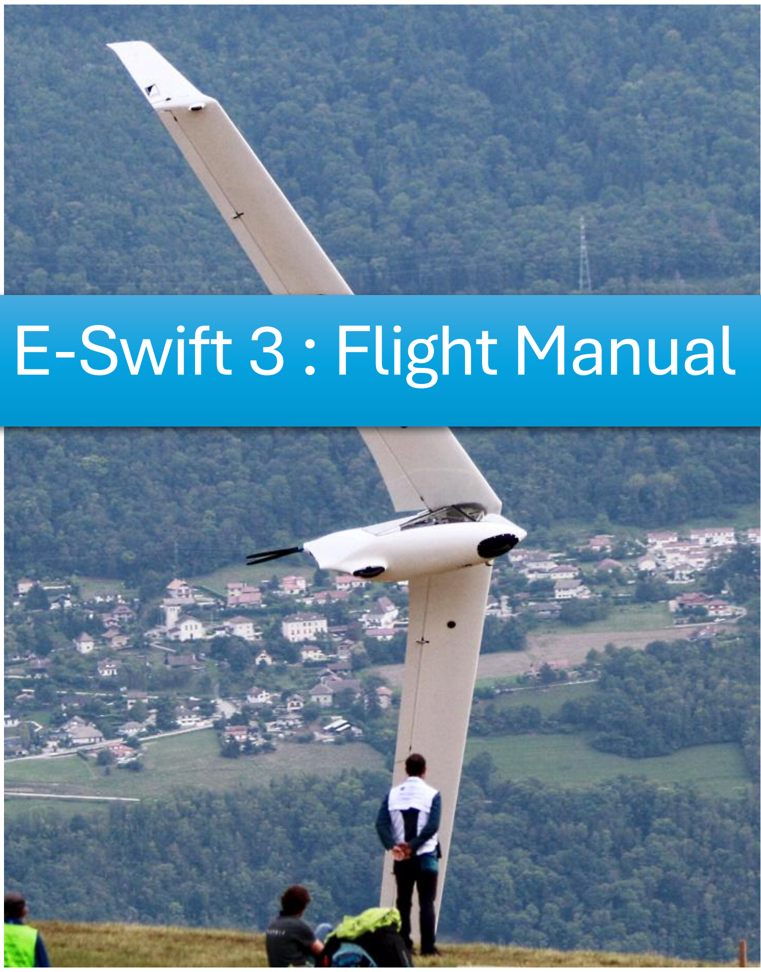
Microlight Aircrafts and Composite Engineering

SWIFT 3

E-Swift 3 : Flight Manual



Revision Record

Rev.	Date	Modified by	Description of Changes	Pages
1.0	10/9/2024	V. PIRET	First issue	All
1.1	17/9/2024	V.PIRET	Corrections JB	All
1.2	24/10/2024	V.PIRET	Battery info/Smoke and Fire	
1.3	24/2/2025	V.PIRET	Empty weight Motorization range Minimum level of charge	p.13 p.28 pp 18 & 23

Warning

You are about to become a pilot of the Swift 3 with electric auxiliary propulsion! Congratulations, and welcome aboard the most efficient ultra-light glider on the market.

The Swift 3 is designed to be safe and easy to fly. BUT, like any other aerial activity, flying the Swift 3 requires prior training, which includes not only learning how to pilot the Swift 3, but also understanding meteorology and aerology.

Flying this aircraft is entirely the responsibility of the pilot. It is up to the pilot alone to decide whether or not to take off, based on their own physical and mental abilities, the technical condition of the aircraft, and the current weather conditions.

The pilot assumes full responsibility for the technical condition of the aircraft and must always perform a pre-flight checklist.

Flying, even cautiously, involves risks that may result in injury or even death. Aeriane s.a. assumes no liability or warranty for these risks. Therefore, Aeriane s.a. is not covered by civil liability insurance related to aviation risks.

Reading and understanding this manual is essential before the first flight. Do not hesitate to contact us if any aspects are unclear.

FLY SAFELY!

A complete reading of this manual is essential before the first flight!

For assembly, storage, transport precautions, and maintenance, please refer to the separate document "**E-Swift 3 Assembly and Maintenance**"

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1 Reminder of Some Safety Elements

Be cautious of the propeller.

The folded propeller is barely noticeable when stopped, but it deploys abruptly at startup. Since the propeller is not in the pilot's field of vision, it's essential to ensure that no one is nearby before starting the engine!

Deploy the propeller smoothly.

Avoid a sudden opening of the propeller, which would place excessive strain on the propeller and motor shaft. Start the engine with the potentiometer set to the minimum.

Land with the engine off.

It is recommended to land with the engine off. In the event of a hard landing, this will significantly reduce damage to the propeller, engine, and pilot! Additionally, even at idle, the engine continues to provide thrust, which flattens the descent angle.

Restarting in flight: Be cautious!

The propulsion system is designed to be restarted multiple times in flight. However, the engine may still fail to restart, so you should always stay within the safety cone of a landing area.

Pay attention to the centering!

The Swift 3 is designed so that the center of gravity remains within the specified limits. This is crucial for a flying wing. It is essential to assemble the Swift 3 as designed and not add components that could alter the center of gravity.

Do not modify the airflow over the wings.

For example, attaching a camera trigger cable on the airfoil can dangerously affect wing performance, both on the upper and lower surfaces, especially near the leading edge.

2 Description

2.1 Philosophy - Use

The Swift 3 was originally designed as a free-flight glider, capable of being foot-launched. The design prioritizes flight characteristics in lift and at low speeds, with a focus on soaring performance—meaning without an engine. The aircraft is comfortable, robust, and safe, and it is the highest performing in its category.

The addition of an electric motor in the 'E-Swift 3' version makes the Swift 3 self-sufficient, freeing it from the constraints of other takeoff methods: foot-launched, catapulted, winched, or towed. However, it is an auxiliary power system—the motor is not meant to be used for the entire flight. The E-Swift 3 is best described as an ultra-light glider with an integrated takeoff device.

The main objective is to retain behavior as close as possible to the non-motorized version.

Thanks to its steerable nose wheel and wingtip wheels, the E-Swift 3 is fully autonomous during taxiing and takeoff, requiring no assistance.

The E-Swift 3 is not designed for aerobatic maneuvers.

2.2 Wings

The E-Swift 3 is a flying wing, meaning it is a tailless aircraft equipped with three types of control surfaces distributed along the trailing edge, starting from the center of the wing:

- **Flaps**, which are deflected to adjust the wing's lift, but are primarily used as trim to control the speed range.
- **Elevons** (elevators + ailerons), controlled by a side stick connected to a mixer, function as both pitch (elevator) control when deflected simultaneously and roll (aileron) control when deflected differentially.
- **Rudders**, mounted on the inclined wingtips (winglets), serve as yaw control. They only open outward and can be deployed simultaneously to act as additional airbrakes.

The aircraft is also equipped with airbrakes, which deploy only on the upper surface.

2.3 Taxiing

The landing gear consists of two main wheels aligned along the symmetry plane of the aircraft:

- The rear wheel, which bears 2/3 of the weight, is equipped with a disc brake.

- The front wheel is steerable.

The landing gear is complemented by the “tiplets”, two small winglets at the wingtips that integrate a small wheel, designed to protect the wingtips when stationary or during low-speed taxiing.

