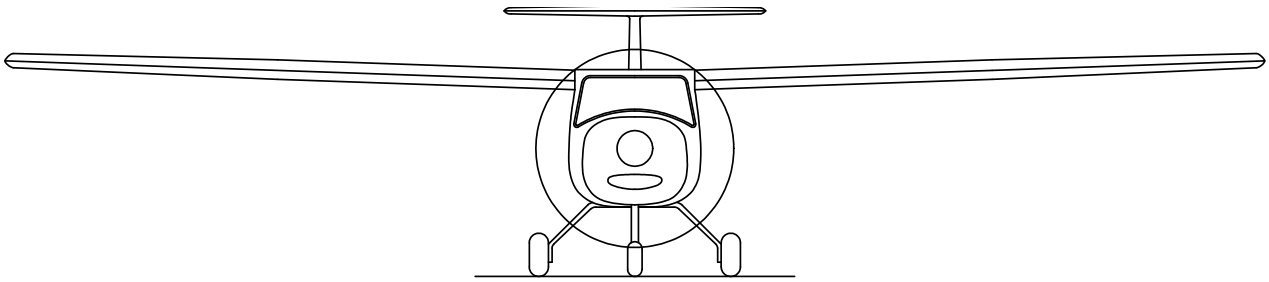
PIPISTREL

Pilot's Operating Handbook

Alpha Electro



Doc n. : POH-167-00-40-002

REV A00

(7th September, 2022)

SERIAL NUMBER _____

REGISTRATION NUMBER _____

For additional document applicability information, please refer to:

SB-160-00-80-999 Status of S-LSA registered Alpha Trainer continuing airworthiness documentation

ASTM Standards compliance

The aircraft this flight manual applies to is compliant with following ASTM standards:

F2245 Design & Performance
F3198 Continued Airworthiness

Performance - Specifications

ALPHA Electro	60 kW Electric
Stall speed (flaps extended +25°) **	38 KIAS (70 km/h)
Stall speed (flaps retracted 0°) **	43 KIAS (80 km/h)
Best endurance speed **	85 KIAS (157 km/h)
VNE **	135 KIAS (250 km/h)
Maximum speed in level flight with maximum continuous power (Vh) **	120 KIAS (222 km/h)
Best endurance - not considering reserves *	60 min
Standard range at cruise	75 NM (139 km)
Takeoff - ground roll - at MTOW	555 ft (169 m)
Takeoff total distance over 50 ft obst. at MTOW	870 ft (265 m)
Landing distance over 50 ft obst.	1510 ft (460 m)
Absolute ceiling at MTOW	12,800 ft (3900 m)

**** NOTE** See Appendix for CAS values

*** NOTE** Legal flight time must be applied according to applicable local regulations!

NOTE **The above performance figures are based on an airplane weight of 1212 lbs (550 kg), standard atmospheric conditions, level hard-surfaced dry runways and no wind. They are calculated values derived from flight tests conducted by Pipistrel , under the supervision of the Slovenian CAA and under carefully documented conditions. Figures may vary based on numerous factors (surface condition, temperature, water on wing, etc).**

ALPHA Electro	60 kW Electric
Maximum weight takeoff	1212 lbs (550 kg)
Maximum weight landing	1212 lbs (550 kg)
Empty aircraft weight (incl. BPRS, no batteries)	552 lbs (251 kg)
Battery capacity, total	21.0 kWh
Battery capacity, useful	20.0 kWh
Motor	60 kW E-Motor
Propeller	three blade, fixed pitch composite propeller, diameter 64 9/16" (1640 mm)

Coverage

The Pilot's Operating Handbook (POH), found in the airplane at the time of delivery from Pipistrel, contains information applicable to the ALPHA Electro airplane and to the airframe designated by the serial number and registration number shown on the title page. All information is based on data available at the time of publication.

This POH consists of nine sections that cover all operational aspects of a standard equipped airplane. Section 9 contains the supplements which provide amended operating procedures, performance data and other necessary information for those airplanes that conduct special operations and/or are equipped with both standard and optional equipment. Additional supplements are individual documents which are issued/revised separately. The log of effective pages should be used to determine the status of each supplement.

Revision tracking, filing and identifying

Pages to be removed or replaced in the Pilot's Operating Handbook are determined by the log of effective pages located in this section. This log contains the page number and revision number for each page within the POH. As revisions to the POH occur, the revision number on the effected pages is updated. When two pages display the same page number, the page with the latest revision shall be used in the POH. The revision number on the log of effective pages shall also coincide with the revision number of the page in question. As an alternative to removing and/or replacing individual pages, the owner can also print out a whole new manual in its current form, which is always available from www.pipistrel-aircraft.com.

Revised material is marked with a vertical bar that will extend the full length of deleted, new, or revised text added to new or previously existing pages. This marker will be located adjacent to the applicable text in the marking on the outer side of the page. The same system applies when the header, figure, or any other element inside this POH is revised. A list of revisions is located at the beginning of the log of effective pages. Pipistrel is not responsible for technical changes/updates to OEM manuals supplied with the aircraft (eg. radio, transponder, GPS, etc.).

Warnings, cautions and notes

Safety definitions used in the manual:

WARNING! Disregarding the following instructions leads to severe deterioration of flight safety and hazardous situations, including such resulting in injury and loss of life.

CAUTION! Disregarding the following instructions leads to serious deterioration of flight safety.

NOTE An operating procedure, technique, etc., which is considered essential to emphasize.

Online updates, service notice tracking

For updates and information related to service/airworthiness, please go to www.pipistrel-aircraft.com and log in with:

Username: aetechpub
Password: AE2020!

Abbreviations legend

AC	-	Anti-collision
EA	-	Electric Aircraft
BMS	-	Battery management system
BPRS	-	Ballistic parachute rescue system
CAS	-	Calibrated Air Speed
COM	-	Communication
ELT	-	Emergency locator transmitter
ft	-	Feet
IAS	-	Indicated airspeed
IFR	-	Instrument flight rules
IMC	-	Instrument meteorogical conditions
KCAS	-	Calibrated Air Speed - Knots
kg	-	Kilogram
KIAS	-	Indicated airspeed - Knots
km/h	-	Kilometers per hour
kts	-	Knots
kW	-	Kilowatt
kWh	-	Kilowatt hour
LDG	-	Landing gear
m	-	Meters
MAC	-	Mean aerodynamic chord
MCP	-	Maximum continuous power
MTOW	-	Maximum takeoff weight
NAV	-	Navigation
POH	-	Pilot's operating handbook
PWR	-	Power
RPM	-	Revolutions per minute
SOC	-	State of charge
SOH	-	State of health
sqft	-	Square feet
TC	-	Power module of the charger
V	-	Volt
VAC	-	Volts alternating current
VFR	-	Visual flight rules

Index of revisions

The table below shows the revision history of this POH. Check your registration authority's or the manufacturer's website occasionally for the most up-to-date releases of operation-relevant documentation, which includes this POH.

Designation	Reason for Revision	Release date	Affected pages	Issuer
REV A00	Initial issue	7th September, 2022	All	SLO.DOA.002

Log of Effective Pages

Use the table below to determine the currency and applicability of your POH. Pages affected by the current revision are marked in bold text in the page number column.

Page number	Page status	Rev. number	Page number	Page status	Rev. number
Cover	Original	0	3-8	Original	0
i-1	Original	0	3-9	Original	0
i-2	Original	0	3-10	Original	0
i-3	Original	0	3-11	Original	0
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i-6	Original	0	4-2	Original	0
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Log of Effective Pages (continued)

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9-12	Original	0
9-13	Original	0

CAUTION!

This manual is valid only if it contains all of the original and revised pages listed above.

Each page to be revised must be removed, shredded and later replaced with the new, revised page in the exact same place in the manual.

Table of contents

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1 General

Introduction

This manual contains all the information needed for appropriate and safe use of ALPHA Electro .

IT IS MANDATORY TO CAREFULLY STUDY THIS MANUAL BEFORE USING THE AIRCRAFT.

Pipistrel is not responsible for any damage or injury resulting from not following the instructions contained in this manual.

Technical brief

DIMENSIONS	ALPHA Electro
Wing span	10.50 m (34' 5 3⁄8")
Length	6.47 m (21' 2 3⁄4")
Height	2.05 m (6' 8 11⁄16")
Wing surface	9.29 m^2 (100 sqft)
Vertical fin surface	1.1 m^2 (11.84 sqft)
Horizontal stabilizer and elevator surface	1.08 m^2 (11.62 sqft)
Wing aspect ratio	11.8
Positive flap settings	0°, 15°, 25°
Center of gravity (% MAC) - Range limits	20% - 35%

3-view drawing

Motor/Power controller, battery system

WARNING! The motor is not certified for aviation use, therefore, there is no assurance it won't fail during operation at any given moment, without prior notice.

Motor

TEMPERATURE °C	PEM 60MVLC
Maximum takeoff power (1 min)	56 kW
Maximum continuous power	50 kW
Maximum operating temperature	90° C
Maximum ambient temperature	40° C
RPM	**PEM 60MVLC**
Maximum allowable rpm	2500
Takeoff RPM (typical)	2400
Climb RPM (typical)	2250

Power controller

POWER CONTROLLER	H300A
Nominal power	60 kW
Maximum operating temperature	65 °C
Maximum ambient temperature	40 °C

WARNING! Do not, under any circumstances, attempt to use any other batteries other than pipistrel factory-supplied batteries. Only use them with the motor and power controller mentioned in this POH.

Battery system

Battery system	PB345V105E-A
Maximum voltage	398 V
Minimum voltage	288 V
Recommended voltage range for storage	355 V - 365 V
Maximum operating temperature	55° C
Minimum operating temperature	5° C
Allowable temperature range for storage	10 °C - 40 °C
Minimum charging temperature	0 °C
Maximum battery temperature before takeoff	40 °C

CAUTION! Temperatures below 10°c will cause a decrease in battery capacity. Plan your flight accordingly.

WARNING! Do not, under any circumstances, attempt to charge the batteries with any third party chargers. Only Pipistrel original equipment must be used.

WARNING! Respect operating and storage temperature limits at all times. Failure to do so may result in battery damage.

Propeller

ALPHA Electro	FP03-60E
three blade, fixed pitch composite propeller	64 $^{9}/_{16}$" (1640 mm)

Motor instrument markings

Instrument	Red (minimum)	Yellow (caution)	Green (normal)	Yellow (caution)	Red line (maximum)
Tachometer (RPM)	/	/	0 - 2399	2400 - 2499	2500
Motor temp. (°C)	/	/	(-20) - 89	90 - 94	95
Power controller temp. (°C)	/	/	(-20) - 59	60 - 64	65
Battery sys. temp. (°C)	5	6 -10	11- 44	45 - 49	50

Weight limits

Basic model weights

WEIGHT	ELECTRO
Empty aircraft weight (incl. BPRS and std. battery system)	368 kg (811 lbs)
Maximum takeoff weight (MTOW)	550 kg (1212 lbs)
Minimum combined cockpit crew weight (depends on C.G. of empty aircraft)	55 kg (121 lbs)
Maximum combined cockpit crew weight (depends the weight and balance)	see page 4-2

WARNING! Should one of the above-listed values be exceeded, others must be reduced in order to keep the mtow below 550 kg (1212 lbs). Failing to comply with any of the weight limitations may cause uncontrolled ground handling and/or flight due to extreme center of gravity position.

Center of gravity range

- The aircraft's safe in-flight center of gravity position ranges between 20% and 35% of mean aerodynamic chord.
- The in-flight center of gravity point ranges between 8 1⁄16'' (220 mm) and 14'' (355 mm) aft of the datum. The datum is the wing's leading edge at the fuselage root.

G-load factors

Max. positive wing load: **+ 4 G**

Max. negative wing load: **– 2 G**

2 Aircraft & systems

Introduction

The ALPHA Electro is a 34' 5 ⅜" (10.5 m) wing-span, two-seat T-tail high-wing motorplane made almost entirely of composite materials.

It has a robust, tricycle undercarriage that incorporates brake-equipped wheels, a U-shaped composite strut and a steerable nose wheel.

The ALPHA Electro features flaperons, meaning that one movable surface on each wing acts both as the flap and the aileron. Flaps offer 3 settings: retracted 0°, +15° and +25°.

Full dual main flight control levers make the ALPHA Electro ideal for initial and advanced flight training. All aileron, elevator and flap controls are connected to the cabin controls using self-fitting push-pull tubes. The rudder is controlled via cables. The elevator trim is electric.

All aircraft are shipped with 4-point safety belts attached to the fuselage at three mounting points. The rudder pedals can be adjusted before and also in-flight to suit your size and needs.

The aircraft is equipped with two battery packs: one is located aft of the cabin bulkhead and the other is aft of the firewall. The battery system is ventilated and thermally protected.

The electric motor is a 60 kW peak power unit capable of energy recuperation during descent.

The windshield, doors and top window are made of 2 mm anti-UV tinted Lexan, which was specially developed not to shatter or split on impact.

The main wheel brakes are hydraulically driven drum type and activated via a cockpit hand-lever. The hydraulic brake fluid used is DOT 4.

Cabin ventilation is achieved through special vents fitted into the doors.

The propeller is a fixed pitch three-blade design.

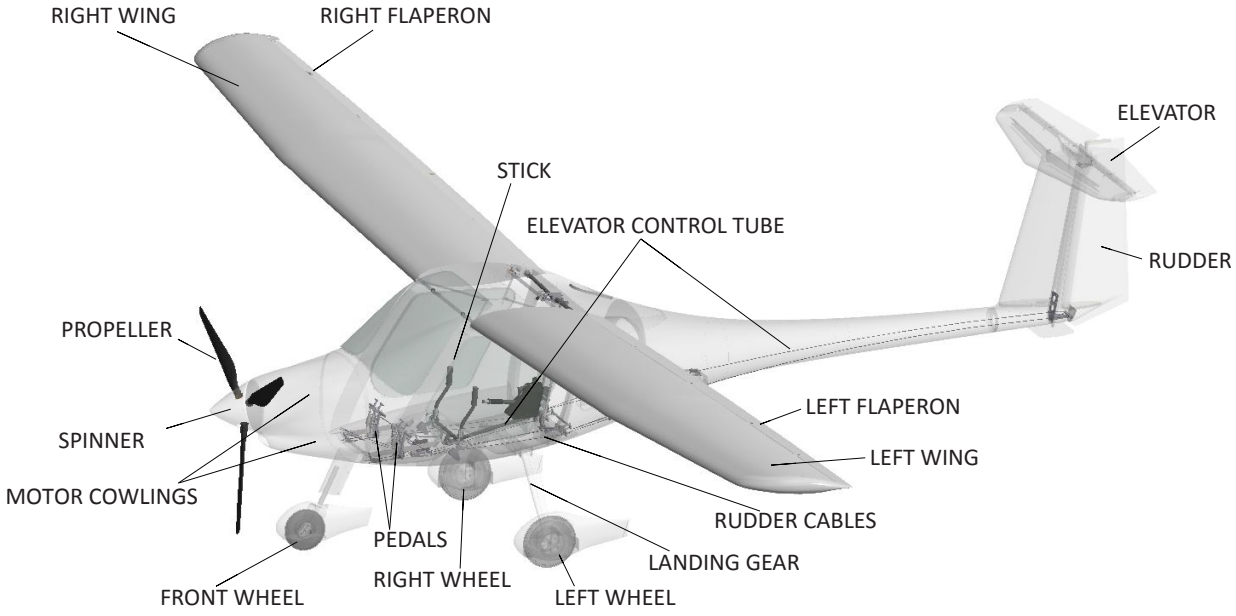
The resettable electric circuit breakers enable the pilot to test individual circuit items and disconnect the batteries from the circuit if required.

Navigational (NAV) lights, anti collision (AC) lights and a landing (LDG) light are installed.

The firewall is reinforced with heat and noise insulation.

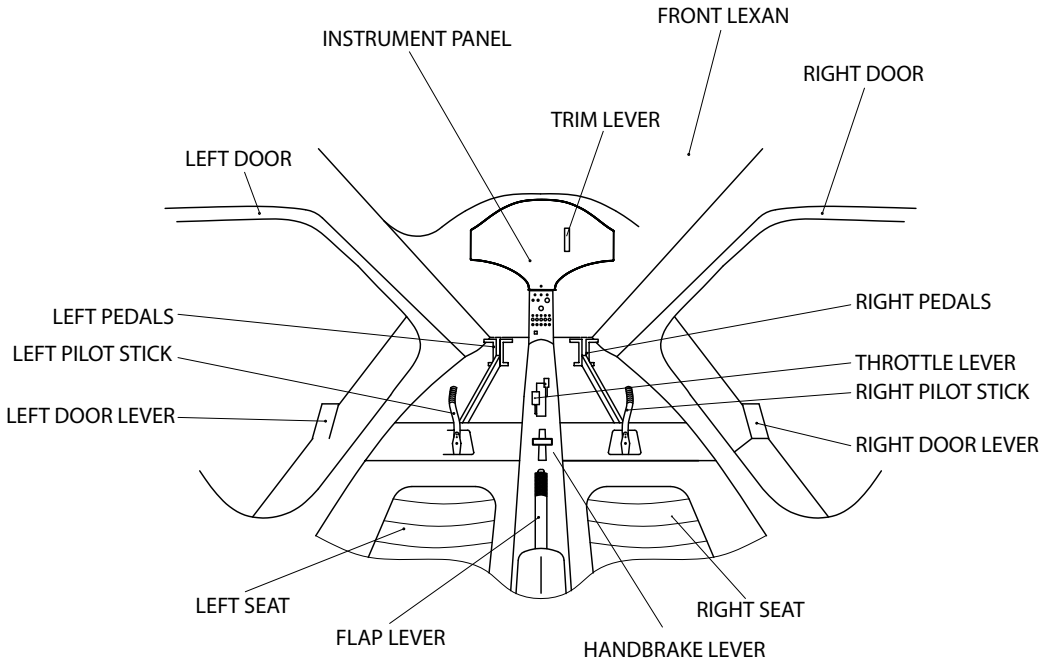
Basic instruments come installed with operational limits pre-designated.

