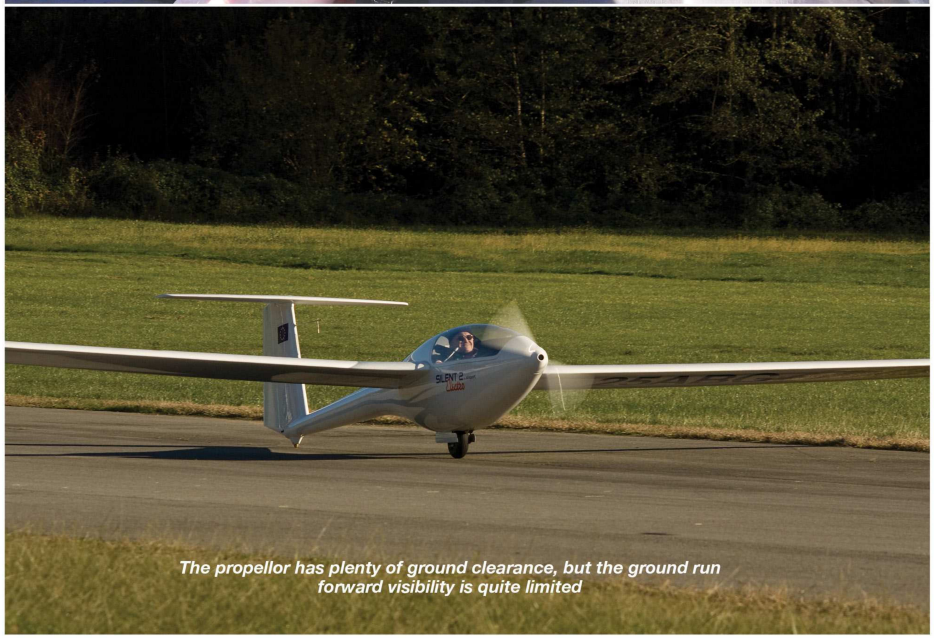
Operating temperatures of the engine unit and of the power regulator remain well within the limits, proof of the good work done on the cooling airflow after the first tests two years ago.

After a short climb, I check the behaviour at very low power settings, and this is where the FES and the Silent Electro really differ from other propulsion systems. Thanks to the clean aerodynamics, the lack of a retractable pylon allows the Silent Electro to maintain altitude with only 4 or 5 kW of power delivered to the engine. In these conditions the range extends to over 45 minutes which will allow level cruising for almost 100 km.

I then resume the climb at the moderate setting of 11 kW. At full power the motor drains 23 kW and the battery will last for about twelve min-



Climbing at a steady 2 m/s, the engine draws 17 kW out of a max of 23 kW at full power. Level flight requires only 4-5 kW of power



The propellor has plenty of ground clearance, but the ground run forward visibility is quite limited

utes. To my surprise, it's easy to gain altitude even at quite low settings, flying through weak bands of rising air, which allows great energy savings. I reach the 1,200 meters QNH of the Campo dei Fiori in Varese (a climb of 1,000 meters), and yet I still have just under 50% of the total battery capacity.

Engine performance is indifferent to density altitude, only the propeller loses 4% of its efficiency per 1.000 m of altitude. In-flight restarts are easy and immediate, with no perceptible altitude loss.

The nose cone incorporates an air intake, which provides engine cooling but not enough airflow in the cockpit. During a hot summer day, the engine will probably be ok, but pilot comfort may not be optimal as the canopy window seems also very small.

Retraction of the main landing gear is operated mechanically with a lever which is unusually situated in an aft position, more or less under the left elbow of the pilot. I choose to operate it with my right hand, while holding the stick temporarily with my left hand. Extension is totally effortless, and retraction is light as well.

Flap control is traditional, but still a tall pilot like me finds its more aft (positive) settings a little bit difficult to reach. Control force is moderate albeit with some friction. There is no trim control, as it is no longer needed thanks the variable incidence of the tailplane. The stick opposes almost no resistance to push and pull inputs at low to moderate speeds, and this is quite unusual but by no means a problem. Longitudinal stability is still excellent, in spite of what I might have expected.