2.4 Motor and Propeller

The **electric motor**, installed behind the pilot and aligned with the propeller axis, is a pancake motor (large diameter compared to its length). This design allows it to rotate more slowly and eliminates the need for a gearbox, directly driving the propeller through a shaft.

The motor is powered by a **battery** located in the fuselage, beneath the pilot, approximately at the aircraft’s center of gravity. The battery includes a built-in **BMS** (Battery Management System), which is a critical safety component.

The **BMS** controls the charging and discharging of the battery, balances the charge across the individual cells, monitors the temperature, and prevents overcurrent. If any parameter exceeds set limits, it reduces or interrupts the current flow.

A specific **charger** is provided with the aircraft. During charging, the BMS monitors battery parameters and regulates the charging current.

The motor operation is managed by the **controller**, an electronic unit installed behind the pilot. The pilot controls the controller (and thus the propeller’s startup and rotation speed) via a small, easily accessible module equipped with a display that shows essential data such as rotational speed, current consumption, remaining battery charge, and temperatures of the battery, controller, and motor. The controller receives data from the BMS and the motor, only allowing the motor to start if all parameters are within permitted limits. If limits are exceeded during motor operation, the controller reduces power or stops the motor.

The **propeller**, which is propulsive and automatically foldable, is mounted at the rear of the fuselage on a shaft directly connected to the motor's axis.

Two propeller models are available:

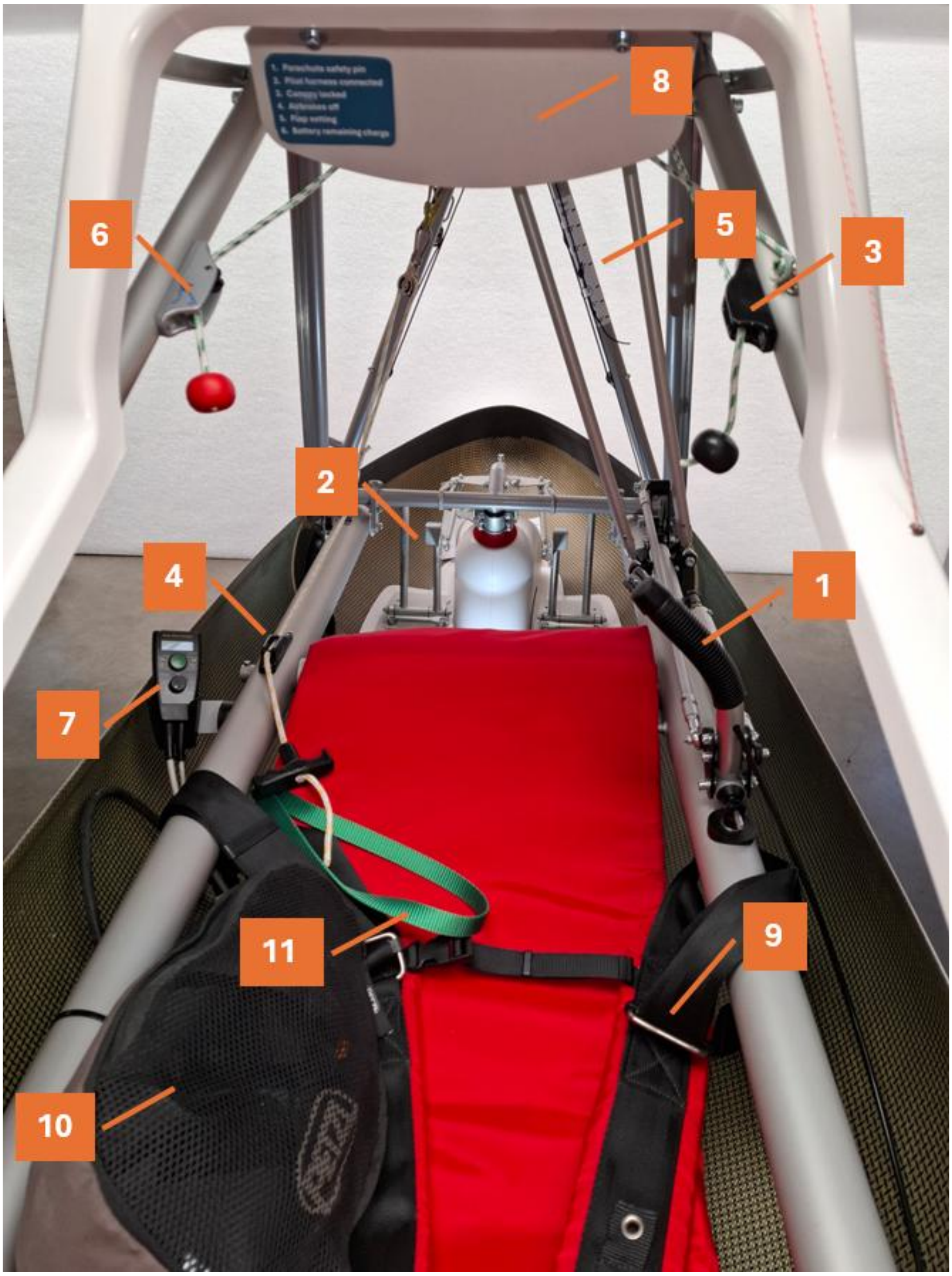
- A fixed-pitch, two-blade propeller, **Helix HK25**, diameter 1.4 m.

- An optional ground-adjustable pitch, two-blade propeller, **E-Props**, diameter 1.44 m.

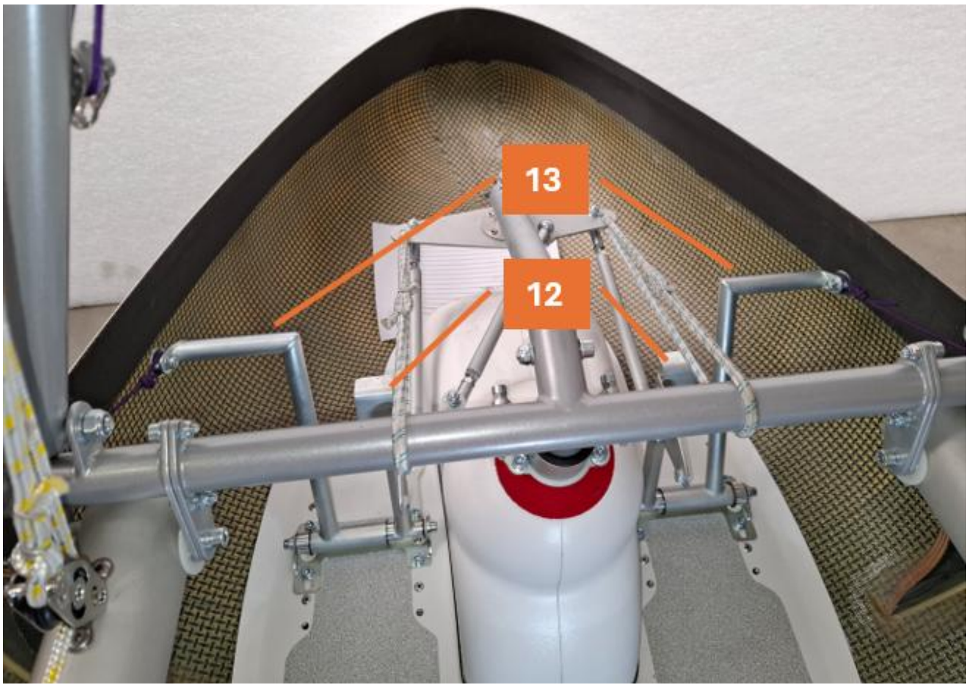
The **Battery (+BMS)/Charger/Controller/Motor/Propeller system** is a complete unit, and its integrity is essential for safety. Each component must be in good condition, undamaged, and cannot be replaced with other equipment without compromising the safety chain.