A BPRS is present and located in aft fuselage.



Cockpit controls

The ALPHA Electro cockpit levers are divided into two groups:



Individual control levers: pilot stick and rudder pedals

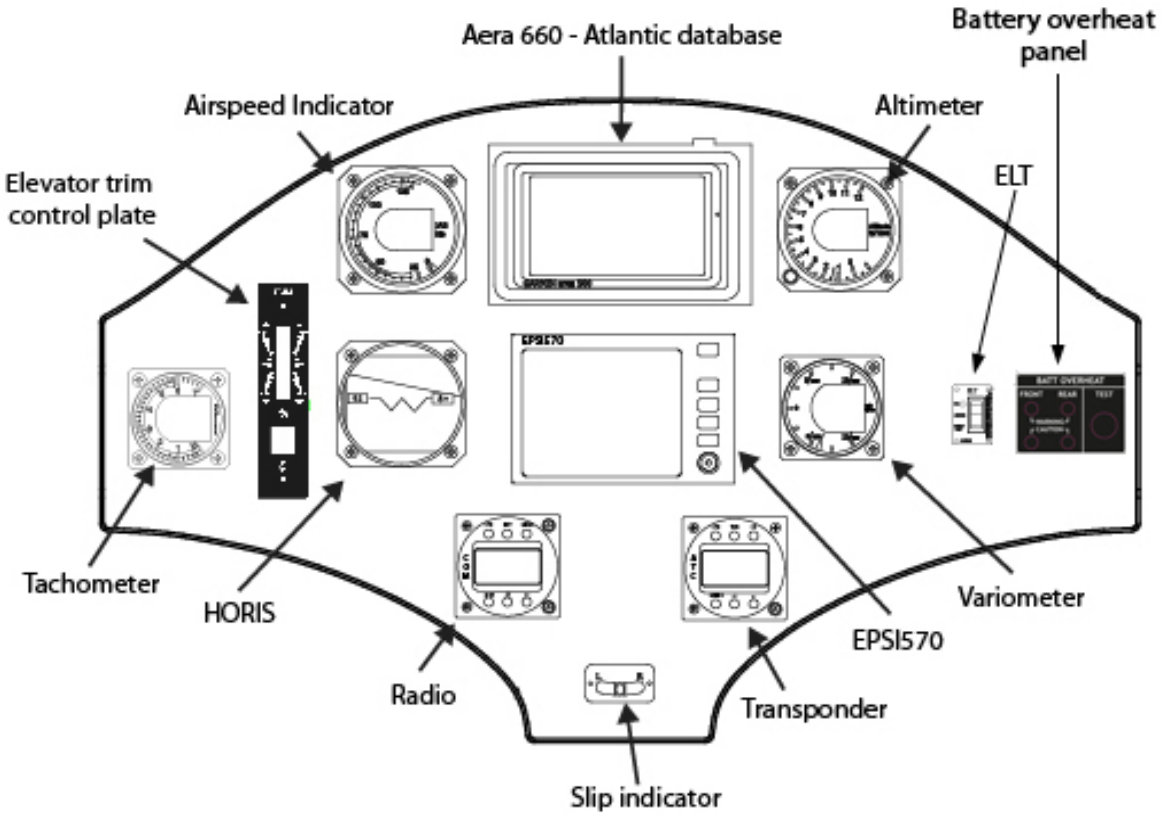
Dual control levers: power lever, handbrake lever, flap lever, trim lever, door handles and BPRS release handle.

Instrument panel

The instrument panel is equipped with various instruments/gauges that indicate airspeed, altitude, RPM, etc.. The equipment include: artificial horizon, EPSI570 electric system parameters (monitors RPM, power controller temperature, motor temperature, coolant temperature, state of charge, battery temperature and state of health), 2 caution (amber) and 2 warning (red) LED lights for front and rear battery pack overheat and test button (Battery overheat panel), radio f.u.n.k.e. ATR833, transponder f.u.n.k.e. TRT800H-OLED and the GPS Garmin AERA 660. Instructions on how to use the instruments/gauges (COM, GPS) are found in individual equipment manuals, which are to be considered supplement to this POH. The gauges are round and 80 mm or 57 mm in diameter, while the GPS has a touchscreen. The radio is a modern lightweight unit, features full VOX intercom and dual PTT connections.

NOTE See appendix (section 9) for additional details about the EPSI570

NOTE See emergency procedures (section 6) for additional details about Battery overheat panel



Cockpit electrical system panel:

The cockpit electrical system panel incorporates a separate master switch, avionics switch, separate battery enable and power enable switches. There are fuses located in the illuminated rectangular toggle switches, which are wired behind the avionics switch to each of the electrical avionics loads. Label positions may vary.

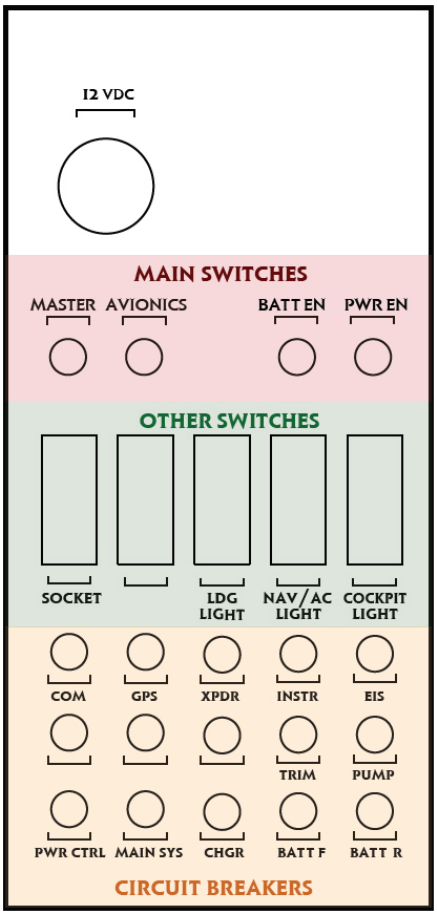
When using the cockpit electrical system panel, use the following sequence:

MOTOR START-UP		**MOTOR SHUT-DOWN**	
PWR CTRL BREAKER	**PUSH**	OTHER SWITCHES	**OFF**
MASTER SWITCH	**ON**	POWER ENABLE SWITCH	**OFF**
AVIONICS SWITCH	**ON**	BATTERY ENABLE SWITCH	**OFF**
BATTERY ENABLE SWITCH	**ON**	AVIONICS SWITCH	**OFF**
POWER ENABLE SWITCH	**ON**	MASTER SWITCH	**OFF**
OTHER SWITCHES	**ON as desired**	PWR CTRL BREAKER	**PULL**

NOTE pull out all of the circuit breakers If the motor and/or any other equipment on the aircraft remains on after the master switch is turned off. reinsert them before commencing with the next motor start-up.

WARNING! Make sure that "PWR CTRL" circuit breaker is always in "pull" position when the aircraft is parked on the ground.

Switch panel:



Switches and breakers description:

MASTER	Enable system switch
AVIONICS	Enable instruments switch
BATT EN	Battery enable switch
PWR EN	Power enable switch
SOCKET	12 VDC socket switch
LDG LIGHT	Landing light switch
NAV/AC LIGHTS	Navigation/ anti- collision lights switch
COCKPIT LIGHT	Cockpit light switch
COM	Radio circuit breaker
GPS	Navigation system circuit breaker
XPDR	Transponder circuit breaker
INSTR	Other instruments circuit breaker
EIS	EPSI570 Information System circuit breaker
TRIM	Trim actuator circuit breaker
PUMP	Coolant pump circuit breaker
PWR CTRL	Power control circuit breaker
MAIN SYS	Main system circuit breaker
CHGR	Charger circuit breaker
BATT F	Front Battery circuit breaker
BATT R	Rear Battery circuit breaker

Undercarriage

The tricycle undercarriage incorporates brake-equipped wheels, a U-shaped composite strut and a steerable nose wheel. The rudder pedals are used to steer the nose wheel.

Distance between main wheels:	63 " (1.6 m)
Distance between main and nose wheel:	60 " (1.52 m)
Tire, 6 ply:	4,00'' x 6'' (main wh.), 4,00'' x 4'' (nose wheel)
Recommended tire pressure:	2.5 bar/36 psi (main), 1.5 bar/22 psi (nose)
Brakes:	drum type, actuated by cockpit hand lever, parking brake included
Brake fluid:	DOT 4

The parking brake is applied using a lock pin on the handbrake lever. To apply it, pull the handbrake lever firmly and, while holding it back, slide the lock pin downwards into it's respective groove. To release it, simply pull back on the handbrake lever, pull the lock pin out of it's groove and release handbrake lever.

Seats and safety harnesses

The ALPHA Electro comes equipped with either stiff, leather seats or soft, fabric-covered seats. The former can be easily removed and the later folded forward, making it easy to access the aft fuselage. Seat position is fixed, whereas pedal position is adjustable. Custom made seats are available for ordering. All ALPHA Electro ship with H type safety harness attached to the fuselage at three mounting points.

Pitot-static system

The Pitot-static tube is attached to the bottom side of the starboard wing.
The Pitot lines run through the inside of the wing to the fitting placed on the wing/fuselage joint. Then the lines go to the instrument panel.

ELT (Emergency Locator Transmitter)

The ALPHA Electro can be equipped with an Emergency Locator Transmitter (ELT). The device is composed by the ELT transmitter, installed behind the right seat, a remote switch mounted on the instrument panel, connecting wires and antenna. In the event of an aircraft accident, these devices are designed to transmit a distress signal on different frequencies (121.5 and 406 MHz). The ELT is activated either automatically, once a certain force threshold is reached (e.g. in case of incident) or manually, by setting the remote switch, installed on the instrument panel, to ON. Two ELT models can be found on the aircraft: Kannad 406 AF or Artex 345.
For correct operation of the system, following switches position must be ensured:

	Artex 345		**Kannad 406 AF**	
	ELT (box)	***Remote switch***	***ELT (box)***	***Remote switch***
Flight position (normal):	ARM/OFF	ARM/OFF	ARM	ARMED
Manual activation during emergency landing:	use remote switch	ON	use remote switch	ON
Manual activation (after emergency landing):	ON	ON	ON	ON
End transmission:	ON>ARM/OFF	ON>ARM/OFF	OFF	RESET/TEST

NOTE Please refer to OEM documentation for periodical testing procedure and additional info mation.

NOTE If the ELT is inadvertently activated in its distress mode, the operator should deactivate it AND contact the nearest COSPAS-SARSAT Mission Control Centre or local RCC as soon as possible to request cancellation of the distress alert (Deactivating the ALT alone does NOT cancel the distress alert that already has been transmitted by the beacon and received by COSPAS-SARSAT).

Powerplant, propeller and energy storage

The ALPHA Electro has a out-runner type electric motor that provides direct-drive to the propeller. The motor is a 3-phase synchronous motor with permanent magnets, which exhibits high torque and above average efficiency ratings. Motor and power controller cooling is provided by a fluid based system and radiator. The power controller is mounted inside the fuselage in an IP54 enclosure. All components are protected against rain.

The system is controlled by a color-display EPSI570 cockpit interface instrument. It indicates the drive mode and important parameters to the pilot. The EPSI570 also communicates with the Battery-Management-System (BMS) and delivers information about the state of charge (SOC) and monitors the charging. All components communicate via the CAN interface with a proprietary communication protocol. The battery state of health (SOH) is displayed in the display incorporated in each battery pack.

Motor:

TEMPERATURE °C	PEM 60MVLC
Maximum takeoff power (1 min)	56 kW
Maximum continuous power	50 kW
Maximum operating temperature	95 °C
Maximum ambient temperature	40 °C
RPM	**PEM 60MVLC**
Maximum allowable	2500
Takeoff RPM (typical)	2400
Climb RPM (typical)	2250

Power controller:

POWER CONTROLLER	H300A
Nominal power	60 kW
Maximum operating temperature	65 °C
Maximum ambient temperature	40 °C

WARNING! Do not, under any circumstances, attempt to use any other batteries other than Pipistrel factory-supplied batteries. Only use them with the motor and power controller mentioned in this POH.

Propeller type:

FP03-60E	three blade, fixed pitch composite propeller, diameter 64 9/16”(1640 mm)

Energy storage & charging

Description:	2 metal battery boxes(packs) which include cells, BMS and communication modules, power and signal connectors
Total battery capacity:	21.0 kWh
Useful battery capacity:	20.0 kWh

CAUTION! In order to maintain battery life, discharging the battery below 20% charge is not recommended. The useful range is considered to be between 20%-100% of system charge.

CAUTION! Once the batteries reach 0% SOC, they will be disconnected from the system. The 12v battery supplying avionics and auxiliary systems will still be available.

The batteries are housed in 2 metal boxes(packs), which contain the battery cells, the BMS and communication modules, as well as the power and signal connectors. One of the packs is positioned firewall forward, while the other is aft of the cabin bulkhead. Be sure to always position the pack in the same location, as they're not interchangeable. Make sure that all the connectors (2x power connectors, 2x CAN BUS connector, one of each per pack) are fastened properly before each flight, as indicated in the EPSI570.

NOTE State of health (SOH): SOH is a measure of usable energy in the batteries. It's related to battery age, temperature and how properly the batteries have been used.

NOTE State of charge (SOC): SOC is an indication of the current charge level given the batteries current capability, which depends on SOH

Battery management system (BMS)

Each of the battery packs has an independent BMS, which monitors and balances the system's voltage. All the units communicate with the EPSI570 and log data from each individual battery cell. If an error occurs, EPSI570 will display a message (error code). Contact the manufacturer if this happens. Under normal circumstances the BMS requires no human intervention and is a fully automated system that takes care of itself.

Battery system	**PB345V105E-A**
Maximum voltage	398 V
Minimum voltage	288 V
Recommended voltage range for storage	355 V - 365 V
Maximum operating temperature	55 °C
Minimum operating temperature	5 °C
Allowable temperature range for storage	10 °C - 40 °C
Minimum charging temperature	0 °C

CAUTION! Temperatures below 10°C will cause a decrease in battery capacity. Plan your flight accordingly.

WARNING! Do not, under any circumstances, attempt to charge the batteries with any third party chargers. Only Pipistrel original equipment must be used.

WARNING! Respect operating and storage temperatures and storage limits at all times. Failure to do so may rsult in battery damage.

WARNING! If you have purchased another set of batteries, make sure you do not mix the packs between sets. The same group of 2 packs must always be used!

Charging

The charger is a dedicated charger ranging from **3 kW to 20 kW charging power.** Charge time will vary upon battery charge status and electrical power availability from the network**.** The charger is a world-wide charger and a portable unit which can be connected to any 110V and 240V, 50 Hz or 60 Hz electrical grid or the Solar Trailer.

Charging times

Charger: power setting	~ phases	VAC	Hz	Charging time (approx.)
3 kW	1 ~	85 - 265	45 - 65	8 h
10 kW	1 ~	85 - 265	45 - 65	2 h 30 min
15 kW	1 ~	85 - 265	45 - 65	1 h 45 min
10 kW	3 ~	380	45 - 65	2 h 30 min
20 kW	3 ~	380	45 - 65	1 h 10 min

WARNING! Before connecting the charger, make sure the aircraft electrical system is OFF (Master Switch in OFF position).

FULL CHARGE PROCEDURE (fully charged battery for a flight)

- Plug the charger in.
- Unscrew the **FAST CHARGE PORT** cap.
- Plug the charger into the charging socket located in the nose of the aircraft.
- Power-up the charger using the charger's rocker switch.
- Access the charger's display and it's menu.
- Push the "**FULL CHARGE"** button in the charger display's menu.
- Select the desired charger input current from the left side of the display
- Confirm your selection with the "**CONFIRM"** button.
- The charger will initiate charging.
- The charger's display indicates when charging is completed > press "**CONFIRM"** button.
- To disconnect the charger, turn the rocker switch on the right side of the charger to OFF.
- Remove the charging cable from the **FAST CHARGE PORT**.
- Place the cap back on the aircraft's charging socket.

NOTE After performing a full charge, do not keep the battery charged above 80% STATE OF CHARGE (SOC) for more than 5 days. Either perform a flight or run the motor to discharge the battery to the recommended 50-80% SOC for storage.

NOTE Discharging the battery below 20% SOC can negatively affect battery life and thus is not recommended.