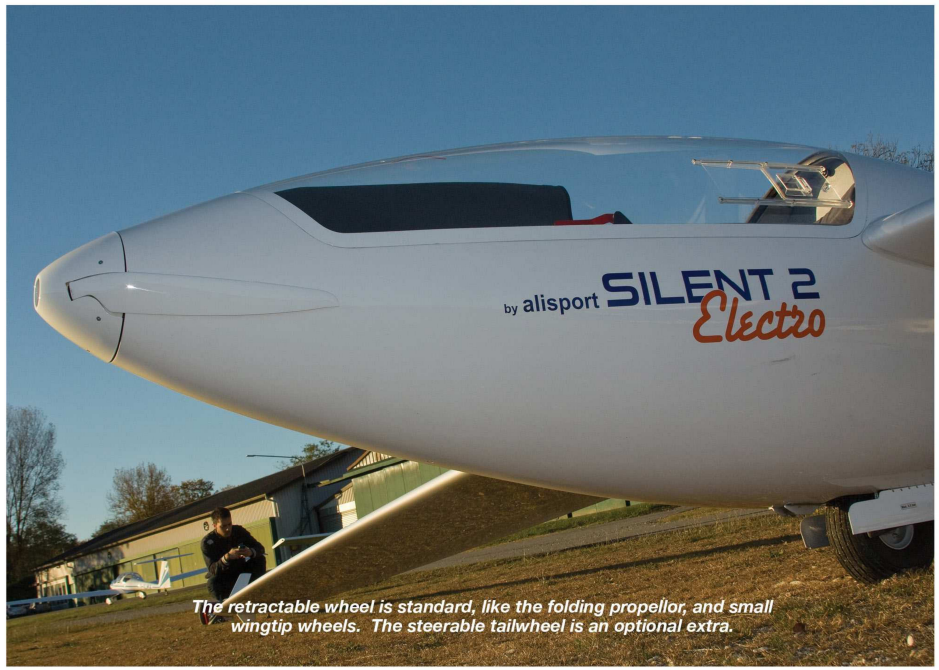
Aileron forces are also very modest, and this well matches pitch control, though the effect is very quick. Roll inversion (+ / - 45 ° of bank) requires less than three seconds with neutral flaps, and about 0.5 s more with positive flaps, well below the usual values for larger gliders.

The rudder must be used with care to produce a coordinated turn at full aileron deflection. As much as half of the vertical tail surface is rudder, so it's a bit too effective and should be used sparingly. A smaller chord of the rudder, or maybe a taller fin might probably improve yaw stability at low speeds.

At higher speeds and up to Vne, control forces get proportionally higher and the Silent is very enjoyable, with a straight and very stable glide.

The stall seems absolutely normal in every flap setting. The aerodynamic buffeting is perceptible. Wing drops (the prelude to a spin) only happen if the stick is held all the way aft, and of course it is quicker the more positive the flap is set. In most cases, it's the right wing that drops so maybe there is a small asymmetry of aerodynamic controls or surfaces.

After a while I feel confident enough to perform very narrow turns and some careful low-altitude ma-



The retractable wheel is standard, like the folding propellor, and small wingtip wheels. The steerable tailwheel is an optional extra.

noeuvres, for the sake of press photography. This sailplane, as compared to modern, heavier gliders of larger span, makes me feel as if I am riding a very light motorcycle, of the kind that, during a turn, you may kick the ground to maintain control and save yourself from an imminent fall.

THE SILENT IN THE GLIDING WORLD

Bureaucracy is not the same everywhere. Countries where the burdens of regulation are more adversely affecting sports aviation will find an answer in ultralight sailplanes. Operating costs are reduced as well, mostly thanks to owner-maintenance and no "form 1s" for certification of components and spare parts. Also, rigging and ground handling are much less of a burden.

Buying price is favourably compared to larger new gliders, while the second hand market may offer the same or more performance at lower price. In pure gliding flight, the Silent offers Club Class performance, with modern and responsive handling, plus very light control forces, and it will fit the new 13.5 m FAI competition class.

The lack of an engine pylon on this powered sailplane leaves the aerodynamics unchanged during engine operation. Changes in power setting have no noticeable effects on stability and pitch. Many of the traps of power failure management, which can (but shouldn't) catch the pilot by surprise, are defeated, thus drastically lowering stress levels.

The system performed reliably during my flight, as witnessed by two years of extensive development tests performed by Alisport, and also by a tour of over 900 km in four days across Italy, performed by Leo Brigliadori and Luigi Bertoncini. All over the "safari" they used a total of only 12 minutes of engine and battery power, an average of three minutes before transitioning to free flight.

The batteries don't come cheap, but with a few precautions they should last for at least 10 to, maybe, 20 years of operation. Their enemies are the discharge to below the minimum specified voltage, the exposure to excessive temperatures, and the use of unsuitable charging equipment.

The Silent Electro creates a market niche in which it is the only protagonist. The final price (about 65,000 Euros excl. taxes) is interesting, especially when compared to its innovative features. The annual costs can vary in different countries, but can be close to nil. To improve the product the manufacturer should, in my opinion, design a new fuselage with sleeker shape to match the beautiful and modern elliptical wing, with a longer cockpit and a more traditional throttle and landing gear levers.

I would also like to see a two-seater Silent, for training and more social flying.