This system is provided by the company **Geiger Engineering**. Detailed documentation and a manual are available on their website (https://www.geigerengineering.de/en/avionics/downloads).

2.5 Cockpit



1. Stick (for controlling elevons)
2. Rudder pedals
3. Winglet rudder adjustment
4. Flap adjustment
5. Flap position indicator
6. Airbrake control
7. Motor control
8. Instrument mount
9. Shoulder straps with buckle
10. Harness
11. Harness attachment strap
12. Wheel rudder pedals
13. Winglet rudder pedals



Note: A pocket located behind the headrest allows for the storage of small hardware and flight documents.

2.5.1 Stick and Elevons

The elevons act as both ailerons and elevators. A short side stick controls the elevons through a system of rods and bell cranks, which is a rigid assembly entirely mounted on ball joints and bearings. The mechanism includes a pitch/roll mixer, making the elevon control feel exactly like flying a conventional aircraft. A ground-adjustable trim compensates for the weight of the control surfaces and allows for adjusting the speed of the aircraft with the stick released.

2.5.2 Rudder Pedals

The rudder pedals are split into two types:

- The **wheel rudder pedals** (12) control the steering of the front wheel during taxiing.

- The **winglet rudder pedals** (13) are independent of the wheel pedals and control the rudders installed on the winglets. They only open outward. The left pedal controls the left rudder, and the right pedal controls the right rudder. The winglet rudder pedals are not interconnected: they can be pressed simultaneously, providing an effective airbrake effect during approach (see the chapter on "normal procedures – landing").

It is possible to use only the winglet pedals or both the winglet and wheel pedals simultaneously, depending on the foot position.

The winglet pedals can be adjusted during flight using the rudder adjustment control (3), for example, to align them with the wheel pedals and allow simultaneous control of both the winglet and wheel pedals.

To achieve maximum winglet deployment as airbrakes, the pilot should set the rudder pedals as high as possible during the landing approach.

For optimal use of the split rudder pedals, it is recommended that the pilot wear narrow and lightweight shoes.

2.5.3 Flaps

The high-deflection flaps allow for adjusting the curvature of the wing's central section to suit the flight configuration.

The position of the flaps significantly modifies the speed with the stick released (trim). They also affect the descent angle and influence the minimum speed.

A mark on the control line indicates 0° when it aligns with the end of the toggle pointing towards the pilot.

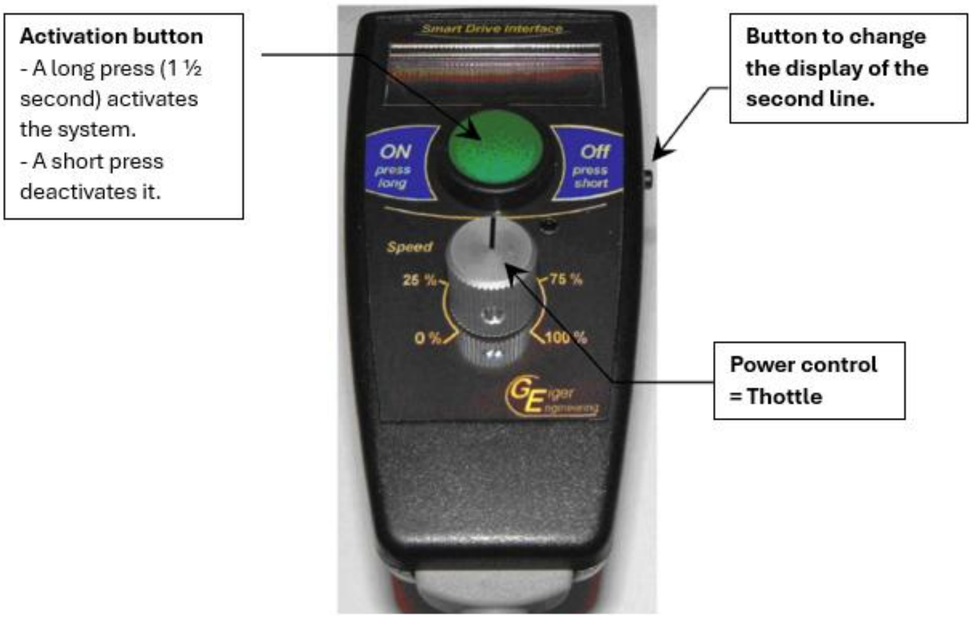
The angular value indicated on the front triangle is marked by the position of the ring relative to the indicator (5).

> ⚠️ Abrupt release of the flap control can lead to a dangerous loss of altitude near the ground. It is important to ensure that the control line is properly engaged in the clam cleat during maneuvers close to the ground.

The 0° position of the flaps (and elevons) can be checked by aligning the elevons and flaps with the Karman (fairing) connecting the wings and winglets. The position of the indicator ring can be easily adjusted if necessary.

2.5.4 Engine controls

The engine is controlled by the SDI (Smart Drive Interface), an electronic interface located near the driver's left hand.



An automatic protection prevents the system from being activated if the potentiometer is not at zero, an intermittent audible alarm sounds, and error message appears.

- **Parameters**

The SDI screen provides information on the motor, battery, system operating status, safety alarms concerning the various components of the propulsion system.

1st line	53V 23Ah	Battery voltage 53 V, remaining capacity 23 Ah
2nd line	I = +178A	Current intensity 178 A

The information on the 1st line cannot be changed: it always displays the battery voltage and its remaining capacity.
The 2nd line has 13 different displays: you switch from one to the other successively each time you press the SDI side button.
Here is the list of possible displays (default setting):