NOTE do not unplug the charger's cable from the fast charge port during the charge procedure

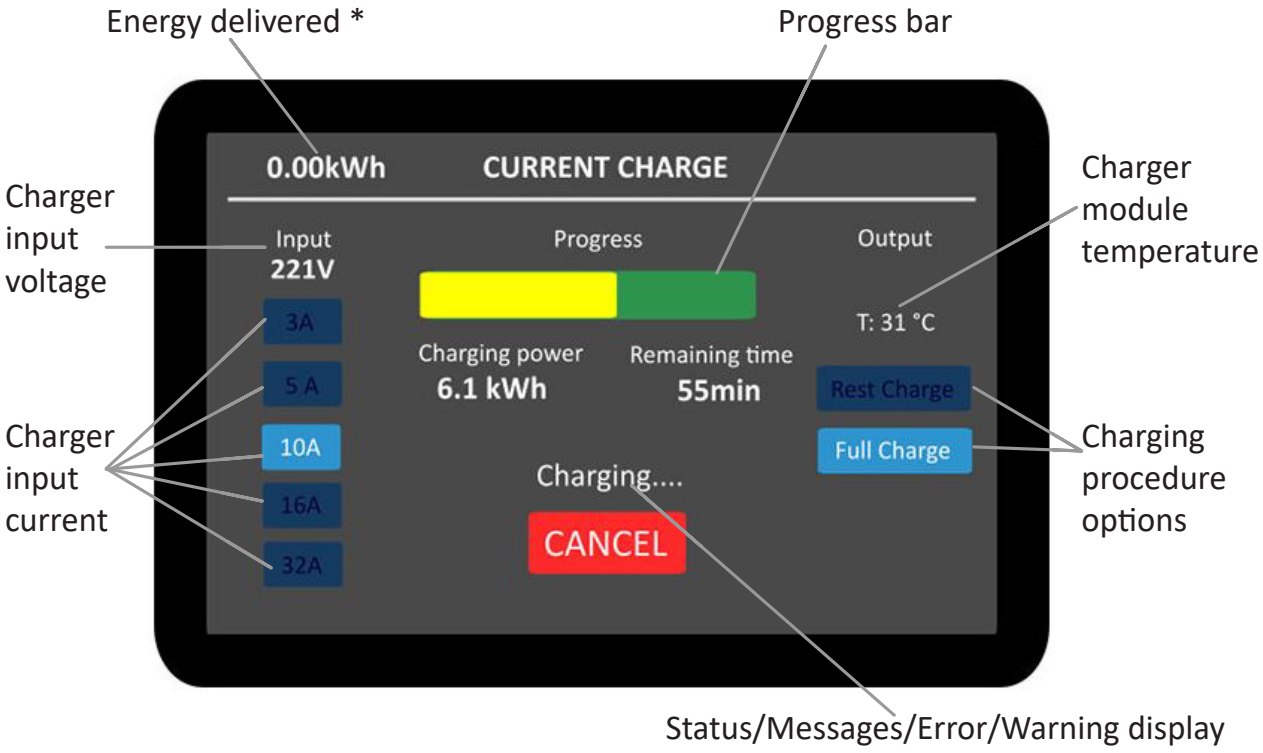
REST CHARGE PROCEDURE (storage charge)

When the aircraft is not in use, **performing a keep-alive (storage) charge once every 90 days is required.**

- Repeat the same procedure as outlined in FULL CHARGE PROCEDURE, but instead of "**FULL CHARGE**" mode select **"REST CHARGE"** mode on the charger display.
- This will charge the battery to an optimum level for aircraft storage.

NOTE After a period of no-flying activity, perform a full charge 24 hour before actual flight.

NOTE After charging has started, the "Rest Charge" and "Full Charge" options disappear.



*** THE "ENERGY DELIVERED" VALUE INDICATES HOW MUCH ENERGY HAS BEEN TRANSFERRED SINCE INITIATING THE CHARGING PROCEDURE. IT DOES NOT REPRESENT THE TOTAL AMOUNT OF ENERGY IN THE BATTERIES (FOR THIS VALUE PLEASE REFER TO "STATE OF CHARGE" (SOC)).**

Wheels and brake system

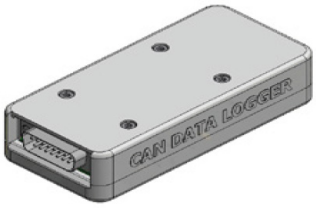
The wheel brakes are drum type, hydraulic operated, actuated simultaneously by pulling on a the handbrake lever.

The hydraulic brake fluid used is DOT 4.

Parking brake function is applied using a lock pin on the handbrake lever. To apply the parking brake, pull handbrake lever firmly and, while holding it back, slide the lock pin downwards into it's respective groove. To release it, simply pull back on the handbrake lever, pull the lock pin out of it's groove and release handbrake lever.

CAN (data) Logger

The aircraft is equipped with a CAN logger, which is used for logging CAN (Controller Area Network) bus data and can be assimilated to a flight data recorder. The device consists of Logger (an electronic box) with SD card and attached cable with 15-pin DB-15 Connector which can be connected directly to the main controller trough diagnostics port positioned on the right side of the instrument panel.



Data Logger

Connector

Setup procedure

Step	Action
1	Approach the right hand side of the aircrafts control panel and locate the socket marked DIAGNOSTICS.
2	Plug in the 15-pin DB-15 Connector into the DIAGNOSTICS socket.
3	Tighten the screws on the connector with a flat screw driver to the socket.

NOTE: Power supply for the device is provided via the attached cable. Device turns on and Logger starts logging CAN bus data on SD card immediately when aircrafts Master switch is turned to ON position. Device turns off and data logging stops when Master switch is turned to OFF position.

Logging and downloading data, during flight and uploading them to the dedicated on-line Pipistrel electro portal, is highly recommended. Submitting the data to the manufacturer will not only make it easier to provide product support and troubleshooting advice, but also give insight into the aircraft's life history. It also helps the design data owner monitor the fleet and implement design improvements based on performance data analysis.

Login to Pipistrel Electro Portal and follow the instructions to upload the logged data by using the link:
https://cloud.pipistrel.si/electro
Contact first **electro.support@pipistrel-aircraft.com** to receive username and password.

For additional help on seting up Pipistrel's flight logger, please refer to:
https://cloud.pipistrel.si/electro/help or contact **electro.support@pipistrel-aircraft.com**

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3 Limitations

Introduction

This section includes operating limitations, instrument markings and basic placards necessary for the safe operation of the airplane, it's motor, standard system and standard equipment.
Adhering to the limitations outlined in this section is required by law.

Airspeed limitations

NOTE for calibrated values (CAS) see the Appendix

	Velocity	IAS [kts (km/h)]	Remarks
VS0	Stall speed landing configuration	**38 (70)**	Stall speed flaps extended +25°
VS	Stall speed clean	**43 (80)**	Stall speed flaps retracted 0°
VFE	Max. velocity flaps extended	**70 (130)**	Do not exceed this speed with flaps extended +15°.
		60 (111)	Do not exceed this speed with flaps extended +25°.
VA	Design maneuvering speed	**90 (167)**	Do not make full or abrupt control movements above this speed.
VNE	Velocity never to be exceeded	**135 (250)**	Never exceed this speed in any operation.
VNO	Velocity normal operating	**108 (200)**	Maximum structural cruising speed in turbulent air (V_C).

Airspeed indicator markings

MARKING	IAS [kts (km/h)]	Definition
White band	**38 -70 (70 - 130)**	Full Flap Operating Range. Lower limit is the maximum weight VS0 in landing configuration. Upper limit is maximum speed permissible with flaps extended.
Green band	**43 -108 (80 - 200)**	Normal Operating Range Lower end is maximum weight VS at most forward C.G. with flaps retracted. Upper limit is maximum structural cruising speed.
Yellow band	**108 - 135 (200 - 250)**	Maneuver the aircraft with caution in calm air only.
Red line	**135 (250)**	Maximum speed for all operations. VNE
Blue line	**70 (130)**	Best climb rate speed (V_Y)
/	**53 (98)**	Best angle of climb speed (Vx)

Powerplant limitations

WARNING! The motor is not certified for aviation use, therefore, there is no assurance it cannot fail in its operation at any given moment, without prior notice.

Motor

TEMPERATURE °C	PEM 60MVLC
Maximum takeoff power (1 min)	56 kW
Maximum continuous power	50 kW
Maximum operating temperature	95 °C
Maximum ambient temperature	40 °C
RPM	**PEM 60MVLC**
Maximum allowable	2500
Takeoff RPM (typical)	2400
Climb RPM (typical)	2250

Power controller

POWER CONTROLLER	H300A
Nominal power	60 kW
Maximum operating temperature	65 °C
Maximum ambient temperature	40 °C

WARNING! Do not, under any circumstances, attempt to use any other batteries other than pipistrel factory-supplied batteries. Only use them with the motor and power controller mentioned in this POH.

Battery system

Battery system	PB345V105E-A
Maximum voltage	398 V
Minimum voltage	288 V
Recommended voltage range for storage	355 V - 365 V
Maximum operating temperature	55° C
Minimum operating temperature	5° C
Allowable temperature range for storage	10 °C - 40 °C
Minimum charging temperature	0 °C
Maximum battery temperature before takeoff	40 °C

CAUTION! Temperatures below 10°c will cause a decrease in battery capacity. Plan your flight accordingly.

WARNING! Do not, under any circumstances, attempt to charge the batteries with any third party chargers. Only Pipistrel original equipment must be used.

WARNING! Respect operating and storage temperature limits at all times. Failure to do so may result in battery damage.

Propeller

ALPHA Electro	Propeller
with 60 kW electric motor	three blade, fixed pitch composite propeller, diameter 64 9/16" (1640 mm)

Motor instrument markings

Instrument	Red (minimum)	Yellow (caution)	Green (normal)	Yellow (caution)	Red line (maximum)
Tachometer (RPM)	/	/	0-2399	2400-2499	2500
Motor temp. (°C)	/	/	(-20) - 89	90-94	95
Power controller temp. (°C)	/	/	(-20) - 59	60-64	65
Battery sys. temp. (°C)	5	6 -10	11-44	45-49	50

Weight limits

Basic model weights

WEIGHT	ELECTRO
Empty aircraft weight (incl. BPRS and std. battery system)	368 kg (811 lbs)
Maximum takeoff weight (MTOW)	550 kg (1212 lbs)
Minimum combined cockpit crew weight (depends on C.G. of empty aircraft)	55 kg (121 lbs)
Maximum combined cockpit crew weight (depends the weight and balance)	see page 4-2

WARNING! Should one of the above-listed values be exceeded, others MUST be reduced in order to keep MTOW below 550 kg. failing to comply with any of the weight limitations may cause uncontrolled ground handling and/or flight due to extreme center of gravity position.

Center of gravity range

- The aircraft's safe in-flight center of gravity position ranges between 20% and 35% of MAC (mean aerodynamic chord).
- The in-flight center of gravity point ranges between 8 1/16" (220 mm) and 14" (355 mm) aft of the datum. The datum is the wing's leading edge at the fuselage root.

G-load factors

Max. positive wing load: + 4 G
Max. negative wing load: – 2 G

Service ceiling, crosswind

Service ceiling is. 12,800 ft (3900 m). Maximum crosswind component is 18 kts.

Maneuver limits

The following NON-aerobatic maneuvers are permitted as defined:

Power-on and -off stalls not below 1500 feet (450 meters) above ground level.

Power on and off lazy eights not below 1500 feet (450 meters) above ground level, entry speed 90 kts.

Steep turns with initial speed of 80 kts.

Chandelle maneuvers not below 500 ft (150 m) above ground level, entry speed 105 kts.

WARNING! Aerobatic maneuvers, including intentional spins, are prohibited.

CAUTION! Intentional flying with both cabin doors open is prohibited. Flying with one door open in flight is approved with airspeeds up to 60 kts, flying with one door removed is approved without changes to the limitations of the normal operational envelope.
Flying with both doors removed is not approved.

Kinds of operations

ALPHA Electro can be used for DAY - VFR operations only.
Flight into known icing conditions is prohibited.

WARNING! Should you find water drops on the airframe during pre-flight check-up at temperatures close to freezing, you may expect icing to appear in flight.

Minimum equipment list (DAY - VFR)

- Placards, checklist, this POH
- Airspeed indicator (functional), Altimeter (functional), Compass (functional)
- EPSI570
- Battery overheat panel - LED system (functional)
- Both battery packs (functional), Safety belts (2x)

Energy limitations

Description:	2 metal boxes(packs) which include battery cells, BMS and communication modules, power and signal connectors
Total battery capacity:	21.0 kWh
Useful bat. capacity:	20.0 kWh
Maximum allowed output power with one battery pack connected	35 kW

NOTE The system will function with only one of the battery packs connected, however, the power output must be kept below 35 kW.

WARNING! Takeoff is prohibited with a state of charge below 40%.

Other restrictions

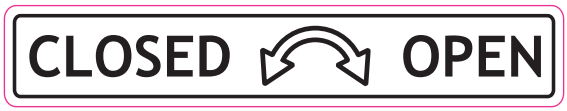
Due to flight safety reasons it is forbidden to:

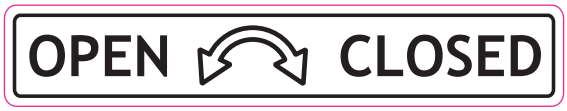
- fly in heavy rainfall
- fly during thunderstorm activity;
- fly in a blizzard
- fly according to Instrument Flight Rules (IFR) or attempt to fly in instrument meteorological conditions (IMC)
- fly when the temperature of the aircraft´s surface is at risk of exceeding 55 °C (130 °F)
- perform aerobatic flying
- take off with flaps retracted (0°)
- land with flaps retracted (0°), other than in cases of very strong winds (not to be performed as a normal procedure)
- the 12 Volt power outlet is not approved to supply power to flight-critical communication or navigation devices
- take off when state of charge is below 40%
- fly with either of the battery packs removed

Placards

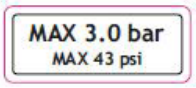
Placards (external):

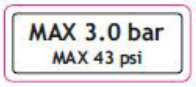
Next to door opening latches:

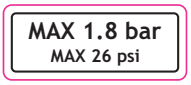




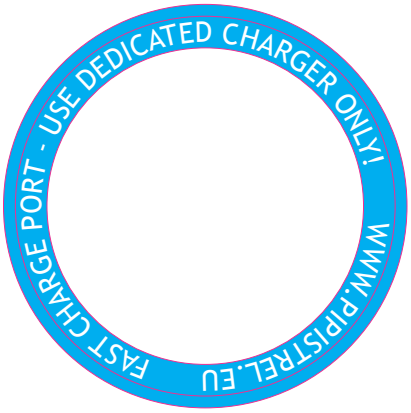
Next to wheels:



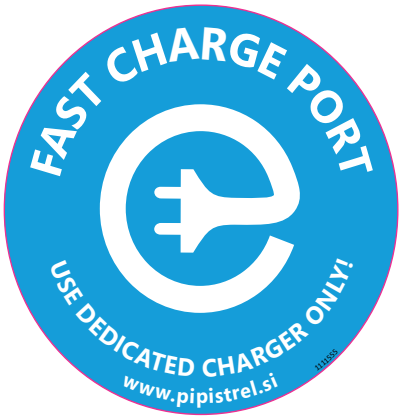




Next to FCP:



or

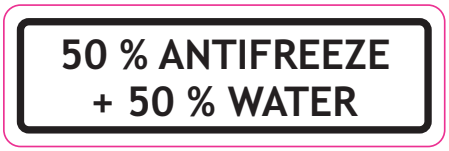


Next to battery bay door lock:

Next to battery bay cooling outlets:

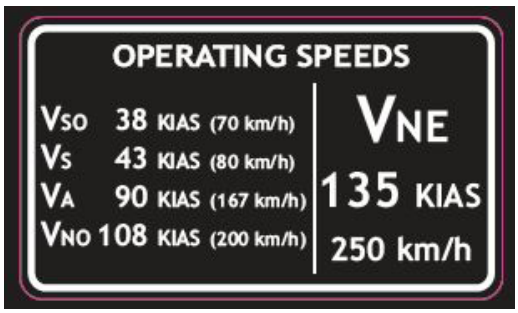
Placards (motor compartment):

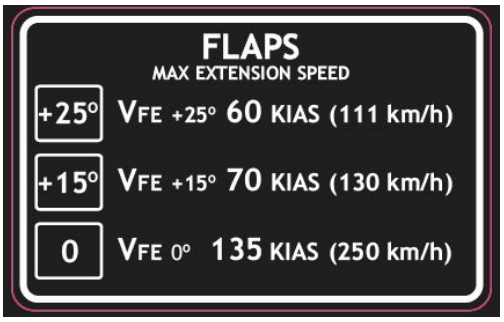
On overflow bottle :

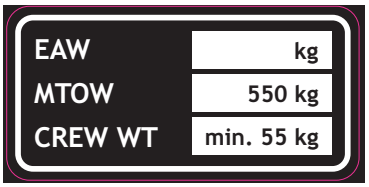


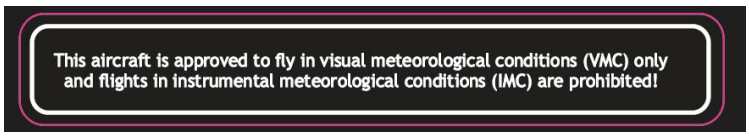
On junction box and battery packs:

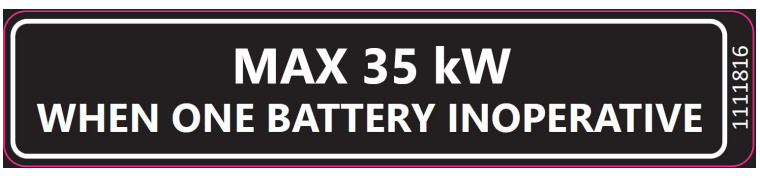
Placards (intsrument panel and center console):

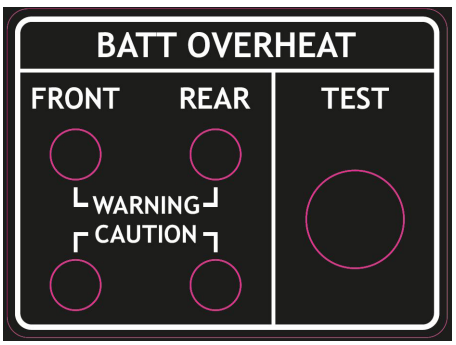










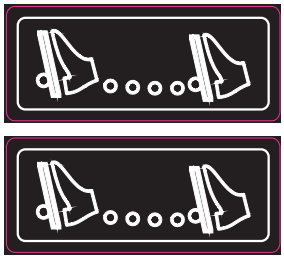


Right side of the instrument panel :

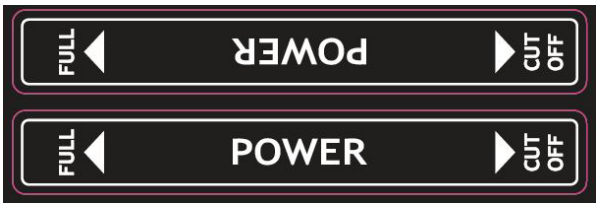
Next to microphone jacks:

Next to headphone jacks:

In front of control sticks (rudder pedal adjustment):

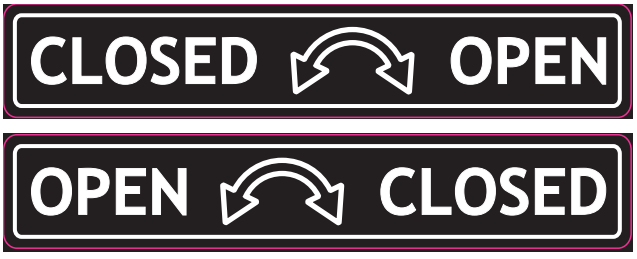


Next to power lever:

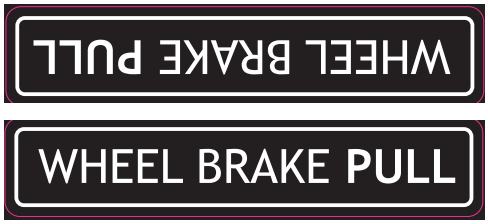


On flap lever:

Below each door to depict door handle operation:



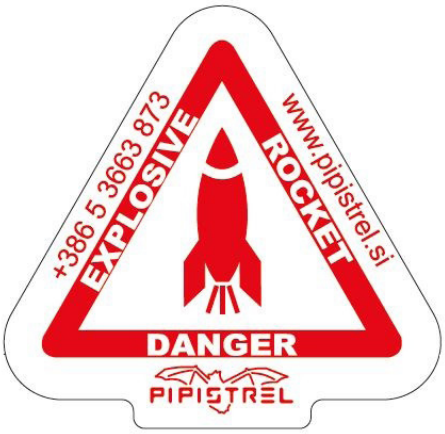
Next to wheel brake lever:



On upper tube in front of pilot:

Placards (Ballistic BPRS):

On BPRS hatch:



Next to rocket exhaust (bottom of fuselage):

Next to activation handle (cockpit)

Next to each door, top aft corner:

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4 Weight and balance

Introduction

This section describes the procedure for establishing the basic empty weight and moment of the airplane. Sample calculations are provided for reference. Specific information regarding the weight and arm for this airplane as delivered from the factory can be found in the aircraft documentation folder, look for Weight and Balance Report.

WARNING! It is the responsibility of the pilot to make sure the airplane is loaded properly. Operation outside of the prescribed weight and balance limitations could result in an accident and serious or fatal injury.

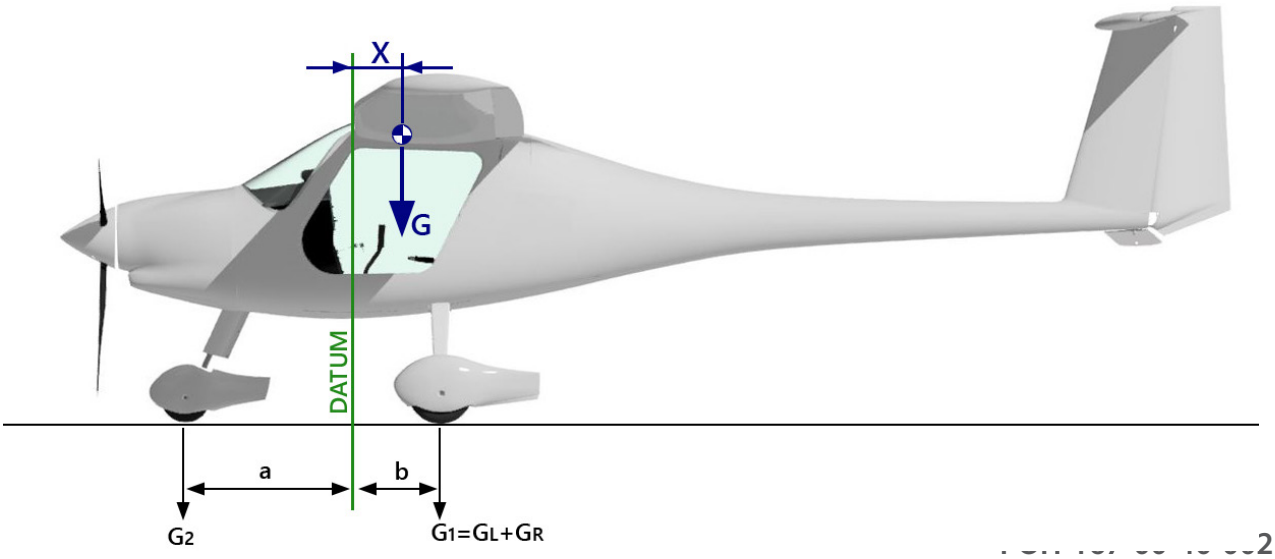
Weighing procedure

Make sure all listed aircraft parts and appliances are installed and in position.
Remove all other objects (e.g. tools, rags, tie downs and other items ...).
Install batteries. Retract flaps and leave control surfaces centered.
Level the aircraft inside a closed spaced using a digital level. Calibrate it so that it reads 0° when placed on the levelling surface (i.e the surface the aircraft is on). Then use it to make the tail cone's center line parallel to the levelling surface. Do this by placing the level on the upper surface of the tail cone just fore of the vertical stabilizer and measuring the angle. Do the same on the tail cone's lower surface. The aircraft (tailcone centerline) is level once these two readings are the same. .
Once levelled, read the scale readings and subtract eventual tare weight.
Now record all readings and fill out the bottom table.
The datum is the wing's leading edge at the fuselage root. Calculate the lever arm of empty aircraft CG using this formula:

Lever arm of CG (X) = $$CG_{Emm} = \frac{b \times G_1 - a \times G_2}{(G_1 + G_2)}$$

Weighing form

Weighing point and symbol	Scale reading	Tare	Net
Right main wheel (G_R)			
Left main wheel (G_L)			
$G_1 = G_R + G_L$			
Nose wheel (G_2)			
Total Empty ($G = G_1 + G_2$)			



Equipment list

The aircraft's empty weight data is unique for each and every ALPHA Electro delivered. The owner is responsible for keeping the equipment list up to date. Fill it out according to actual status.

ALPHA Electro

Serial number:

Registration number:

Equipment installed:

Determination of in-flight CG position

	Weight (kg)	Weight's lever arm (mm)	Moment (kg x mm)	Remarks
Basic cfg. empty data	*	*		
Instruments		- 310		minus!!!
Pilots		370		
other				

*** NOTE These values are to be obtained from the applicable aircraft's weight and balance report or from weighing procedure.**

Each newly installed part or appliance must be registered in the upper table. Also, the new total weight and lever arm of CG values must be entered and the position of CG re-determined. Furthermore, the moment must be recalculated. This is rather easy to do. First multiply the new part's weight by it's lever arm measured from the reference point (wing's leading edge). Then sum up all moments and divide the sum by the new total weight.

WARNING! The aircraft's safe in-flight center of gravity position ranges between 8 11/16" (220 mm) and 14" (355 mm) aft of datum and is not critically affected by cockpit crew weight.

WARNING! Storing luggage or any other items in the battery bays is strictly prohibited!

WARNING! It is the responsibility of the pilot to make sure the airplane is loaded properly. Operation outside of the prescribed weight and balance limitations could result in an accident and serious or fatal injury.

Sample c.g. calculation

NOTE all the numbers in this section are used purely as an example.

1) Determination of empty aircraft CG position and empty aircraft weight.
Weigh the aircraft according to the procedure described in this chapter and write down values of G_1 (sum of scale readings at main wheels) and G_2 (scale reading at front wheel).

Example: $G_1 + G_2 = G = 368$ kg

Then calculate the position of empty aircraft CG in millimeters (CG_{Emm}) from the datum (wing's leading edge at wing root).

Use the following formula:

$$CG_{Emm} = \frac{b \times G_1 - a \times G_2}{(G_1 + G_2)} = \frac{505 \times G_1 - 1020 \times G_2}{(G_1 + G_2)} = 275 \text{ mm}$$

where:
a is the distance from nose wheel axis to wing's leading edge (datum),
b is the distance from main wheel axis to wing's leading edge (datum)

2) Determination of in-flight CG position and operative aircraft weight.
Use the procedure and the table in "Determination of in-flight CG position" for calculation of in-flight position (CGmm) and In-flight weight. Use values of empty aircraft (step 1) as starting point (Basic cfg. empty data).

	Weight (kg)	Weight's lever arm (mm)	Moment (kg x mm)
Basic cfg. empty data	*368*	*275*	*101200*
Pilots	*70+80*	370	*55500*
Total	**518**	**302**	*156700*

Total in-flight weight is 518 kg (<550 kg MOTM)
In-flight CG position (CGmm) is 302 mm (within the allowable range 220mm - 355mm)
Weight and in-flight CG position limitations are respected.

3) Conversion of in-flight CG position in mm to CG position expressed in %MAC.
Determine the CG position in percentage (%) of Mean Aerodynamic Chord (MAC) with following the formula:

$$CG_{\%MAC} = \frac{CG_{mm} - R}{MAC} \times 100 = \frac{275 - 40}{900} \times 100 = 26.1\ \%MAC$$

where:
CG_{mm} is the position of CG in millimeters (step 2),
R is the difference between wing's leading edge and MAC's leading edge (40 mm),
MAC is the Mean Aerodynamic Chord (900 mm).

In-flight CG position is 29.1% MAC, within the allowable range (20%MAC - 35%MAC).

5 Performance

Introduction

This section provides information about the aircraft's airspeed calibration, stall speeds and general performance. All data published was obtained from test flight analysis using average flying skills.

The ALPHA Electro has demonstrated adequate motor cooling performance at ambient temperatures of up to 40 °C (104 °F). This is not to be regarded as a temperature limit, however higher temperatures may have an adverse effect on motor cooling and overall performance.

Stall speeds

Stall speeds at MTOW (1212 lbs / 550 kg) for the ALPHA Electro are as follows (see Appendix for CAS values):

Flaps 0° (retracted):	**43 KIAS (80 km/h)**
Flaps +15° (extended):	**40 KIAS (74 km/h)**
Flaps +25° (extended):	**38 KIAS (70 km/h)**

Energy management and mission planning

When flying the ALPHA Electro, it's important to pay special attention to energy and endurance management. The following is a set of SOC depletion guidelines for the different flight stages:

- 1% of SOC for every 100 ft of climb
- 15% of SOC for flight from take-off to the training area 1500 ft AGL and 10 km away
- 10% of SOC for 5 minutes of manoeuvring in the training area (at 20-25kW)
- 10% of SOC to return from the same training area
- 10% of SOC for 1 circuit pattern at 1000 ft AGL
- 7% of SOC for 1 circuit pattern at 500 ft AGL

Increase all of the above by a further 10% in case of high winds and/or turbulence.
Example:

- 10% of SOC for 1 circuit pattern at 1000 ft AGL – in turbulence this circuit pattern would require 11% of SOCs.

The flight should be programmed and combined in a way that ensures the SOC at landing is no less than 30%.

NOTE In order to improve battery life not discharging the batteries below 20% SOC is recommended. Normal SOC at the end of flight should always be >=30%.

Takeoff performance

All data published in this section was obtained under the following conditions:

Aircraft at MTOW
Elevation: sea level
Wind: calm
Runway: grass runway
Data extrapolated for ICAO standard atmosphere

ALPHA Electro	ALPHA Electro
Takeoff ground roll at MTOW	555 ft *(170 m)*
Takeoff runway length (over 50 ft/15 m obstacle)	870 ft *(265 m)*

NOTE In order to meet the data for takeoff runway length over 50 ft obstacle maintain V_x (53 kts, 98 km/h) after take off.

The runway length required for takeoff may vary depending on the wind, temperature, elevation and wing & propeller surface condition.

Effect of elevation

The table below provides data about the effect of elevation on takeoff runway length.

Elevation (m)	0	500	1000	1500
Elevation (ft)	0	1640	3280	4921
Atmosph. pressure (inHg)	29.92	28.17	26.52	24.95
Atmosph. pressure (hPa)	1013	954	898	845
Outside temperature (°C)	15,0	11,7	8,5	5,2
Outside temperature (°F)	59	53	47	41
	Takeoff ground roll [ft] *([m])*			
ALPHA Electro	555 *(170)*	700 *(213)*	870 *(265)*	1090 *(332)*
	Takeoff distance over 50 ft / 15 m obstacle [ft] *([m])*			
ALPHA Electro	870 *(265)*	1035 *(315)*	1295 *(395)*	1420 *(433)*

Effect of outside air temperature

The table below provides data about the effect of outside temperature on takeoff runway length. Data is referenced for sea level performance at MTOM.

Temperature (°F)/(°C)	59°F / 15°C	68°F / 20°C	77°F / 25°C	86°F / 30°C	95°F / 35°C
	Takeoff runway length [ft] *[(m)]*				
ALPHA Electro	555 *(170)*	670 *(205)*	820 *(250)*	935 *(285)*	1020 *(310)*
	Takeoff distance over 50 ft / 15 m obstacle [ft] *[(m)]*				
ALPHA Electro	870 *(265)*	965 *(295)*	1045 *(320)*	1280 *(390)*	1410 *(430)*

Extreme outside temperature performance

Temperature (°F)/(°C)	32°F / 0°C	50°F / 10°C	**104°F / 40°C**
	Takeoff runway length [ft] *[(m)]*		
ALPHA Electro	455 *(140)*	490 *(150)*	**1040** ***(317)***
	Takeoff distance over 50 ft / 15 m obstacle [ft] *[(m)]*		
ALPHA Electro	785 *(240)*	835 *(255)*	**1490** ***(455)***

WARNING! The runway length required for takeoff depends on elevation and temperature. Use the following formula to determine the runway length required:
$L = 1{,}10 \cdot (L_h + L_t - L_0)$.

Abbreviations are as follows:
L_h = takeoff runway length at present elevation, ISA standard conditions (effect of elevation)
L_t = takeoff runway length at sea level at same temperature as on the given location (effect of temperature)
L_0 = zero wind takeoff runway length at 15°C at sea level (basic conditions performance data)
EXAMPLE: if the outside temperature is 25°C and you are at 500 m elevation, your takeoff runway length will be: $L = 1{,}10 \cdot (L_h + L_t - L_0) = 1{,}10 \cdot (213\ m + 250\ m - 170\ m) = 322$ meters.

Effect of the wind

Wind (head, cross or tailwind) affects aircraft's ground speed (GS).
Headwind on takeoff or landing causes the takeoff and landing distance length to shorten as the GS is smaller during these two flight stages. The opposite holds true for **tailwind** on takeoff and landing as tailwind prolongs takeoff and landing distances significantly.

Headwind shortens takeoff and landing distances by 25 feet (8 meters) with every 3 kts (1.5 m/s) of wind increase (e.g. provided there is a 6 kts (3 m/s) headwind on takeoff and landing, distances will be approximately 50 ft (16 meters) shorter than ones published in the manual).

Tailwind prolongs takeoff and landing distances by 60-65 feet (18-20 meters) with every 3 kts (1.5 m/s) wind increase (e.g. provided there is a 6 kts (3 m/s) tailwind on takeoff or landing, distances will be approximately 120-130 feet (36-40 meters) longer then ones published in the manual).

WARNING! Tailwind affects takeoff and landing performance by more than twice as much as headwind does.

The table below provides data about the effect of headwind (+) and tailwind (-) on the runway length required for takeoff and landing (referenced for sea level conditions, airplane at MTOW). Relative effect is maintained at any elevation.