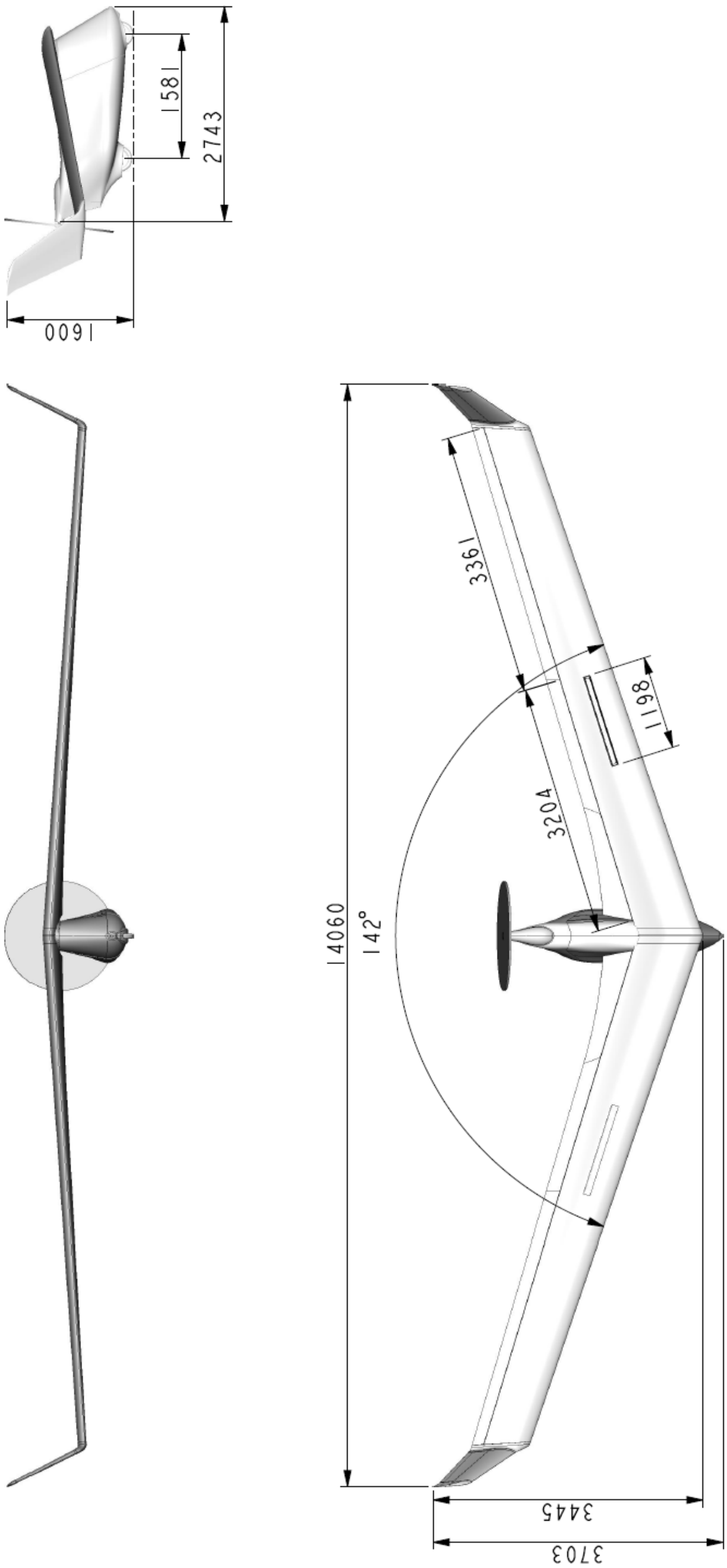
Index	Display	Meaning
0	I = +178 A	Present Current 178 Amperes
1	N = 1920 U	Present Speed 1920 rpm
2	P = 11450 W	Present Power 11.450 Watts
3	TA = 45 C	Battery pack Temperature 45 °C
4	TM = 67 C	Motor Temperature 67 °C
5	TS = 75 C	Controller Output Stage Temperature 75 °C
6	TH = 60 %	Potentiometer (throttle) setting 60%
7	PWM = 50 %	Inverter Set Point Value 50%
8	D = 912 m	Working time since delivery 912 minutes
9	A = 250 m	Air pressure reference altitude 250 meters
10	V = + 0.8 ms	Variometer, climb rate 0.8 m/s
11	14 : 30 :	Time 14h30 :00
12	01.09.18	Date 1 Sept 2018
Error code appearing automatically		
-	T.Motor	Motor is too hot

• Alarms and protections

In the event of an anomaly, an intermittent audible alarm sounds and an error code appears:

Display	Meaning	Automatic protection
U<Umin	Battery voltage < 40 V	Controller stop the motor
T.Contr	Controller Temp. > 85°C	Controller decreases motor Power
T.Motor	Motor Temp. > 100°C	Controller decreases motor Power
Battery	Battery Temp. > 60°C	Controller decreases motor Power
I_Limit	Current Limit exceeded	Controller decreases motor Power
Cut OFF	- Controller Temp.>95°C - Motor Temp.>110°C - Battery Temp.>65°C - Courant>max - Motor start error	Controller stop the motor
External	No controller enable signal	Motor start blocked
Poti min	Potentiometer not at 0%	Motor start blocked
SD-Card	SD-Card Lost or Defect	

2.6 3-View drawing



3 Limitations:

3.1 General Information

The Swift 3 with electric motors can fly considerably faster than the maximum authorized speed (Vne).

To fly safely, it is important to be aware of the speed limits and not to exceed them under any circumstances.

The Swift 3 must be equipped with a reserve parachute, with ballistic triggering, attached to the structure and to the pilot. This parachute is part of the centering of the aircraft.

3.2 Authorized maneuvers

The E-Swift 3, although equipped with an electric motor, is an ultra-light glider, intended for flights in thermals with the engine stopped. Acrobatic maneuvers and spins prohibited

Authorized maneuvers:

- Turn up to 60° of bank.
- In pitch: nose-up 30° maximum in relation to the horizon line.
- Nose-down 30° maximum in relation to the horizon line.
- Stalls authorized above 300 m ground level.

3.3 Weight

3.3.1 Maximum Take-off Weight

MTOW 210 kg

3.3.2 Maximum Empty Weight

OEW 124 kg

The maximum empty weight must not exceed 124 kg, even with a light pilot.
The empty weight of the E-SW3 when delivered is less than MEW 115 kg (including parachute).
For structural and centering reasons, it is important not to overload the aircraft.
Flying wings are very sensitive to centering – be careful when adding equipment.
Read the chapter on centering for more details.

3.3.3 Recommended Pilot Weight Range

50 to 96 kg (110 to 210 lbs)

3.4 Speeds

3.4.1 Maximum Speed

The speeds mentioned are the conventional speeds = read on a barometric anemometer corrected for its errors = V_{CAS}.

Note: The Swift 3 is delivered without instruments.

Never Exceed Speed

V_{NE} 140 km/h until 3 000 m
133 km/h until 4 000 m
126 km/h until 5 000 m

Maneuvering Speed (speed up to which the control surfaces can be fully deflected without overloading the aircraft):

V_A 110 km/h

Design gust speed (Maximum speed in turbulent air)

V_B 110 km/h

Maximum airbrakes exit speed

V_{BS} 120 km/h

3.4.2 Minimum speed

Minimum speed in landing configuration (flaps set between 10° and 30°), at MTOW:

V_{SO} 50 km/h

Minimum speed with flaps set to 0°, at MTOW:

V_s 52 km/h

Note: This speed is dependent on centering.

3.5 Load Factors

Maximum load factor: + 5.3 g/- 2.65 g (tested with a safety coefficient of 1.5, i.e. +8 g).

To give an idea, here are some figures to help you understand the constraints an aircraft undergoes during maneuvers:

a. Load factor versus the inclination of a stabilized turn

Inclination Φ	30°	45°	60°	70°	80°
Load factor n (g)	1,15 g	1,41 g	2 g	3 g	**6 g**

b. Maximum theoretical resource load factor.

Speed during resource	52 km/h	104 km/h	156 km/h
Load factor n (g)	1 g	4 g	**9 g**

a. Load factor when encountering a vertical gust.

At 110 km/h (VB), a vertical gust of 15 m/s generates a load factor of 5.25 g (Wing load test case).

3.6 Centering limits

The centering measurement is explained in detail in the document "E-SW3_Assembly and Maintenance Manual".

The centering should be between 1,130 mm and 1,160 mm, measured from the nose of the wing with the aircraft resting on level ground.

The ideal value is around 1,150 mm, or a little less if you prefer to fly at higher speeds.

The aircraft as delivered should have this centering with the pilot on board, the parachute installed, and the battery mounted in the forward position.

> The **centering range** is quite narrow and must be respected. The performance and behavior of flying wings are very sensitive to centering.
>
> - Centering too far back makes the aircraft dangerous, stalls are more difficult to recover from and above all the wing can spin much more easily.
>
> - Centering too far forward significantly reduces performance: the minimum speed increases, the glide ratio decreases, the sink rate with the engine off deteriorates.
>
> Therefore, avoid modifying the aircraft. Do not carry heavy loads, and do not place loads far from the center of gravity.

3.7 Propulsion group

Electric motor by Geiger Engineering, HPD12, with a "pancake" design (wide diameter compared to its length), which drives the propeller directly via a shaft, without a gearbox.

3.7.1 Maximum Power

Continuous power (Pm): 12 kW

Peak power (short duration): 16 kW

Nominal speed: 2184 RPM

3.7.2 Maximum motor speed

The motor's maximum speed is 3,000 RPM but is limited to 2,500 RPM by the controller.

3.7.3 Maximum propeller speed

- **Fixed-pitch, two-blade Helix HK25 propeller**, diameter of 1.4 m: continuous maximum speed of 2,500 RPM.
- **Ground-adjustable pitch, two-blade E-Prop propeller** (optional), diameter of 1.44 m: continuous maximum speed of 2,900 RPM.

3.8 Noise level

Minimum Overflight Height Outside of Takeoff or Landing Phases, respecting the 65 dB noise limit regulation: 65 m.

4 Emergency procedures

4.1 Engine failure

Gliding (engine off) represents the normal flight mode. Always remain within the safety cone of a suitable landing area.

In case of engine failure, follow the normal landing procedure.

4.2 In flight engine restart

- Ensure the throttle is set to zero.
- Press and hold the green button on the engine control for 1.5 seconds. An intermittent beep will sound, indicating the engine is ready to start.
- Slowly turn the throttle clockwise to start the engine and adjust its power.

4.3 Smoke and fire

- Switch the engine off by setting the throttle to zero and briefly pressing the green button on the engine control.
- Turn off the battery by pressing and holding the battery's green button.
- Land as quickly as possible.
- If smoke accumulates in the cockpit, partially open the canopy (by releasing the Velcro closures) to improve ventilation. If ventilation is still insufficient, you may partially or fully detach the side windows, which are held only by Velcro strips. With the windows removed, the pilot is nearly in open air.

4.4 Emergency landing

The Swift 3 is designed for off-field landings. Choose a firm or grassy field, avoiding obstacles like power lines, fences, and tree rows. Land into the wind, accounting for possible furrows or ditches.

4.5 Spin

The Swift 3 is difficult to spin. It will generally recover on its own in less than one turn if the stick is kept in neutral position.

If the flaps are set at a high angle, reduce them to between 0° and 10°.

To immediately recover from a spin, push the stick slightly forward and use the opposite rudder to the spin direction.

4.6 Using the parachute

The parachute should only be used as a last resort, in the case where the aircraft becomes uncontrollable or partially destroyed.

Once deployed, the pilot can no longer control the direction or speed of the aircraft, and the landing location cannot be chosen.

There is a significant risk of damage to the aircraft, and the pilot could be injured if the landing area is unfavorable.

If possible, turn off the engine before deploying the parachute. To deploy, firmly pull the release handle located to the pilot's right, next to the stick.

5 Normal procedures

5.1 Pre-Flight check

5.1.1 After each assembling

5.1.1.1 Turn around the right wing starting from the nose:

- ❑ Wing spar screws: check butterfly nuts and safety rings
- ❑ Inter-wing connection: 2 clevis pins + safety rings
- ❑ Condition of the right leading edge
- ❑ Tiplet (wingtip wheel) attachment
- ❑ Winglet fairing attachment
- ❑ Winglet flap control – no interference with fairing – check cable condition – lever attachment
- ❑ Wingtip play[1]
- ❑ Condition of the right elevon – elevon-to-wing joint
- ❑ Elevon control: Clevis pin + safety ring – free movement – positive control of control rod linkage[2]
- ❑ Condition of the right flap
- ❑ Flap control linkage

5.1.1.2 Continue inspecting the left wing

- ❑ Inter-wing fairing – ¼ turn screws
- ❑ Condition of the left flap – level with right flap
- ❑ Flap control linkage
- ❑ Elevon control: Clevis pin + safety ring – positive control of control rod linkage
- ❑ Condition of the left elevon – elevon-to-wing sticker
- ❑ Winglet flap control – no interference with fairing – check cable condition – lever attachment
- ❑ Winglet fairing attachment
- ❑ Tiplet attachment
- ❑ Condition of the left leading edge

5.1.1.3 Electric motor and battery

- ❑ Propeller play – check propeller blades' folding/unfolding
- ❑ Motor and propeller shaft attachment
- ❑ Battery attachment and electrical connections

5.1.1.4 Fuselage

- ❑ Canopy and window assembly

[1] Press one wingtip to the ground while lifting the other – a play of several cm is normal – it is necessary to monitor the evolution.
[2] Consists of raising and lowering the elevon alternately and checking that the stick moves simultaneously.

- ❑ Stick and wing linkage – free stick movement in all directions – no interference with wings or linkages
- ❑ *Stick pulled backward raises both elevons; stick moved left raises left elevon, lowers right elevon*
- ❑ Flap control cables
- ❑ Rudder line – **ensure right foot controls the right rudder!**
- ❑ Airbrake operation
- ❑ Check pulleys are in line with control cables and cables are not trapped beside pulleys
- ❑ Tires inflated?
- ❑ Instruments – no interference with controls – airspeed sensor
- ❑ **Safety pin on the parachute handle**
- ❑ Brake

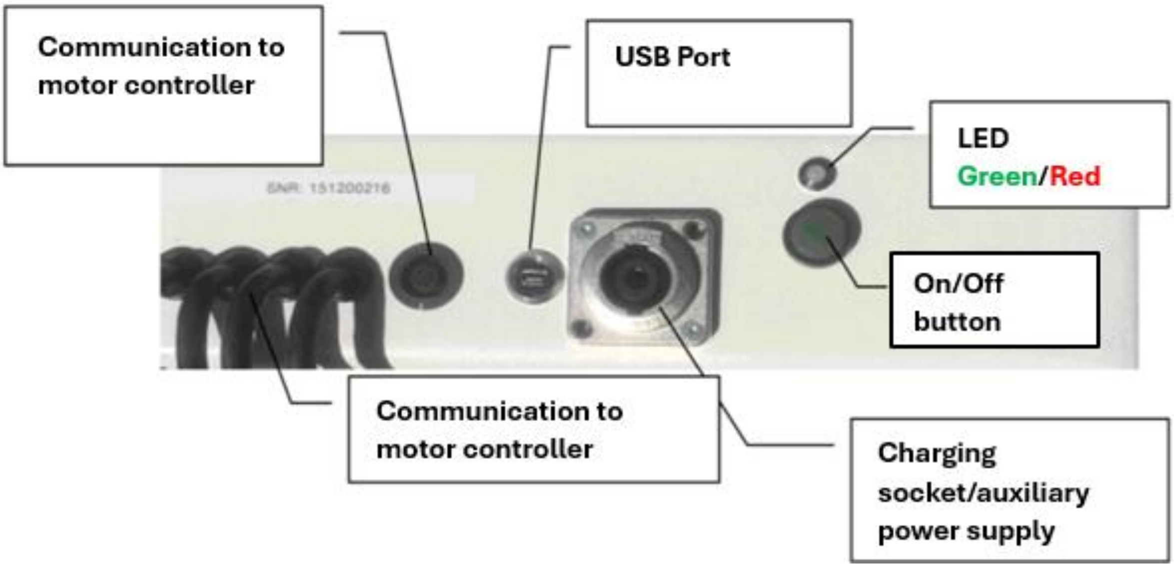
5.1.2 Before each flight

- ❑ Tires inflated
- ❑ Battery – Charge level (at least 20 Ah) – Temperature
- ❑ Instruments – Altimeter set
- ❑ Elevon/flap/rudder deflections
- ❑ Nose wheel steering
- ❑ Velcro fasteners on windows
- ❑ Clevis pins and rings on elevon and flap controls
- ❑ Canopy secured
- ❑ Parachute trigger pin removed