	Tailwind						**windspeed**		**Headwind**					
kts (m/s)	**-6**	(-3)	**-4**	(-2)	**-2**	(-1)	**0**	(0)	**4**	(2)	**8**	(4)	**12**	(6)
	Takeoff runway length [ft] *([m])*													
ALPHA Electro	680 *(207)*		645 *(197)*		605 *(185)*		555 *(170)*		525 *(160)*		495 *(151)*		480 *(146)*	
	Takeoff distance over 50 ft / 15 m obstacle [ft] *([m])*													
ALPHA Electro	1130 *(345)*		1065 *(325)*		965 *(295)*		870 *(265)*		810 *(247)*		760 *(232)*		720 *(220)*	

Climb performance

NOTE Climb rate is measured at a max continuous motor power of 40 kW with the flaps retracted (0°) at V_y and MTOW.

ALPHA Electro	ALPHA Electro
Best climb speed (V_Y)	70 kts (130 km/h)
Best climb rate at MTOW, sea level	610 fpm (3.1 m/s)

Effect of outside air temperature

For every 5 °C (10 °F) increase in OAT versus the ISA, the climb rate decreases by 60 fpm (0.3 m/s).

Effect of altitude

The table below provides data about the effect of elevation on climb rate at best climb speed V_y at MTOW.

ALPHA Electro	ALPHA Electro
0 m (0 ft)	610 fpm (3.1 m/s)
500 m (1600 ft)	594 fpm (3.0 m/s)
1000 m (3300 ft)	561 fpm (2.8 m/s)
1500 m (5000 ft)	528 fpm (2,7 m/s)

NOTE Climb rate is measured at a max continuous motor power of 40 kW with the flaps retracted (0°) at V_y and MTOW.

Climb performance may vary depending on temperature, altitude, humidity and wing & propeller surface condition.

Cruise

Aircraft at MTOW, recommended cruise power of 20-30 kW in international standard atmosphere (ISA), sea level altitude, flaps retracted (0°):

ALPHA Electro	ALPHA Electro
Cruise airspeed	85 kts (157 km/h)

Cruise energy calculation

When flying the ALPHA Electro outside the circuit pattern, it is important to estimate when the remaining energy is sufficient for a safe return to home base. The PNR (Point of No Return) in flight is when we have just sufficient %SOC to return to base (and arrive there with 30%). This PNR is calculated for flights from point A to point A (A-A). Most ALPHA Electro flights are A-A.

NO WIND CONDITION - EXAMPLE

When flying in no wind conditions along a straight track, calculating our PNR is not particularly difficult. We have enough %SOC available to take off and fly toward our destination along our track knowing, as long as we do not proceed beyond the halfway point, we should be able to make it back to home airfield safely.

If we start with 100% SOC. We have to be back with 30%. Therefore we have a usable SOC of 70%. Half of this useable SOC is 35%. So, we have to turn back towards the home base - mission accomplished or not - at 65% of SOC. The halfway point is 65% of SOC. This is only true if we start with a full charge.

WINDY CONDITIONS - EXAMPLE

Cruise speed 85 kts IAS, and we have an outbound tailwind of 15 kts (from GPS ground speed reading). The difference between the IAS and TAS at ALPHA Electro altitudes are negligible and we can take the IAS as TAS.

Therefore:

GS outbound: 85 kts + 15 kts (tailwind) = 100 kts
GS inbound: 85 kts - 15 kts (headwind) = 70 kts
The %SOC to PNR is calculated with the PNR equation:

%PNR SOC = useable SOC x GS homebound / (GS homebound + GS outbound).

In our example, this is: 70% x 70 kts / (100 kt + 70 kts) = 28%, that is the %SOC used to reach PNR.

So our PNR is 100% - 28% = 72%, where 100% is the initial SOC in this example.

This is very important. If we are flying with a tailwind we have to turn back to the point of origin much sooner.

Descent

The reference sink rate with flaps extended to +25° and power at idle, measures 440 fpm (2.2 m/s) at 50 kts (92 km/h).

ALPHA Electro	ALPHA Electro
Sink rate at 50 kts (92 km/h), extended flaps (+25°), zero thrust	440 fpm (2.2 m/s)
Sink rate at 50 kts (92 km/h), extended flaps (+25°), with recuperation	650 fpm (3.25 m/s)

The glide

The glide is defined as unpowered wings-level flight at the speed providing best lift over drag ratio or minimum sink rate.

Should the motor become inoperative in flight, as a result of either intended or unintended actions, and it cannot be restarted, react as follows:

- establish wings-level flight at the speed providing best lift over drag ratio, if you desire to glide the greatest distance from a given altitude.

- establish wings-level flight at speed providing minimum sink rate, if you desire do stay airborne the longest. This may come in handy when you're forced to give way to other aircraft or if you simply need time to determine the most appropriate site to land out on.

ALPHA Electro	ALPHA Electro
Minimum sink speed	58 kts (107 km/h)
Minimum sink rate, flaps retracted 0°	350 fpm (1.8 m/s)
Best lift/drag ratio speed	64 kts (118 km/h)
Best lift over drag ratio , flaps retracted 0°	15:1

CAUTION! If the motor fails, especially in climb, the aircraft always loses some 30 meters (100 feet) of altitude before reaching best glide speed in wings-level unpowered flight.

Landing performance

Final approach speed should always be 55 kts (102 km/h) with flaps extended to +25°. The required landing runway length may also vary depending on the elevation, gross weight, touchdown velocity, wind direction and how aggressive the braking action is (i.e. recuperation).

The landing roll measures 410 ft (125 m) in the following conditions: aircraft at MTOW, airport at sea level and wind calm. Should you be flying solo, the required landing runway length decreases length shortens by another 30 ft (10 m).

Total landing distance over 50 ft/15 m obstacle measures 1510 feet (460 m).

Landing roll increases by 10% for every 2000 ft (610 m) increase in density altitude.
Total landing distance increases by 2% for every 2000 ft (610 m) increase in density altitude.

Energy recuperation decreases required runway length and makes the approach steeper!

Crosswind takeoffs/landings

The maximum allowed crosswind component speed on takeoff and landing is 18 kts (34 km/h).
In these conditions it is recommended not to takeoff with flaps positioned at +25°.
Normal crosswind landings are made with flaps extended to +15°. Avoid prolonged slips. After touchdown, hold a straight course with rudder and brakes as required.
Only in case of high crosswind component it is permitted to land with flaps retracted (0°).

The runway length required increases by 10% for every 5 kts of crosswind component.

6 Emergency procedures

Introduction

This chapter provides information on how to react when confronted with typical flight hazards.

NOTE See EPSI570 user action guide at the end of this chapter for a complete list of system warnings and cautions that can appear on the EPSI570 during operation.

Stall recovery

1. Reduce the angle of attack by easing-off on the control stick.
2. If the motor is running, add full power.
3. Resume horizontal flight.

Spin recovery

The ALPHA Electro is constructed in such a manner that it is difficult to fly it into an inadvertent spin. However, once spinning, react as follows:

1. If the motor is running, set power to idle (lever in full back position).
2. Apply full rudder deflection in the direction opposite to spin direction.
3. Lower the nose towards the ground to build up speed (stick forward).
4. As the aircraft stops spinning neutralise rudder deflection.
5. Slowly pull up and regain horizontal flight.

ALPHA Electro tends to recover from spin by itself after spinning about 90°.

WARNING! Keep the control stick centered along its lateral axis (no aileron deflections throughout the recovery phase!).

WARNING! After the aircraft stops spinning, recovering from the dive must be performed using gentle stick movements (pull), rather than over-stressing the aircraft. However, VNE must not be exceeded during this maneuver.

Resume normal flight when the aircraft is straight and level.

Motor failure

Motor failure during takeoff or initial climb

Ensure proper airspeed by lowering the nose and land the aircraft in runway heading, avoiding eventual obstacles in your way. Set master switch to the OFF position. Land straight ahead.

WARNING! Do not change course or make turns if this is not of vital necessity! After having landed safely, ensure protection of the aircraft and vacate the runway to keep the runway clear for arriving and departing traffic.
Do this calmly and carefully not to cause damage to yourself and any equipment.

Motor failure in climb

First ensure proper airspeed by lowering the nose, then start scanning the terrain underneath and choose the most appropriate site for landing out.

WARNING! The decision where to land when landing out is final! Changing your mind, even if you happen to come across a different, perhaps more appropriate landing site, should be your last resort.

Motor restart in flight

NOTE: The minimum height, at which a motor restart attempt can be made safely, is 1000 ft AAL.

1. Set the POWER LEVER to CUT OFF
2. Set PWR EN SWITCH to OFF
3. Set MASTER SWITCH to OFF
4. DISENGAGE the PWR CTRL Circuit breaker
After 3 seconds:
5. ENGAGE the PWR CTRL Circuit breaker
6. Set MASTER SWITCH to ON
7. Set PWR EN SWITCH to ON
8. SLOWLY INCREASE the POWER LEVER
If restart is not successful, perform an emergency landing.

Emergency landing

1. Master switch OFF.
2. Fasten your seat harness tightly.
3. ELT remote switch - ON (if necessary, especially when landing in remote/mountain ous areas).
4. Approach and land with extreme caution with +10 km/h (+5 kts) airspeed reserve if the chosen landing terrain length permits.
5. Leave the aircraft immediately after landing.

Fire

Powertrain fire on ground

Should you encounter motor fire on the ground, react as follows:
1. Come to a complete standstill, master switch OFF and disengage PWR CTRL circuit breaker.
2. Abandon the aircraft and start extinguishing the fire with a waterless agent.

WARNING! After the fire has been extinguished DO NOT attempt to restart the motor.

Powertrain fire in flight

1. Set master switch to OFF and disengage PWR CTRL circuit breaker.
2. Open all cabin vents.
3. Perform side-slip (crab) maneuver in direction opposite the fire.
4. Perform emergency landing procedure and leave the aircraft immediately

Battery system fire

Indication of battery fire is dense smoke and a distinctive chemical smell. Disengage both battery circuit breakers, land immediately and leave the aircraft as soon as possible.

WARNING! Be aware that lithium battery fires are extremely dangerous because they are self-sustaining! They are a result of chemical reactions and are impossible to extinguish. You can only prevent or delay fire propagation by continually cooling down the batteries and surrounding items with a copious amount of water.

Smoke in cockpit

1. Set master switch to OFF.
2. Open all cabin vents for adequate breathing.
3. Land as soon as possible.

EPSI570 failure

While on the ground:
During taxi: Do not takeoff!
During takeoff run: If possible and safe, abort the takeoff procedure!

While in flight:
Without power to the motor: Look for a spot to carry out a safe outlanding. If practical check the circuit breakers, disengage the system's four main switches, power lever to cut-off, and attempt a re-start.
With power to the motor: Do not switch the motor off. Attempt to fly to the next airfield and land as practical.

Flutter

Flutter is described as the oscillation of control surfaces. In most cases it is caused by abrupt control deflections at speeds close to or in excess of VNE. As it occurs, the ailerons, elevator or even the whole aircraft start to vibrate violently.

Should flutter occur, pull on the stick and reduce power immediately!

WARNING! Fluttering of ailerons or tail surfaces may cause permanent structural damage and/or inability to control the aircraft.
After a safe landing, the aircraft MUST undergo a series of check-ups performed by authorised service personnel to verify airworthiness.

Exceeding VNE

Should the VNE be exceeded, reduce airspeed slowly and continue flying using gentle control deflections. Land safely as soon as possible and have the aircraft verified for airworthiness by authorised service personnel.

BPRS

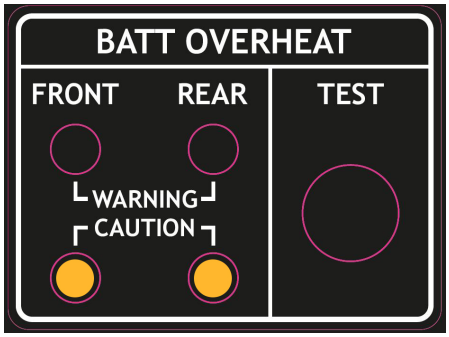
Please refer to Appendix (9-2) for information about the use of Ballistic Parachute Rescue System during emergency.

Battery overheat panel

The Battery overheat panel is located on the right side on the instrument panel. The system is composed by four LED indicators and a test button. The LED indicate which battery is in overtemperature status and the severity of the overheat. Apply the procedures below in case of LED activation. Test button is used to test LED functionallity during the pre-flight checklist.

BATTERY SYSTEM OVERHEAT - **CAUTION**

Should the BATT OVERHEAT – **CAUTION** indication light up, react as follows:



1. Identify the overheated battery
2. Pull circuit breaker of overheated battery
3. Attempt to fly to the next airfield and land as soon as possible
4. After landing turn all switches off, abandon the aircraft

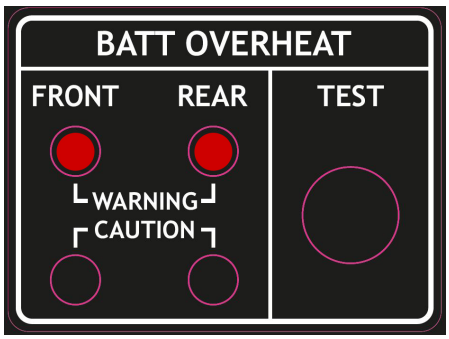
WARNING! Single battery operation is considered an emergency situation in which the maximim power output must be kept below 35 kW! Plan actions and maneuvers accordingly.

After pulling the circuit breaker the relays will disconnect. The displayed SOC will be 0% and a warning message "BATTERY 1/2 NOT PRESENT" will be displayed in the EPSI. In case RPM>300 a warning message "ONLY ONE BATTER Y PACK IS ACTIVE" will also be displayed.

Should the battery temperature rise even further triggering the WARNING light, follow battery system overheat – WARNING procedure. Be ready to perform an emergency landing.
Upon landing have the battery system examined by authorised personnel.

BATTERY SYSTEM OVERHEAT - **WARNING**

Should the BATT OVERHEAT – **WARNING** indication light up, react as follows:



1. Identify the overheated battery
2. Pull circuit breaker of overheated battery
3. Perform emergency landing as soon as possible
4. After landing turn all switches off, abandon the aircraft

WARNING! Single battery operation is considered an emergency situation in which the maximim power output must be kept below 35 kW! Plan actions and maneuvers accordingly.

After pulling the circuit breaker the relays will disconnect. The displayed SOC will be 0% and a warning message "BATTERY 1/2 NOT PRESENT" will be displayed in the EPSI. In case RPM>300 a warning message "ONLY ONE BATTER Y PACK IS ACTIVE" will also be displayed.

WARNING! Increased risk of fire from the corresponding battery compartment. Should fire develop follow fire emergency procedure.

Upon landing have the battery system examined by authorised personnel.

Battery failure

With two battery packs on board the battery system is automatically redundant. A failure of one battery pack will be displayed on EPSI570 as a warning and the system will automatically switch to a single-battery mode, enabling continuation of flight. Land as soon as practical and have the battery system verified by authorised personnel.

WARNING! Single battery operation is considered an emergency situation in which the maximum power output must be kept below 35 kW! Plan actions and maneuvers accordingly.