5.2 Battery: Installation, Charging, Operation, and Precautions

5.2.1 Description - Connections

- **Battery Model**: Geiger ref 030150, 60 Ah, High-current Model
- **Configuration**: 14S/20P cell structure
- **Capacity**: 3.1 kWh, nominal voltage 52 V, continuous current rating 120 A, maximum current 300 A for up to 60 seconds.



5.2.2 Charging

Only use the charger provided, which is specially configured for this battery.

Charging below 20°C will not achieve full capacity (about a 1% decrease in capacity per °C below 20°C).

- The BMS (Battery Management System) allows charging only if the battery temperature is below 45°C (default parameter, adjustable).
- Ensure the BMS is off by pressing the push button for 4 seconds.
- First, connect the charger cable to the battery's dedicated socket.
- Then, plug the charger into a power outlet.
- Turn on the BMS by pressing the button for 1 second.
- Check that the battery LED flashes Green/Red (0.5 seconds).

The charging program begins: throughout the charge cycle, each cell's voltage is monitored, and the system compensates for any deviations in charging currents.

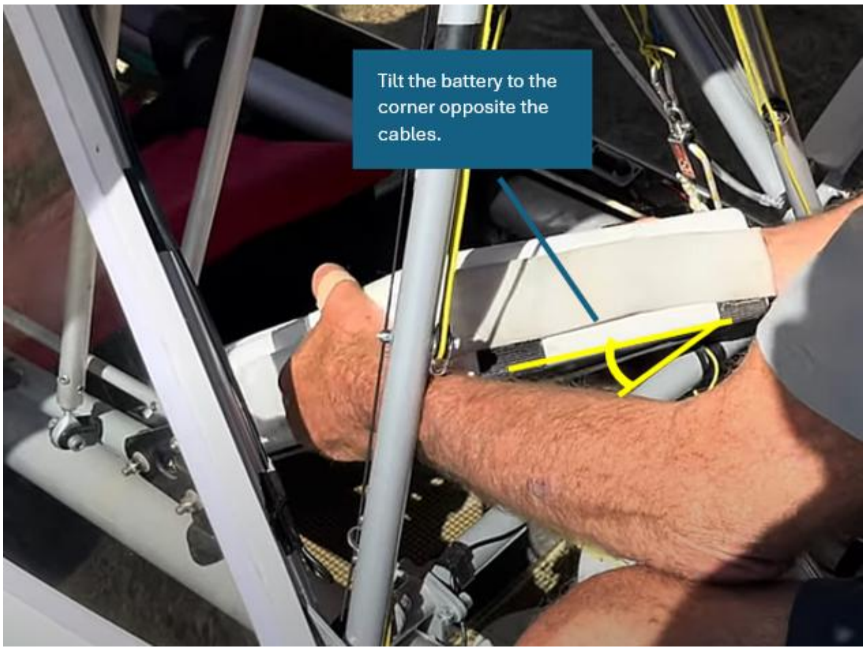
When charging is completed, the BMS and charger automatically shut off.

5.2.3 Installation

It may be easier (though not required) to detach the hammock from its front tube for battery installation.

The battery can be installed in 3 different positions, with the standard position being the most forward.
Remove the front mounting plate and install the rear mounting plate (keeping strap clips facing up).
Insert the battery from the front, ensuring power cables are not bent at their bases. Ensure proper cable clearance through the designated opening in the mounting plate and secure it firmly onto the rear mounting plate.

Note: To avoid bending power cables, tilt the battery on the side opposite the cables so they do not contact the floor until the battery is near horizontal.



Attach the front mounting plate, insert the locking tube on both sides, and secure the tube with two beta pins.

Optional Straps: Eyelets on the battery mounting plates allow for the addition of straps to further secure the battery or attach other equipment. These straps are not included in the standard equipment.

Connect the battery cables (red and black power cables and the network cable), ensuring they are fully engaged without mechanical tension.

5.2.4 Powering On/Off

Turning on the BMS:
Press the battery button for 1 second. The green indicator light will turn on or flash, accompanied by a beep.

The on/off ratio of the LED light indicates charge level: if the LED is off 50% of the time, the battery is about 50% charged.

The BMS detects whether the charger or controller is connected; this process takes 25 seconds. If neither is detected, the BMS will turn off automatically after a set time (default 5 minutes).

Turning Off: After flight, always turn off the BMS by pressing the battery button for 4 seconds.

After using the battery to its full capacity, recharge it without delay to at least 50%.

5.2.5 Precautions

Storage

The battery should be stored at a temperature between 10°C and 25°C; otherwise, its capacity and lifespan will be reduced.

☝ Never store the battery fully charged or fully discharged.

Long storage (Winter storage)

If the battery will be unused for over six weeks, it should be maintained at a preset charge level to avoid reducing its lifespan.

For winterizing a discharged battery:

- Follow the standard charging process but press and hold the button for 7 seconds; an audio signal will confirm the start of the process.
- Throughout the cycle, which can last several days, the battery LED will flash quickly Green/Red (0.1 seconds).
- The BMS automatically shuts off when the battery reaches the desired state.

For winterizing a charged battery:

- Press and hold the button for 7 seconds (without connecting the charger); an audio signal will confirm the start of the process.
- The cycle, which can last up to 7 days, will cause the battery LED to flash quickly Green/Green (0.1 seconds).
- When the battery reaches the desired state, the BMS automatically shuts off.

If winter storage extends beyond 6 months, reconnect the charger and restart a "winterizing" cycle.

Safety rules

- Never leave the battery exposed to direct sunlight.
- Before and after each use, inspect the battery's exterior: if there are signs of impact (dents, punctures) or limit violations (overheating, overcurrent), the battery must not be used and should be returned to the manufacturer for inspection.
- The BMS is calibrated for use exclusively with HPD motors and the Pi 300 controller; do not use this battery for other purposes.

5.3 Ground Maneuvers

General Guidelines

- For ease of movement, it is generally best to push the aircraft backward by pressing on the nose of the wing and lifting the front wheel.

Important Note: Given the wings' span, significant leverage forces can occur:

- Avoid moving the aircraft by pressing on a single winglet, as this creates considerable torsional stress on the fuselage.
- Lift the front wheel when you want to pivot the Swift 3.

5.4 Pilot installation

- Turn on the BMS by pressing the battery button for at least **1 second**; after a self-test lasting 25 seconds, a brief beep and the battery's **green** LED light confirm that the E-Drive is ready.
- Check the battery's voltage and charge level on the SDI screen. There must be at least 20 Ah of capacity remaining to undertake a takeoff.
- Put on the harness.
- Set the flaps fully downward and open the canopy.
- With hands on the wing upper surface or oblique tubes for balance, step onto the hammock.
- Squat and slide down into position on the hammock.
- Fasten the shoulder straps with the quick-release buckle, adjusting as needed to fit securely.
- Attach the harness carabiner to the parachute's side strap.
- If applicable, remove the pin that secures the parachute release handle.
- Close and secure the canopy using the Velcro straps.

5.5 Takeoff

Avoid taking off, and if possible, flying in the rain. Raindrops on the airfoil can disrupt airflow, significantly affecting the airfoil's characteristics. Under these conditions, stall speed increases considerably, and glide ratio decreases.

5.5.1 Starting the engine

- Ensure the propeller area is clear.
- Check that the SDI's throttle is set to 0.
- Press and hold the green button on the SDI for at least 2 seconds: a beep confirms that the controller is ready to supply power to the motor.
- Slowly turn the throttle to start the engine and unfold the propeller.

5.5.2 Taxiing

With the Swift 3 positioned in an open space and the wheel brake released, gradually increase power until the aircraft starts moving.
Steer using the nosewheel rudders.

To stop:

- Set the throttle to 0; the engine stops, and the propeller folds, while an intermittent beep sounds.
- Use the brake if needed.
- To stop fully and silence the beep, briefly press the green button (throttle must be at 0).

Precautions:

- *The intermittent beep with the engine off serves as a reminder* that any throttle movement would start propeller rotation.
- Avoid tall grass or rocky ground to prevent damage to the propeller.

Note*: On flat, firm ground, taxiing uses minimal energy and has a minor effect on range.*

5.5.3 Takeoff

- Set flaps to 10-15°.
- Complete the pre-takeoff checklist.
- Ensure the runway is clear and that no aircraft are on final approach before entering the runway and aligning with the takeoff axis.
- Adjust the winglet rudders to enable simultaneous use of the nosewheel and winglet rudders.
- Gradually apply power using the throttle: let the propeller fully unfold before setting the throttle to full power. The takeoff roll begins.
- !! Do not pull on the stick; the Swift 3 will lift off on its own !!

Note: Pulling the stick for takeoff reduces lift (elevons raise) and thus extends the take-off run.

- At 30 to 50 meters altitude, set the flaps to 0° (minimal drag). The optimal speed for heading toward a suspected thermal area is around 80 km/h (near maximum glide, optimizing motor cooling).
- Quickly reduce power to 160-180 A (or lower as conditions allow) to limit battery heating.

5.6 Cruise flight

In general, use the engine to climb, and conduct the rest of the flight with the engine off, restarting it later if necessary. When the engine is running, the pilot has a reduced perception of lift, comfort is diminished, and concentration is reduced.

5.6.1 Powered flight

During the climb, the available power is limited by heating of the motor components (battery/controller/motor). The limitation mainly comes from the battery.

- Maximum current supported by the battery:
    - 300A for 60 seconds
    - 120 A continuously (i.e., 6 kW)
- *Ta* Battery Temperature, protection at 60°, limit at 65°
- *Tm* Motor Temperature, protection at 100°, limit at 110°
- *Ts* Controller Temperature, protection at 85°, limit at 95°

These temperatures are visible on the motor control.

☝ In "protection" mode, power is limited to 60% of nominal power. When the limit is reached, the controller stops the engine.

Therefore, it is essential to monitor the battery's temperature rise and use the available power wisely.
If the goal is to climb high with the engine, a compromise must be found between the battery's

temperature increase rate and the duration of the climb. Current should be more limited (around 140 A? To be tested!).

If the goal is a rapid climb but lower altitude, current can be higher (160 to 180 A).
In any case, it is preferable to start with a "cool" battery but not too cold: capacity reaches its maximum at around 20°C and decreases by approximately 1%/°C below this value.
At 140 A, the battery temperature increases by about 2°C/minute.

As the battery discharges, the voltage at its terminals decreases. Below a certain threshold, the BMS sends a signal to the controller, which will limit available power to around 60% of nominal power. The controller stops the engine when the battery voltage reaches about 39V. The battery still has enough capacity to keep the propeller folded to reduce drag.

In horizontal flight, powered flight requires very little engine power (around 3.5 kW depending on speed), and level flight can be maintained until the battery is depleted without risk of overheating.

5.6.2 Gliding flight

Upon entering a lift area, reduce power to better feel the lifts.

To stop the engine:

1. Reduce the potentiometer to 0%. The engine stops, and the propeller folds. An audible signal reminds you that the engine can be restarted immediately.
2. To confirm the stop, briefly press the green SDI button (sound signal stops).

To restart the engine:

1. Ensure the potentiometer is at 0%.
2. Press the green SDI button for 1.5 seconds.
3. When the audible signal sounds, turn the potentiometer to the desired power level.

The Swift is very easy to control, with highly responsive controls.

☝ Be mindful of speed: the Swift 3 has little drag. It can easily and quickly reach excessively high speeds. Furthermore, the cockpit fairing can make it difficult for pilots accustomed to other free-flight aircraft to gauge speed.

☝ Corollary: always fly with a reliable airspeed indicator[3] !!

- Avoid over-controlling. The Swift tends to self-correct most deviations caused by turbulence.
- Avoid holding control surfaces in extreme positions (full stick back - flaps at 30° or 40°): this considerably reduces wing efficiency.

The Swift 3 has almost no inertia in pitch, though it is more inert and well-damped in roll and yaw. Beginners tend to oscillate in pitch due to over-controlling, though this behavior is not dangerous. Generally, avoid "over-flying" the aircraft. The Swift 3 flies very well on its own, flying straight and stably. Any action on the control surfaces reduces the aircraft's performance.

[3] *sensor must be placed in the intended location, at the end of the tube supplied with the Swift 3 for this purpose.*

Adjust control surface settings and speed based on the situation:

- Take-off: Flaps 15°
- Lift: flaps 10° to 20°, speed +/- 55 km/h (best sink rate)
- Best glide ratio: flaps 0°, speed 70-80 km/h
- High speed: flaps negative
- Never-exceed speed (Vne): 140 km/h.
- Maximum speed in turbulent air (Vra): 110 km/h.

To optimize performance (and comfort), the pilot can adjust the center of gravity by shifting position:

- In lift, move back as far as possible on the hammock.
- At high speed, move forward as much as possible.

Adjusting the center of gravity not only reduces stick effort by acting on trim (hands-off speed), but also optimizes performance by avoiding excessive control surface deflection.

Spin
With the correct centering, the Swift 3 is difficult to put into a spin. It recovers automatically in less than one turn with the stick neutral.
If flaps are significantly deflected, release them between 0° and 10°.
To quickly recover from a spin, gently push the stick forward and apply rudder opposite to the spin.

Stall
When gradually slowing down, the stall occurs very progressively. With the stick fully back, the Swift "porpoises," gently oscillating around its pitch axis without significant altitude loss. The aircraft remains fully controllable with the elevons, regardless of flap position.

The wing actually stalls near the root, ahead of the center of gravity. The twisted wingtip generally maintains good airflow.

A 'true' stall can be achieved with a pronounced pull-up after gaining speed.

☝ Despite these very safe characteristics, avoid getting too slow near the ground or terrain, as an unexpected stall or spin may occur following turbulence.