Ditching

1. **Airspeed - Set airspeed for best glide**
2. **Flaps - set position 0°**
3. **Throttle - idle**
4. **Disengage both battery circuit breakers (BATT F and BATT R)**
5. **Life vests - check**
6. **Items in cabin - secure**
7. **Seat belts - check fastened and tighten**
8. **Radio - set 121.5 MHz and trasmit "MAYDAY, MAYDAY, MAYDAY, ..."**
9. **ELT remote switch - ON**
10. **Transponder - Set to 7700**
11. **Approach: high seas and high wind approach into the wind, light wind heavy swells appraoch parallel to the coastline**
12. **Doors - unlatch/ unlock**
13. **Master - OFF**
14. **Disengage PWR CTRL circuit breaker**
15. **Flaps - set to max extension before making contact with the surface**
16. **Landing - make contact with water surface at the lowest possible speed**
17. **Seat belts - release immediately**
18. **Aircraft - exit as soon as possible**
19. **Life vest and raft - inflate when outside the cabin**

EPSI570 user action guide

Warning and Caution messages	
CAUTION (orange)	**User action**
BATTERY 1/2 OVERTEMPERATURE	- **Reduce power** - **Monitor battery temperature** - **Land as soon as practical if the problem persists**
SOC < 10%	- **Power lever idle** - **Land as soon as practical - monitor the residual %SOC (battery will disconnect by itself, depends on the cell voltage**)
BATTERY 1/2 SOC ADJUSTED	This message indicates that a SOC estimation failure has occurred. The SOC will be updated to a more conservative and safe value. Reset the message by pressing the knob. - **Change the flight plan according to the updated SOC value.**
WARNING (red)	**User action**
ONLY ONE BATTERY PACK IS ACTIVE	This warning appears when power controller is ON and when motor RPM exceeds 300. This message is meant to avoid the possibility of taking off with only one pack active. - **Do not take-off (if appears while on the ground)** - **Land as soon as practical (if appears during flight)**
BATTERY 1/2 NOT PRESENT	This warning means that the battery is not detected by the system. - **If this occurs on the ground do not take-off and check battery installation** - **If this occurs in flight land as soon as practical**
BATTERY 1/2 DISCONNECTED DUE TO [DISC CURRENT, CHG CURRENT, OVERTEMP, INTERLOCK, UNDERVOLTAGE, OVERVOLTAGE]	OVERTEMPerature, DISCharge CURRENT and cell UNDERVOLTAGE warnings only appear while flying. The message indicates that the system has automatically disconnected a battery pack due to the reason described. - **Reduce power immediately to 35 kW or less (battery will disconnect by itself) and land as soon as practical**
BATTERY 1/2 DISBALANCED REDUCE POWER	- **Reduce power** - **Reset message and monitor system status**
BATTERY 1/2 STARTUP FAILED EC: [X]	This warning appears after turning the power enable switch on during ground operation. »X« represents the error number. - **Do not take-off** - **NOTE the number** - **Report error number to technical support at** maintenance@pipistrel.si
DRIVE OVERTEMPERATURE	This warning appears when maximum power controller or motor temperature is exceeded. - **Reduce power** - **Monitor temperature** - **Land as soon as practical if the problem persists**
DRIVE TEMPERATURE SENSOR FAILURE	**WARNING! The power controller may reduce power to 0 if and when sensor failure happens.** - **Reduce power** - **Land as soon as possible**
DRIVE COMMUNICATION FAILURE	The warning only appears during ground operation. - **in this case the start-up is not possible**
COOLANT SENSOR FAILURE	- **Reduce power** - **Land as soon as practical**

COOLANT PUMP FAILURE	- **?**
DC/DC COMMUNICATION FAILURE	- **If this occurs on the ground do not take-off** - **If this occurs in flight land as soon as practical**
DC/DC MALFUNCTION	- **If this occurs on the ground do not take-off** - **If this occurs in flight land as soon as practical**
DC/DC NOT WORKING	This warning appears when motor RPM exceeds 300. - **If this occurs on the ground do not take-off** - **If this occurs in flight land as soon as practical**
POWER LEVER COMMUNICATION FAILURE	When this warning appears the power setting will stay on the last value. If the available power is enough to maintain level flight: - **Land at the nearest airfield** - **When the touch-down point is within the gliding cone, pull out the PWR CTRL circuit breaker and perform an emergency engine-out landing** If the available power is NOT enough to maintain level flight or is higher than MCP: - **Locate a suitable landing spot** - **When the available power is not needed anymore, pull out the PWR CTRL circuit breaker and perform an emergency outlanding**
DRIVE AUX POWER FAILURE	When this error appears, the motor and power controller don`t have power. This error only appears during ground operation.
PUMP AUX POWER FAILURE	This warning indicates water pump failure and only appears during ground operation.

7 Normal procedures

Daily inspection

The daily inspection is the same as the pre-flight inspection.

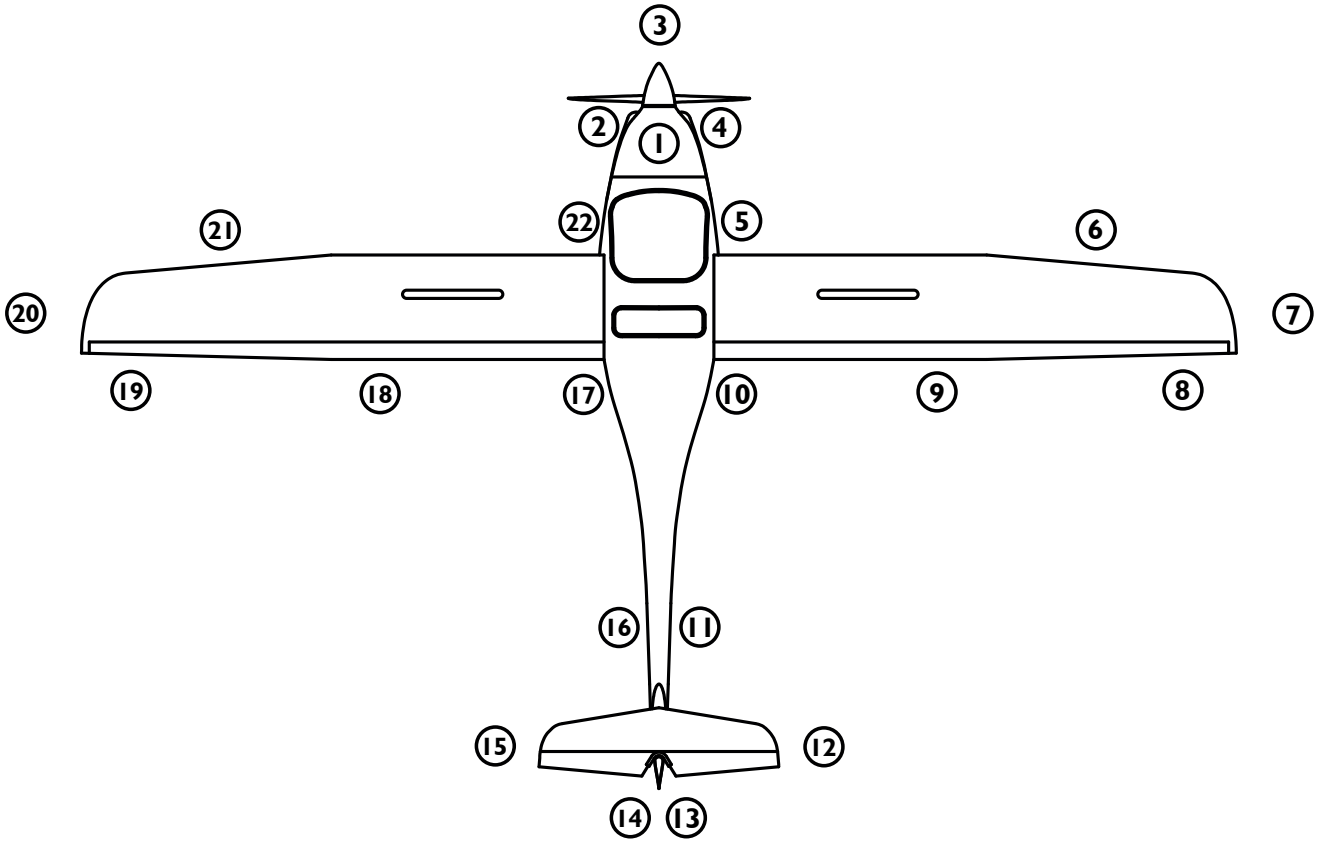
Pre-flight inspection

WARNING! Every single inspection mentioned in this chapter must be performed prior to every flight regardless of when the previous flight took place!

The person responsible for the pre-flight inspection is the pilot, who is required to perform the check-up in the utmost thorough and precise manner.

If the status of any of the parts and/or operations does not comply with conditions stated in this chapter, the damage MUST be repaired prior to motor start-up. Disobeying these instructions may result in serious additional damage to the plane and crew, including injury and loss of life!

Schematic of pre-flight inspection



1 Motor, motor cover
2 Propeller
3 Spinner, nose wheel
4 Batteries front
5 Undercarriage, RH wheel
6 Right wing - leading edge
7 Right wing tip, lights
8 Right wing - trailing edge
9 Right wing - continued
10 Fuselage (RH side)
11 Fuselage, continued (right)
12 Hor. tail surfaces (right)
13 Vert. tail surfaces (right)
14 Vert. tail surfaces (left)
15 Hor. tail surfaces (left)
16 Fuselage, continued (left)
17 Batteries back
18 Left wing - continued
19 Left wing - trailing edge
20 Left wing tip, lights
21 Left wing - leading edge
22 Undercarriage, LH wheel

Motor, motor cover (1)

Cooling fluid level: expansion tank full, overflow bottle between min and max *

Radiators and hoses: no mechanical damage and/or leakage

Fasteners and motor cover screws: tightened, motor cover undamaged, charge port door secured

*Do the cooling fluid level check only before every first flight of the day.

Batteries front (4)

Battery packs: inserted and 4 pins secured, door closed and latched.
Battery bay cooling inlet: free of all/any obstructions.
Battery pack COM and PWR cables: connected.

Spinner (3)

Spinner: no mechanical damage (e.g. cracks, impact spots), screws tight
Bolts and nuts: secured
Nose wheel: grab aircraft's propeller and push it towards the ground to verify proper nose wheel suspension operation. Then lift the nose wheel off the ground and check for nose leg strut free play.
Bolts: fastened
Tire: no cracks, adequate pressure
Wheel fairing: undamaged, firmly attached, clean (e.g. no mud or grass on the inside)

Propeller (2)

Hub and blades: no mechanical damage (e.g. cracks), surface immaculately clean
Bolts and nuts: secured

Undercarriage, wheels (5) (22)

Bolts: fastened
Landing gear strut: no mechanical damage (e.g. cracks), clean
Wheel: no mechanical damage (e.g. cracks), clean
Wheel axle and nut: fastened
Fluid line (hydraulic brakes): no mechanical damage and/or leakage
Tire: no cracks, adequate pressure

Batteries back (17)

Battery packs: inserted and secured, door closed and latched.
Battery bay cooling inlet: free of all/any obstructions.
Battery pack COM and PWR cables: connected.

Wing leading edge (6) (21)

Surface condition: pristine, no cracks, impact spots, no paint and/or edge separations
Pitot tube: firmly attached, no mechanical damage or bends. Remove protection cover and make sure it is not blocked or full of water.
Wing drain holes: make sure they are not blocked and clean accordingly.

Wing tip, lights (7) (20)

Surface condition: pristine, no cracks, impact spots or bumps, no paint separations

Wings' trailing edge (8) (19)

Surface condition: pristine, no cracks, impact spots, no paint and/or edge separations
Aileron: pristine surface, no cracks and/or impact spots, no paint abnormalities and edge separations, no vertical or horizontal free play, smooth and unobstructed deflections

Charger door (9) (18)

Charger door: secured.

Fuselage, antenna, rescue parachute cover (10) (17)

Kevlar belt covers: firmly attached, not damaged
Flaperon control system cover, antenna: firmly attached

Fuselage, continued (11) (16)

Surface condition: pristine, no cracks, impact spots or bumps, no paint separations

Horizontal tail surfaces (12) (15)

Surface condition: pristine, no cracks, impact spots or bumps, no paint and/or edge separations
Hinges: no free play in any direction
Horizontal stabilizer attachment mechanism: fastened and secured
Mylar seals covering the gap between horizontal tail surfaces: in position
Elevator: smooth and unobstructed up-down movement, no side-to-side free play

Vertical tail surfaces (13) (14)

Vertical fin bottom part: no cracks, impact spots or paint separations along main chord
Surface condition: pristine, no cracks, impact spots or bumps, no paint separations
Hinges: no free play in any direction
Rudder cable endings: intact, bolts in position
Mylar seals covering the gap between vertical tail surfaces: in position

Cockpit pre-flight inspection

BPRS activation handle safety pin:	- IN POSITION AND SECURED
Main wing spars and connectors:	- NO VISIBLE ABNORMALITIES OF METAL PARTS, SPARS, PINS AND BOLTS - ALL BOLTS AND NUTS IN POSITION
Pitot-static lines and wing tip lights electrical cables:	- CONNECTED PROPERLY AND IN POSITION
Instrument panel and instruments:	- VISUAL INSPECTION
ELT/ ELT remote switch:	- CHECK: ELT switch/remote switch positions according to table page 2-6.
Master switch OFF:	- NO CONTROL LIGHTS AND/OR ELECTRONIC INSTRUMENT ACTIVITY
Master switch ON:	- EPSI570 IS ENABLED
EPSI570 display:	- CLEAN WITH NO CRACKS.
Avionics switch :	- ON
Make sure you have set all instruments to correct initial setting:	- QNH, COMM FREQUENCY SET
Radio:	- FUNCTION CHECK
Elevator trim:	- VERIFY TRAVEL - SET TO NEUTRAL
Flap handle:	- BUTTON SPRING FIRM - LOCKING MECHANISM WORKING PROPERLY - SMOOTH MOVEMENT ALONG FULL DEFLECTIONS - NO FREE PLAY OR VISIBLE DAMAGE
Parking brake:	- APPLIED
Controls:	- FREE ALL/ANY OBSTRUCTIONS
Battery %SOC, temperature and status:	- CHECK VALUES
AUX battery voltage	- CHECK >= 13 V
Power controller status:	- CHECK
Motor status:	- CHECK
HV-Bus voltage:	- CHECK
Isolation:	- CHECK - no failure
Doors - Safety belts:	- Closed/secured - fastened
BAT EN/PWR EN switches ON:	- CHECK - no warnings
Battery overheat panel - LED test	- TEST button - push: all led operative - no caution or warning indications
Motor power check: cut off - full - cut off	- CHECK >60 kW - no warnings

Normal procedures and recommended speeds

To enter the cabin, first lift the door all the way to the wing's bottom surface. The silver knob will grab and secure the door in position. Sit on the cabin's edge and grab it to support your body. Drag yourself onto the seat, lifting only one leg over the stick for best position. Immediately after positioning yourself in the seat, check that the position of the rudder pedals suits your size and needs.

NOTE Rudder pedal position is also adjustable during flight.

To lower the door DO NOT attempt to grab and pull door's handle, but gently pull the silver knob instead. To secure the door, rotate the handle so that it locks and verify that all three closing points are secured.

Fasten the safety belts according to your size.

Adjust the rudder pedals according to your required legroom. Sit inside the cockpit and release the pressure off the pedals. Pull the black knob in front of the control stick to bring the pedals closer to you. To move the pedals further away, first release the pressure of the pedals, then pull on the knob slightly (this will release the locking mechanism). Now push the pedals forward using your feet, while simultaneously pulling on the black adjustment knob.

WARNING! Tighten both the bottom and shoulder straps of the safety harness so that you're completely secured in your seat. This is especially important when flying in turbulent conditions, as turbulence can cause injury to passengers not wearing their safety harness.

Motor start-up

Before motor start-up

CAUTION! To ensure proper and safe use of the aircraft it is essential to familiarise yourself with the motor's limitations and motor manufacturer's safety warnings. Before motor start-up make sure the area in front of the aircraft is clear. It is recommended to start the motor up with the aircraft's nose pointing into the wind.

Check the state of charge to make sure there is sufficient battery power for the planned duration of flight.

NOTE Tests have shown that the battery system does not overheat or behave adversely when the outside air temperature is between -5 °C and 37 °C.

Make sure the pitot tube is uncovered and rescue parachute safety pin removed.
Apply the wheel brakes. Apply parking brake.

Motor start-up

See Motor Start-Up on page 2-4. If power lever is not in "idle" the motor/propeller will not start running. After moving the power lever to "idle", apply power and the motor will start running.

Motor warm-up procedure

No warm-up is necessary.

Taxi

Release parking brake if set and release the handbrake. Taxiing technique does not differ from other aircraft equipped with a steerable nose wheel. Prior to taxiing it is essential to check the wheel brakes for proper braking action.
It is recommended to perform ELT periodical test before takeoff, following procedure indicated in OEM documentation. The test should be performed monthly (but not more than one per week, to save ELT battery).

Holding point

Make sure motor temperatures at full power range are within operational limits.
Make sure the safety belts are fastened and doors closed and secured at all three closing points.
For short field operations extend flaps 25°. For all other operations extend them to 15°.
Power idle.

Before takeoff power check

1. **Check PARKING BRAKE is ENGAGED**
2. **INCREASE POWER LEVER to FULL**
3. **Check POWER INDICATION >= 56 kW** (EPSI570 - flight page)
4. **CUT OFF POWER LEVER**
5. **Check BATTERIES IN "ACTIVE" MODE** (EPSI570 - system page)
6. **Check ENGINE and BATTERY TEMPERATURES** (EPSI570 - flight page)
7. **Check NO CAUTIONS or WARNINGS** (EPSI570 - flight page)

CAUTION! At FULL POWER the motor RPM should be between 2000 and 2500, while the motor power should be 56 kW or more. If this is not the case, do not proceed with flight and check the system for correct installation.

CAUTION! Max battery temperature before takeoff is 40°C (check section 3 - Limitations). Temeratures higher than 40°C at takeoff may result in high in-flight battery temperatures when OAT is high or high power settings are applied. See also section 6 - Emergency procedures.

Takeoff and initial climb

Before lining-up, verify the following:

Parking brake / brakes : Released
Battery SOC: sufficient
Safety belts: fastened
Cabin doors: closed securely
Trim lever: in neutral position
Flap handle: For short field operations extend flaps 25°. For all other operations extend them to 15°
Runway: clear

Now release brakes, line up and apply full power.
Verify motor PWR at full power not less than 56 kW.

CAUTION! Keep adding power gradually, as sudden bursts of power can cause airframe damage on certain runways due to rocks and debris.

WARNING! If the motor PWR is less than 56 kW with power lever in full position, abort take-off immediately, come to a standstill and verify systems.

Start the takeoff roll pulling the control stick one third backward and lift the nose wheel off the ground as you accelerate. Reaching 40-43 kts (75-80 km/h), gently pull on the stick to get the aircraft airborne.

CAUTION! Takeoff with crosswind (lateral component max 18 kts/34 km/h) should be performed by applying control stick pressure into the wind. Special attention should be paid to maintaining runway heading!

Initial climb

When airborne, apply brakes momentarily to prevent in-flight wheel spinning.
Accelerate at full power and maintain proper climbing speed.
When you reach 60 kts (110 km/h) above 150 ft (50 m), retract the flaps to 15°. Retract the flaps to 0° when reaching 70 kts (130 km/h) at 300 ft (100 m). Reduce power to 40 kW and continue climbing at 76 kts (140 km/h).
Adjust the trim to neutralise stick force if necessary.
Remember to keep the motor temperatures and RPM within operational limits during climb out.

CAUTION! Reduce power and lower nose (i.e. increase speed) if additional motor cooling is required.

Cruise

When horizontal flight has been established, verify on-board energy quantity again.
Keep the aircraft balanced while maintaining desired flight parameters.
To conserve energy, cruise at 85 kts (157 km/h) or slower.

Cruising in rough conditions

Should you experience turbulence, reduce airspeed below VNO and continue flying with flaps retracted (0°).

CAUTION! In rough air, reduce motor power if necessary to keep airspeed below VNO.

Descent and final approach

Descend at speeds at or below VNO with the flaps retracted (0°)

For approach reduce speed to 70 kts (130 km/h) and extend flaps to 15° only after turning to base leg.
Adjust motor power to maintain proper airspeed. Set the trim to neutralise stick force if necessary.
During the descent, monitor temperatures and keep them within operational limits.

CAUTION! With power lever set close to idle, the motor will recuperate energy during the descent and the vertical sink speed will increase, similar to the effects of airbrakes on sailplanes.

On final, reduce speed to 60 kts (111 km/h) and extend flaps to 25°.
Align the aircraft with the runway and reduce power to idle.
Maintain an airspeed of 55 kts (102 km/h).
Use the power lever to control your descent glide path. Control your attitude and crab if necessary.

CAUTION! Crosswind landings require higher final approach speeds to ensure safe maneuvrability. Increase the approach speed by 1 kts for every 1 kts of crosswind component e.g. If there's a crosswind component of 5 kts, increase the approach speed by 5 kts.

Roundout and touchdown

CAUTION! See chapter "Performance" for landing performance.

Roundout and touchdown (flare) occurs at following airspeeds:

Calm air, aircraft at MTOW	**40 kts (75 km/h) IAS**
Rough air, aircraft at MTOW (incl. strong crosswinds up to 18 kts (34 km/h) of lateral component)	**42 kts (78 km/h) IAS**

CAUTION! Land the aircraft in such a manner that the two main wheels touch the ground first, allow the nose-wheel touchdown only after speed has been reduced below 25 kts. When lowering the nose wheel to the runway the rudder MUST NOT be deflected in any direction (rudder pedals centered).

When on the ground, start the braking action while holding the control stick in full back position. Steer the aircraft using the rudder only. If the runway length is sufficient, come to a complete standstill without engaging the brakes, while holding the control stick slightly backwards as you slow down.

NOTE In event of hard landing ELT may activate. Transmission is signalled by the blinking LED light on the ELT remote switch. Stop the transmission by resetting the switch (see table page 2-6).

Crosswind approach and roundout

CAUTION! Crosswinds prolong landing runway length due to elevated airspeed

When performing a crosswind landing, the wing-low method should be used. When using the wing-low method it is necessary to gradually increase the deflection of the rudder and aileron to maintain the proper amount of drift correction.

WARNING! If the crab method of drift correction has been used throughout the final approach and roundout, the crab must be recovered before the touchdown. Do this by applying rudder to align the aircraft's longitudinal axis with its direction of movement.

Parking

Come to a complete standstill by using the handbrake lever. Carry out motor shut-down (see page 2-5). Insert BPRS handle's safety pin. Apply the parking brake. Disengage PWR CTRL circuit breaker. Open cabin door, unfasten safety belts and exit the cabin. Chock the wheels and cover the pitot tube with it's protective sleeve.

8 Handling and maintenance

Special inspections

After having exceeded VNE or landed in a rough manner:

Check the undercarriage, fuselage & wing surfaces and main spars for abnormalities. It is highly recommended to have the aircraft verified for airworthiness by authorised service personnel.

Battery inspection

Make sure the battery packs are secure and that both cables are properly connected. Check for any signs of wire/cable damage or chafing.

Tie down

Point the aircraft into the wind and retract flaps fully (0°). Chock all three wheels. Put an extra rope around the tail-cone and into the slot between the propeller and the spinner. When using rope of a non-synthetic material, leave sufficient slack to avoid damage to the aircraft. To tie down the tail, tie a rope through the tail skid and secure it to the ground. When finished, cover the pitot tube with a protection cover.

Storage

Ideally, the aircraft should be stored in a hangar. For increased in-hangar maneuvrability use of an original Pipistrel push-cart is recommended. Stuff the battery bay cooling inlets with some foam or a rag to prevent the ingress of dirt, dust, small animals, etc..
The BPRS is installed in your aircraft, so make sure the activation handle safety pin is inserted every time you leave the aircraft.
Should the aircraft be stored for a longer period of time (more than 6 months), disconnect the 12V battery in the cockpit to prevent the battery from over-discharging during storage.

CAUTION! Follow the instructions given in the battery/charging section in chapter "Aircraft & systems".

Cleaning

Use fresh water and a soft piece of cloth to clean the aircraft's exterior. If you are unable to remove certain spots, consider using mild detergents. Afterwards, rinse the entire surface thoroughly.
The Lexan surfaces are protected by an anti-scratch layer on the outside. To avoid damaging these protective layers and coatings, always use fresh water only to clean the surfaces.
To protect the aircraft's surface (excluding Lexan surfaces) from the environmental contaminants, use high quality car wax.
The interior is to be cleaned with a vacuum cleaner.
Cover or stuff the battery bay cooling inlets with foam or protective tape to prevent water or cleaning solutions from entering the battery bays.

Keeping your aircraft in perfect shape

In order for the ALPHA Electro to perform the way it should, all of the airframe's surfaces must cleaned on a regular basis. This is especially true for the wing's leading edges, which can seriously affect performance if left dirty. Cleaning must be carried out carefully, so that the aircraft's composite surfaces don't incur any damage.

Precautions

Rubbing any of the aircraft's surfaces aggressively or polishing any of them is not permitted and, if necessary, can only be carried out by an approve maintenance organization.

Avoid the use of ALL aggressive cleaning solutions and organic solvents whenever possible, including window cleaning spray, benzene, aggressive shampoos etc.

When flying in regions with a lot of bugs in the air the leading edges of the airframe (propeller, wings, tail) need to be protected before flight with antistatic furniture spray cleaner such as Pronto (transparent, manufacturer: Johnson Wax), or something equivalent. When using such spray, do not apply it directly onto the wing but onto a soft cloth instead (old T-shirts are best).

After having finished with flight activity for the day, clean the leading edges of the airframe as soon as possible with a lot of water and a drying towel (chamois, artificial leather skin). This will be very easy to do if the leading edge was sprayed with an antistatic spray cleaner before flight.

Post-flight wash down

Bugs, which represent the most of the dirt to be found on the airframe, are to be removed with clean water and a soft cloth (this can also be done using a drying towel, chamois or artificial leather skin). Begin by soaking all the leading edges of the airframe first. Then wipe the aircraft's entire surface until it is completely dry. Clean the propeller and remove any grease spots separately using a mild car shampoo with a wax.

CAUTION! Do not, under any circumstances attempt to use aggressive cleaning solutions, as you will severely damage the lacquer, which is the only protective layer before the structural laminate.

When using the aircraft in difficult atmospheric conditions (intense sunshine, dusty winds, coastline, acid rains etc.) make sure to clean the outer surface more thoroughly.

CAUTION! Do not, under any circumstances attempt to remove such bug-spots with abrasive sponges and/or rough polishing pastes.

Periodical cleaning of all outer surfaces with car shampoo

It is recommended the aircraft be cleaned from top to bottom using a soft sponge. Be careful not to use a sponge that is contaminated with any fine particles, such as those found in mud and sand, as this could abrade/damage the surface. While cleaning, soak the surface and the sponge many, many times. Use a separate sponge to clean the bottom of the fuselage, as is it usually greasier than the rest of the airframe. When pouring water over the airframe, be careful not to direct it over the charger door, battery inlets, wing-fuselage joining section, BPRS straps and cover, pitot tube, tail static probe and/or motor cowlings.

Always rinse the shampooed surfaces again before they dry, then just wipe the whole aircraft dry using a drying towel, chamois or artificial leather skin. Also, clean the control surface gap seals on the empennage. Lift the seals gently and insert ONE layer of cloth underneath, then move along the whole span of the seal.

Cleaning the transparent Lexan surfaces

All the of the ALPHA Electro's window surfaces are made of Lexan. Cleaning Lexan is not the same as cleaning Plexiglas. It is really important to only use clean water (no cleaning solutions are necessary) when cleaning and a really clean drying towel.

CAUTION! Do not use the towel that was used to dry the airframe's surfaces to dry the window surfaces. Use another unused towel for the window surfaces.

Should the window surfaces be dusty, remove the dust first by pouring water (not spraying!) and gliding your hand over the surface. Glide the drying towel over the surface, squeeze it out and soak it before touching the Lexan again. If there are bugs on the windshield, soak them with plenty of water first, so less wiping is necessary. After drying the window surface, apply some antistatic furniture spray cleaner such as Pronto (transparent, manufacturer: Johnson Wax), or something similar and wipe the surface clean with a separate soft cotton cloth.

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9 Appendix

BPRS: use, handling and maintenance

System description

The BPRS provides you with a chance to rescue yourself from an unexpected situation.
The system is placed inside a durable cylinder mounted on the starboard side of the aft battery bay. The parachute is Inside this cylinder and stored inside a deployment bag with a rocket underneath. This brand new design deploys a canopy that is not gradually drawn from the container or exposed to distortion by air currents, but it actually opened safely in 0,4 to 0,7 seconds over at 50-60 ft above the aircraft. It incorporates a special deployment bag, which decreases the risk of aircraft debris damaging the canopy.
The BPRS is activated manually, by pulling the activation handle mounted on the top of the cabin bulkhead. After being fired, the main canopy opens and fully inflates in about 3.2 seconds.

WARNING! Activation handle safety pin should be inserted when the aircraft is parked or stored in a hangar to prevent accidental deployment. However, the instant pilot boards the aircraft, the safety pin MUST be removed!

Using the BPRS

Typical situations for use of the BPRS are:

- structural failure
- mid-air collision
- loss of aircraft control
- motor failure over hostile terrain
- pilot incapacitation (incl. heart attack, stroke, temp. blindness, disorientation...)

Prior to activating the system (if time permits):

- shut the motor down and set the master switch to OFF
- fasten safety harnesses tightly
- protect your face and body

To deploy the parachute, firmly pull the activation handle out towards the instrument panel until it extends at least 15” (38 cm) out of it’s housing.

Once you have pulled the handle and the rocket has deployed, it will be about two seconds before you feel the impact produced by two forces. The first force is that of the system stretching. The second force follows after the canopy opens. It will seem as if the aircraft has pulled backwards briefly. The airspeed is reduced instantly and the aircraft begins descending.

As a pilot you should know that the phase following parachute deployment is unpredictable. If in such a situation for the first time, understand that determining where to land and doing so properly is out of your control.

CAUTION! Should you end up in power lines (carrying electrical current), DO NOT under any circumstances touch any metal parts inside or outside the cockpit. This also applies to anyone attempting to help or rescue you. Be aware that anyone touching any part of the aircraft while standing on the ground will probably suffer mayor injury or die of electrocution. Therefore, you are strongly encouraged to confine your movements until qualified rescue personnel arrives at the site to assist you.

After the BPRS has been used or if you suspect any possible damage to the system, do not hesitate and immediately contact the manufacturer!

Handling and maintenance

Prior to every flight all visible parts of the system must be checked for proper condition. Special attention should be paid to corrosion on the activation handle inside the cockpit. Also, the main fastening straps on the outside of the fuselage must be undamaged at all times.
Furthermore, neither system, nor any of its parts should be exposed to moisture, vibration and UV radiation for long periods of time to ensure proper system operation and life.

All major repairs and damage repairs MUST be done by the manufacturer or authorised service personnel.

For all details concerning the BPRS rescue system, please see the "BPRS - Galaxy Rescue System Manual for Assembly and Use".

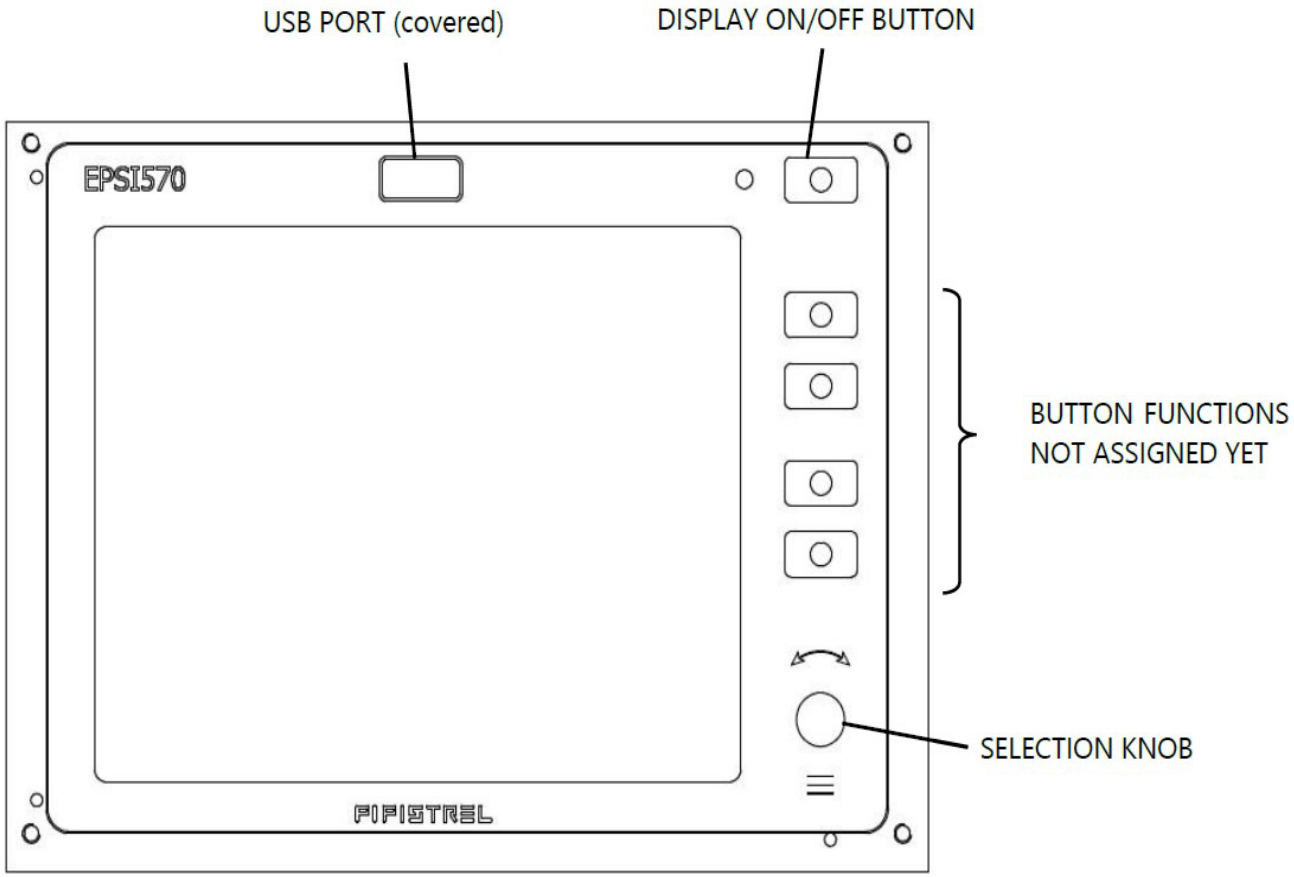
EPSI570 System description

EPSI570 is an integrated avionics device which monitors several propulsion system operational parameters on the ALPHA Electro. The display informs the user about system status and shows RPM, power controller temperature, motor temperature, coolant temperature, state of charge (SOC), battery temperature and state of health (SOH).

EPSI570 device is installed on the instrument panel of the aircraft and is located in the center or starboard side depending on the panel configuration (See page 2-4). The device is composed of a main display, a selection knob, five buttons (only the first one from the top is functional) and a USB port for software updates.

The device is operative when the AVIONICS switch is engaged. The display is switched off by pressing the first button, which does not deactivate the system, but just turns the screen off.

Rotation of the selection knob allows the user to move from page to page on the display. Warning and caution messages are aknowledged by pressing the selection knob. Next message, if present, will appear.