5.7 Landing

The approach and landing are done with the engine off: the approach angle will be steeper (making the approach easier).

- On downwind, set the rudders to the shortest setting, set flaps to 20°, and adopt a speed of approximately 70 km/h.
- Press the green SDI button for 2 seconds to arm the propulsion system for ground roll or a possible go-around.
- On the base leg, use the air brakes to control the descent path.
- On final approach, if the wind is strong or in case of heavy turbulence, increase the speed, control the glide path with air brakes, and if that's insufficient, firmly press both rudders to add drag from the winglet controls. The air brakes should be deployed during the "flare" to reduce ground effect.

- During the flare, keep the wings level, and fight against any lifting from a gust of wind or turbulence.

☝ **The final flare should be as smooth as possible**: if the pilot pulls the stick too sharply, the elevons rise more — in this configuration, the airfoil becomes less supportive, and the aircraft "sinks," leading to a hard landing.

In strong winds, it is essential to increase speed: the wing is very close to the ground and is highly affected by the wind gradient. If speed has not been sufficiently increased beforehand, the aircraft will descend too much in the last 2 meters, and, without recourse, the pilot will be unable to avoid a hard landing.

If using air brakes, it is not recommended to land with significant flap deflection (30° to 40°), as it risks a hard landing.

An S-shaped approach, as used in hang gliding or paragliding, can be helpful during field landings or in strong winds but is reserved for experienced pilots.

Avoid turning near the ground: the wingtip is much lower than the pilot might expect, and there is a real risk of hitting an obstacle on the ground.

During crosswind landings, make sure to keep the wings strictly level: if a wingtip touches the ground too early, the aircraft may tend to spin quickly.

During a field landing, if the terrain slopes, favor landing uphill, even if it means landing with a crosswind or tailwind.

For an experienced pilot, a slip is an effective way to steepen the descent path.

5.8 After Landing

After landing, if the ground is clean (especially without rocks), the engine can be restarted to move autonomously.

Do not leave the aircraft parked facing the wind (it may tip over, especially if the flaps are not retracted) or facing tailwind (the control surfaces will flap). Position the aircraft at an angle to the wind.

Reinsert the safety pin on the parachute trigger handle.

Switch off the battery.

6 Performances

6.1 Takeoff

- Recommended speed 60 km/h
- Ground roll distance 80 m
- Takeoff distance (15 m obstacle clearance) 180 m
- Demonstrated cross wind limit 18 km/h or 5 m/s

6.2 Landing

- Recommended speed 70 km/h

- Landing distance (15 m obstacle clearance) 200 m
- Demonstrated crosswind limit 18 km/h or 5 m/s

6.3 Maximum glide

- Maximum glide ratio, with engine off and propeller folded, is estimated to be 34 at 75 km/h at MTOW.

6.4 Minimum sink rate

- Vmin sink 0,56 m/s at 57 km/h

6.5 Range with the motor

- At maximum weight, after a climb to 1500 ft (450 m), the range is about 50 minutes of level flight.
- At maximum mass, the possible altitude gain on a battery charge is about 1600 m.

7 Mass and centering, equipment

- Reference empty weight: 114 kg, including battery, parachute, and Helix propeller.
- Reference empty centering: as the aircraft is very light, the pilot's weight significantly affects the total weight and balance of the aircraft. Therefore, the balance should be measured only with the pilot seated.
- Chosen aircraft configuration for determining the reference empty weight: E-Swift 3 ready to fly, battery installed, Helix HK 25 propeller (2.16 kg), Galaxy parachute (5.7 kg).

Note: The E-Props propeller is slightly heavier (2.97 kg), bringing the aircraft's empty weight to approximately 115 kg.

8 Centering, Weighing, Assembly and Adjusmtents

For aircraft centering and weighing, as well as for assembly, disassembly, storage, maintenance, and adjustments, refer to the specific manual: "E-Swift 3: Assembly and Maintenance Manual."

9 Battery Safety Information

A battery made up of lithium-ion cells can be potentially dangerous in case of thermal runaway or a short circuit.

For this reason, the motorization manufacturer, Geiger Engineering, has implemented a series of measures to achieve a very high level of safety.

Over the past 10 years, approximately 700 battery packs for aircraft motorization have been provided by Geiger Engineering, with no notable incidents.

Two safety principles guided the design of the entire motorization system:

- **Availability**: Avoid unintentional engine shutdown.
- **Limitation**: Avoid overloading or overheating motorization components to reduce the risk of thermal runaway and fire.

Under normal operation, i.e., if there is no failure in the motorization components:

Temperature, current, and rotational speed parameters are constantly monitored for each relevant component of the motorization system.

Voltage (for battery protection), current, temperature (for all components), and rotational speed (for the motor and propeller) thresholds are set to remain well below potentially dangerous values.

Data is exchanged between the controller and the BMS (Battery Management System, an integral part of the battery). If the current data sent to the BMS differs from that measured by the BMS, the BMS breaker will trip. This serves as additional protection against malfunctions, short circuits, and overcurrent.

During battery discharge, all relevant battery parameters (temperatures, voltage, current) are continuously measured. If any parameter exceeds a primary limit (called "protection"), the BMS sends a signal to the controller to reduce available power to 60% of nominal power. This ensures maximum system availability. The battery will only go offline if a second threshold is reached, thus preventing a dangerous situation or irreversible damage to the motorization.

The battery's temperature limit values are: protection (= power reduction) at 60°C / limit at 65°C. Battery temperature can be read on the motor controller.

In case of malfunction – intrinsic safety:

- The battery consists of 280 cylindrical cells (14 in series x 20 in parallel) with a steel casing. **Each cell in the battery has individual short-circuit protection.** During a cell short circuit, the amount of heat generated before protection activation is negligible. Even if the BMS fails, a global battery short circuit without protection would not generate enough heat to create a hazard or cause thermal runaway. If the BMS fails during a battery short circuit, individual cell protections will activate.
- The entire battery has been tested under short-circuit conditions for 6 hours without consequences, thanks to the protection provided by the BMS.
- Before battery manufacturing, each cell is individually tested according to a charge/discharge cycle lasting several hours. Cells deviating by more than 1% from nominal values are rejected. This prevents thermal runaway in any cells that might diverge significantly from the others.
- **Secondary Protection in Case of Fire**:

  The battery block is housed in a GRP case (composite material: polyester + fiberglass) **with a 6 mm thick inner layer of ceramic fiber. This material can withstand a temperature of 1,200 °C permanently.** A test simulating thermal runaway of one cell (among others) was performed to verify the effects of a single cell failure. There were no consequences for neighboring cells.

- In the event of thermal runaway, gas may escape from affected cells. The GRP case is not sealed and could release this gas. This gas could be easily vented from the cockpit during flight by partially opening the canopy.
- Drop tests were conducted by dropping the same battery from a height of 1 m onto a concrete floor in various positions. The GRP casing was damaged, but no mechanical damage occurred to the cells, and the battery operated perfectly.

Useful information for transportation

The battery has been tested according to the UN/DOT 38.3 standard (transport tests for lithium-ion cells and batteries). A document can be downloaded from the manufacturer's website:

https://www.geigerengineering.de/_Resources/Persistent/1d96d107413d348a39dc6c531dbf9283209272f9/Intertec_UN_38_3_Akkupruefbericht_14_04_2017.pdf