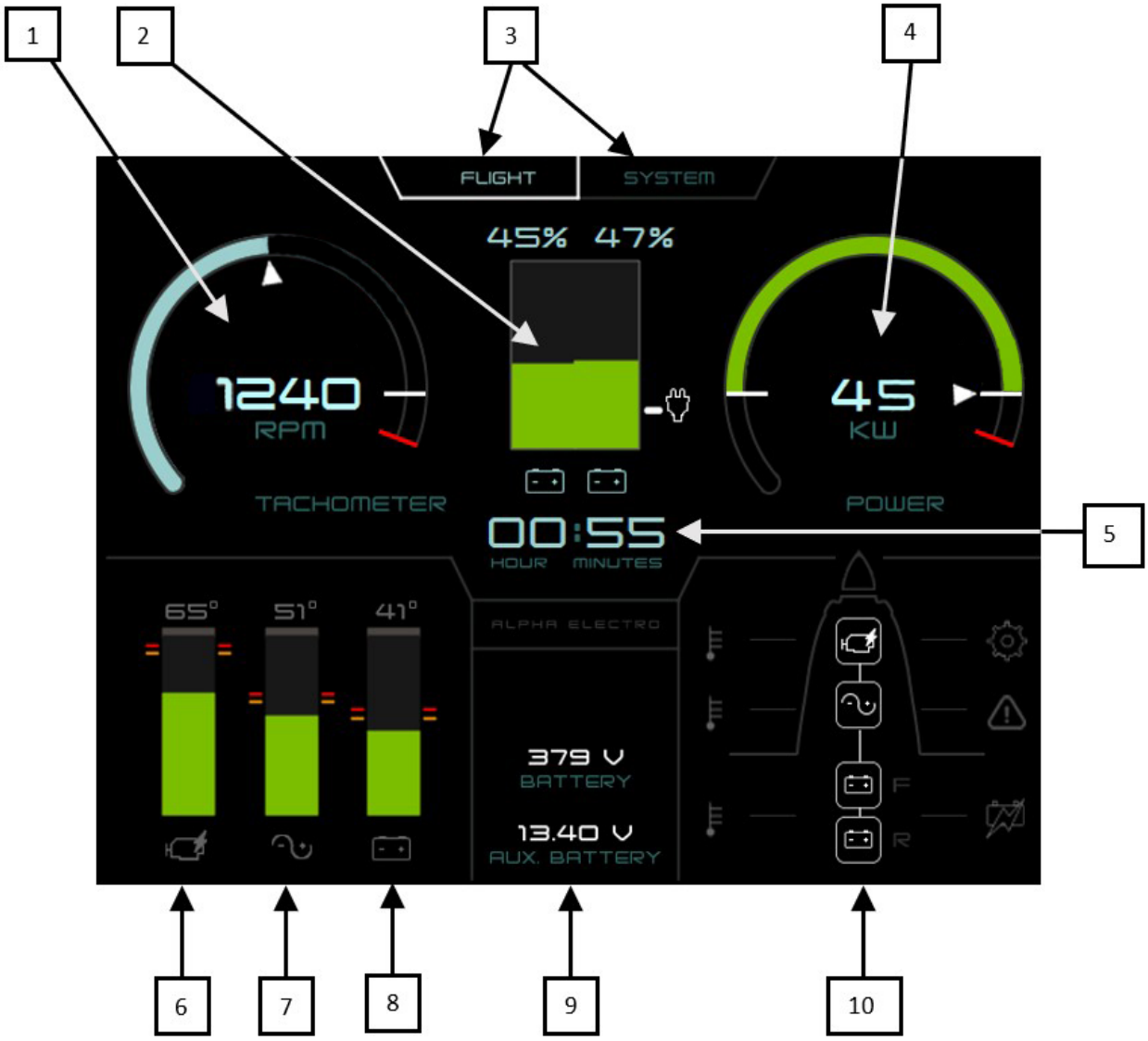
Display Modes

EPSI570 has three different display modes/pages: Flight mode, System mode and Charge mode. The transition from a mode to another is done by the selection knob rotation. Charge mode page is available during battery charge process.

NOTE values shown in the pictures below are for demontrative purposes only and do not apply to any specific real operational situation.

FLIGHT mode

FLIGHT mode is the mode used most during flight. It displays the actual operational parameters like RPM and power kW (battery output power). This screen allows the monitoring of component status and tempreratures, battery voltage and warning messages as well.
See the picture below for a description of FLIGHT mode page.



1 - RPM actual value, 2 - Battery state of charge (one bar per each battery), 3 - Actual menu page,
4 - Power actual value, 5 - Remaining flight time, 6 - Motor temperature,
7 - Power controller temperature, 8 - Battery temperature, 9 - Battery and aux battery voltage,
10 - System status

SYSTEM mode

SYSTEM mode shows several diagnostic values of the system components. This mode is selected by rotating the knob. Refer to the table below for a short description of the parameters.

BATTERY section	
One column for each battery	
Parameter	**Description**
Mode:	Battery status (ready = connected ; active = connected and power relays closed ; error)
SOC:	State Of Charge of the batteries
MAX temp:	Shows the max temp inside the battery pack, detected by the temperature sensors integrated. (x) value: number of temperature sensors not working
MIN V: MAX V:	Minumum and Maximum voltage value of the cells in each battery pack.
Bus U:	Voltage on the bus (power lines after the batteries) (0 when batteries are ready but no power transfer)
Batt V: Batt I:	Battery voltage and current. Negative values possible during charging.
PC err:	Pre-Charge error. This value is for servicing purposes.

Parameter	Description
SW / bal:	Software version / balancing (0 = balancing not active ; 1 = active)
Uptime:	Uptime/elapsed lifetime of the battery (minutes)

DC/DC section

DC/DC converter

Parameter	Description
Presence:	yes/no: active output to the bus or not
State/SW:	Active output after the converter First number presents State; 0 = not active, 32 = active Second number presents SW, software version
Output V: Output I:	Voltage and current output of the converter
Input V: Input I:	Voltage and current input to the converter

DRIVE section

Power controller and motor

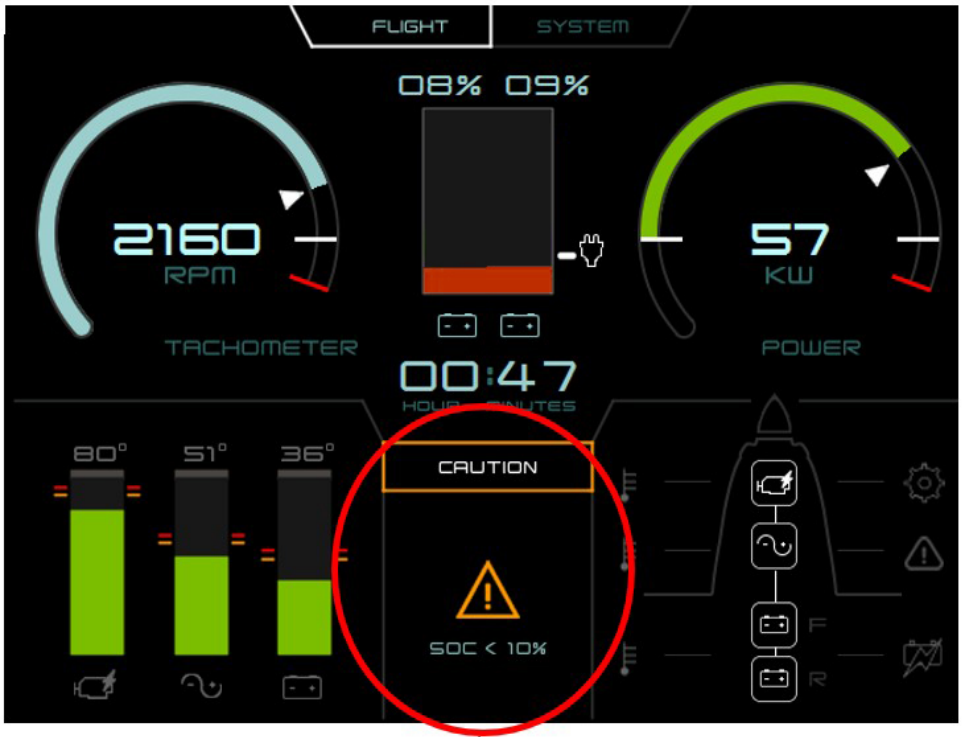
Parameter	Description
NMT State: Status:	Status of the power controller
Temp M/I:	Motor and power controller temperatures
RPM:	RPM
Coolant:	Coolant temperature after and before the cooler
Hobbs:	Hobbs meter of the power controller
Isolation:	- Field not used -

POWER LEVER section	
Power lever	
Parameter	**Description**
Presence:	yes/no: On-line status of the component
Output:	Value (0 to 1000) depending on the linear power position
Scaled:	Value (0 to 1000) - software scaled and adapted output value using a fixed map for the conversion. The relationship between output and scaled values can't be modified by the operator
Final:	Power controller final value (-300 to 1000). It takes the recuperation contribution into account
Seen zero:	yes/no: shows if the power lever has been moved to idle after battery activation. This is a safety feature. The motor can only be started once power lever has been moved to idle

Warnings and Cautions messages

System or component malfunctions, warnings and errors are shown in the central part of the display when in FLIGHT mode. It is possible to reset the warning and error messages by pressing the knob. The warning and error messages are "descriptive", and give a basic description of the problem and/or system affected.

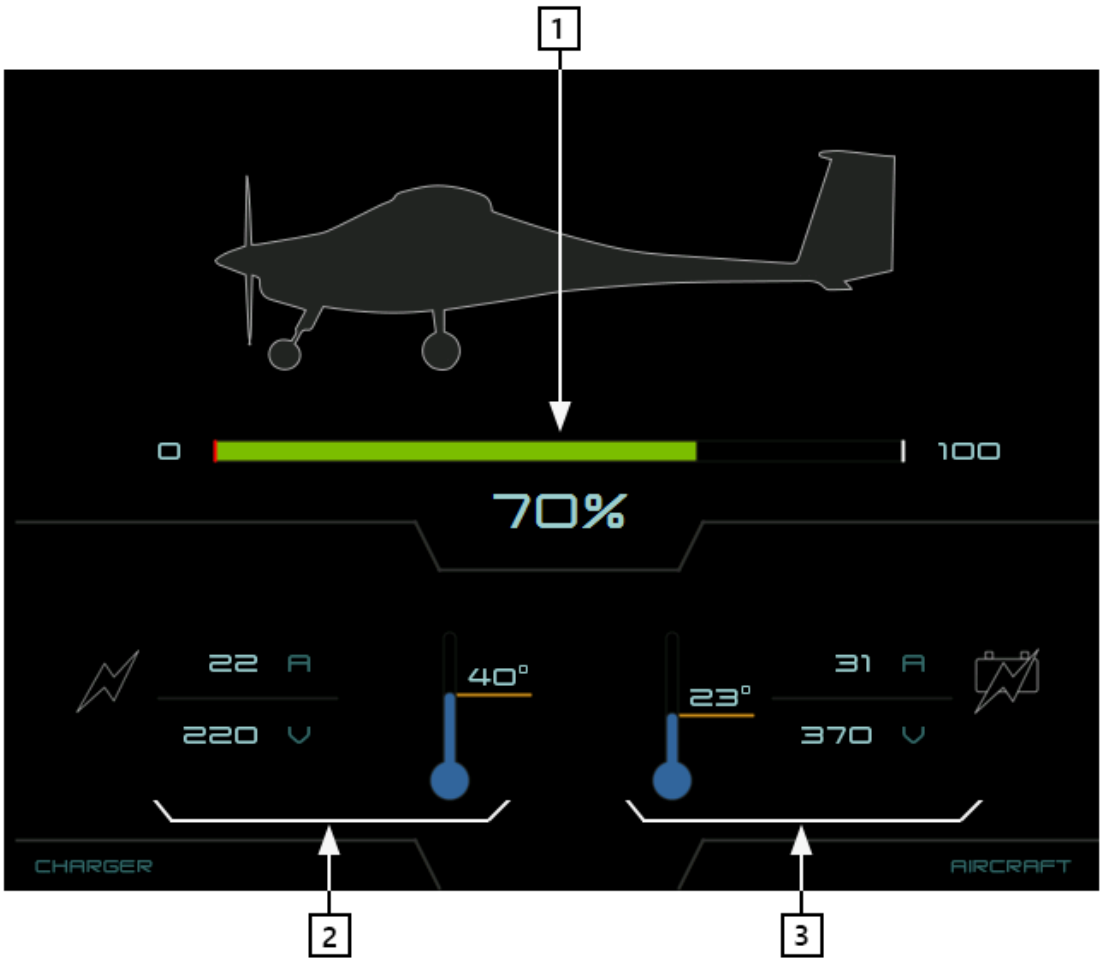
NOTE See EPSI570 user action guide in Emergency procedures section of this manual for a complete list of system warnings and cautions that can appear on the EPSI570 during operation.



EPSI570 screen area displaying warning and caution messages

CHARGE mode

CHARGE mode is active during charging process. It displays the actual charging process parameters in the form of a progress bar (100% is charge completed), current, voltage and temperatures of the charger and of the aircraft battery system.



1 - Charge - progress bar %, 2 - Charger - input parameters: AC current (mains), voltage (mains), charger power module temperature, 3 - Aircraft - battery system parameters: DC input current, charging voltage, battery temperature (highest value measured among all temperature sensors).

Charger user action guide

CHARGER	
Error	**User action**
CONNECTOR UNLOCK FAILURE	- **Abort charging** - **Contact technical support at** maintainance@pipistrel.si
BALS UNLOCK FAILURE	When this error appears, the cable between the charger and the power source not plugged in properly. - **Disconnect and re-connect the charging cable**
POWER STAGE BOOT FAILURE	- **Contact technical support at** maintainance@pipistrel.si
POWER STAGE INPUT VOLTAGE FAILURE	- **Abort charging** - **Contact technical support at** maintainance@pipistrel.si
TC NOT PRESENT	This error appears when the TC charging module isn't working. - **Contact technical support at** maintainance@pipistrel.si
RELAY TURN ON FAILURE	- **Contact technical support at** maintainance@pipistrel.si
RELAY TURN OFF FAILURE FAILURE	- **Contact technical support at** maintainance@pipistrel.si
BATTERY VOLTAGE DETECTION FAILURE	- **Contact technical support at** maintainance@pipistrel.si
COMMUNICATION FAILURE	- **Abort charging** - **Contact technical support at** maintainance@pipistrel.si
EA LOCK FAILURE	When this error appears, the cable between the aircraft and the charger is not plugged in properly. - **Disconnect and re-connect the charging cable**
BATTERY ACTIVATION FAILURE	- **Abort charging** - **Contact technical support at** maintainance@pipistrel.si
CHARGING RELAY FAILURE	- **Abort charging** - **Contact technical support at** maintainance@pipistrel.si
UNSUPPORTED BATTERY TYPE	- **Abort charging** - **Contact technical support at** maintainance@pipistrel.si

Calibrated airspeeds (CAS)

Airspeed limitations

	Velocity	CAS [**kts** (km/h)]	Remarks
VS0	**Stall speed landing configuration**	**41** (76)	Stall speed flaps extended +25°
VS	**Stall speed clean**	**45** (83)	Stall speed flaps retracted 0°
VFE	**Max. velocity flaps extended**	**71** (131)	Do not exceed this speed with flaps extended +15°.
		62 (115)	Do not exceed this speed with flaps extended +25°.
VA	**Design maneuvering speed**	**89** (165)	Do not make full or abrupt control movements above this speed.
VNE	**Velocity never to be exceeded**	**130** (241)	Never exceed this speed in any operation.
VNO	**Velocity normal operating**	**106** (196)	Maximum structural cruising speed in turbulent air (V_c).

Stall speeds

Stall speeds at MTOW (1212 lbs / 550 kg) for the ALPHA Electro are as follows:

Flap Setting	Stall Speed (KCAS)	*Stall Speed (KIAS)*
Flaps 0° (retracted):	**45 KCAS (83 km/h)**	***43 KIAS (80 km/h)***
Flaps +15° (extended):	**43 KCAS (80 km/h)**	***40 KIAS (74 km/h)***
Flaps +25° (extended):	**41 KCAS (76 km/h)**	***38 KIAS (70 km/h)***

Performance

ALPHA Electro	60 kW Electric
Best endurance speed	85 KCAS (157 km/h)
VNE	130 KCAS (200 km/h)

Training/Familiarisation supplement

Pipistrel offers additional computer-based training for anyone interested in becoming more familiar with the ALPHA Electro. Contact Pipistrel to find out more.

Conversion table

SI	US	US	SI
1 bar	14.5037 psi	1 psi	0.0689 bar
1 mm2	0.0016 in2	1 in2	625 mm2
1 cm2	0.1550 in2	1 in2	6.4510 cm2
1 daN	2.2481 lbf	1 lbf	0.4448 daN
1 g	0.0353 oz	1 oz	28.328 g
1 hPa	0.0295 in.Hg	1 in.Hg	33.898 hPa
1 kg	2.2046 lb	1 lb	0.4536 kg/min
1 kg/min	2.2046 lb/min	1 lb.min	0.4536 kg/min
1 l	0.2641 US gal	1 US gal	3.7864 l/min
1 l	1.057 US quart	1 US quart	0.9461 l
1 l/min	0.2641 US gal/min	1 US gal.min	3.7864 l/min
1 daNm	88.4956 lbf.in	1 lbf.in	0.0113 daNm
1 daNm	7.3801 lbf.ft	1 lbf.ft	0.1355 daNm
1 m	3.2809 ft	1 ft	0.3040 m
1 mm	0.0394 in	1 in	25.4 mm
1 cm3	0.06102 in3	1 in3	16.393 cm3
1 hPa	0.0145 psi	1 psi	68.965 psi

Warranty statement/voids

For applicable warranty terms and conditions please refer to www.pipistrel-aircraft.com

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